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RESEARCH ARTICLE

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Finance and local economic growth: New evidence from China

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Abstract

We study the relationship between finance and growth using a sample of 275 Chinese cities from 2009 to 2018. We exclude bank loans to local governments through the local government financing vehicles (LGFVs) and construct a better financial development index which measures the level of loans extended by banks to enterprises and households. We find that financial development in the form of a higher loan-to-GDP ratio leads to lower economic growth. This negative relationship between finance and growth may be attributed to various mechanisms, including discrimination in bank lending, housing market bubbles, and an imbalance in growth between real and financial sectors.

KEYWORDS

banks, china, city-level, economic growth, financial development

JEL CLASSIFICATION

O16, O18, O53, G21, N25

1 | INTRODUCTION

Since the 2007–2008 global financial crisis, China launched a series of measures and reforms to boost its domestic investment and to mitigate the negative impact of the financial crisis on its economic growth. A massive stimulus programme worth four trillion RMB (equal to $586 billion) was initiated in November 2008 with appeals for the banking sector to expand loans to the economy. This policy shift not only helped China to recover quickly but also structurally shaped its growth model from an export-led model to an investment-led one. As a result, China's financial sector, wholly dominated by banks, underwent a remarkable period of development and expansion. However, there are concerns about the unprecedented rapid growth rate in bank lending and whether these lending activities generate a positive impact on local economic growth.

In this study, we first examine the finance-growth nexus using a panel dataset of 275 cities over the period 2009–2018. To do this, we construct a new financial development index which improves the measurement of the depth of China's banking sector. The ratio of total loans in the financial system to GDP is widely used as China's financial depth indicator. However, since 2008 this loan-to-GDP ratio covers the information of a large amount of off-balance-sheet government loans. Thus, this loan-to-GDP ratio tends to significantly overestimate the level of private loans relative to GDP. Our new financial development index excludes government-related loans from the total loans. This new index is a more accurate

measurement of corporate and household loan to GDP ratio (Beck et al., 2000; Levine, 1999).

Our study will show that China's local financial development (in the form of a higher loan to GDP ratio) negatively impacts local economic growth during a decade after the global financial crisis. Our empirical study contributes to the literature on China's finance and growth. We provide the most recent empirical analysis of this topic. Previously, related empirical studies based on regional data have shown mixed results. Some studies find that China's financial institutions may hinder GDP growth (Allen et al., 2005; Boyreau-Debray, 2003; Guariglia & Poncet, 2008). Other studies find a positive role of financial development on economic growth as financial efficiency has been evidently improved by the ongoing financial reforms in China (Chen, 2006; Hasan et al., 2009; Huang & Wang, 2011).

We then explore the underlying mechanisms behind the finance-growth nexus we find. We evaluate how finance affects investment at the local level (see Benhabib & Spiegel, 2000 for a general discussion on growth and investment). The negative finance and growth relationship can be partly explained by the earlier literature which stresses that China's state-dominated banking sector often discriminates against the private sector in granting loans, and as a result, the more productive private enterprises are unable to receive sufficient loans to invest and grow (see Allen et al., 2005; Boyreau-Debray, 2003). This is a long-term problem related to capital misallocation between the state-owned enterprises (SOEs) and non-state-owned enterprises (non-SOEs). The second investment problem we investigate is capital misallocation in the real estate sector. As investment in this sector is one of the main engines for China to reach its growth target, the real estate housing booms and bubbles attract more resources while crowding out the non-real estate investment.

Additionally, our study is related to the financial stability literature on the imbalance in growth between financial and real sectors. Empirical studies in the last decade have shown that excess finance may be bad for economic growth. China's financial system has an intrinsic feature of financial repression due to its state-ruled nature. During the initial stage of China's economic and financial reforms in the 1980s, the government-ruled system enabled China to maintain a remarkable growth rate by reducing market failures and financial risks (Huang & Ge, 2019; Huang & Wang, 2011). However, with the process of greater financial liberalization, the financial system that worked quite well earlier may no longer deliver similar outcomes in recent years. China's experience may be useful for other emerging economies. Unlike advanced countries, these countries often have very weak legal and financial institutions which constrain the ability of the banks to make their independent commercial lending decisions to support productive sectors. We add to this line of studies by showing the role of banks in building up systemic financial risks which may trigger financial instability failing to serve the growth of the real economy.

The rest of this paper is organized as follows. Section 2 reviews the finance-growth literature and discusses the possible mechanisms underlying the finance-growth relationship. Section 3 describes the empirical model and the data and presents the baseline fixed effects regression results. Section 4 addresses the endogeneity issues, presents the GMM and IV results and provides several robustness checks. In the IV approach, a colonization index and the bank branch density are employed as instrumental variables. Section 5 discusses and provides empirical evidence on the mechanisms underlying the finance-growth nexus. Section 6 concludes this paper.

2 | LITERATURE REVIEW

Financial intermediaries are crucial determinants of economic growth as they facilitate the savings-investment process. One key research question in the literature is whether the development of financial institutions has a favourable impact on economic growth. The optimistic view describes a positive effect of financial development on growth. A well-developed financial system may: (1) mobilize savings and optimize the allocation of capital (Bencivenga & Smith, 1991; Levine, 1997); (2) facilitate information sharing and risk management (Blackburn & Hung, 1998; Greenwood & Jovanovic, 1990; Sahay et al., 2015). A large empirical literature documents the positive effect of financial development on economic growth (see Beck & Levine, 2004; Jerzmanowski, 2017; Quinn et al., 2011; Ranciere et al., 2006).

There is a growing literature which stresses the uncertainty about the general validity of this positive link between finance and growth. Rousseau and Wachtel (2011) reveal that the facilitating effect of financial development on growth has weakened in recent years in comparison to earlier studies on the 1960–1989 period. Excessive financial deepening may lead to financial and macroeconomic instability (see Allen & Carletti, 2006; Allen & Gale, 2004; Festić et al., 2011; Gennaioli et al., 2012). There is also evidence of a non-linearity in the finance-growth nexus. Arcand et al. (2015), Law and Singh (2014), and Samargandi et al. (2015) find that financial development helps growth up to a certain point, after which additional financial deepening starts to hurt growth.

One important channel underlying a negative finance-growth relationship is capital misallocation. For example,

Cecchetti and Kharroubi (2015) claim that the financial sector expands faster than the real economy and conclude that too much finance can burden R&D-intensive industries with high financial dependence. Another example is linked to the fact that the financial sector might generate high opportunity costs for the economy (see Santomero & Seater, 2000). Related, Philippon and Reshef (2012) find that financial liberalizations in the US lead to a rise in skill intensity and wages in financial industries. This contributes to attracting highly skilled human capital into the financial sector at the expense of other sectors.

The finance-growth nexus studies on China also show mixed results. Most existing studies use local-level data (either at the provincial or city level) and explore the research question of whether local financial development benefits local economic growth. Studies based on the sample covering the financial reforms since the mid-1990s tend to reveal that financial development contributes to strong economic growth. Financial reforms such as interest rate liberalization, loosening restrictions on ownership takeovers, and market entry deregulation significantly increase the efficiency and the independence of the banking sector. For example, Chang et al. (2010) find that financial reforms implemented during 1995–2003 were a key driver of economic growth during the same period. They argue that the positive effect is mainly driven by the formal banking system, while the development of the informal financial sector is negatively correlated with GDP growth. Zhang et al. (2012) find that financial development played an important role to support rapid growth in China during the 6 years after its entry into the World Trade Organization when a lot of opportunities were created in its tradable sectors. Yao (2010) finds a positive finance-growth relationship during 2002–2006 and attributes this positive relationship to an improvement in banks' independence.

