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Credit Misallocation and Disintermediation in China's Infrastructure Financing

Xiang Chi
University of Colorado Boulder

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Department of Economics

University of Colorado Boulder
Boulder, Colorado 80309

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Abstract

This paper investigates how the institutional arrangement in China's financial market increases the cost of capital for underdeveloped areas. I show that fiscal capacity results in higher leverage but not superior profitability for local government financing vehicles. Infrastructure in fiscally strapped cities is more growth-enhancing, however, they can hardly access the low-interest bond market, and instead largely rely on expensive bank loans. To raise a given amount of debt, a disadvantaged city would fork over anywhere from zero to five times more interest of what would cost a city with bond instruments. Such credit redlining spawns a vicious circle that results in a salient and persistent interregional inequality.

1 Introduction

Over the past decades, China has made remarkable achievements in infrastructure development. The rapid urbanization since the 1980s has induced heightened demand for infrastructure. Infrastructure stimulates a local economy, and thus boosts the promotion prospect of the politician in office. However, the 1994 fiscal reform shifted a large portion of local tax revenue to the central government (Han and Kung, 2015; Jin et al., 2005; Zhang and Zou, 1998). Local tax revenue and grants-in-aid can hardly make ends meet. To make the matter worse, China's budgetary law had prevented subnational governments from either running a fiscal deficit or borrowing directly from creditors. To circumvent this statutory restriction, local governments set up state-owned enterprises (SOE) to borrow indirectly for infrastructure investment (Ang et al., 2019; Chen et al., 2020; Cong et al., 2019; Gao et al., 2021; Huang et al., 2020). This special type of SOE is called the "Local Government Financing Vehicle" (LGFV). The debt raised by LGFVs skyrocketed in the aftermath of the 2008

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[*]Department of Economics, University of Colorado Boulder (Email: xich0606@colorado.edu).

financial crisis, which aroused widespread attention among policymakers, practitioners, and economists.[1]

This paper investigates two key questions. For one, how does the institutional arrangement in China's financial market increase the cost of capital in infrastructure financing for underdeveloped areas? For another, how does the unevenness in financing mode translate into interregional inequality? The macro-finance theory has extensively highlighted financial access as a pivotal factor for growth.[2] Financial markets and intermediaries lessen the sting of credit constraint for productive firms. However, the literature has paid little attention to the structural distress of inadequate cheap capital despite adequate access to external finance and its profound implications on regional disparity. This study fills this void.

I assemble a novel dataset of city-level fiscal budgets, firm-level bond issuance and accounting statements, and bureaucrat-level characteristics spanning the years from 1999 to 2018, collected from various sources. I unveil the pattern of credit misallocation and disintermediation in infrastructure financing from three perspectives. First, transportation infrastructure in fiscally strapped cities is more growth-enhancing, as evidenced by higher shadow price in a hedonic approach. However, their cost of capital can hardly rival those of wealthy ones. Second, LGFVs in wealthy and high-notch cities operate with higher leverage and utilize more bond financing, but do not outperform those of low-income cities in terms of profitability and liquidity. This is robustly confirmed in both city and firm data with relevant controls. Third, local capital budgeting in infrastructure is under the sway of the opportunistic behavior that stems from bureaucrats' promotion incentive. I identify an inverted U-shaped curve for infrastructure spending and land remise with regard to the mayor's age. To ensure that my results are unique to the government-LGFV nexus, I conduct placebo tests on three alternative types of firms and find that such patterns either turn insignificant or are substantially weakened.

Cross-country, industry-level, and firm-level studies on finance and growth yield preponderant evidence that a well-functioning financial system is growth-enhancing (Levine, 2005). In a frictionless financial market, capital first flows into the most productive and profitable sector. However, credit misallocation exists in many emerging or transitional economies. For instance, SOEs in China predominantly utilize loanable funds, which are more difficult to obtain for private firms (Allen et al., 2005; Guariglia et al., 2011; Song et al., 2011). Within the private sector, crony capitalism prevails such that firms with political connections are more likely to clinch credits (Cull et al., 2015). Financially constrained firms sometimes have to use informal channels which come with exorbitant cost as compared to traditional intermediaries.[3]

The aforementioned studies extensively compare the credit allocation between the state

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[1]Appendix Figure A.1 shows that the debt ratio of public facility investment for cities mounted from 13% in 1994 to over 50% in the 2000s, with a quantum leap in 2009.

[2]See Levine (2005) for a survey on the effect of financial development on economic growth.

[3]Informal channels include fiducial business, peer-to-peer lending (IOU), commercial paper, crowdfunding, pawning, etc. Ayyagari et al. (2010) find that firms using bank loans grow faster than those using informal channels.

and the private sector, but overlook the nuances of financing modes within the state sector. Although SOEs in general are less financially constrained than private firms, there exists a split in their financing modes. Specifically, bank loans are costlier than bonds. For wealthy or high-notch cities, their LGFVs received more government appropriations or more valuable properties than their ill-endowed counterparts. Meanwhile, the central government set a nationwide procrustean standard for bond issuance. Consequently, well-endowed LGFVs have preferential access to the low-cost bond market, while expensive bank loans are often the only game in town for LGFVs in disadvantaged cities.

This paper joins the existing studies on firm capital structure. The corporate finance literature proposed three premier theories: pecking order, trade-off, and market timing.[4] They model the determinants of firm capital structure from various microeconomic perspectives. Closer in spirit to this paper is the pecking-order theory: a firm will begin with its retained earnings, then seek external debt, and lastly tap equity financing (Myers and Majluf, 1984). Within debt financing, bank debt and publicly traded debt (*a.k.a.* bond) are the two dominant modes. Prior studies find that public debt is mostly sought after by firms with highly-rated credit (Denis and Mihov, 2003), more growth options or stronger bargaining power in default (Morellec et al., 2015), lower odds of financial distress (Chemmanur and Fulghieri, 1994), and excess control rights held by large shareholders (Lin et al., 2013). Large and credit trustworthy firms diversify their debt structures across various stripes (Colla et al., 2013). Small, immature, and risky firms use bank debt exclusively (Bolton and Freixas, 2000; Hackbarth et al., 2007). Some research stretched out of the asymmetric information framework and looked into political connection and its associated credit access (e.g., Chan et al., 2012; Li et al., 2008). This paper illustrates how the cost of capital difference emanates from asymmetric information in the financial market and projects its insights onto a broad screen of macroeconomic development. It also goes down the politics-finance path and illuminates the interlinkage between the pattern of local capital budgeting and the age-promotion rule of bureaucrats.

This paper is also related to the genre of literature on the distortion in China's market-oriented reform (e.g., Brandt et al., 2013; Hsieh and Klenow, 2009). It documents the factor market misallocation across sectors and regions, and its consequence on productivity. Yet, there is a dearth of research for the persistent effect of credit misallocation on development disparity. Not only does this paper add to the existing literature on financial deepening and economic performance, but also it navigates into an uncharted territory about the effect of bifurcated infrastructure financing within the state sector on urban development. The paper sheds light on a novel mechanism that the rising disparity across Chinese cities is attributable to this credit misallocation in terms of the access to disintermediated finance.

The rest of this paper proceeds as follows. Section 2 navigates through the institutional background. Section 3 describes my data. Section 4 presents the estimation strategy and empirical findings. Section 5 offers concluding remarks.

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[4]The trade-off theory weighs the tax shield of debt against the loss from bankruptcy. The market timing theory makes equity issuance contingent on stock market performance. See Frank and Goyal (2008) for a survey on these theories.

2   Background

2.1   Subnational Public Finance

In 1994, China's central government instituted a fiscal reform to solve its long-standing expenditure overrun. The reform redefined the revenue sharing system by diverting a large portion of local tax revenue to the central budget. Under the current regime, a local government's income consists of local tax revenue, fines & administrative fees, grants-in-aid, government-managed funds, and earnings of local SOEs, many of which are related to land management.[5] For instance, urban land using tax, land appreciation tax, and arable land use tax belong solely to the local tax revenue. Within the government-managed fund, land remise revenue is the single largest part (Chen and Kung, 2016, 2018).[6]

Subnational governments bear the brunt of providing local public goods, such as K-12 education, social security, health care, and public facilities. More importantly, local officials have the dual responsibilities of promoting economic development and maintaining social stability. To attract industrial investment, local governments usually offer preferential tax rebates and subsidies, a practice most common in special economic zones (SEZ).

2.2   The LGFV Operation

Since the 1994 fiscal reform, subnational governments have fallen short of funds to make ends meet.[7] Due to the budgetary law, they can neither run a fiscal deficit nor borrow directly from creditors. LGFV became a devious but indispensable tunnel to access the loanable fund market because the debt raised by SOEs do not show up on government budgets (Ang et al., 2019; Chen et al., 2020; Gao et al., 2021; Huang et al., 2020). LGFVs are state-owned conglomerates in transportation, power, or real estate industries. They are typically titled "Transportation/Railway/Energy Construction and Investment Company", "Urban Development and Investment Company", "State-owned Asset Operation Company", or "Investment Holding Group". A local government seeds its LGFVs with some start-up capital, which can be collateralized to take out loans. Additionally, a LGFV can issue bonds or new shares. The local government confers the monopoly power to its LGFVs in certain markets, such as, expressway or affordable housing. More importantly, the government usually offers debt guarantee and indemnifies in case it goes under. The revenue of LGFVs come from property sale, rent, construction service, asset appreciation, utility charge, toll, tonnage due, landing fee, advertising, subsequent government appropriation, etc.

To combat the economic downturn in the 2008 financial crisis, China's government launched

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[5]See appendix Table A.1 for China's fiscal structure of revenue sharing and expenditure obligation between the central and the local government.

[6]Although China's agrarian law forbids selling the freehold of urban land, local governments could sell land leasehold for 20-70 years, with its tenure depending on zoning and purpose. The local government's reliance on land-related revenue is referred to as "land financing" in literature.

[7]There are studies showing that the 1994 fiscal decentralization amplified the interregional development inequality (e.g., Qiao et al., 2008).

the "Four Trillion Stimulus Package". This stimulus plan featured large-scale infrastructure construction. The central government emboldened local governments to set up LGFVs for leveraged credit expansion.[8] In the wake of this, LGFV debt swelled ubiquitously across all administrative levels.

2.3 China's Debt Market

China's banking sector is highly concentrated in immense state-owned commercial banks (Allen et al., 2017). The People's Bank of China (PBC), which is the central bank, gives credit guidance to commercial banks on the volume of loanable funds, the priority of prospective debtors, and the range of interest rate. Commercial banks must set their loan interest rate within a certain range of the PBC benchmark rate (see appendix Table B.1). For a long time, the lower bound was around 70%-90%, with the upper bound ranging between 110% and 230%. Since the 2013 interest rate liberalization, a group of commercial banks have collectively set a loan prime rate (LPR) as their reference level, which gradually supplanted the role of the PBC benchmark rate.

China's domestic bond market is segmented into two parts.[9] One is the interbank market inaugurated in 1997. This OTC market accounts for the bulk of issuance volumes with institutional investors as participants. The other is the exchange market founded in 1991, which is for retail investors to trade publicly syndicated bonds. Treasury and municipal bonds are only traded in the interbank market; while bonds issued by LGFVs are traded in both markets. Appendix Section B.1 lists the requirements for bond issuance. Some key criteria are having minimum net equity, maintaining good profitability, and no arrears of interest payment. Treasury bonds are issued by the Ministry of Finance (MOF) to supplement the central government's revenue. Central bank bills are issued by the PBC as monetary policy instruments. From 2009 to 2014, the MOF acted on behalf of provinces and five separately planned cities to issue municipal bonds; and as of 2015, those provinces and cities were allowed to issue municipal bonds by themselves. However, the volume and term of municipal bonds are still subject to the MOF's ratification.

3 Data Description

3.1 Local Government Debt

LGFVs can take out debts by either loan or bond. The loan terms and rates for unlisted companies are often unobservable, but bond market data are highly transparent. I extract the bond issuance data (1999-2019) from the RESSET database and WIND Financial Terminal. The statistics on China's subnational government debt are opaque and sometimes conflicting across different sources. To my knowledge, there are two official statistics. One is the

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[8]See, for example, Article I in the administrative memo of credit expansion published on 3/18/2009: www.gov.cn/gongbao/content/2009/content_1336375.htm.

[9]See Amstad and He (2020) for a thorough introduction to China's fixed income security market.

National Audit Office's (NAO) reports in 2011 and 2013. Unfortunately, these nationwide audit reports do not have detailed breakdowns. The other is the list of active LGFVs tallied by the China Banking Regulatory Commission (CBRC). I combine the CBRC tally with LGFV issuers flagged by the RESSET and WIND. I drop non-company entities, non-SOEs, and companies whose primary businesses are apparently irrelevant with LGFVs'.

I obtain 15,935 LGFV bonds corresponding to 2,366 LGFV issuers.[10] I gather information on bond classification, coupon rate, reference YTM (yield to maturity), underwriter, issuance volume, issuance/maturity date, credit rating, and various other firm and bond characteristics. I next extract bond issuers' financial statements to obtain accounting variables disclosed on their balance sheets, income statements, and statements of cash flow. Lastly, I link LGFVs to their oversight governments. Most LGFVs have their immediate supervisory governments in their company names. For unidentifiable LGFV names, I undertake queries on public company databases, such as *Tianyancha, Aiqicha, Qichacha, Qixin*, etc. A LGFV's majority shareholder or actual controller should be its oversight government.[11] In the end, I establish the presence of LGFV bond issuance for each city.

3.2 Subnational Statistics

I obtain local socioeconomic data from various statistical almanacs and yearbooks published by government agencies.[12] To construct the local infrastructure financing variables, I extract data from *China Urban Construction Statistical Yearbook* for provinces, prefectures, and county-level cities, and *China County Seat Construction Statistical Yearbook* for counties.[13] Then, I assemble *China Statistical Yearbook (County-Level)*, *China City Statistical Yearbook*, *China Statistical Yearbook for Regional Economy*, and provincial statistical yearbooks for obtaining city-by-year socioeconomic variables. I supplement these data with land remise information from *China Land and Resource Almanac*, which allows me to examine the role of land financing in the local fiscal toolkit.

Starting 1998, local governments were allowed to sell land tenure for revenue and such data were published starting 1999. Thus, I set 1999 as the starting year and end my analysis in 2018. In constructing my data, I exclude cities that changed their territories over the period of 1999-2018 or lacked the pertinent information on aforementioned variables. This leaves me with 19 provincial/sub-provincial municipalities, 312 prefectural cities, and 1,783

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[10]Provincial LGFVs are often located in the capital city of a province, but they are bankrolled by provincial governments rather than the cities where they are located. Except LGFVs of the four municipalities, I exclude provincial SOEs in city-level analysis.

[11]A LGFV could have multiple shareholders, have other SOEs as its shareholders, be a subsidiary of another company, or cross-hold with a legal person. In this case, I trace its ultimate actual controller to look up its oversight government.

[12]Those publications are digitized at various data vendors: CNKI (http://data.cnki.net/), EPS (https://www.epsnet.com.cn/), CEInet (https://ceidata.cei.cn/), Soshoo (http://soshoo.com.cn/), etc.

[13]The former publication spans the period of 1999-2018, whereas the latter spans 2015-2018. If a city has at least one non-missing source of its infrastructure funding, I code missing components as zero. If instead all subdivisions of its funding are missing, I delete this observation.

counties to construct a panel dataset over my sample period. I proceed to match the LGFV bond dataset established in Section 3.1 with this city panel based on the LGFV's oversight government and the year of bond issuance.