Empirical studies based on other periods of China's economy do not seem to support the positive finance-growth nexus hypothesis and many of them find a significant and negative relationship. For example, Chen (2006) shows that loan expansion has no benefits for economic growth at the provincial level during 1985–1999 due to inefficient financial intermediaries. Boyreau-Debray (2003) uses province-level data and finds that financial intermediation has a negative impact on local economic growth during 1990–1999 (see also Allen et al., 2005; Hasan et al., 2009; Zhao & Gong, 2021).

These scholars all point out a fundamental problem underlying China's financial system. Due to the weakness of China's legal and banking systems in enforcing effective governance, financial development is unable to fulfil its potential in driving rapid economic growth. The negative relationship between finance and growth uncovered in the existing empirical studies can be explained by three theoretical mechanisms.

2.1 | Bank lending preferences: SOEs versus non-SOEs

In the state-dominated banking sector, political considerations lead banks to support loss-making SOEs while neglecting the financial needs of more productive private firms (as highlighted in studies by Aziz & Duenwald, 2002; Boyreau-Debray, 2003; Biggeri, 2003; Chen, 2006; Hasan et al., 2009; Lam et al., 2017). Guariglia and Poncet (2008) find that the nature of financial development in China, whether driven by government intervention or market forces, has significant implications. Using two distinct sets of financial development indicators, they demonstrate that from 1989 to 2003, indicators reflecting politically driven financial intervention hinder economic growth, whereas indicators associated with market-driven financial development show a positive relationship with growth.

Given that non-SOEs continue to play a crucial role in driving economic growth, accounting for a significant share of manufacturing output and employment (as depicted in Figure 1), the issue of capital misallocation between SOEs and non-SOEs remains highly relevant for post-2008 economic growth. The discriminatory practices of banks against private firms result in credit constraints for these firms (as highlighted in studies by Bai et al., 2016; Deng et al., 2020; Huang et al., 2020). As a consequence, private firms are unable to attain optimal investment levels, which hampers local economic growth.

In contrast, SOEs operating in slow-growing sectors, particularly those within heavy industries, are found to obtain cheap loans and engage in poor investments. This leads to overinvestment, excessive capacity, speculative activities, and ultimately imposing high financing costs on the overall economy and thereby reducing economic growth (as evidenced in studies by Boyreau-Debray, 2003; Cull & Xu, 2003; Cull & Xu, 2005; Handley, 2017; Liu et al., 2018; Zhao & Gong, 2021).

2.2 | The real estate booms and bubbles

The occurrence of real estate booms and bubbles is notable during the period of 2009–2018, with average housing prices roughly tripling. This steep increase in the housing price-to-income ratio in urban China has surpassed the average levels observed in developed economies in recent years (as noted in studies by Shen, 2012; Sun, 2020). While the real estate sector plays a significant role in driving post-crisis economic momentum through fixed

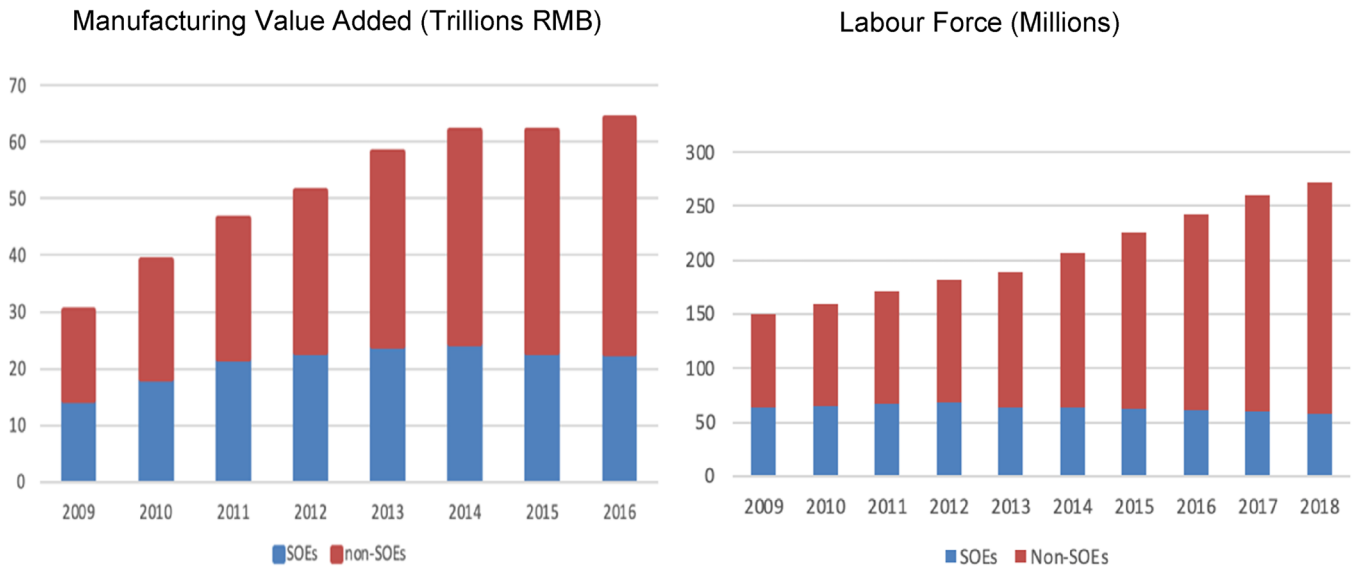

FIGURE 1 Labour force and manufacturing value added for non-SOEs and SOEs. *Data source*: National Bureau of Statistics of China (NBS) (http://www.stats.gov.cn/english/). [Colour figure can be viewed at wileyonlinelibrary.com]

investments, the excessive investment and speculative activities in this sector lead to underinvestment in other sectors. As a result, the traditional finance-growth relationship may turn negative (as discussed by Chen et al., 2017). China's banking system may have further exacerbated the problem of capital misallocation at the local level, contributing to the emergence of asset bubbles during the post-crisis period.

The reason for such capital misallocation between the real estate and non-real estate sectors is related to the so-called 'crowding out' effect. When housing prices are on the rise, it is profitable and safe for banks to prioritize the financing of investment in the real estate sector (Chen et al., 2016; Han & Lu, 2016; Song & Xiong, 2018), which crowds out the access to bank financing for non-real estate sectors. Furthermore, the rising house prices also increase firms' speculative motivation to finance and acquire more land and thus reduce their non-land investment. For example, during 2000–2015, roughly one-fifth of the capital investment of publicly listed corporations (excluding financial, real estate, and construction firms) was in purchasing industrial, commercial, and residential land (Chen et al., 2017). Finally, there is a collateral effect. The soaring housing and land prices can help land-holding firms to obtain more bank loans by using the land use rights as collateral, which strengthens investment demand in the real estate sector.

2.3 | Imbalance in growth between financial and real sectors

It is worth noting that financial development can be associated with financial risks within the banking system, ultimately leading to financial and macroeconomic instability. The rapid expansion of loans driven by the four trillion stimulus programs implemented in 2008–2009 does not effectively support the growth of productive sectors in the real economy (as discussed in studies by Huang & Ge, 2019; Song & Xiong, 2018). Empirical evidence indicates that state-controlled banks exhibit significant moral hazard issues in their lending decisions (as highlighted in research by Jiang & Yuan, 2022; Zhang et al., 2016). In particular, state-owned commercial banks and undercapitalized banks tend to take on more risks, which can result in accelerated bank loan growth and a higher incidence of non-performing loans in the financial system.

The runaway growth of bank loans further exacerbates the imbalance in growth between financial and real sectors, potentially leading to a reduction in overall economic growth. According to Ductor and Grechyna (2015), a balanced growth of financial and real sectors is crucial to sustain economic growth rates. A sufficiently fast-growing real sector can maintain a high demand and high costs for financial funds. This makes less efficient projects unprofitable and thus reduces the possibility of allocating capital to less productive projects. As a result, it can sustain long-run economic growth. However, a disproportionally fast-growing financial sector can produce high rents and attract resources (e.g., skilled workforce and productive assets) away from non-financial sectors (see Bolton et al., 2016; Ductor & Grechyna, 2015; Santomero & Seater, 2000). The inefficient resource allocation increases financial instability and raises a threat to the economy unable to achieve an optimal growth level.

The empirical research on the relationship between finance and growth in China has been limited, particularly

for the period after the global financial crisis. Therefore, the objective of our paper is to address this research gap by utilizing up-to-date data and employing a robust methodology. We are the first to construct a new financial development index at the city level, which provides a more accurate measurement of the loans provided by banks to enterprises and households. Additionally, we seek to delve into the three mechanisms that underlie the relationship between finance and growth, shedding light on this complex relationship.

3 | DATA, METHODOLOGY AND BASIC EMPIRICAL RESULTS

Unlike previous studies that relied on provincial data, our analysis employs a panel dataset of 275 prefecture-level Chinese cities. This dataset provides a larger number of observations and enables us to leverage the rich heterogeneity of local economies. The chosen period of analysis spans from 2009 to 2018 as city-level data before this period is incomplete. This choice is also guided by academic reasons.

First, there are notable differences in the macro-level variables of interest, namely the private credit-to-GDP ratio and GDP growth rate, before and after 2008–2009. Prior to this period (see Figure 2), the private credit-to-GDP ratio in China fluctuated between 100% and 120% without displaying a clear trend, while the GDP growth rate exhibited an upward trajectory. However, starting in 2009, following the implementation of a significant economic stimulus program, the credit-to-GDP ratio increased sharply, while the GDP growth rate demonstrated a distinct downward trend. Many economists argue that the government stimulus programs introduced during this period caused distortions in the financial system, leading to capital misallocation. Therefore, investigating the relationship between finance and growth at the city level after 2009 would provide a deeper understanding of the structural changes in China's credit efficiency.

Second, during this period, we observe a worrisomely high credit-to-GDP ratio. From 2009 to 2018, there was a substantial surge in the credit-to-GDP ratio, reaching 158% (see Figure 3). This can be seen as a warning signal for potential financial crises (as discussed by Boissay et al., 2016; Borio & Lowe, 2002; Schularick & Taylor, 2012). While there is no consensus on the specific threshold of credit-to-GDP level that may lead to a financial crisis, it is informative to compare China's credit level with major countries that experienced financial crises in the past two decades. Figure 3 illustrates the credit levels of selected countries, such as the US, the UK, Greece, and Spain. It is evident that these countries all experienced a prolonged period of credit expansion prior to their respective financial crises, resembling the situation in China after 2009. In terms of China's credit ratio, it surpasses the credit level associated with the Greek financial crisis and reaches the crisis-level credit of advanced countries like the UK (120%–160%) and Spain (100%–150%). Given China's fragile financial system characterized by weak financial regulation and supervision, we believe that the sample period of 2009–2018 holds significant importance in understanding the existing risks in the financial system that could potentially trigger financial crises and macroeconomic instability.

3.1 | Measurement of financial development

China's credit markets are geographically segmented, providing an ideal opportunity to examine the relationship between finance and growth in cities at the prefecture level. Two factors contribute to this geographical segmentation within its banking system. First, local banks, including city and rural financial institutions, are officially restricted from conducting business beyond

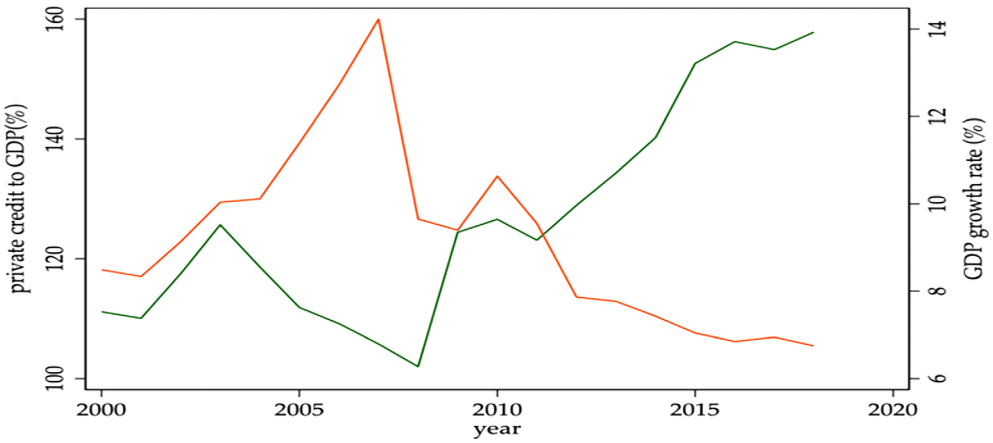

FIGURE 2 Private credit to GDP (green) and GDP growth (red), China, 2000–2018. [Colour figure can be viewed at wileyonlinelibrary.com]