3.3   Political Elites

To unveil the politico-economic factor in determining local public finance, Section 4.5 examines the role of local bureaucracy profiles in determining capital budgeting. In China's one-party regime, a mayor is the *de jure* leader in the local administration. However, the communist party standing committee is *de facto* on the apex of the power pyramid. The committee typically consists of 9-13 apparatchiks with the party secretary being the first in rank. I obtain the biographies of local party secretaries and mayors from Chen (2016), Jiang (2018), and the Chinese Research Data Service (CNRDS). The combined dataset assembles rich personal information on age, gender, ethnicity, place of birth, field of study, academic degree, university *alma mater*, civil service rank, and work history for local leaders of cities, municipalities, and districts above the prefecture level. Then, I supplement the data with the list of officials who were disciplined for bribery, embezzlement, or malfeasance from Wang and Dickson (2021). Lastly, I impute some missing entries by manual collection using Internet search engines: *Baidu Encyclopedia*, *Wikipedia*, and *Duxiu*. In my final sample, there are altogether 3,778 unique individual-city-position observations, involving 1,819 party secretaries and 1,959 mayors. I match this biographical data of local officials with the city panel and LGFV establishment data.[14]

3.4   Auxiliary Data

Albeit with the aforementioned city panel constructed from government published data, they are sometimes susceptible to statistical gamesmanship (e.g., Xiong, 2019). To this end, I draw upon the nighttime lightness as a cross-check for regional output. Previous research has shown that pixel-based satellite data are more reliable in places with a poor statistical system and less vulnerable to data fudging (e.g., Chen et al., 2019). Appendix Section C discusses the source and processing of satellite luminosity. Another auxiliary city variable is the distance to provincial capitals, for which I obtain from the China Stock Market & Accounting Research (CSMAR) database.

I draw upon two alternative groups of firms for falsification tests and loan rate comparison. One is non-LGFV bond issuers. I use the firm classification and shareholder information in the WIND along with the actual controller tracing in firm query engines (e.g., *Aiqicha*) to regroup bond issuers into four ownership types: local LGFV, non-LGFV local SOE, central/provincial SOE, and private/foreign companies.[15] I delete bonds issued by financial

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[14]See appendix Section D for details in assembling this dataset and processing individual characteristic variables.

[15]A provincial SOE is defined if its ultimate majority shareholder or actual controller is a provincial government bureau. Private companies include collectively owned firms, such as those owned by labor

enterprises, joint bonds, bonds denominated in a foreign currency, convertible/exchangeable bonds, and Panda bonds.[16] I also drop firms with unidentifiable actual controllers and those that changed their ownership types over 1999-2018. My final sample consists of 1,015 non-LGFV local SOEs, 1,194 central/provincial SOEs, and 1,494 private/foreign companies.

The other group is publicly listed SOEs in the A-share market.[17] I collect the bank loan rates of listed firms from the CSMAR database. I use their stockholder information to filter firms with the central government, individuals, or foreign entities as actual controllers. Then, I delete zero-interest and concessional loans taken out from policy banks and loans denominated in a foreign currency. Lastly, I keep observations with complete disclosures of loan rate, term length, and start date. There are altogether 208 listed provincial and local SOEs for a total of 1,454 firm-loan observations.

Lastly, I pick out regional statistics and regulatory information from *Almanac of China's Finance and Banking*, *Finance Yearbook of China*, *China Statistical Yearbook*, and government websites.

In sum, my panel data for analysis span the twenty years from 1999 to 2018, covering an assortment of fiscal, demographic, industrial, and financial variables as well as politician profiles and bonds across counties, prefectures, and municipalities. Appendix Tables A.2, A.3, and D.3 display the descriptive statistics for variables used in the analyses below.

4 Empirical Evidence

This section maps out a range of empirical evidence to corroborate the framework. To compare cities on a level arena, I first compute the economic value of infrastructure in cities with various fiscal capacities. Then, I assess the fiscal and political determinants of local leverage and financing mode. I also draw upon establishment level evidence to ascertain the credit misallocation in the LGFV bond market. Lastly, I undertake falsification tests on firms of alternative shareholder types to validate my results.

4.1 The Divergence in Infrastructure and Growth

Infrastructure is a locomotive for economic growth. The literature on the effect of infrastructure on growth is voluminous. Infrastructure fuels the economy through multifaceted mechanisms, such as integrating interregional markets, reducing trade and commuting costs,

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unions or industry associations. Foreign companies include joint ventures between a domestic firm and a foreign (or Hong Kong, Macau, Taiwan) shareholder.

[16]Financial enterprises (banks, credit unions, security brokers, mutual funds, insurance companies, asset management companies, fiduciary trusts, derivative exchanges, credit and lending companies, financial lease firms, etc.) have vastly different accounting rules with non-financial corporations. Panda bonds are issued in China by foreign entities or multinational organizations.

[17]There are four types of public listing for Chinese firms: A-share, B-share, H-share, and overseas listing. A-share is the majority. B-share was originally issued for authorized foreign investors. H-share is traded in Hong Kong.

boosting employment, to name just a few (e.g., Banerjee et al., 2020; Faber, 2014; Zheng and Kahn, 2013). Infrastructure is a double-edged sword in terms of externality. On the one hand, it generates positive spillover effects for other sectors. For example, government loans to infrastructure facilitate the growth and expansion of private firms as measured by their assets, sales, profits, and employment numbers (Ru, 2018). Transportation networks diffuse population and industries from metropolitan to peripheral areas, thereby freeing up space for the former and promoting prosperity for the latter (Baum-Snow et al., 2017). On the other hand, such diffusion may adversely affect the production and government revenue of non-connected peripheral counties (Faber, 2014). Additionally, expressway connections bring in heightened pollution for connected peripheral counties (He et al., 2020).

There are several broadly defined types of infrastructure: transportation (e.g., airport, railway, seaport, highway, canal, bridge, tunnel, subway, etc.); public utility (e.g., water supply, electricity grid, sanitation, sewerage, waste treatment, greening, etc.); energy/natural resource (e.g., power plant, centralized heating, gas pipeline, dam, reservoir, irrigation facility, etc.); and telecommunication (e.g., cable network, base station, communication tower, Ethernet switch, satellite, etc.). This section will explore the growth effect of highway buildup. The reasons for focusing on transportation infrastructure are threefold. First, more than half of the LGFVs are in the transportation industry. Second, transportation expenditure has consistently been the single largest part in local infrastructure spending. Third, transportation infrastructure has reliable and consistent measures for cross-year intercity comparison. Particularly, I use highway length to measure the stock of transportation infrastructure.[18]

It seems far-fetched to claim that the economic value for highways is identical everywhere. To compare apples to apples, I employ a hedonic approach to gauge the shadow price of highway across cities. First, I fit the GDP per-capita (deflated to the price level of year 2000) $Y_{c,p,t}$ of provincial municipalities and prefectural cities by a set of control covariates $W_{c,p,t}$:

$$Y_{c,p,t} = \alpha + W_{c,p,t}\Sigma + u_{c,p,t} \qquad (1)$$

where c indexes city of province p and t indexes year. $W_{c,p,t}$ includes log population density, the percentage of nonagricultural output, loan-to-GDP ratio, and foreign direct investment (FDI) to GDP ratio.[19] The residual of this regression is the variation of regional income per capita that cannot be explained by variables in $W_{c,p,t}$. Then, I regress this residual to lagged highway length $H_{c,p,t-1}$ for each city:[20]

$$\widehat{u}_{c,p,t} = \alpha + \tilde{\beta}_{c,p}H_{c,p,t-1} + \epsilon_{c,p,t} \qquad (2)$$

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[18]There are still at least three caveats in using highway length. First, some highways (e.g., national trunk expressway) are built by the central government. Second, government statistics on transportation do not have breakdowns of greenfield projects v.s. repairing decrepit facilities. Third, the quality, scalability, and viability of highways are hard to measure.

[19]The loan-to-GDP ratio measures the degree of financial deepening. The FDI-to-GDP ratio measures the openness of a local economy. I convert USD-denominated FDI to Chinese currency values by the yearly average onshore exchange rate.

[20]I drop observations with abnormal highway length (which likely represent misrecording) and cities with fewer than ten consecutive years of observations.

where $\tilde{\beta}_{c,p}$ is the city-specific shadow price for one kilometer of highway. The lagged highway length is imposed to take account of the time for infrastructure to effectuate income growth. Figure 1 presents the point estimates of $\tilde{\beta}_{c,p}$. There is a striking difference between the cumulative growth of satellite luminosity (top panel) and the shadow price of highway buildup (bottom panel) in their geographic distributions: Cities that experienced slower development have far greater economic values of highway. In other words, the growth potential of vast disadvantaged prefectures is locked by underinvestment in transportation infrastructure.

To further elucidate the interregional development inequality, I halved the cities based on whether its GDP per capita was above the median in 1999. Figure 2 displays a yawning gulf between the two groups of cities over the next 20 years. While both groups moved up across variables measuring development, the bottom 50% cities trail the top half in real income (Panel A), satellite luminosity (Panel B), transportation (Panel C), and utility (Panel D) by a growing margin. In addition, and just as important, the top 50% cities persistently have higher leverage in their infrastructure investment (Panel E); and more bond financing in all except two years (Panel F). In 1999, the group of wealthier cities were not far ahead in terms of income per capita and transportation infrastructure, but they have outpaced the bottom half in the next two decades. Contrary to Banerjee et al. (2020), transportation infrastructure not only has a level effect, but also has a growth effect. It is perhaps no coincidence that cities which had built more infrastructure, pursued higher leverage, and utilized more bond financing experienced a greater income rise. In a nutshell, places that start off poor do not catch up over time. Although a majority of Chinese cities share similar cultures and nationwide policies, the income convergence predicted by the neoclassical growth theory is not borne out.

4.2   Local Leverage and Disintermediation

As documented in Section 2.1, local governments lack the wherewithal to fund infrastructure projects. They harness LGFVs to access the loanable fund market. Since loan is levered through commercial banks, there is a wedge between LGFVs and creditors. Additionally, loans usually cannot be transacted in a secondary market. The interest spread between loan and bond represents the cost of financial intermediation and compensation for illiquidity. Wealthy and high-notch cities have a plethora of financing options: municipal bond, LGFV bond, bank loan, equity financing, etc. For counties and financially strapped cities, bank loan is often the only game in town due to the strictures of bond issuance and the endowment deficiency of their LGFVs. This section explores the determinants of financial avenues at the city level. The sum of liabilities in LGFVs' financial statements usually differ from the corresponding infrastructure debt in government statistics. The discrepancy results from several factors. First, many LGFVs are not bond issuers and thus their loans are unobservable. Second, some debts taken out by LGFV issuers are used for alternative purposes. Third, non-LGFV firms may undertake infrastructure projects. Fourth, LGFVs may finance through shadow banking instruments which are off-balance-sheet (to be discussed in Section 4.6). To err on the side of caution, I use both city and establishment level data in this paper.

To fathom the debt structure of cities, I consider two dependent variables: leverage ratio to measure indebtedness and the presence of bond issuance to measure disintermediation:

$$Finance_{c,p,t} = \alpha + \beta_1 Fiscal_{c,p,t-1} + \beta_2 Tier_{c,p} + W_{c,p,t-1}\Sigma + \psi_p + \eta_t + \epsilon_{c,p,t} \qquad (3)$$

$Finance_{c,p,t}$ takes two variables. One is a binary dummy equal to one if the city c tapped the bond market in year t; and zero otherwise. The other is the leverage ratio, which is the percentage of loan and bond in urban facility investment (excluding surplus from preceding years). The key independent variable $Fiscal_{c,p,t-1}$ is the log fiscal revenue in the preceding year.[21] $Tier_{c,p}$ is the city's administrative level.[22] To make sure that I compare otherwise similar cities, I control log population density, log real GDP per capita, the percentage of nonagricultural output, loan-to-GDP ratio, log distance to the provincial capital, and log number of industrial firms in $W_{c,p,t-1}$.[23] Province fixed effect ψ_p absorbs time-invariant and province-idiosyncratic factors. Year fixed effect η_t captures macroeconomic cycles, including the 2009 stimulus package shock. Standard errors are clustered at the province level to account for within-province correlations.

Reported in columns (1) and (2) of Table 1, an increase in fiscal revenue significantly begets a rise in both bond financing likelihood and leverage ratio (see summary statistics in appendix Table A.2). Cities with deep pockets could lever more funding and have relatively easier access to the bond market for infrastructure investment. While fiscal capacity has a significant and positive effect on bond issuance, so does tier. Although high-notch cities are by and large wealthier, fiscal capacity does not eclipse the significance of administrative level in determining bond issuance. Holding fiscal revenue and control variables fixed, the bond issuance odds for provincial municipalities are 1.67 and 4.17 times higher than for prefectures and counties, respectively. In terms of average margin effect, the probability of bond access would decrease by 9.80% for a prefectural city and 22.03% for a county-level city as compared to a provincial municipality. The wherefores of this finding are threefold. First, bank headquarters, security underwriters, and credit rating agencies are located in high-notch cities where their LGFVs may take the advantage of insider information. Second, officials of high-notch cities may have stronger political connections to nudge the financial regulatory authority into approving the bond issuance. Lastly, experienced managers and skilled labor agglomerate in metropolises. The manager's financial literacy and workforce productivity constitute another aspect of human capital advantage.

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[21]Another variable to measure fiscal capacity is fiscal expenditure. However, fiscal expenditure includes grants-in-aid from upper level government and is a noisy variable. With the intent of poverty relief, penurious cities receive more grants-in-aid, in which categorical grants are earmarked for certain purposes and cannot be used at local governments' discretion.

[22]Chinese cities are assigned different tiers based on their economic and political clout. Appendix Table D.2 summarizes this hierarchical system. Since only four cities are of the provincial level, I pool them together with sub-provincial cities henceforward. Analogously, I lump prefectural and sub-prefectural cities into one group.

[23]The proximity to provincial capital captures the intensity of political clout from upper level government, which presumably decays for remote places. The number of industrial firms is from the NBS annual survey, covering those with sales revenue above a designated threshold. To deal with zero value observations, I add one for variables taking the log.

The credit redlining in infrastructure financing is a pivotal factor for the sizable and sustained income inequality. Bond financing is a privilege for a handful of wealthy and high-notch cities. As shown in appendix Table A.2, only 6% of all city-year observations utilize bond financing. Affluent cities would easily establish more LGFVs and pursue higher leverage for infrastructure projects. Improving local infrastructure is often a *quid pro quo* for attracting entrepreneurial investment, which in return brings in tax revenue and boosts employment for the local economy. The barrier to bond financing and credit market spawns a vicious circle for disadvantageous cities.

4.3 Bond Market Dysfunction

Since local infrastructure projects are financed by either municipal bonds or LGFVs, this section investigates the interface between local fiscal capacity and financial cost in the bond market. I start with comparing the risk premiums of municipal and LGFV bonds in Figure 3. As expounded in Section 2.3, municipal bonds are issued by provincial and sub-provincial municipal governments for direct use in their budgets. LGFV bonds are issued as corporate/enterprise bonds for use in their issuers' infrastructure projects or other expenses. Panel A of Figure 3 graphs the LGFV bond credit spread against its oversight government's fiscal revenue in the preceding year.[24] Fiscal capacity and financial cost are probably intertwined in a circular way. To avoid falling prey to reverse causality, I choose the average fiscal revenue from 1999 to 2008 to indicate fiscal capacity, and plot it against post-crisis financial variables on the vertical axis for Panels B, C, and D of Figure 3. All municipal bonds and most LGFV bonds were issued after the 2008 financial crisis. This treatment ensures that my following graphs capture the effect of fiscal capacity on financing performance, but not the reverse. The scatters in the graph are clustered by city tiers. A rigorous analysis would control for more bond characteristics, but a glimpse at the two-way pattern is still instructive. It is crystal clear that municipalities and prosperous cities fetch the lowest cost of capital. On the other end of the spectrum, county-level and fiscally strapped cities bear higher costs. For municipal bonds in Panel B, their credit spreads vary in a narrower range and its correlation fiscal revenue is much weaker than LGFV bonds.