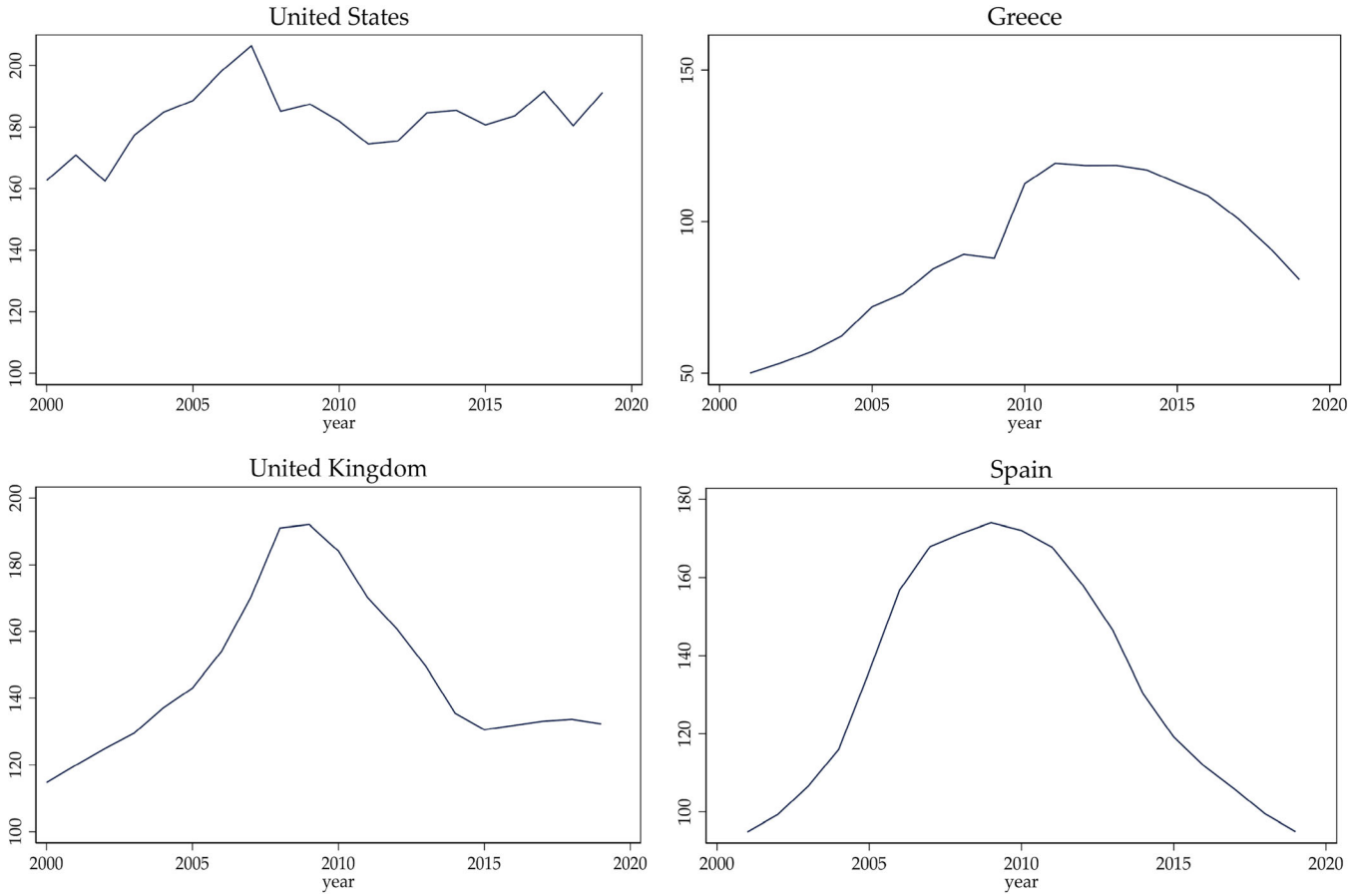

FIGURE 3 Credit to GDP ratio in selected countries, 2000–2018. [Colour figure can be viewed at wileyonlinelibrary.com]

their local regions. Second, nationwide policy banks and commercial banks typically focus on local business operations. Previous studies suggest that this feature is further strengthened by interventions from local governments requiring banks to lend locally (Fan et al., 2022; Gao et al., 2021; Huang et al., 2020).

The existing finance-growth literature uses the ratio of private credit to GDP as a proxy for financial development. The credit used in the cross-country studies includes loans, non-equity securities, trade credits and other accounts receivable. As China's finance heavily relies on loans (Song & Xiong, 2018), the conventional financial development index for China is measured by the total outstanding claims of regulated financial intermediaries on non-financial enterprises and households, divided by GDP (see Aziz & Duenwald, 2002; Chen, 2006; Hasan et al., 2009; Zhang et al., 2012). Thus, we use the loan-to-GDP ratio in this study.

This financial development index overestimates the level of enterprise and household loans as it includes a large number of implicit government loans in the banking system. Zhou (2017) sheds light on the situation: China's local governments obtained a large number of off-balanced-sheet loans through their connected financing platforms. This is one of the main reasons for China's extremely high corporation leverage. The local government financing vehicles (LGFVs) are government-controlled firms which can borrow from banks and spend on behalf of the local government and they accumulate most of the off-balance-sheet government debt.

We consider that the loans granted to LGFVs should be excluded from the calculation of the financial development index for the following two reasons. First, LGFVs are endowed with implicit government guarantees and thus face fewer financing constraints than other enterprises and households (Huang et al., 2020). Second, many of the projects financed by LGFVs are related to public infrastructure and social housing projects which do not follow a profit-maximization rule as those projects of state-owned or private enterprises (Akimov et al., 2009; Zhang et al., 2015).

Following Huang et al. (2020), we estimate the total level of loans banks grant to the LGFVs. All LGFVs seeking approval to issue bonds in a particular year t disclose their current and at least previous 3 years' financial statements to the public. This allows us to collect the bank loan data of LGFVs from the Wind Information Co. (WIND) database.[1] City-level government-related bank loans in a given year are measured by aggregating the bank loans of

TABLE 1 Description of variables.

Variable	Description	Sources
GDPGro	Real GDP per capita growth rate (%)	China City Statistical Yearbook (CCSY)
Initial GDP	The logarithm of initial GDP per capita (Billions of RMB)	CCSY
$FinDev^{original}$	Total loans by financial institutions to GDP ratio (%)	CCSY
Govtloan	Government loans (measured as LGFV loans) by financial institutions to GDP ratio (%)	Wind and author's construction
FinDev	Private loans (measured as the difference between total loan and government loans) by financial institutions to GDP ratio (%)	Authors' construction
PopGro	Population growth rate (%)	CCSY
Openness	Sum of import and export to GDP ratio (%)	CCSY
Investment	Total fixed asset investments to GDP ratio (%)	CCSY
Education	Students enrolled in secondary schools in the total population (%)	CCSY
GovtExp	Government consumption to GDP ratio (%)	CCSY
Inflation	Annual change in CPI (%, provincial data)	China Statistical Yearbook
LandTrans	Land transfer income to GDP ratio (%)	China Land and Resources Statistical Yearbook

all LGFVs located in that city. In Appendix A, we show how our LGFVs loan data is estimated. The result is very similar to that of Huang et al. (2020).

According to our estimation, the average local government (LGFVs) loan at the city level is about 13.6% of city-level GDP during 2009–2018 and it varies from zero to 118.2%. This conventional financial index substantially overestimates the financial development level for many cities. Thus, we remove this type of loan from the total bank loan (divided by GDP) and construct a new financial development index.

3.2 | Basic model

To empirically test how finance affects growth, our fixed effects regression model is:

$$GDPGro_{c,t} = \alpha + \beta * FinDev_{c,t} + \gamma * X_{c,t} + \vartheta_t + \mu_c + \varepsilon_{c,t} \quad (1)$$

where $GDPGro_{c,t}$ is the real GDP per capita growth rate of city c in year t. μ_c and ϑ_t stand for city and year fixed effects, respectively.

$FinDev_{c,t}$ is the level of financial development at the city level which is measured as bank loan-to-GDP ratio (excluding the LGFV loan). We describe the construction of the data in Section 3.1. $X_{c,t}$ represents city-level control variables which are defined in Table 1. They include *Initial GDP* (lagged GDP), Govtloan (LGFV loans-to-GDP ratio), *PopGro* (growth of the labour force), *GovtExp* (city government expenditure to GDP ratio as its size), *Openness* (the degree of openness of the local economy), *Investment* (investment in physical capital), *Education* (human capital accumulation), *Inflation* at the provincial level, and *LandTrans*(land transfer income). Land transfer income is an important indicator of China's local development as it is an important source of government revenue (Zhong & Lu, 2015). Most of our data are obtained from the China City Statistical Yearbook (see Table 1) and the summary statistics are shown in Table 2.

Table 3 shows the fixed effects estimates for Equation (1). It reveals a significant and negative relationship between *FinDev* and $GDPGro_{c,t}$ using the new measure of financial development we constructed. Our fixed effects regression results are contrary to the positive growth-driven function of financial development in the conventional literature. This result suggests that the bank loan-to-GDP ratio is not associated with higher local economic growth. Additionally, our result justifies that it is better to exclude the Govtloan from the original measure of financial development. Indeed, we find that Govtloan is not significantly related to growth and the size of this effect is much smaller compared to that of the *FinDev*. This is quite plausible as we pointed out earlier that loans to LGFVs are related to projects that are long-term or public-oriented.

4 | ENDOGENEITY ISSUES

Many studies show a reverse causality of financial development on economic growth. This reverse causality may generate biases in the fixed effects estimates shown in Table 3. For example, if financial development reacts positively to the expectation of growth, the error term in the fixed effects regression is positively correlated with

TABLE 2 Summary statistics.