As an ex-ante measure of perceived default risk, I draw upon the credit ratings of LGFV bonds and their issuers. Appendix Figure B.1 shows that the majority of LGFV bonds and issuers are rated in or above the AA- notch, suggesting that they have strong repayment capacity and low default risk.[25] To rigorously assess the bond characteristics, I regress a LGFV bond's credit rating and credit spread with respect to its oversight government's fiscal revenue and tier:

$$Bond_{b,f,c,p,t} = \alpha + \beta_1 Fiscal_{c,p,t-1} + \beta_2 Tier_{c,p} + X_{f,c,p,t}\Omega + Z_{b,f,c,p,t}\Pi + \psi_p + \eta_t + \epsilon_{b,f,c,p,t} \quad (4)$$

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[24]Following Au and Henderson (2006), statistical variables for a city in what follows refer to those of the city's jurisdictional districts (*shi xia qu*), excluding its subordinate counties/cities. Jurisdictional districts are ordinarily the heartland of a city. Subordinate counties/cities have relative fiscal independence from their upper-level city.

[25]See appendix Section B.2 for details on bond credit rating.

The left-hand-side variables $Bond_{b,f,c,p,t}$ are credit spread and credit rating for bond b issued by firm f in year t. Credit spread is a bond's APR or YTM minus the risk-free interest rate, measured in the unit of basis points (1 bps=0.01%). For a short-term bond (term length less than one year), I subtract the accrued risk-free interest from its YTM to obtain the credit spread.[26] For a medium or long-term bond that matures one year and above, I take the yearly risk-free rate from its APR to obtain the credit spread. For discounted/premium, zero-coupon, monthly/quarterly/semi-annually-dividend, and amortizing bonds, I replace the coupon rate by its reference APY. For floating-rate bonds, I use their initial APRs. A bond could have several credit ratings over its life cycle (from issuance to maturity) from different credit rating agencies. I choose the earliest credit rating, which is usually published on its prospectus.

The key independent variable $Fiscal_{c,p,t-1}$ is the log fiscal revenue of the LGFV issuer's oversight city c of province p in the preceding year. $Tier_{c,p}$ is the administrative level of the LGFV's oversight government. Variables of firm characteristics $X_{f,c,p,t}$ are firm age (years passed since establishment), a dummy for listed firm, and a vector of dummies indexing WIND industry classification. Variables of bond characteristics $Z_{b,f,c,p,t}$ are term length, a dummy of having guarantee from third-parties, a dummy for cross-market trading, a vector of dummies indicating special bond or embedded option (asset-backed security, private placement note, callable bond, puttable bond, and deferred interest bond) with plain vanilla bond being the reference, dummies for credit rating agencies (for credit rating only), and the number of underwriters (for credit spread only). ψ_p are province fixed effects, absorbing time-invariant factors. η_t are year fixed effects, capturing nationwide economic cycles.

Column (3) of Table 1 reports the ordered logit regression of bond credit rating (see summary statistics in appendix Table A.2). For a 1% increase in the fiscal revenue of a municipal government, its LGFVs' bond credit rating would climb by 0.915 in the log-odds scale while other variables are held constant. A city's tier also has significant and sizable impetus on the odds-ratio of its LGFV bonds' credit ratings. Column (4) reports the result for credit spread. *Ceteris paribus*, a 1% increase in fiscal revenue reduces the LGFV bond financing cost by 31.9 bps.

The pattern discovered here seems to be explainable by the risk-return tradeoff theory: bondholders perceive LGFV bonds backed by affluent or high-notch governments as safer. One would expect that LGFVs in wealthy cities should outperform those of low-income cities since they have better endowment and lower cost of capital. Columns (5)-(8) of Table 1 investigates whether local fiscal capacity has the anticipated effect on LGFV performance by panel fixed effect regression:

$$Issuer_{f,c,p,t} = \alpha + \beta_1 Fiscal_{c,p,t-1} + \beta_2 Tier_{c,p} + X_{f,c,p,t}\Omega + \psi_p + \eta_t + \epsilon_{f,c,p,t} \qquad (5)$$

The left-hand-side variables $Issuer_{f,c,p,t}$ are corporate finance variables for firm f located in

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[26]The RESSET computes the risk-free interest rate on the basis of the 3-month CD rate (prior to 8/6/2002), the 3-month PBC bill's coupon rate (8/7/2002-10/7/2006), or the Shanghai interbank offered rate (10/8/2006-present). The accrued risk-free interest is the monthly risk-free rate compounded by the number of months in its term length.

city c of province p in year t. I measure profitability by ROA (return on asset) and ROE (return on equity). For liability, I use debt-to-asset ratio to test capital structure and log bond finance to measure financial disintermediation.[27] The results in columns (5)-(8) are striking: the endowment advantage translates into higher debt-to-asset ratio, more bond financing, but not superb profitability. Indeed, higher leverage implies riskier debt overhang and lower pledgeability. The ROA is even decreasing with respect to fiscal revenue. It would be more difficult for wealthy cities to keep their LGFV afloat in light of their inferior profitability combined with high leverage. Although fiscal revenue may not directly worsen LGFV performance, it is an anomaly for a LGFV to incur a higher interest in the bond market if its profitability is on par with, if not better than, another one.

Since 97% LGFVs are non-listed firms, I cannot employ stock valuation methods such as *Tobin's q* or price-earnings ratio. My measures for profitability and leverage use book value instead of market value. Nonetheless, Carpenter et al. (2021) show that "stock prices in China have become as informative about future profits as they are in the US" (page 679). In other words, higher profitability as measured by ROA or ROE translates into higher market value. Ostensibly, LGFV bonds issued by wealthy cities are more secure. However, those LGFVs operate with higher leverage and lower profitability, which result in heightened risk exposure. The anomaly discovered in this section captures the notion that the bond market malfunction tilts the playing field towards well-endowed LGFVs despite their higher debt ratio and absence of excelling profitability.

4.4 Endowment and Financing Mode

As revealed in the NAO audit report, local governments offered three types of liability aid to their LGFVs: direct repayment, guarantee, and bailout.[28] Although local governments bear the brunt of their LGFV debts, the central government provided debt restructuring solutions for financially vulnerable LGFVs to make sure that their debts are on a sustainable footing: one is to ratify more municipal bond issuance; the other is to grant a refinance option for maturing debt.[29] There have been 747 bond defaults corresponding to 227 issuers by December 2019, of which 72.7% are private/foreign companies and only two are LGFVs.[30] This is a tiny portion of the entire corporate bond market. Column (1) of Table 2 regresses bond default dummy on fiscal revenue using the specification and control variables in Equation (4). Neither local fiscal capacity nor city's tier has a statistically discernible effect on bond

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[27]The value of bond finance is the sum of short-term and long-term bonds taken from the balance sheet. Using the annual flow value of bonds (not affected by debt rollover from previous years) taken from the statement of cash flow yields a qualitatively similar result. ROA, ROE, and debt-to-asset ratio are winsorized at the 1% and 99% levels to eliminate extreme values.

[28]See Table 3 of the *NAO Local Government Debt Audit Report* (*No. 2013-32*) at `http://www.gov.cn/gzdt/2013-12/30/content_2557187.htm`.

[29]See, for example, Section 3 of the *2019 Report on the Work of the State Council* at `http://www.gov.cn/premier/2019-03/16/content_5374314.htm`.

[30]As defined by the RESSET, bond default refers to delinquent coupon payment on a due date, failure to repay principal at maturity, or both.

default probability. Hence, the credit spread differential across LGFVs with various fiscal capacities is not indicative of the default risk. This is in stark contrast to the U.S. municipal bond market where default risk accounts for more than 74% of credit spreads during 1998-2015 (Schwert, 2017).

The bond market anomaly with inexplicable interest premium is only one facet of the credit misallocation in China's local public finance. A grim reality is that a lot of LGFVs cannot tap the bond market in the first place. For example, in the 2011 audit report, 79.01% of accumulated local government debt is bank loan while bond only constitutes 7.06%.[31] On the CBRC tally, less than 10% of LGFVs have ever issued bonds. Panels C and D of Figure 3 seek to analyze the effect of local fiscal revenue on the issuance volume and endowment of LGFVs. Panel C shows that more fiscal income translates into larger issuance volumes. A considerable number of counties or underprivileged cities invariably end up with no LGFV bonds at all, which implies that those poverty-stricken cities cannot prop up any volume of bond issuance. Panel D plots the relationship between fiscal revenue and LGFV endowment. I measure a LGFV's endowment by its registered capital, the seed money or property granted by its oversight government. A LGFV can collateralize this capital to siphon loanable funds for its infrastructure projects. Unsurprisingly, the average registered capital for LGFVs increases monotonically with their local fiscal capacity. There are two institutional features underpinning this result. First, the nationwide tax code discriminates against underdeveloped areas. For urban maintenance and construction tax, metropolitan districts levy a flat rate of 7%, counties and towns levy 5%, and rural units levy 1%. For the arable land use tax, densely populated metropolises levy a higher rate than sparsely populated areas. Second, the PBC explicitly allowed commercial banks to charge higher interest premiums above the benchmark level for small firms, which disproportionately concentrate in underdeveloped cities (see appendix Table B.1).

Bond issuance is a privilege enjoyed by a small portion of LGFVs. There are hard-and-fast rules for bond issuance. A LGFV may be thwarted to enter the bond market if it does not meet the requirement prescribed by law or for quota reasons. More registered capital means less collateral constraint and more financial maneuvers. This is another way of saying that, all else equal, the more of a city's fiscal revenue, the more likely its LGFVs can issue bonds. To illustrate this point, I further examine the cross-sectional dispersion of LGFVs in Figure 4: Not only do prosperous cities buttress more LGFV issuers (top figure), but also their bonds have lower credit spreads (bottom figure). Anecdotally, LGFVs prefer bond financing to bank loans for cost reasons. To be concrete, I excerpt a LGFV bond prospectus:

"*As of 6/30/2013, our company's accrual loan was 67.415 billion yuan, of which the parent company held 51.889 billion and subsidiaries held 15.526 billion. The financial cost of a bank loan was relatively high. Our company hopes to ameliorate the financing structure through this short-term bond issuance. Our company plans to use the 500 million raised in this bond issuance to repay the parent company's loan so that we optimize our term structure*

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[31]See Table 4 of the *NAO Local Government Debt Audit Report* (*No. 2011-35*) at `http://www.gov.cn/zwgk/2011-06/27/content_1893782.htm`.

and ratchet up the proportion of disintermediated financing."[32]

This LGFV refinanced its bank loan by a bond issuance. To substantiate the cost advantage of bond over loan, Figure 5 compares the interest cost across several financing modes. I categorize them by term length to match with that of the PBC benchmark rate.[33] Municipal bonds consistently dwarf loan and LGFV bonds as the cheapest capital. The loan rates for unlisted companies are unobservable; so I use listed provincial and local SOEs, the group of firms closest to LGFVs by nature. The cost advantage of LGFV bonds is evident: Before the 2008 financial crisis, the PBC benchmark level was well above the interest rates of most LGFV bonds and the actual loan rates of listed SOEs hover around the PBC benchmark level within a narrow range. Thereafter, the loan interest fluctuation was gradually deregulated, but most of the list SOEs' loan rates surpassed the PBC benchmark level and their average value exceeded the corresponding average bond interest rate (weighted by issuance volume). The criteria of profitability, capital structure, corporate governance, and information disclosure for IPO are more rigorous than for bond issuance. They are a group of highly creditworthy and transparent firms in the lending market. It is conceivable that their loan rates are the lower bounds for nonlisted firms.[34] In contrast to the bond credit spread, the loan spreads (the loan interest rate subtracted by the PBC benchmark level) are insensitive to the local fiscal revenues of those SOEs' oversight governments. This reaffirms that the loan interest is strictly regulated whereas the bond market is more marketized.

4.5   Bureaucracy and Capital Budgeting

China's politico-economic regime implies that local bureaucracy may influence public finance through executive actions. The underlying mechanism is the promotion tournament. Local officials face a bottom-up competition in the government hierarchy, in which promotion is largely contingent on the performance of an official's governance (Li and Zhou, 2005; Yao and Zhang, 2015). Additionally, research on listed companies find that the political connection (such as party affiliation, congress delegate, government work experience, etc.) of executives brings in preferential loan access and financial gains (Chan et al., 2012; Li et al., 2008). I cannot replicate this practice directly for LGFVs because most of them are non-listed firms, so they do not disclose their executive profiles. Nonetheless, LGFVs are under the sway of their oversight governments and many of their CEOs are former bureaucrats. This supervisory relationship still makes my exercise feasible.

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[32]The excerpt was translated by the author from the *Prospectus of Jiangxi Expressway Investment Group 2014#1 Short-Term Bill* (page 21). See its original text at `http://bond.jrj.com.cn/bv/2014/0214/000000000000008wudy.shtml?to=pc`.

[33]Since no municipal bonds have maturities under six months and very few SOE loans surpass five years, I focus on the comparison of three financial instruments with term length between six months and five years, which encompassed 72% of LGFV bonds.

[34]For example, an IPO on the A-share main board requires the candidate company to make at least 30 million net profits over the last three fiscal years. A circumstantial evidence is that bonds of listed LGFVs have significantly lower rates than non-listed ones in the regression of Equation (4). Chen et al. (2020) show that the actual loan interest rates for LGFVs are usually higher than the PBC benchmark level.

Besides economic performance, age is vital in determining an official's promotion prospect. Other than a handful of paramount leaders, there is a mandatory age-based "promote-or-retire" rule at each ladder of the bureaucratic hierarchy. For example, a prefectural mayor cannot exceed age 60 for re-nomination or promotion. Columns (1)-(2) of appendix Table D.1 identify an inverted U-shaped relationship between age and promotion. The tipping point which has the highest odds of promotion is age 46 for party secretaries and 39 for mayors (when assuming office).[35] It also identifies a complementary role for infrastructure spending in a local official's promotion endeavor: For those who are towards their upper-bound age limits, they could raise the infrastructure spending to boost their promotion prospects.

Table 3 fathoms the role of bureaucracy on capital budgeting. My key explanatory regressors are age and its squared term to embody the feature of age-tenure promotion rule. Column (1) shows that infrastructure expenditure scaled by local fiscal revenue is an inverted U-shaped function of mayor's age with the turning point at 47. It implies that a young mayor would advance his career by tilting the spending towards infrastructure which signals his achievement. On the other hand, a lame-duck official who perceives a slim chance of promotion would not have such impetus. Additionally, many local governments heavily rely on land sale revenue for LGFV debt collateral and repayment. Land remise serves as a proxy for the pledgeability of local government debt. Column (2) traces out an inverted U-shaped pattern between mayor's age and land remise area with a peak age of 51. Consistent with Chen and Kung (2018), a young official would presumably sell many parcels of land to fund infrastructure projects. Columns (3) analyzes the impact of age structure on leverage. Contrary to the pattern in columns (1)-(2), the relationship is U-shaped for mayors. To disentangle the blurred aggregation within a city, I switch to the LGFV panel data with fixed-effects in Column (4). The inverted U-shaped curve between average LGFV indebtedness and the age of mayors is reinstated. The age profile of party secretaries is not as relevant as for mayors in the determination of capital budgeting. This might be ascribed to their different roles: although a party secretary is ordinarily occupying the first rank in the power pyramid, his primary duty is to oversee personnel appointment, propaganda, policymaking, and disciplinary action. A mayor, similar to a chief executive, is more involved in administering economic affairs, particularly fiscal planning and making operational decisions for SOEs.[36]

Taken together, these lines of evidence manifest that the opportunistic behavior of party secretaries regarding the promotion incentive played a role in determining a city's capital budgeting. It constitutes another facet of credit misallocation because in a frictionless financial market, a firm's value-enhancing investment should be financed irrespective of the bureaucracy that governs it. Note that there is a caveat in my specification. I do not address the endogeneity in the local leader appointment process, which is contingent on multitudinous factors: accomplishment, experience, age, diversity, temperament, litmus test, crony-

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[35]Appendix Section D spells out the construction of the local personnel database and presents its descriptive statistics.