Variable	Obs.	Mean	Std. Dev.	Min	Max
GDPGro	2491	9.563	3.886	−12.222	22.853
GovtExp	2491	19.003	10.011	4.388	98.601
Openness	2491	16.966	29.126	0.018	246.234
Investment	2491	78.174	29.434	25.125	238.170
Inflation	2491	2.264	1.570	−2.346	6.338
LandTrans	2491	4.539	4.287	0.242	84.248
Education	2491	5.234	1.650	1.897	14.925
PopGro	2491	0.611	0.578	−1.664	4.078
FinDev	2491	76.221	40.647	24.048	249.368
$FinDev^{original}$	2491	90.170	53.241	28.400	314.713
GovtCredit	2491	13.614	20.826	0.000	118.204

TABLE 3 Fixed effects regression: (real GDP per capita growth on financial development).

FinDev	−0.028***
	(0.003)
GovtCredit	−0.002
	(0.008)
Initial GDP	−0.930***
	(0.326)
GovtExp	−0.014
	(0.013)
Openness	−0.012**
	(0.006)
Investment	0.026***
	(0.003)
Inflation	0.409***
	(0.115)
LandTrans	0.043***
	(0.015)
Education	0.022
	(0.045)
PopGro	−0.554***
	(0.140)
Observations	2491
Adjusted *R*-squared	0.644

Note: Robust standard errors in parentheses.
*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

financial development and thus biases the fixed effects estimate (Favara, 2003; Wait et al., 2017). It is also possible that the reverse causality is negative during the post-crisis period. When economic growth slows down or the economy experiences a recession, the government may institute a stimulus programme through the banking system leading to an increase in the loan-to-GDP ratio. To address this problem, we will use the generalized method of moments (GMM) approach in Section 4.1, and the instrumental variable (IV) approach in Section 4.2.

4.1 | GMM

The GMM approach has been applied in the finance-growth literature (see Beck et al., 2000) to address potential endogeneity. We use the system GMM estimator (by Arellano & Bond, 1991). To obtain better asymptotic efficient estimates, we also deploy a two-step system GMM estimator rather than a one-step system GMM (see Ganda, 2019; Roodman, 2006a).

In Column (1) of Table 4, the GMM estimation reveals a significant and negative *FinDev* coefficient. This negative relationship is consistent with the fixed effects result in Table 3. The negative coefficient of *FinDev* estimated by GMM is more sizable than the fixed effects coefficient. A second-order serial correlation test and a Hansen test[2] are used in validating the GMM estimate.

4.2 | The IV approach

The GMM approach sometimes is inadequate to fully address endogeneity. In this section, we use the IV approach as an alternative method. It includes two external instruments, i.e., colonization intensity index and bank branch density. We discuss these two instruments as follows and the IV results are shown in Table 4.

Our first external instrument for financial development is a colonization intensity index. To understand the

TABLE 4 Regressions correcting for endogeneity.

Dependent variable: Real GDP per capita growth rate	(1) GMM	(2) IV	(3) IV	(4) IV
FinDev	−0.056*	−0.031***	−0.042*	−0.028**
	(0.033)	(0.010)	(0.022)	(0.011)
GovtCredit	0.030	0.031***	0.037***	0.029***
	(0.024)	(0.007)	(0.014)	(0.008)
Initial GDP	0.282	0.183	0.356	0.129
	(3.016)	(0.298)	(0.512)	(0.280)
GovtExp	0.306	0.020	0.038	0.014
	(0.336)	(0.021)	(0.040)	(0.022)
Openness	0.021	0.004	0.006	0.004
	(0.066)	(0.004)	(0.005)	(0.005)
Investment	−0.034	0.019***	0.017***	0.019***
	(0.027)	(0.004)	(0.005)	(0.004)
Inflation	6.308**	0.524***	0.513***	0.526***
	(3.133)	(0.170)	(0.182)	(0.167)
LandTrans	−0.044	0.069***	0.080**	0.065***
	(0.527)	(0.023)	(0.033)	(0.023)
Education	0.895	0.049	0.075	0.042
	(0.993)	(0.053)	(0.086)	(0.050)
PopGro	−1.318	−0.387***	−0.414***	−0.378***
	(3.007)	(0.139)	(0.145)	(0.141)
obs	2491	2488	2491	2488
GMM test				
Hansen test (*p*-value)	0.867			
AR(1) test (*p*-value)[a]	0.008			
AR(2) test (*p*-value)[a]	0.133			
AR(3) test (*p*-value)[a,b]	-			
IV test				
IV		$Colonization_c$ and $\frac{Branch_{c,2008}}{Population_{c,t-1}}$	$Colonization_c$	$\frac{Branch_{c,2008}}{Population_{c,t-1}}$
Cragg-Donald *F* statistic		55.603	30.187	88.884
StockYogo[c]-15%		11.59	8.96	8.96
StockYogo[c]-10%		19.93	16.38	16.38
LM statistic		17.252***	4.523**	12.083***
Sargan-Hansen test (*p* values)		0.538	-	-

Note: Robust standard errors in parentheses.
*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.
[a]AR(1) and AR(2) tests are the Arellano–Bond test for serial correlation of order one and two, respectively.
[b]If there is evidence of serial correlation of order two in the differenced residuals, we restricted the instrument set to lags three and deeper (see Roodman (2006)).
[c]StockYogo-15% and StockYogo-10% are weak identification tests with critical values for 10% and 15%, respectively (see Stock and Yogo (2005)).

importance of colonization in shaping China's financial development, it is necessary to look back at the history of banking in China. China's first modern bank was established in 1897. Before 1897, early Chinese banking institutions were composed by 'Piao Hao' and 'Qian Zhuang'. Those early financial institutions focused

primarily on commercial banking based on close familial and personal relationships, and their working capital was primarily based on the float from short-term money transfers rather than long-term demand deposits. The four decades after 1897 witnessed the rapid development of the modern Chinese banking system. The government authorities normally appointed the banks' officers with political connections but little financial talent. Thus, those newly established Chinese banks were strictly controlled by governments and hence were restricted from making independent commercial businesses.

However, since the late Qing Dynasty (1840–1911), foreign colonial powers largely weakened the unrestricted privileges of the Qing government to monopolize the domestic banking system. During the late 18th century, China was defeated in a series of wars against foreign powers, including two Opium Wars with Great Britain, the Sino-Japanese War of 1894–1895, and the Boxer Rebellion. In the wake of military defeats, the Qing government was forced to sign unequal treaties, including territorial concessions. To service the growing number of foreign trade and finance firms in these territorial concessions, foreign powers effectively established a significant number of bank branches, such as Germany's Deutsch-Asiatische Bank, France's Banque de l'lndochine bank, Japan's Yokoham Specie Bank. The foreign powers reduced the Qing government's arbitrary use of power over financial sectors, and established a market-oriented, legalized, and internationalized financial environment in the colonized areas. This financially open atmosphere helped some cities to quickly become financial centres, such as Shanghai and Tianjin, which still take a prominent position in their respective local financial markets.