[36]The career-finance pattern identified here echoes that of Ru (2018), but a major difference is that Ru (2018) uses party secretary only whereas I put mayor and party secretary in juxtaposition.

ism, or even bribery, etc. Some variables are omitted in my specification but unobservable or difficult to codify. Suppose, for example, a city with a vacancy in mayor has large unmet needs in its budget. The provincial party committee might select a Keynesian ideologist to step up debt financing. The same logic holds true when a fiscal conservative is chosen to deleverage an overstretched city. To the extent that the endogenous appointment process is affecting my outcomes of interest, I cannot draw the conclusion that an official's education and career trajectories are statistically irrelevant with the city's capital budgeting under his governance. Since the appointment process is like a "black box" (outsiders usually do not know who are short-listed for a vacancy and local leaders are frequently transferred from one city to another), it is practically infeasible to establish an airtight causality between bureaucrat characteristics and local financing. However, the local bureaucracy is in some systematic ways correlated with credit provision, which should not arise in an efficient financial market.

4.6 Falsification and Robustness Tests

Until this point, I have presented evidence regarding local fiscal capacity and bureaucracy in determining infrastructure financing. Nonetheless, it is imprudent to leap to a casual relation as other assorted factors can move in tandem over time. This section examines three alternative types of firms. The first group is non-LGFV local SOEs. As with LGFVs, they are founded and administered by local governments. The difference is that their business model is not to siphon money from the credit market and use it for local infrastructure. They operate in sectors like manufacturing, natural resource, agriculture, real estate, service industry, etc. Their markets are not geographically restricted to the cities where they are located. The second group is SOEs controlled by provincial or central governments (excluding provincial LGFVs). Provincial SOEs are often headquartered in the capital city, but they are bankrolled by provincial governments and operate in the entire province rather than the cities where they are located. Likewise, many central SOEs are headquartered in Beijing, but they are not under the sway of the Beijing municipal administration. Presumably, this group of firms are unlikely to be influenced by local fiscal capacity or bureaucratic factors. The third group is private and foreign companies. They are on their own and do not lean on local governments for appropriation or debt guarantee. I conduct falsification tests by replicating as closely as possible the analyses in Sections 5.3-5.5. If the government-LGFV relationship is responsible for the findings I documented above, then I should not expect the local fiscal capacity or bureaucracy to have a parallel relationship with their corporate finance variables.

Table 4 replicates the exercise of fiscal capacity and LGFV performance. Columns (1)-(2) show that bond credit rating is increasing while interest rate is decreasing with local fiscal capacity for non-LGFV SOEs and private/foreign companies. This pattern is analogous to LGFVs. It might arise from the implicit factors like local business environment, proximity to financial market, etc.[37] However, the magnitudes of their coefficients are not as large

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[37]A potential linkage between local government and alternative types of firms results from the tax territoriality principle. A city levies corporate tax for all firms (regardless of their shareholders) within its

as for LGFVs and the city tier fails to produce a consistently significant impact. Local governments have strong influence on the capital structure of their LGFVs, but columns (3)-(6) detect no such effects for other types of firms. This falsification test ascertains that the credit misallocation that I discover is not as relevant as in alternative types of firms, and the reliance on local governments is the strongest for LGFVs. Columns (5)-(7) of Table 3 replicate the exercise of local bureaucracy and firm capital structure. Other than non-LGFV SOEs, The indebtedness of alternative types of firms is statistically insensitive to the local leader's age profile. No matter if I use central and provincial SOEs or private and foreign firms, the coefficients are insignificant either way. Neither mayor's nor secretary's age has much of an effect on those firms' debt financing. In a nutshell, the patterns of credit misallocation and financial inefficiency discovered in preceding sections are unlikely to be driven by unidentified factors that apply to any firm regardless of its ownership type.

Table 2 reports estimates from a series of robustness checks. Column (2) begins by examining the operating ROA. Higher liability quintessentially goes hand in hand with more interest payment. LGFVs may also differ in their tax treatment and prorating method. To strip out those external influences on profit, I employ operating ROA where the numerator is EBITDA (earnings before interest, taxes, depreciation, and amortization). The EBITDA is a metric of the firm's cash flow from operating activities and purges the tax shields of debt and accounting treatment.[38] The result remains materially identical in that fiscal revenue is not associated with a higher operating ROA. Columns (3)-(4) switch to current ratio and capital turnover rate. Current ratio is a metric of the ability to cover short-term obligations with current assets. Capital turnover rate is the sum of cash, short-term investment, and note receivable divided by long-term liability. It measures a LGFV's ability to repay its long-term debt. The coefficients for fiscal revenue are significant for neither of them. A LGFV might have both cash flow-based and asset-based lending. I then employ the debt-to-EBITDA ratio in column (5) and debt coverage ratio (EBITDA divided by the sum of interest and principal repayment) in column (6). Still, they are insensitive to fiscal revenue. These lines of evidence further attest to the credit misallocation that fiscal capacity is not indicative of a LGFV's profitability or solvency.

Since the credit expansion in 2009, local governments have been inundated with crushing debt. Lest debt overhang, the MOF started to restrict local governments from running up colossal LGFV debts in 2013. In response to the tightened fiscal auditing, the role of traditional debt dimmed while there is a growing trend that local governments ramp up shadow banking, a last resort for LGFVs whose balance sheets are awash in maturing debt. A prominent model is entrusted loan. Particularly, a trust settlor funnels loanable money through a trustee to an LGFV beneficiary. The trustee sometimes securitizes entrusted loan covenants into wealth management products. The financing cost of shadow banking

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territorial jurisdiction.

[38]The income statements for Chinese bond issuers do not report EBITDA. Following the method of WIND, I compute it by adding tax, fixed asset depreciation, intangible asset amortization, amortization of long-term deferred expenses, and cash disbursement for interest to net profit.

is exorbitant vis-à-vis traditional bank loan.[39] Shadow banking ballooned in the aftermath of the 2008 financial crisis (appendix Figure A.2) as the "Four Trillion Stimulus Package" pushed it onto the stage. Since shadow banking is off-balance-sheet, many over-indebted local governments turned to this conduit for refinancing (Allen et al., 2019; Chen et al., 2018; Cong et al., 2019; Lin and Milhaupt, 2017). Even some LGFV bonds were levered by shadow-banking transactions (Chen et al., 2020).

Bond delinquencies surged in 2019 and maturity looms for a growing number of LGFV bonds in the next few years. The average ROA for LGFV issuers is 1.65%, lower than the interest rates of most LGFV bonds. The average ROE for LGFV issuers is 3.43%, lower than the minimum standard 6% for stock offering specified by China Securities Regulatory Commission.[40] This means that most LGFVs can neither rely on their own cash flows to foot the outstanding debt nor utilize equity financing to convert debt into shares. Local governments are mortgaging the future and would eventually be swamped by debt. As substantiated in this paper, the regulatory barrier in bond issuance is counterproductive, rendering LGFVs of affluent cities more overstretched but less profitable than those of low-income governments. Moreover, Chinese housing bubbles began to prick in 2021. This would have a knock-on effect on the local government's financial distress because the land remise revenue collected from private real estate developers is ordinarily the collateral for LGFV debt.

5   Conclusion

The neoclassical growth theory manifests that the income difference for economies with similar backgrounds should be narrowing down. However, the catch-up pattern does not transpire within China; instead, the interregional inequality has been rising since the market-oriented reform (Piketty et al., 2019). Despite favorable grants-in-aid and poverty relief programs to penurious regions, many of them were still stuck at the lower step of the development ladder. It has not been cognizant of the fundamental stranglehold to turn this vicious circle into a virtuous one.

Infrastructure weaves the economic fabric. It is a public good for its local economy on the one hand, and it is also a business for LGFVs on the other hand. The procrustean standard for bond market access stands out as an institutional wedge and inadvertently scars underprivileged places. Wealthy cities pursue riskier leverage and have preferential access to the bond market despite their inferior profitability. LGFVs in ill-endowed cities have insuperable endowment deficiencies and suffer considerably higher cost of capital. To raise a given amount of debt, a disadvantaged city would fork over anywhere from zero to five

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[39]Entrusted loans exist because the PBC prohibits direct commercial lending and borrowing between non-financial firms. Their lending rates are not subject to the PBC benchmark rule; instead, the usury law in 2015 stipulated that the annualized lending rate could be 24%-36% at the maximum (See `www.chinacourt.org/law/detail/2015/08/id/148349.shtml`).

[40]Seen from appendix Tables A.2 and A.3, LGFVs have the lowest average ROA and ROE among all types of firms.

times more interest of what would cost a city with bond instruments. This pattern is robustly confirmed in both city and firm data with relevant controls. The credit misallocation also lies in the bureaucratic setup that young party secretaries act aggressively on debt financing in an effort to clinch a higher office.

In the context of credit expansion and heightened leverage from 2009 onward, those who get loanable funds at a lower cost essentially collect the seigniorage from the rest of individuals and firms. When bridging into the future, challenges ahead of policymakers seems direr than expected. The crushing debt combined with the economic slowdown since 2015 put many LGFVs on the brink of insolvency over the ensuing years. Had the institutional roadblock to clinch bond instruments be eliminated, there would be a lot of issuer-hopefuls who would have lowered their financial cost and jumpstarted their growth potential. This would probably stave off a massive financial market dislocation. Taking the arguments in this paper to a global context, the cross-country income inequality has been rising for the postwar period. Although there are myriad factors at work, the role of finance is crucial. This is especially true when fiscal authorities around the world were becoming more indebted than ever before to combat the Covid-19 crisis. Examining the cross-country difference in the capital cost of public debt and its underpinning structure merits exploration by future research.

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Figure 1: The Divergence in Income Growth and Shadow Price
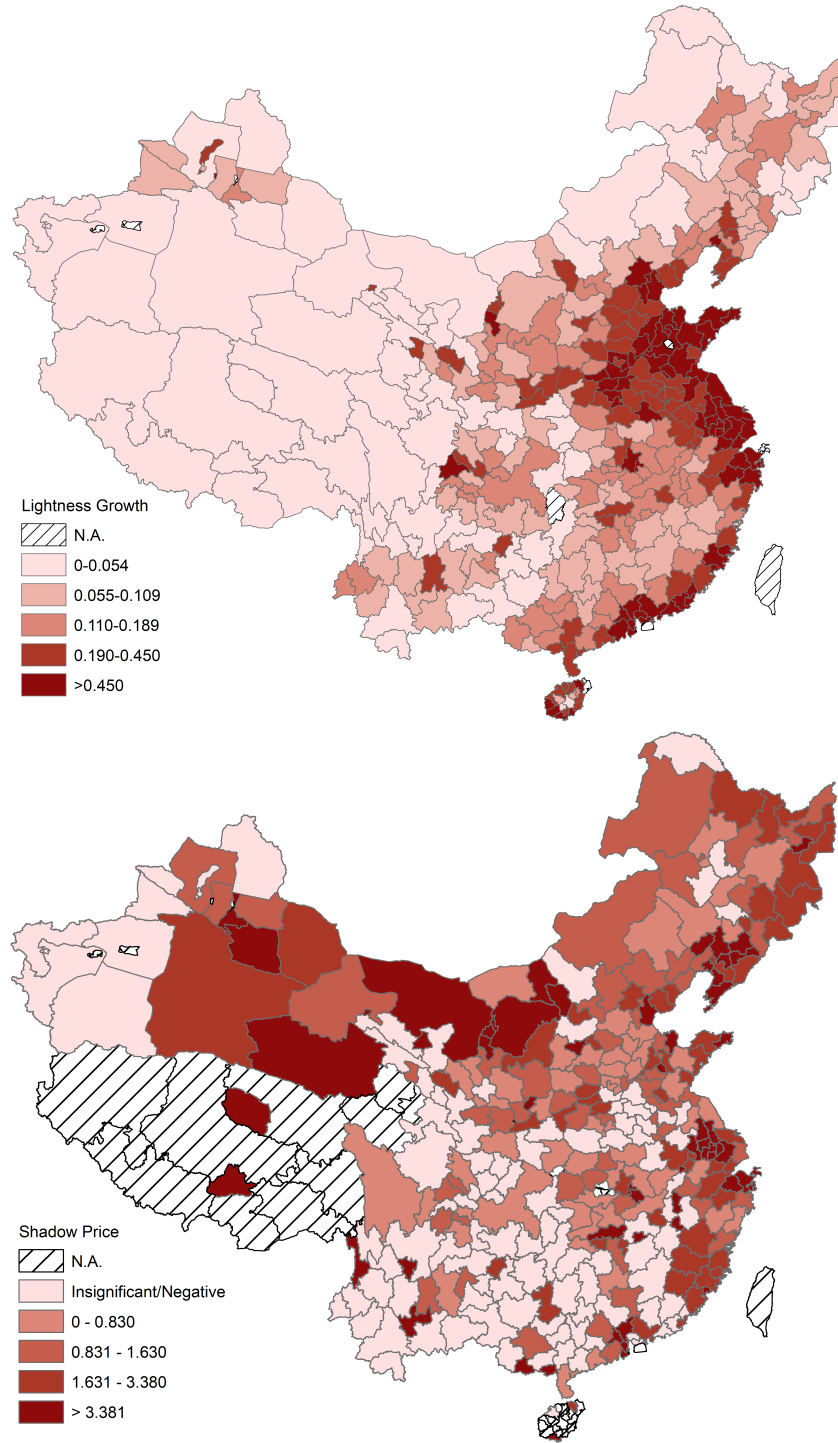
Notes: The top figure depicts the cumulative growth of satellite luminosity from 1999 to 2018. Prefectures with zero light densities every year throughout the sample period are dropped. The bottom figure depicts the shadow price of highway length with regard to per capita GDP (deflated to the year 2000 price level). Data come from *China Statistical Yearbook (County-Level)*, *China City Statistical Yearbook*, *China Statistical Yearbook for Regional Economy*, *China Statistical Yearbook*, and provincial statistical yearbooks.

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Figure 2: The Divergence in Infrastructure and Growth
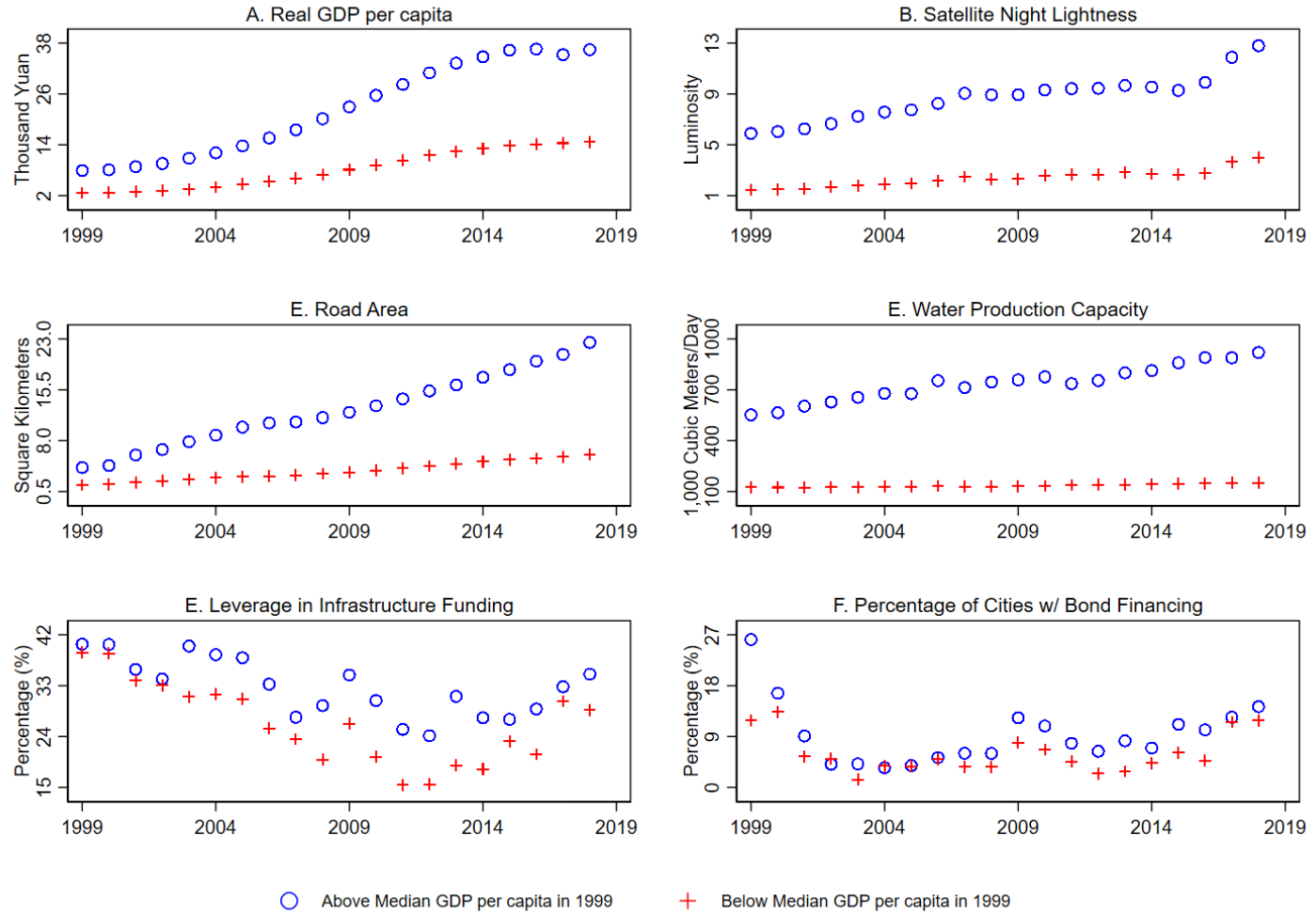
Notes: GDP per capita in Panel A are deflated to the price level of year 2000. Satellite luminosity in Panel B is expounded at greater length in Appendix Section C. Data come from CNRDS, CEI, and *China City Statistical Yearbook*.

Figure 3: LGFV and Fiscal Capacity
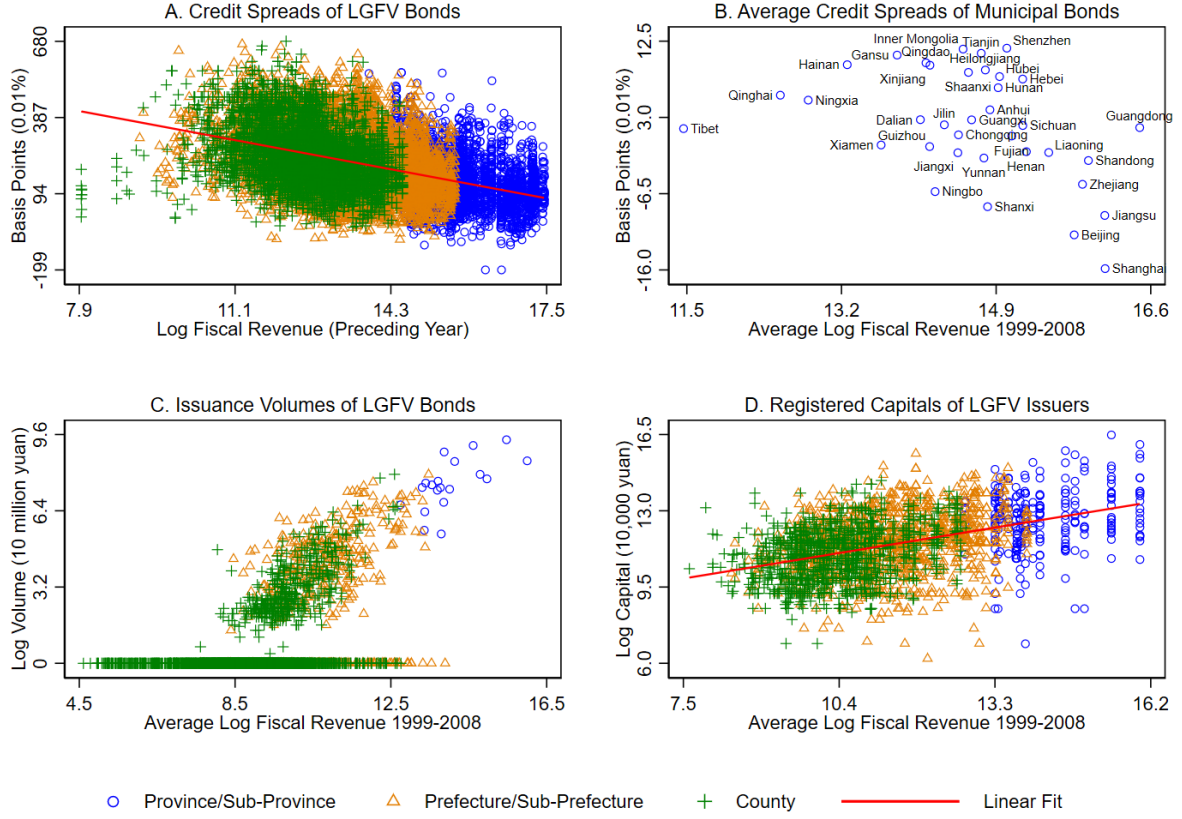
Notes: Fiscal revenue is deflated to the price level of year 2000. For Panel A, YTMs are applied for short-term and special types of bonds, and initial APRs are applied for floating-rate bonds in computing credit spreads (see Section 4.3 for details). For Panel B, the average bond credit spread is weighted by its respective issuance volume. Data come from RESSET, WIND, *China City Statistical Yearbook*, *China Statistical Yearbook (County-Level)*, and provincial yearbooks.

Figure 4: LGFV Issuer Count and Bond Credit Spread by Prefecture

LGFV Issuers
- N.A.
- 0
- 1
- 2-3
- 4-8
- >8

Avg. Credit Spread
- N.A.
- 0-212
- 213-249
- 250-287
- 288-500
- No Issuance
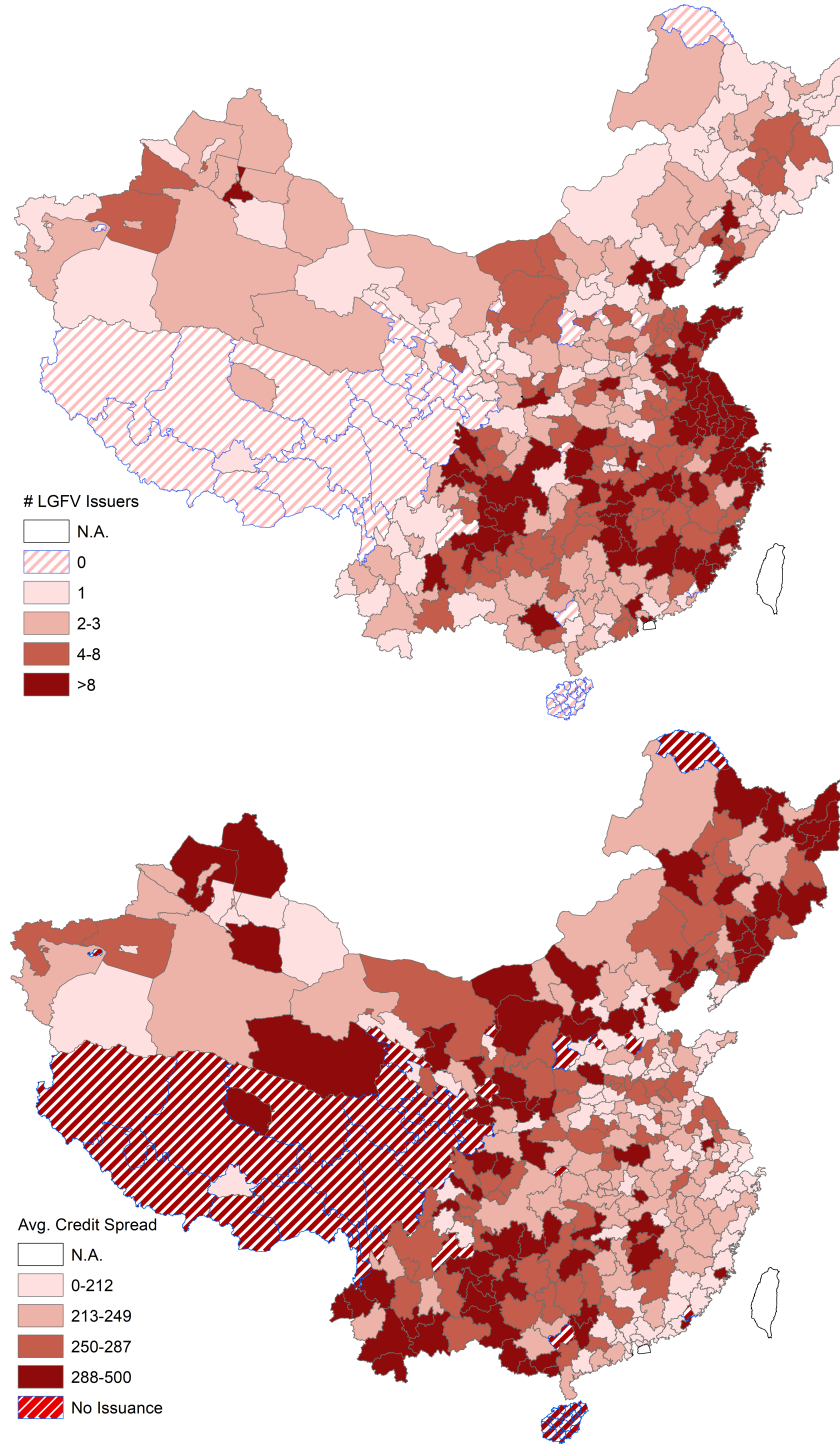
Notes: The top figure depicts the number of LGFV issuers. The bottom figure depicts the average credit spread (weighted by issuance volume) of LGFV bonds. LGFVs of the province level are excluded because they are not propped up by the city where they are located. Data come from RESSET and WIND.

Figure 5: Comparison of Interest Rates by Financing Mode (%)
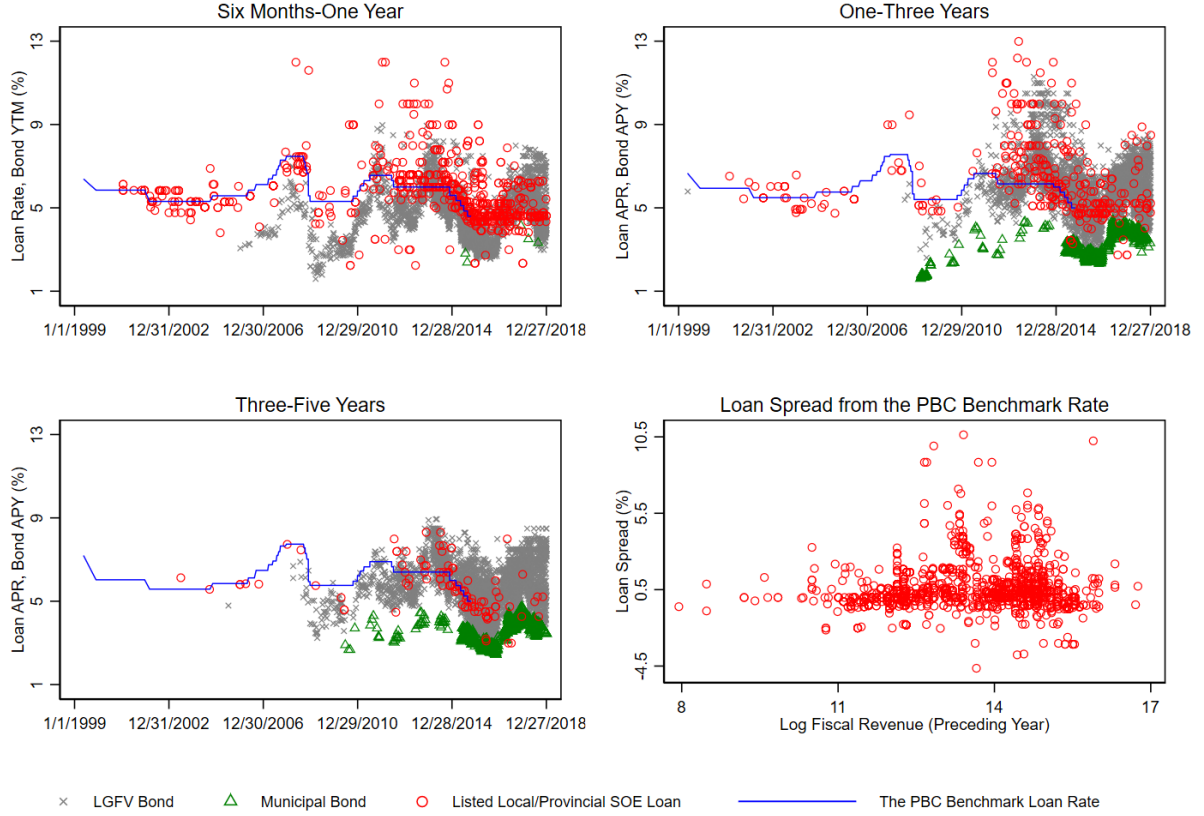
Notes: Except for the bottom-right panel, horizontal axes denote the LGFV bond issuance dates, the loan start dates for listed SOEs, and the effective dates of the PBC benchmark rates. Municipal bonds do not include those issued by local housing provident fund management centers. Zero-interest and concessional loans taken out from policy banks and loans denominated in a foreign currency are dropped. YTMs are applied for short-term and special types of bonds, and initial APRs are applied for floating-rate bonds (see Section 4.3 for details). Term length below six months or above five years and interest rates outside the [1%, 13%] interval are not plotted. Data come from RESSET, CSMAR, and *Almanac of China's Finance and Banking*.

Table 1: Fiscal Capacity, Infrastructure Financing, and LGFV Performance

	Infrastructure Financing		LGFV Bond		LGFV Liability		LGFV Profitability	
	Bond Access=1 (1)	Leverage Ratio (2)	Credit Rating (3)	Credit Spread (4)	Debt-Asset Ratio (5)	Log Bond Finance (6)	ROA (7)	ROE (8)
Fiscal Revenue	0.188**	1.935**	0.915***	-31.906***	3.625***	1.106***	-0.150***	0.045
	(0.089)	(0.841)	(0.080)	(5.467)	(0.439)	(0.148)	(0.035)	(0.073)
Prefecture Level	-0.515*	-9.413**	-0.888***	-11.175	0.109	1.817***	0.183	0.598
	(0.270)	(4.136)	(0.274)	(8.685)	(1.334)	(0.472)	(0.161)	(0.373)
County Level	-1.428***	-14.568***	-0.722***	-19.726	-0.806	0.070	0.319	0.848*
	(0.368)	(4.227)	(0.253)	(16.364)	(2.193)	(0.788)	(0.201)	(0.416)
City Control	Y	Y	N	N	N	N	N	N
Bond Charcs.	N	N	Y	Y	N	N	N	N
Firm Charcs.	N	N	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	10,633	10,588	7,281	15,536	21,028	21,045	20,965	20,959
Pseudo/Adjusted R^2	0.091	0.166	0.342	0.453	0.264	0.364	0.205	0.121

Notes: City control variables include log population density, log real GDP per capita, the percentage of nonagricultural output, loan-to-GDP ratio, log distance to the provincial capital, and log number of manufacturing firms. Variables of firm characteristics are firm age, a dummy for listed firm, and a vector of dummies indexing industry classification. Variables of bond characteristics are bond term length, a dummy of having guarantee, a dummy for cross-market trading, a vector of dummies indicating special bond or embedded option (asset-backed security, private placement note, callable bond, puttable bond, and deferred interest bond), dummies for credit rating agencies (for column (3)), and the number of underwriters (for column (4)). Regressands in columns (5), (7), & (8) are winsorized at the 1% and 99% levels to eliminate extreme values. Columns (1) and (3) use panel and ordered logit regressions respectively, both of which report Pseudo R^2. Robust standard errors in parentheses are clustered at the province level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Regressions in columns (2) & (4)-(8) have a constant term.