We conjecture that the previously colonized cities are more likely to experience higher financial development as they are more likely to have inherited informal institutions and environments that promote financial openness and participation. It is plausible that the duration of local colonial powers is a good measure of such effect. Thus, we use a colonization intensity index as an external instrument to explain differences in financial development across cities. The colonization intensity index is zero for cities without any colonization history. For cities with this experience, the colonization intensity index is constructed as follows:

$$Colonization_c = \ln\left(\sum\nolimits_m C_{c,m}\right)$$

where $C_{c,m}$ is the duration of colonial power m in the city c. The colonized cities with information on the duration of their colonization are collected following Wang and Luo (2022) (see details in Appendix B, Table B1). As many cities in our sample had colonization experience and were influenced by multiple colonial powers, our colonization intensity index of city c is the logarithm of aggregate colonization durations of all colonial powers in city c. It is important to point out that we do not distinguish the different effects of different foreign powers on financial development as all of them exerted a strong positive impact by protecting the financial sector of colonial domains against the strong interference of the Qing government (see Chen, 2023 for the empirical analysis confirming this).

Our colonization intensity index has some advantages over other alternative colonization instruments such as a colonization dummy variable. Our index captures two important factors of the colonization experience that the dummy variable cannot capture. First, some cities and provinces had multiple foreign concessions. Second, the duration of the occupation is different. These two factors influence the foreign financial environment and informal institutions; thus, our index provides a better measure of colonial power on financial development. In addition, since most colonized regions in China are in coastal areas, using our intensity index can mitigate the geographic endogeneity problems arising from using the colonization dummy.

The first-stage IV regressions in Table 4 validate our conjecture for the relevance of the instrument: the colonization intensity index is a powerful predictor of financial development in the cross-city dimension. This instrument variable could be considered exogenous as the concessions and treaty ports are historically determined.

Additionally, we use the bank branch density as our second instrument variable for financial development. Existing financial institutions increase the supply of financial services, and thus promote financial development (Calderón & Liu, 2003; Guiso et al., 2004; Yang et al., 2022). We use the density rather than the number of bank branches to account for the fact that population size also matters for access to financial services. The bank branch density is computed as the ratio of the total number of bank branches[3] to the total population in city c in year t (denoted as $\frac{Branch_{c,t}}{Population_{c,t}}$). While the set-up of bank branches heavily relies on exogenous political factors such as administrative divisions, it is still possible that $\frac{Branch_{c,t}}{Population_{c,t}}$ may not be strictly exogenous. To mitigate this, we use a revised instrument based on predetermined lagged variables, denoted as $\frac{Branch_{c,2008}}{Population_{c,t-1}}$. This instrument is strictly exogenous as it is unlikely to be affected by any other unobserved shocks in year t.

We use both the colonization intensity index and bank branch density as instruments in our IV regression. The results are shown in column (2) of Table 4. There is

TABLE 5 Robustness checks.

	(1) Long-run		(2) Nonlinear		(3) $FD_{c,t}^{Loan\&Deposit}$		
	OLS	IV	Fixed effects	GMM	Fixed effects	GMM	IV
FinDev	−0.016***	−0.025*	−0.085***	−0.117***			
	(0.003)	(0.013)	(0.010)	(0.045)			
$FinDev^2$			0.000***	0.000**			
			(0.000)	(0.000)			
$FD_{c,t}^{Loan\&Deposit}$					−0.011***	−0.014***	−0.010***
					(0.001)	(0.004)	(0.004)
GovtCredit	0.015***	0.023***	−0.018**	0.033**	0.027***	0.065***	0.049***
	(0.005)	(0.009)	(0.009)	(0.014)	(0.008)	(0.016)	(0.012)
Initial GDP	0.431***	0.199	−1.092***	−2.008	−0.908***	−1.301	−0.103
	(0.109)	(0.413)	(0.325)	(1.391)	(0.328)	(1.499)	(0.324)
GovtExp	0.009	0.010	−0.005	0.104	−0.014	0.059	0.019
	(0.012)	(0.030)	(0.013)	(0.117)	(0.013)	(0.044)	(0.029)
Openness	0.001	0.005	−0.009	0.030	−0.011*	0.001	0.004
	(0.004)	(0.005)	(0.006)	(0.031)	(0.006)	(0.025)	(0.004)
Investment	0.015***	0.012**	0.026***	−0.025*	0.027***	−0.024**	0.018***
	(0.005)	(0.006)	(0.003)	(0.014)	(0.003)	(0.012)	(0.004)
Inflation	2.045***	1.846***	0.384***	0.491	0.465***	0.866	0.872***
	(0.507)	(0.670)	(0.114)	(1.065)	(0.114)	(0.759)	(0.224)
LandTrans	0.077**	0.084	0.047***	−0.011	0.042***	−0.248**	0.063***
	(0.035)	(0.052)	(0.015)	(0.091)	(0.015)	(0.105)	(0.020)
Education	−0.063	−0.047	0.010	0.149	0.028	−0.219	0.124**
	(0.082)	(0.119)	(0.045)	(0.442)	(0.045)	(0.406)	(0.054)
PopGro	0.223	0.053	−0.605***	0.224	−0.547***	1.419	−0.422***
	(0.215)	(0.232)	(0.139)	(1.352)	(0.140)	(1.033)	(0.144)
obs	275	273	2491	2491	2491	2491	2133
Adjusted *R*-squared	0.980		0.650		0.642		
GMM test							
Hansen test (*p*-value)				0.695		0.607	
AR(1) test (*p*-value)				0.000		0.000	
AR(2) test (*p*-value)				0.000		0.002	
AR(3) test (*p*-value)[a]				0.112		0.423	
IV test							
IV		$\frac{Branch_{c,2008}}{Population_{c,2008}}$ and $Colonization_c$					$Colonization_c$ and $\frac{Branch_{c,2008}}{Population_{c,t-1}}$
Cragg-Donald *F* statistic		6.512					61.079
StockYogo-15%		11.59					11.59
StockYogo-10%		19.93					19.93

(Continues)

TABLE 5 (Continued)

	(1) Long-run		(2) Nonlinear		(3) $FD_{c,t}^{Loan\&Deposit}$		
	OLS	IV	Fixed effects	GMM	Fixed effects	GMM	IV
LM statistic		10.554***					27.744***
Sargan-Hansen test (p values)		0.633					0.567

	(4) $FD_{c,t}^{savings}$			(5) Y = real GDP growth		
	Fixed effects	GMM	IV	Fixed effects	GMM	IV
FinDev				−0.028***	−0.038***	−0.038***
				(0.003)	(0.009)	(0.012)
$FD_{c,t}^{savings}$	−0.057***	−0.076***	−0.031***			
	(0.005)	(0.019)	(0.010)			
$Year_{2009,2010} * FinDev$						
$Year_{2011,2012} * FinDev$						
$Year_{2013,2014} * FinDev$						
$Year_{2015,2016} * FinDev$						
GovtCredit	0.016**	0.014	0.022***	−0.001	0.007	0.036***
	(0.008)	(0.016)	(0.004)	(0.008)	(0.012)	(0.008)
Initial GDP	−1.249***	−0.652	−1.053***	−0.939***	1.829*	0.259
	(0.326)	(1.343)	(0.342)	(0.327)	(0.981)	(0.331)
GovtExp	−0.000	0.148	−0.013	−0.014	0.186***	0.036
	(0.013)	(0.110)	(0.014)	(0.013)	(0.064)	(0.026)
Openness	0.003	0.027	0.004	−0.012**	0.009	0.006
	(0.006)	(0.025)	(0.003)	(0.006)	(0.017)	(0.005)
Investment	0.023***	0.003	0.019***	0.026***	−0.023**	0.016***
	(0.003)	(0.014)	(0.003)	(0.003)	(0.011)	(0.004)
Inflation	0.439***	−0.464	0.752***	0.405***	1.542**	0.840***
	(0.113)	(0.899)	(0.194)	(0.115)	(0.661)	(0.254)
LandTrans	0.034**	0.211	0.048***	0.043***	0.116	0.077***
	(0.015)	(0.161)	(0.016)	(0.015)	(0.143)	(0.025)
Education	0.004	−0.162	0.079*	0.022	−0.364	0.138**
	(0.045)	(0.332)	(0.047)	(0.045)	(0.344)	(0.058)
PopGro	−0.654***	−1.298	−0.694***	0.533***	3.196***	0.693***
	(0.139)	(1.163)	(0.169)	(0.140)	(0.792)	(0.142)
obs	2487	2487	2129	2491	2491	2133
Adjusted R-squared	0.652			0.645		
GMM test						
Hansen test		0.186			0.109	
AR(1) test (p-value)		0.000			0.000	
AR(2) test (p-value)		0.000			0.002	
AR(3) test (p-value)[a]		0.162			0.388	