Table 2: Bond Default Risk and Robustness Tests on LGFV Performance

	Bond Default=1 (1)	Operational ROA (2)	Current Ratio (3)	Capital Turnover (4)	Debt/ EBITDA (5)	Debt Coverage Ratio (6)
Fiscal Revenue	-0.095	-0.050	-0.910***	0.054	4.829***	-0.406***
	(0.127)	(0.048)	(0.178)	(0.207)	(1.153)	(0.080)
Prefecture Level	-0.417	-0.284	-0.938	0.064	2.508	-0.676**
	(0.539)	(0.233)	(0.553)	(1.295)	(3.407)	(0.300)
County Level	0.196	-0.139	-0.433	0.331	-0.690	-0.609
	(0.803)	(0.287)	(0.583)	(1.777)	(4.824)	(0.399)
Bond Charcs.	Y	N	N	N	N	N
Firm Charcs.	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	47,422	19,109	20,994	20,683	19,106	18,579
Pseudo/Adjusted R^2	0.203	0.287	0.150	0.067	0.102	0.041

Notes: Column (1) uses logit regression and reports Pseudo R^2. Regressands in columns (2)-(6) are winsorized at the 1% and 99% levels to eliminate extreme values. Variables of firm characteristics are firm age, a dummy for listed firm, and a vector of dummies indexing industry classification. Variables of bond characteristics are bond term length, a dummy of having guarantee, a dummy for cross-market trading, and a vector of dummies indicating special bond or embedded option (asset-backed security, private placement note, callable bond, puttable bond, and deferred interest bond). Robust standard errors in parentheses are clustered at the province level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. All regressions have a constant term.

Table 3: Local Bureaucracy and Capital Budgeting

	City Panel			Bond Issuer: Debt-Asset Ratio			
	Infrast. Expnd./ Fisc. Rev. (1)	Log Area of Land Remise (2)	Leverage Ratio (3)	LGFV (4)	Non-LGFV SOE (5)	Provincial & Central SOE (6)	Private & Foreign Firm (7)
Secretary Age	9.724 (6.107)	0.468*** (0.162)	-3.582 (2.184)	0.479 (1.334)	1.758* (0.891)	0.273 (1.014)	0.406 (0.894)
Secretary Age^2	-0.091 (0.059)	-0.004** (0.002)	0.033 (0.021)	-0.001 (0.013)	-0.015* (0.008)	-0.000 (0.009)	-0.005 (0.008)
Mayor Age	7.212** (3.134)	0.424*** (0.120)	-4.759** (2.140)	2.277** (0.931)	2.216** (0.881)	0.846 (0.598)	1.240 (0.964)
Mayor Age^2	-0.076** (0.033)	-0.004*** (0.001)	0.048** (0.021)	-0.020** (0.009)	-0.020** (0.008)	-0.007 (0.005)	-0.012 (0.009)
Province FE	Y	Y	Y	N	N	N	N
Firm FE	N	N	N	Y	Y	Y	Y
Observations	5,545	5,302	5,627	11,572	6,487	13,632	15,544
Adjusted R^2	0.105	0.249	0.079	0.015	0.005	0.006	0.003

Notes: Columns (1)-(3) use the city panel of 1999-2018 (land remise data are unavailable for year 2018), with each column for a different regressand. Columns (4)-(8) use the fixed-effect bond issuer panel data and employ debt-asset ratio as the common regressand, with each column representing a firm ownership group. See appendix Section D for details in constructing the local personnel dataset. Robust standard errors in parentheses are clustered at the province level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. All regressions have a constant term.

Table 4: Falsification Tests for Bond, Financing, and Performance

	Bond		Liability		Profitability	
	Credit Rating (1)	Credit Spread (2)	Debt-Asset Ratio (3)	Log Bond Finance (4)	ROA (5)	ROE (6)
Panel A: Non-LGFV SOE						
Fiscal Revenue	0.533***	-19.807**	2.489***	0.231	-0.159*	-0.117
	(0.116)	(9.020)	(0.793)	(0.196)	(0.084)	(0.247)
Prefecture Level	0.061	-17.698	1.896	0.935	-0.073	0.051
	(0.307)	(26.828)	(2.200)	(0.715)	(0.268)	(0.686)
County Level	0.267	6.788	1.366	0.331	-0.001	-0.334
	(0.425)	(36.518)	(2.384)	(0.696)	(0.379)	(1.084)
Observations	1,988	6,278	9,026	9,043	8,923	8,920
Pseudo/Adjusted R^2	0.287	0.398	0.163	0.285	0.111	0.054
Panel B: Provincial & Central SOE						
Fiscal Revenue	0.166	0.480	-0.156	0.591	0.009	0.071
	(0.145)	(4.266)	(0.442)	(0.505)	(0.104)	(0.301)
Prefecture Level	-0.254	-3.944	-3.216	0.660	0.202	0.689
	(0.420)	(9.514)	(2.076)	(1.193)	(0.232)	(1.030)
County Level	-0.107	-16.401	-3.432	0.787	0.824	1.987
	(0.526)	(14.150)	(3.632)	(1.933)	(0.585)	(1.793)
Observations	4,926	14,229	13,721	13,777	13,605	13,602
Pseudo/Adjusted R^2	0.319	0.247	0.194	0.254	0.117	0.051
Panel C: Private & Foreign Firm						
Fiscal Revenue	0.200*	-6.317	0.441	0.261	-0.032	-0.197
	(0.105)	(4.475)	(0.482)	(0.218)	(0.110)	(0.240)
Prefecture Level	-0.148	1.909	-1.490	0.338	0.211	-1.105*
	(0.213)	(18.001)	(0.884)	(0.534)	(0.270)	(0.603)
County Level	0.545	-22.942	-2.503	0.809	0.437	-1.048
	(0.405)	(19.419)	(1.854)	(0.714)	(0.447)	(0.923)
Observations	3,625	9,512	15,959	15,991	15,849	15,842
Pseudo/Adjusted R^2	0.233	0.275	0.197	0.273	0.134	0.086
Bond Charcs.	Y	Y	N	N	N	N
Firm Charcs.	N	N	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y

Notes: Column (1) uses ordered logit regression and reports Pseudo R^2. Variables of firm characteristics are firm age, a dummy for listed firm, and a vector of dummies indexing industry classification. Variables of bond characteristics are bond term length, a dummy of having guarantee, a dummy for cross-market trading, a vector of dummies indicating special bond or embedded option (asset-backed security, private placement note, callable bond, puttable bond, and deferred interest bond), dummies for credit rating agencies (for column (1)), and the number of underwriters (for column (2)). Regressands in columns (3), (5), & (6) are winsorized at the 1% and 99% levels to eliminate extreme values. Robust standard errors in parentheses are clustered at the province level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Regressions in columns (2)-(6) have a constant term.

Appendix A   Additional Figures and Tables

Figure A.1: The Leverage of Public Facility Investment
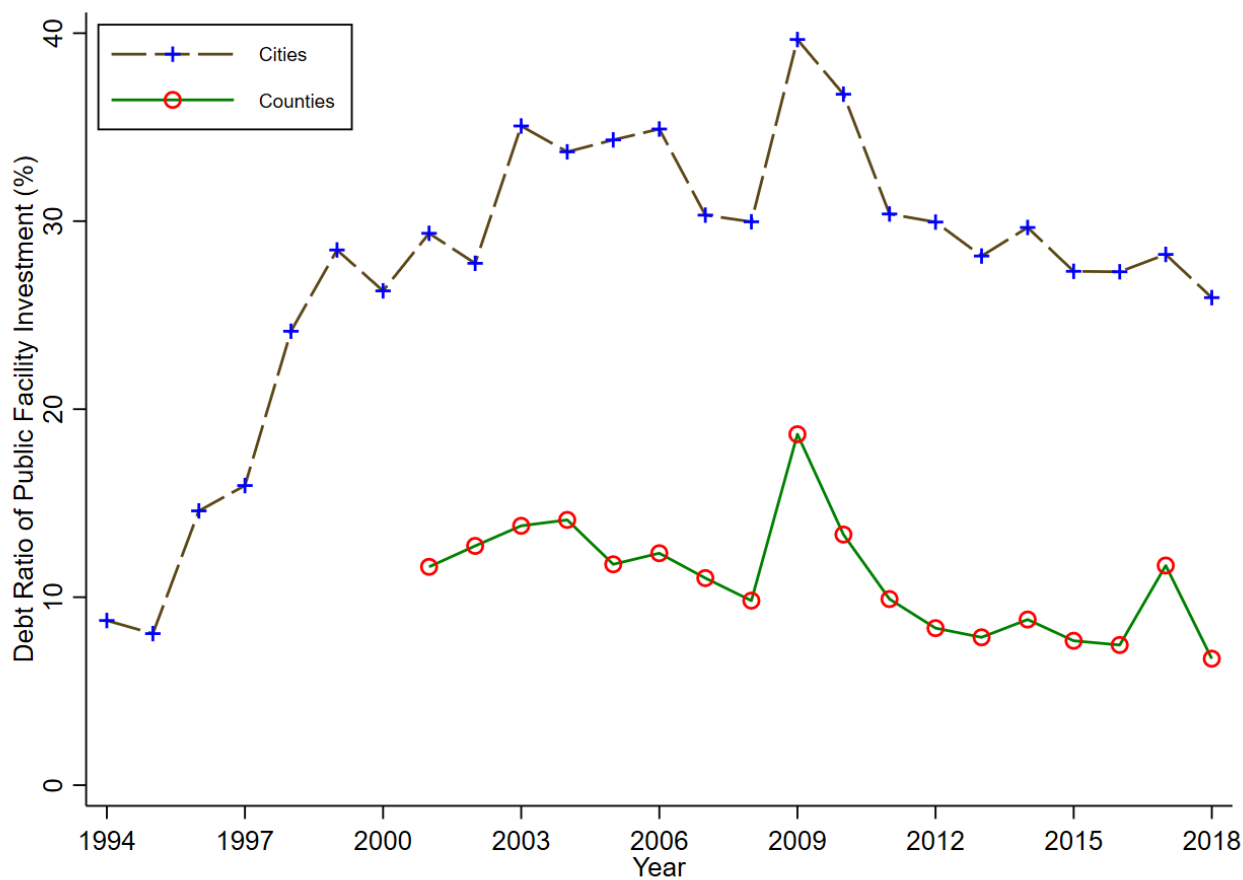
Notes: The debt ratio is the percentage of bank loan and bond in total public facility investment (excluding surplus from preceding years). Data come from *China Urban Construction Statistical Yearbook* and *China County Seat Construction Statistical Yearbook*.

Figure A.2: Flow of Funds to Non-Financial Sectors by Funding Source
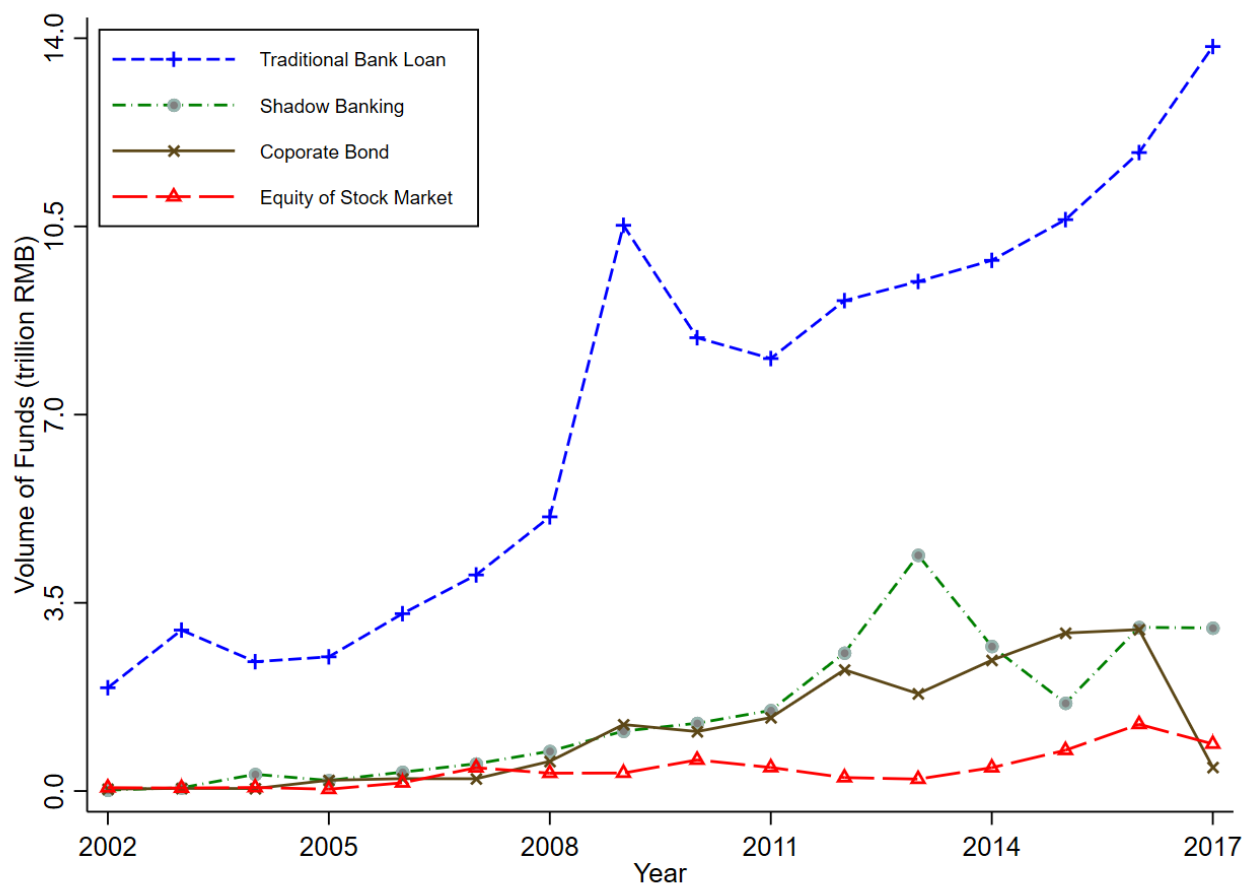
Notes: Data come from *China Statistical Yearbook.*

Table A.1: Fiscal Sharing of Central and Subnational Governments (2003-2014)

	Central Government	Subnational Government
Exclusive Revenue	Tariff Value-Added Tax for Imports Consumption Tax Deposit Interest Tax Cargo Ship Tax Vehicle Purchase Tax Central Government-Managed Funds Revenue from Central SOEs Corporate Income Tax from Railway, State Postal Service, State Bank Headquarters, and Offshore Oil Companies	Urban Land Using Tax Land Appreciation Tax Arable Land Use Tax Deed Tax Property Tax Vehicle and Vessel Use Tax Local Government-Managed Funds Revenue from Local SOEs Agriculture Tax (abolished in 2006 except for tobacco) Stamp Tax (except stock exchange)
Shared Revenue	Value-Added Tax: 75%	25%
	Individual & Corporate Income Tax: 60%	40%
	Urban Maintenance and Development Tax: railway and headquarters of state banks & insurance companies	all else
	Business Tax: same as above	all else
	Resource Tax: offshore oil	terrestrial resources
	Stamp Tax of Stock Exchange: 97%	3%
	Administrative Charge, Fine, and Penalty	Administrative Charge, Fine, and Penalty
Exclusive Expenditure	Defense Diplomacy Transfer to Subnational Governments	Urban and Rural Community Affairs Social Security and Employment Health Care Agriculture, Forestry, and Water Conservancy Energy Saving and Environmental Protection Commerce Service Administration Inter-government Transfer
Shared Expenditure	General Public Service; Public Security; Education; Science and Technology; Culture, Sports, and Media; Transportation; Indemnificatory Housing; Resource Exploration, Power, and Communication Administration; Agrarian and Meteorological Affairs; Grain, Oil, and Material Reserve; Interest Payment for Debt; Financial Regulation.	