TABLE 5 (Continued)

	(4) $FD_{c,t}^{savings}$			(5) Y = real GDP growth		
	Fixed effects	GMM	IV	Fixed effects	GMM	IV
IV test						
IV			$Colonization_c$ and $\frac{Branch_{c,2008}}{Population_{c,t-1}}$			$Colonization_c$ and $\frac{Branch_{c,2008}}{Population_{c,t-1}}$
Cragg-Donald *F* statistic			96.385			47.558
StockYogo-15%			11.59			11.59
StockYogo-10%			19.93			19.93
LM statistic			41.844***			17.386***
Sargan-Hansen test (*p* values)			0.714			0.113

Note: Robust standard errors in parentheses.

[a]If there is evidence of serial correlation of order two in the differenced residuals, we restricted the instrument set to lags three and deeper (Roodman, 2006a).

*Significant at the 10% level.

**Significant at the 5% level.

***Significant at the 1% level.

a significant and negative effect of financial development on economic growth, and this negative effect is larger than those estimated by the fixed effects approach in Table 3. In Table 4, the Cragg-Donald *F*-statistics for the weak IV test indicates our instrument variables are a powerful instrument set. The under-identification test (i.e., LM statistic) and Sargan-Hansen over-identification test also validate the two instruments.

Columns (4) and (5) of Table 4 present the IV estimation results based on the two instruments $Colonization_c$ and $\frac{Branch_{c,2008}}{Population_{c,t-1}}$ used separately. They reveal a robust negative finance-growth nexus. The related IV diagnostic tests indicate that our IV estimates do not suffer from the problem of weak- and under-identification. For robustness checks, we use the number of branches in any year during 2005–2007 to construct alternative branch density IVs, namely $\frac{Branch_{c,m}}{Population_{c,t-1}}, m \sim (2005, 2007)$. The IV regressions using the alternative exogenous instruments still show a robust negative growth effect of financial development (see Appendix C, Table C1).

4.3 | Robustness checks

In this section, we show the results of several robustness checks. First, we examine whether there is a finance-growth nexus in the long run. To do so, the dependent and explanatory variables are averaged over 2009–2018. The OLS estimation in this setting gives similar results as the panel analysis (see column (1) of Table 5), which confirms a long-run negative relationship.

Second, we employ alternative instruments replacing the branch density[4] in our IV regressions in Section 4. The new IV estimation shown in Appendix C gives a sizeable negative coefficient of financial development. This is consistent with the findings in Section 4.

Third, recent studies find a nonlinear finance-growth nexus (see Section 2), that is, financial development only benefits economic growth up to a certain point before it starts to hinder it. To test whether this nonlinear relationship occurs in China's cities, we use the model as follows:

$$GDPGro_{c,t} = \alpha + \beta_1 * FinDev_{c,t} + \beta_2 * FinDev_{c,t}^2 + \delta * GovtCredit_{c,t} + \gamma * X_{c,t} + \vartheta_t + \mu_c + \varepsilon_{c,t} \quad (2)$$

In Table 5, the fixed effects and GMM estimates for Equation (2) show a negative coefficient of *FinDev* and a positive coefficient of its quadratic term in Column (2) of Table 5. It indicates the finance-growth relationship in our study is not an inverted U-shaped but a U-shaped one.[5] This U-shaped finance-growth relationship has a turning point at around 204.4%. Given that only about 2% (i.e., 54 out of 2491) of our *FinDev* observations exceed this value, we have too few observations for the upward-sloping part of this non-linear relationship. Hence, we maintain our finding that at the city level financial development and economic growth are negatively correlated.

Fourth, two alternative financial development indicators at the city level are used in our robustness checks.

TABLE 6 Regressions with population-based measures for financial development.

Dependent variable: Real GDP per capita growth rate	(1) Fixed effects	(2) GMM	(3) IV	(4) IV	(5) IV
FinDev_perC	−0.010**	−0.034*	−0.043***	−0.063**	−0.037***
	(0.004)	(0.019)	(0.013)	(0.032)	(0.014)
GovtCredit_perC	0.056***	0.003	0.071***	0.090***	0.066***
	(0.010)	(0.052)	(0.015)	(0.032)	(0.016)
Initial GDP	−0.600*	7.155**	0.950*	1.621	0.767
	(0.327)	(2.969)	(0.515)	(1.199)	(0.497)
GovtExp	−0.038***	0.082	−0.001	0.015	−0.005
	(0.013)	(0.137)	(0.017)	(0.029)	(0.017)
Openness	−0.010	−0.097*	0.005	0.009	0.004
	(0.006)	(0.056)	(0.005)	(0.007)	(0.005)
Investment	0.028***	0.028	0.019***	0.016***	0.020***
	(0.003)	(0.023)	(0.004)	(0.006)	(0.004)
Inflation	0.480***	3.353*	0.492***	0.472***	0.496***
	(0.116)	(1.891)	(0.165)	(0.175)	(0.163)
LandTrans	0.041***	0.203	0.061***	0.074**	0.057***
	(0.015)	(0.211)	(0.020)	(0.029)	(0.020)
Education	0.031	−1.157	0.155**	0.242	0.132*
	(0.049)	(0.956)	(0.079)	(0.162)	(0.078)
PopGro	−0.504***	1.132	−0.367**	−0.395***	−0.358**
	(0.141)	(2.939)	(0.145)	(0.149)	(0.146)
Observations	2490	2490	2487	2490	2487
GMM test					
Hansen test (*p*-value)		0.707			
AR(1) test (*p*-value)[a]		0.013			
AR(2) test (*p*-value)[a]		0.014			
AR(3) test (*p*-value)[a,b]		0.683			
IV test					
IV			$Colonization_c$ and $\frac{Branch_{c,2008}}{Population_{c,t-1}}$	$Colonization_c$	$\frac{Branch_{c,2008}}{Population_{c,t-1}}$
Cragg-Donald *F* statistic			85.259	41.314	138.741
StockYogo[c]-15%			11.59	8.96	8.96
StockYogo[c]-10%			19.93	16.38	16.38
LM statistic			28.466***	5.891**	20.725***
Sargan-Hansen test (*p* values)			0.398	-	-

Note: Robust standard errors in parentheses.

*Significant at the 10% level.

**Significant at the 5% level.

***Significant at the 1% level.

[a]AR(1) and AR(2) tests are the Arellano–Bond test for serial correlation of order one and two, respectively.

[b]If there is evidence of serial correlation of order two in the differenced residuals, we restricted the instrument set to lags three and deeper (see Roodman (2006)).

[c]StockYogo-15% and StockYogo-10% are weak identification tests with critical values for 10% and 15%, respectively (see Stock and Yogo (2005)).