Notes: In shared revenue, the entries indicate the proportion or items attributable to the central or subnational governments. Items in exclusive expenditure are not completely distinct. I categorize them into the central (or subnational) group if the central (or subnational) government pays for more than 95% of the total expense. Data come from the author's tabulation of the *Finance Yearbook of China*.

Table A.2: Descriptive Statistics for Table 1 and Table B.1

Variable	Obs.	Mean	SD	Min	Max
Table 1 Columns (1)-(2)					
Leverage Ratio (%)	10,588	14.29	22.72	0.00	100.00
Bond Access=1	10,633	0.06	0.24	0.00	1.00
Log Fiscal Revenue (10,000 yuan)	10,633	11.08	1.44	7.00	16.72
Log GDP per capita (yuan)	10,633	9.83	0.80	7.41	12.58
Loan-to-GDP Ratio	10,633	0.82	0.58	0.01	8.25
% of Nonagricultural Output	10,633	86.60	11.54	5.69	99.97
Log Population Density (person/km^2)	10,633	5.96	1.14	0.57	9.55
Log No. of Industrial Firms	10,633	4.89	1.26	0.00	9.04
Log Distance to the Provincial Capital (km)	10,633	4.72	0.67	1.85	5.84
Table 1 Columns (3)-(4)					
Log Fiscal Revenue (10,000 yuan)	15,536	13.67	1.51	7.94	17.45
Bond Credit Spread (bps)	15,536	210.38	118.73	-198.01	680.61
Bond Term Length (year)	15,536	4.01	2.48	0.04	20.00
Publicly Listed Company	15,536	0.03	0.17	0.00	1.00
Firm Age (year)	15,536	14.46	7.04	0.02	68.32
With Debt Guarantor(s)	15,536	0.14	0.35	0.00	1.00
Private Placement Note	15,536	0.16	0.37	0.00	1.00
Asset-Backed Security	15,536	0.01	0.08	0.00	1.00
Cross-Market Trading	15,536	0.18	0.38	0.00	1.00
Callable Bond	15,536	0.04	0.19	0.00	1.00
Puttable Bond	15,536	0.24	0.43	0.00	1.00
Deferred Interest Bond	15,536	0.03	0.17	0.00	1.00
No. of Underwriters	15,536	1.36	0.64	1.00	30.00
Table 1 Columns (5)-(8)					
Debt-Asset Ratio (%)	21,028	49.01	17.30	5.42	96.23
Log Loan Finance (10,000 yuan)	21,045	13.12	10.36	0.00	26.32
ROA (%)	20,965	1.64	2.08	-19.10	23.28
ROE (%)	20,959	3.40	5.07	-77.48	66.99
Table 2					
Operating ROA (%)	19,109	2.83	2.55	-10.95	28.68
Current Ratio	20,994	5.09	6.49	0.17	44.52
Capital Turnover Rate	20,683	1.62	20.04	0.00	556.29
Debt/EBITDA	19,106	33.14	43.95	-68.23	345.82
Debt Coverage Ratio	18,579	1.29	5.14	-0.57	62.74

Notes: To deal with zero value observations, I add one for variables taking the log. Regressands for Table 2 and columns (5), (7), & (8) of Table 1 are winsorized at the 1% and 99% quantiles to eliminate extreme values. Fiscal revenue is deflated to the year 2000 price level. Firm-level accounting variables are computed using the book values. Data come from *China Urban Construction Statistical Yearbook*, *China County Seat Construction Statistical Yearbook*, *China City Statistical Yearbook*, *China Statistical Yearbook (County-Level)*, CSMAR, RESSET, CNRDS, and WIND.

Table A.3: Descriptive Statistics for Table 4

Variable	Non-LGFV SOE			Provincial & Central SOE			Private & Foreign Firms		
	Obs.	Mean	SD	Obs.	Mean	SD	Obs.	Mean	SD
Columns (1)-(2)									
Log Fiscal Revenue (10,000 yuan)	6,278	14.44	1.81	14,229	14.24	1.16	9,512	13.94	1.54
Bond Credit Spread (bps)	6,278	202.35	133.99	14,229	154.37	108.15	9,512	251.85	134.32
Bond Term Length (year)	6,278	2.36	2.14	14,229	2.35	2.52	9,512	2.14	1.88
Publicly Listed Company	6,278	0.25	0.43	14,229	0.24	0.43	9,512	0.40	0.49
Firm Age (year)	6,278	16.52	8.11	14,229	17.67	9.90	9,512	16.63	6.67
With Debt Guarantor(s)	6,278	0.14	0.35	14,229	0.07	0.25	9,512	0.09	0.29
Private Placement Note	6,278	0.10	0.30	14,229	0.08	0.27	9,512	0.09	0.28
Asset-Backed Security	6,278	0.01	0.11	14,229	0.03	0.16	9,512	0.04	0.19
Cross-Market Trading	6,278	0.01	0.09	14,229	0.02	0.12	9,512	0.01	0.10
Callable Bond	6,278	0.04	0.20	14,229	0.06	0.24	9,512	0.03	0.16
Puttable Bond	6,278	0.22	0.41	14,229	0.10	0.29	9,512	0.24	0.43
Deferred Interest Bond	6,278	0.02	0.15	14,229	0.05	0.23	9,512	0.01	0.09
No. of Underwriters	6,278	1.33	0.60	14,229	1.67	0.98	9,512	1.36	0.61
Columns (3)-(6)									
Debt-Asset Ratio (%)	9,026	55.41	18.13	13,721	61.31	18.17	15,959	54.98	18.10
Log Loan Finance (10,000 yuan)	9,043	8.31	10.21	13,777	9.31	10.73	15,991	6.33	9.58
ROA (%)	8,923	2.43	3.93	13,605	2.36	4.01	15,849	4.15	5.72
ROE (%)	8,920	6.14	12.14	13,602	6.66	13.93	15,842	10.58	15.99

Notes: Regressands for columns (3), (5), & (6) of Table 4 are winsorized at the 1% and 99% quantiles to eliminate extreme values. Fiscal revenue is deflated to the year 2000 price level. Firm-level accounting variables are computed using the book values. Data come from *China City Statistical Yearbook*, *China Statistical Yearbook (County-Level)*, CSMAR, RESSET, CNRDS, and WIND.

Appendix B   Supplemental Materials for China's Financial Market

B.1   Requirements for Corporate and Enterprise Bond Issuance

Several central government agencies are involved in the regulation of bond issuance, depending on the type of issuer and bond. As discussed in Amstad and He (2020), there are two premier types of bonds issued by non-financial entities: exchange-traded corporate bonds and enterprise bonds. Corporate bonds are issued by firms registered as corporations and are traded exclusively in the exchange market. China Securities Regulatory Commission (CSRC) approves the issuance of corporate bonds. Enterprise bonds apply to SOEs or central government agencies and are traded in both the exchange and the interbank market. The National Development and Reform Commission (NDRC) approves the issuance of enterprise bonds.

The minimum criteria for corporate or enterprise bond issuance include:[1]

- the minimum net equity is 30 million for limited liability incorporated (INC), and 60 million for limited liability companies (LTD);

- the outstanding balance of bonds cannot exceed 40% of the company's net equity;

- the average allocated profit can afford the annual bond interest payable in the last three years (for enterprise bond issuance, this requirement is to earn positive profits consecutively in the last three years);

- the use of funds raised in the bond issuance aligns with the state industrial policy;

- the bond coupon rate cannot exceed the level set by the State Council;

- the last batch of bond issuance should be sold out completely;

- the company has no record of debt default, delinquent interest payment, misappropriation of funds, misrepresentation of accounting profiles, misinterpretation of statements of the issuers, lapse in required information disclosure, or other violations.

For a public offering of bonds, the CSRC sets additional requirements:[2]

- the term of the bond exceeds one year;

- the issuance volume exceeds 50 million.

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[1]See *Company Law of the People's Republic of China 1993, 1999, 2004*, *Pilot Measures for Corporate Bond Issuance 2007*, and *Regulations for Enterprise Bond 1993*.

[2]See *Securities Law of the People's Republic of China 1998, 2004*.

Beyond coupon and dividend payments, the comprehensive cost of bond issuance includes commission fees paid to underwriters, lawyers, guarantors (if any), credit rating agencies, Shanghai Clearing House, etc. However, bank loans also incur administrative expenses in service charge, collateral appraisal, guaranteeing, stamp tax, insurance, credit inquiry, auditing, etc.
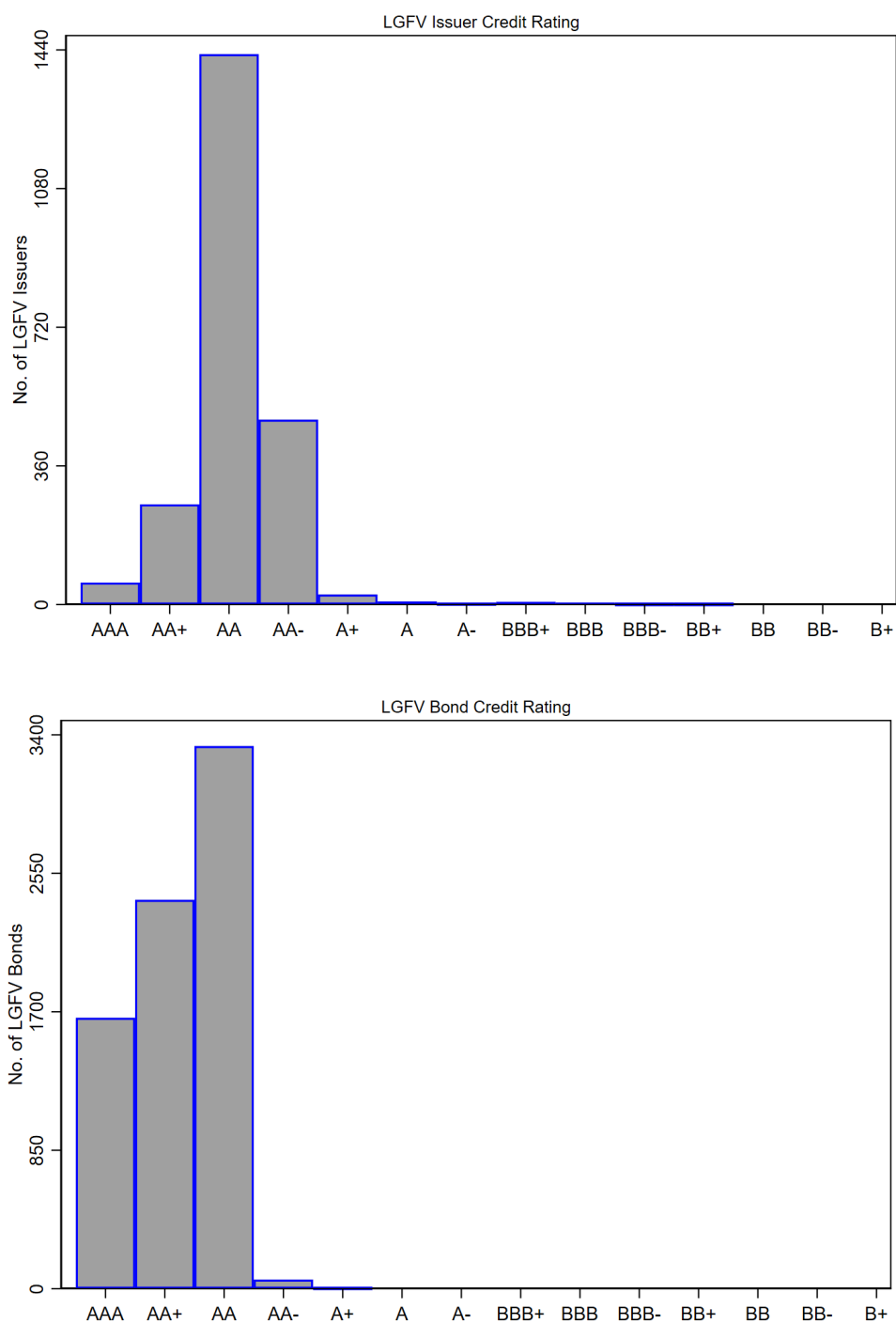
B.2   Bond Credit Rating

There are several domestic credit rating agencies in China: Chengxin, Lianhe, Dagong, Pengyuan, Shanghai Brilliance, and Golden. Chengxin and Lianhe are joint ventures with Moody and Fitch, respectively. Shanghai Brilliance is a private company. Pengyuan is controlled by several provincial SOEs. Dagong and Golden are controlled by central SOEs. Their rating scales adopt the classifications of S&P, Moody, or Fitch. The Moody rating scale is slightly different from those of S&P and Fitch. To compare them on a uniform standard, I apply the following conversion rule: Aaa=AAA, Aa1=AA+, Aa2=AA, Aa3=AA-, A1=A+, A2=A, A3=A-, Baa1=BBB+, Baa2=BBB, Baa3=BBB-, Ba1=BB+, Ba2=BB, Ba3=BB-, B1=B+, B2=B, B3=B-, Caa1=CCC+, Caa2=CCC, Caa3=CCC-, and Ca=CC. Short-term LGFV bonds have a vastly different rating scale and I have to exclude them in this study; but they still concentrate on the investment grade A-1 and A-2.

Issuer credit rating is similar to bond rating. They both look at a company's financial statements, outlook for its business, and macroeconomic factors. The issuer credit rating is an overall metric of a company's creditworthiness. However, a company might issue several bonds with different tranches that are divvied up by repayment priority. For example, a subordinated bond ranks below senior debt with respect to claims on assets in the event of liquidation. A company might issue both secured and unsecured bonds to finance different projects that bear disparate risks and profit margins. Thus, I employ bond rating in Section 4.3.

Bond credit ratings in China are criticized for being inflated and coarse (Amstad and He, 2020). While not comparable to the international standard, there are studies showing that the across-notch differences are nonetheless informative about default risk perceived by investors (Livingston et al., 2018).

Figure B.1: Histograms for Credit Rating

Notes: The top and bottom figures are the credit ratings of LGFV issuers and their bonds, respectively. Short-term bills with a different rating scale are excluded. Data come from RESSET and WIND.

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Table B.1: Commercial Loan Interest Rate Floating Range

Interval	Lower Bound	Upper Bound		
		commercial bank	urban credit union	rural credit union
8/21/1993-4/30/1996	90%	120%	130%	160%
5/1/1996-10/30/1998	90%	110%	110%	140%
10/31/1998-8/31/1999	90%	110% for medium and large enterprises 120% for small enterprises		150%
9/1/1999-12/31/2003	90%	110% for large enterprises 130% for small and medium enterprises		150%
1/1/2004-10/28/2004	90%	170%	170%	200%
10/29/2004-6/7/2012	90%	No limit	230%	230%
6/8/2012-7/5/2012	80%	No limit	230%	230%
7/6/2012-7/19/2013	70%	No limit	230%	230%
7/20/2013-present	No limit	No limit	No limit	No limit

Notes: The floating range is with respect to the PBC benchmark level. Since the 2013 interest rate liberalization, the LPR has gradually supplanted the role of the PBC benchmark rate. The PBC benchmark rate has become *de facto* defunct since Oct.24th, 2015, the last date when it was adjusted. Data come from *Almanac of China's Finance and Banking*.

Appendix C Satellite Night Luminosity

Economists widely use satellite data on nighttime light intensity as the barometer for economic activity (e.g., Henderson et al., 2012; Hodler and Raschky, 2014; Michalopoulos and Papaioannou, 2013). Nighttime light intensity is recorded by U.S. weather satellites and provided by the National Oceanic and Atmospheric Administration (NOAA) from 1992 onward. It is strongly correlated with regional GDP since a denser light means better electrification.[3]

I obtain the satellite luminosity from the Global Nighttime Light Database (GNLD) in the Chinese Research Data Service (CNRDS). Data for 1992-2013 originate from the Defense Meteorological Satellite Program's Operational Linescan System (DMSP-OLS). The satellite images of light density are available at a fine grid. The stable light in a pixel is formulated as digital numbers (DN) ranging on a scale of [0, 63], with higher values implying brighter light (Chen and Nordhaus, 2011).[4] To construct the city-by-year light density panel, the GNLD averages the DN values for the corresponding year over all grid cells and then multiplies this luminosity value by the share of lit pixels in the total cell population that fall within the geographic boundary of the city. To minimize the measurement error, the GNLD follows the procedure in Liu et al. (2012) to correct for differences across sensors and years using regression and calibration. Data for 2013-2018 originate from the Visible Infrared Imaging Radiometer Suite's Day/Night Band (VIIRS-DNB). Compared to the DMSP-OLS, the VIIRS-DNB has three advantages. First, it is not saturated (top-coded) at the highest intensity (DN=63). Second, it has a finer spatial resolution. Third, it has monthly instead of yearly frequencies. The downside of the VIIRS-DNB is that it does not purge atmospheric disturbances and errors in mapping of the earth's topography. The GNLD applies Ma et al. (2018)'s method to denoise the VIIRS-DNB data. I average the monthly luminosity values to obtain their annual series. The DMSP-OLS and the VIIRS-DNB are measured on disparate scales. Since the luminosity for 2013 is reported by both, I transform the VIIRS-DNB data proportionately to the DMSP-OLS scale using their city-specific ratio in 2013.

It should also be noted that both DMSP and VIIRS have drawbacks: DMSP is subject to top-coding, underestimation of spatial inequality, etc; while both have a poor predictive performance at low density areas (Gibson et al., 2021). Since the centerpiece of this study is about interregional disparity, I use the night lights data only for visualization in Section 4.

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[3]The premier feature of the nighttime luminosity is its availability at arbitrarily partitioned geographic levels (finer than administrative divisions) in consistent quality for all regions. This is extremely helpful for research on countries with poor statistical systems.

[4]The DMSP-OLS reports stable images of the Earth captured at night after purging ephemeral optical and atmospheric noises due to cloud shrouds, gas flares, aurora, fires, moonlight, lightning, etc. The DN value is proportional to anthropogenic nocturnal radiance.

Appendix D   Individual Characteristics for Politicians

I assemble the biographic dataset of local party secretaries and mayors from Chen (2016), Jiang (2018), Wang and Dickson (2021), the CNRDS, and Internet search using *Baidu Encyclopedia*, *Wikipedia*, and *Duxiu*.[5] I match this dataset with the city panel. For years with politician turnovers, I choose the one who is in office for the majority of that year in matching with the annual city data. I drop officials whose lengths of tenure are less than six months.

The anecdotal patronage story suggests that local officials vie for appropriation and favor from their upper-level supervisors. Thus, those with strong connections (such as elite university alumni, work experience in the central government, serving hometown province, etc.), more experience, or more knowledge should outwit the rest of their fellows.[6] I use an array of variables to form an image of an official's intellectual quality and social tie. First, I measure an official's educational background by dummies indexing holding a graduate degree, graduating from an elite university, having studied in the central party school, and fields of study (economics and business, science and engineering, and arts, humanities or other social sciences). Second, I capture an official's career trajectory by a dummy for serving his home province, a dummy indicating whether he has ever worked in the central government, and a dummy for ascending from the previous post. Third, I add dummies for being an ethnic minority and female, the group of candidates who are likely to be favored for diversity reasons. To eliminate duplicate observations across years, I collapse the date by individual-city-position spells before running regressions in Table D.1.

Many officials undertake part-time graduate study to further their government careers. Thus, my educational attainment variable is defined as the highest degree level obtained. An elite university is defined as belonging to the "Project 211", an initiative launched by the Ministry of Education to fuel the development of state key universities. It is the basis for subsequent state higher education programs "Project 985" and "Double First-Rank". Short-term non-degree training in "Project 211" universities does not count. I include the predecessors for universities that experienced mergers or reorganizations. My classification of majors is based on the State Council's categories (https://www.chinadegrees.cn/xwyyjsjyxx/sy/glmd/264462.shtml). Particularly, philosophy (01), law (03), education (04), literature (05), history (06), military (11), public administration (1204), and library (1205) are lumped up as arts and humanities. Agriculture (09), medicine (10), and management engineering (1201) are grouped together with science (07) and engineering (8). The third group is economics (02), business administration (1202), and agricultural economics

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[5]Jiang (2018)'s Chinese Political Elite Database is available at www.junyanjiang.com. Wang and Dickson (2021)'s China's Corruption Investigations Dataset is available at https://doi.org/10.7910/DVN/9QZRAD. Chen (2016)'s party secretary and mayor dataset (2000-2010) is available at http://ccs.fudan.edu.cn/index.htm.

[6]The social connection of local politicians and its consequences could not be more complicated. For instance, Fisman et al. (2020)'s study on China's political selection and social tie offers an opposite perspective: They find that such connections are countervailing in that a province-level official's shared hometown or college with Politburo members reduces the promotion likelihood. Jia et al. (2015) identify a complementarity between connection (loyalty) and performance (competence) in the political selection process.

Table D.1: Determinants of Promotion and Corruption

	Promotion		Corruption	
	Secretary (1)	Mayor (2)	Secretary (3)	Mayor (4)
Age	0.813**	0.516**	0.744**	0.348
	(0.320)	(0.202)	(0.317)	(0.322)
Age^2	-0.009***	-0.007***	-0.008**	-0.004
	(0.003)	(0.002)	(0.003)	(0.003)
Infrast. Expnd./Fisc. Rev.	0.002**	0.002**	-0.001	-0.003**
	(0.001)	(0.001)	(0.001)	(0.002)
Leverage Ratio	-0.002	-0.004	0.001	0.004
	(0.003)	(0.003)	(0.003)	(0.004)
Demographics	Y	Y	Y	Y
Education History	Y	Y	Y	Y
Job Trajectory	Y	Y	Y	Y
Observations	1,779	1,919	1,775	1,906
Pseudo R^2	0.028	0.058	0.030	0.039

Notes: The data are collapsed by individual-city-position spells. Demographic variables are dummies for gender and ethnic minority. Variables for educational history are dummies for attending the central party school, being an elite university graduate, holding a graduate degree, and fields of study. Variables of job trajectory are dummies indexing serving home province, having worked in the central government, and promotion from previous position. See appendix Section D for details in constructing those variables. Robust standard errors in parentheses are clustered at the province level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

(1203). An official could have multiple majors at different levels of study.

Work experience in the central government refers to a ministry or bureau belonging to the Central Party Committee, National People's Congress, State Council, National Committee of the Chinese People's Political Consultative Conference, Central Military Commission, Supreme People's Court, and Supreme People's Procuratorate. Since some ministries have been dissolved or reorganized over the years, I take account of all ministries that existed in history (up to 2018), but do not account for their subsidiary enterprises, educational/research institutes, professional associations, or other non-executive business entities. For example, the Central Party Commission consists of General Office, Central Commission for Discipline Inspection, Central Organization Department, Central Propaganda Department, Central United Front Work Department, Central Political and Legal Committee, Central International Liaison Department, Central Financial and Economic Affairs Commission, Central Policy Research Office, State Commission Office for Public Sector Reform, Central Committee of the Communist Youth League, etc.

Cities are assigned different tiers based on their economic and political clout. Appendix Table D.2 summarizes its hierarchical system. Typically, the civil rank of a party secretary/mayor is identical to the city's tier under his/her governance. An exception is that some party secretaries of provincial capitals or large cities hold vice-provincial positions concurrently. The appointment of local leaders is decided by the personnel one level up. A mayor candidate is first nominated by the upper-level party standing committee and works as an acting mayor until formally confirmed by the local people's congress. A party secretary is appointed directly by the upper-level party standing committee. A mayor usually holds a concurrent position of the vice party secretary. The party secretary sometimes holds a concurrent position of the director of local people's congress to wield the powers of legislation and bureaucrat-nominee confirmation.

An official has four outcomes of career placement: promotion, lateral transfer, retirement, or dismissal. Local officials face promotion competitions from their counterparts of other cities as well as upper-level government bureaucrats. I employ Chen and Kung (2016)'s and Jia et al. (2015)'s rules in codifying career placement.[7] It is determined as a promotion if a party secretary's last position is vice mayor, member of municipal party standing committee (a.k.a *shi wei chang wei*), vice municipal party secretary, vice provincial department chief (a.k.a *fu ting zhang*), vice sub-divisional head in a central government ministry (a.k.a *fu si zhang*), executive of a provincial SOE, or inspector (non-leadership position, a.k.a *xun shi yuan*). This rule applies for mayors except when a mayor's last position is a combination of the vice party secretary and mayor of another equivalent-rank city. It is also a promotion if a mayor is transferred to the party secretary position. It is codified as a lateral transfer if an official's previous position is provincial department chief or sub-divisional head in a central government ministry. The ideal placement of a prefectural party secretary is ascending to a member of the provincial party standing committee, a deputy governor, a mayor/secretary of a sub-provincial city, chief justice of provincial court, chief procurator of provincial procuratorate, a deputy minister in the central government, president of a deputy-ministerial

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[7]A few officials were still in office as of 2021. Their placements are yet to be observed.

Table D.2: China's City Tier System

Tier	Scope
Province	23 Provinces, 5 Autonomous Regions, and 4 Municipalities
Sub-Province	Independent Planning Cities: Dalian, Qingdao, Ningbo, Xiamen, & Shenzhen Large Provincial Capitals: Harbin, Changchun, Shenyang, Jinan, Nanjing, Hangzhou, Guangzhou, Wuhan, Xi'an, & Chengdu State Key SEZs: Pudong (Shanghai) and Binhai (Tianjin)
Prefecture	About 330 Prefectural Cities, Prefectures, Autonomous Prefectures, Leagues (Inner Mongolia), or Boroughs of Municipalities
Sub-Prefecture	Hainan: Wuzhishan, Qionghai, Wenchang, Wanning, Dongfang, and all other counties Hubei: Tianmen, Xiantao, Qianjiang, & Shennongjia Henan: Jiyuan Districts and Counties of Sub-Provincial Cities Counties of Chongqing
County	About 2850 Counties, County-level Cities, Autonomous Counties, Banners (Inner Mongolia), or Districts of Prefectures
Town	About 39800 Towns, Villages, Urban Streets, Sumu (Inner Mongolia), or County Subdistricts

Notes: SEZs include high-tech zone, economic development zone, industrial development zone, economic demonstration zone, free trade zone, export processing zone, open economy area, airport economic zone, ecological zone, etc. Other than Pudong and Binhai, SEZs are not tabulated in the administrative division code list published by the Ministry of Civil Affairs. They are governed by administrative committees which are unofficial subnational divisions. Data come from the author's compilation from *Baidu Encyclopedia* and *Wikipedia.*

university, or chairman of a deputy-ministerial central SOE. For prefectural mayors, a natural placement is ascending to the party secretary of his/her current city or another city of equivalent rank. Those who are towards their retirement ages or term limits are ordinarily transferred to the local people's congress or people's political consultative conference. In this case, a promotion is identified if the next position is vice director of provincial people's congress or vice chairman of provincial political consultative conference. If a cadre has deputy provincial rank before assuming office, then transferring to another deputy provincial position afterwards does not constitute a promotion. For party secretaries and mayors of sub-provincial cities, their promotion should be provincial party secretary, governor, director of provincial people's congress, chairman of provincial political consultative conference, or minister in the central government. For leaders of the four provincial municipalities, their promotion should end up in the Politburo.

The data for officials who were caught for corruption or malpractice are drawn from Wang and Dickson (2021) and Jiang (2018). I supplement their data with updates scraped from the Central Commission for Discipline Inspection website. News reports for those corrupt politicians reveal that bribery, embezzlement, and abuse of power were habitual in their careers. Thus, I apply the following rule: If an official is caught (whether ending up in a court trial or a disciplinary action), I designate all his/her current and previous party secretary and mayor positions as being corrupt.

Table D.3: Descriptive Statistics for Party Secretaries and Mayors

Variable	Party Secretary					Mayor				
	Obs.	Mean	SD	Min	Max	Obs.	Mean	SD	Min	Max
Age (at assuming office)	1,815	51.14	3.87	37.33	65.33	1,958	49.02	3.94	35.08	61.17
Female	1,819	0.04	0.20	0	1	1,959	0.05	0.23	0	1
Ethnic Minority	1,819	0.07	0.25	0	1	1,959	0.08	0.27	0	1
Attended the Central Party School	1,819	0.45	0.50	0	1	1,959	0.39	0.49	0	1
Elite University Alumnus	1,819	0.50	0.50	0	1	1,959	0.51	0.50	0	1
Holding a Graduate Degree	1,819	0.68	0.47	0	1	1,959	0.72	0.45	0	1
Studied Economics & Business	1,819	0.51	0.50	0	1	1,959	0.54	0.50	0	1
Studied Arts, Humanities, & Social Sciences	1,819	0.55	0.50	0	1	1,959	0.53	0.50	0	1
Studied Science & Engineering	1,819	0.39	0.49	0	1	1,959	0.39	0.49	0	1
Serving Home Province	1,819	0.66	0.47	0	1	1,959	0.70	0.46	0	1
Worked in the Central Government	1,819	0.13	0.33	0	1	1,959	0.10	0.30	0	1
Promoted from Previous Post	1,819	0.71	0.45	0	1	1,959	0.76	0.43	0	1
Corruption (Disciplinary Action)	1,819	0.17	0.38	0	1	1,959	0.16	0.37	0	1
Promotion (afterwards)	1,819	0.41	0.49	0	1	1,959	0.52	0.50	0	1
Leverage Ratio (%)	1,816	21.57	20.97	0	100	1,957	21.61	21.07	0	100
Infrastructure Spending/Fiscal Revenue (%)	1,785	26.69	56.62	0	1,025.34	1,927	26.34	55.57	0	1,025.34
Log Area of Land Remise (hectares)	1,715	5.76	1.32	0	8.86	1,834	5.73	1.35	0	12.34

Notes: The table presents party secretaries and mayors for cities of prefecture and above levels (excluding autonomous prefectures). The last three variables are collapsed to their individual-city-position averages. I add one for area of land remise before taking the log. Data come from Chen (2016), Jiang (2018), Wang and Dickson (2021), CNRDS, *Baidu Encyclopedia*, *Wikipedia*, *Duxiu*, *China City Statistical Yearbook*, *China Urban Construction Statistical Yearbook*, and *China Land and Resource Almanac*.

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