The first indicator we use is the ratio of total loans and deposits in the financial system to GDP ($FD_{c,t}^{Loan\&Deposit}$). This indicator gauges the overall size of the financial institutions and approximates the financial interrelation ratio. The second indicator is the ratio of total household savings to local GDP ($FD_{c,t}^{savings}$) measuring local financial development regarding mobilizing household savings (Guariglia & Poncet, 2008; Zhang et al., 2012; Zhang et al., 2015). GMM and IV estimates, as well as fixed effects estimates in Columns (3)–(4) of Table 5, show that financial development is negatively related to economic growth.

Fifth, our dependent variable (i.e., real GDP per capita growth rate) is replaced by the growth rate of real GDP. The fixed effects, GMM and IV estimates in Column (5) of Table 5 confirm a robust negative finance-growth nexus.

Sixth, to address concerns regarding the potential correlation between GDP per capita growth and the current financial development index, we introduce an alternative measure of financial development that is scaled by the local population. Specifically, FinDev_perC represents private loans by financial institutions per capita and accordingly, we also use GovtCredit_perC to represent government loans by financial institutions per capita. This robustness check allows us to remove any confounding effects introduced by the GDP factor present in the regression. Table 6 confirm our earlier finding on the negative finance and growth relationship.

Finally, a robustness check is conducted to examine whether the negative finance-growth nexus is robust across different regions. Our sample is divided into three different regions, that is, eastern, central and western areas. The results in Appendix D (Table D1) show a robust negative finance-growth nexus across different regions.

5 | DISCUSSION: MECHANISMS UNDERLYING THE NEGATIVE FINANCE-GROWTH NEXUS

While it is widely acknowledged that a well-functioning banking sector is crucial for economic growth, China's local development experience revealed in this study provides a counterexample to this common insight. In Sections 3 and 4, we show robust evidence that cities with higher loan-to-GDP ratio experience slower growth between 2009 and 2018. This negative finance and growth relationship is not unique to our study. Earlier studies on finance and growth in China during the 1990s also suggest that financial development may not play a positive role in China's economic miracle (see Allen et al., 2005; Chen, 2006; Hasan et al., 2009). This negative relationship we find between finance and growth from 2009 to 2018 can be explained by the three mechanisms we discuss in the literature review. In this section, we present empirical evidence to support these theoretical explanations.

5.1 | Investment and bank discrimination against non-SOEs

China's bank-dominated banking sector is influenced by the strong political intervention from local and central governments. This may constrain the ability of the banks to make their independent commercial lending decisions to support those more productive non-SOEs. Particularly, while small and medium private enterprises are the engine of China's rapid economic growth (Cunningham, 2011; Tsai, 2015), they are discriminated against in loan financing and pay a higher interest rate compared to what is required for SOEs (Bai et al., 2016; Deng et al., 2020; Huang et al., 2020). The existing literature recognizes that this issue may have a detrimental impact on economic growth in China. A direct impact of this discrimination is that private firms may invest less relative to SOEs.

We conduct an analysis to determine if bank lending has varying effects on the investment levels of SOEs and non-SOEs. To test this hypothesis, we examine the relationship between overall investment and local financial development specifically within the contexts of SOEs and non-SOEs. We use the aggregate investment data for SOEs and non-SOEs at the provincial level during the same period of 2009–2018. The provincial investment data is collected from the National Bureau of Statistics of China (NBS).

The fixed effects and GMM results in columns (1)–(2) of Table 7 reveal noteworthy findings regarding the relationship between the total fixed capital investment-GDP-ratio of non-SOEs and the level of provincial financial development. It demonstrates a significant and negative relationship, indicating that as the provincial financial development level increases, the total fixed capital investment-GDP ratio of non-SOEs decreases. On the other hand, the relationship between financial development and total fixed capital investment-GDP ratio for SOEs is significant and positive. This suggests that as the provincial financial development level increases, the total fixed capital investment-GDP ratio of SOEs also increases. These results are consistent with the view that during credit expansions, the banking sector tends to prioritize and support the investment activities of SOEs. At the same time, there appears to be a lack of similar support for the investment of non-SOEs. This finding suggests a potential bias or preference within the banking sector towards supporting SOEs over non-SOEs.

TABLE 7 Possible mechanisms for the negative finance-growth nexus.

	(1) SOEs' fixed capital investment/GDP		(2) Non-SOEs' fixed capital investment/GDP		(3) Real estate investment GDP ratio			(4) Non-real-estate investment GDP ratio		
	Fixed effects	**GMM**	**Fixed effects**	**GMM**	**Fixed effects**	**GMM**	**IV**	**Fixed effects**	**GMM**	**IV**
FinDev	0.071***	0.187***	−0.066***	−0.122***	0.055***	0.032***	0.049***	−0.057***	−0.061**	−0.055***
	(0.022)	(0.048)	(0.019)	(0.030)	(0.004)	(0.011)	(0.015)	(0.004)	(0.028)	(0.017)
GovtCredit	0.077	−0.153	−0.066	−0.084	0.079***	0.076***	0.088***	−0.073***	−0.065**	−0.081***
	(0.066)	(0.131)	(0.059)	(0.090)	(0.007)	(0.018)	(0.017)	(0.007)	(0.031)	(0.019)
GDPGro	0.336**	−0.834**	−0.105	−1.804***	0.174***	0.075	0.037	−0.160***	−0.315	−0.044
	(0.170)	(0.387)	(0.152)	(0.418)	(0.045)	(0.156)	(0.073)	(0.046)	(0.212)	(0.078)
GovtExp	−0.388***	−0.636***	0.092	−0.342***	−0.001	0.063	−0.033	0.007	0.111	0.039
	(0.065)	(0.079)	(0.058)	(0.110)	(0.016)	(0.063)	(0.030)	(0.017)	(0.155)	(0.033)
Openness	−0.130**	−0.295***	0.031	−0.240*	0.003	−0.035	0.002	−0.008*	0.062	−0.006
	(0.051)	(0.102)	(0.046)	(0.129)	(0.005)	(0.024)	(0.007)	(0.005)	(0.056)	(0.007)
Investment	0.218***	0.412***	0.211***	0.238***	0.066***	0.020	0.075***	0.932***	0.988***	0.929***
	(0.027)	(0.069)	(0.024)	(0.083)	(0.005)	(0.013)	(0.011)	(0.006)	(0.023)	(0.012)
Inflation	−2.103***	−2.810**	−1.274**	3.312*	0.367	0.471	0.500	−0.419	−0.094	−0.499
	(0.597)	(1.143)	(0.533)	(1.827)	(0.262)	(0.493)	(0.761)	(0.271)	(1.077)	(0.795)
LandTrans	0.061	0.856***	0.135	0.163	0.385***	0.594***	0.577***	−0.393***	−0.696**	−0.589***
	(0.216)	(0.257)	(0.193)	(0.705)	(0.031)	(0.189)	(0.100)	(0.033)	(0.283)	(0.111)
Education	3.136***	4.205***	−0.252	2.322	0.002	0.105	0.166*	−0.087	−0.390	−0.215**
	(0.577)	(1.444)	(0.515)	(2.106)	(0.083)	(0.443)	(0.098)	(0.085)	(0.656)	(0.101)
PopGro	2.173*	−0.563	0.717	−1.696	0.160	2.105**	0.444*	−0.204	−1.005	−0.476**
	(1.245)	(4.089)	(1.113)	(5.578)	(0.256)	(1.033)	(0.231)	(0.264)	(1.448)	(0.239)
obs	229	229	229	229	2470	2470	2122	2299	2299	2007
Adjusted *R*-squared	0.944		0.872		0.577			0.961		
GMM test										
Hansen test (*p*-value)		0.906		0.718		0.593			0.848	
AR(1) test (*p*-value)		0.036		0.104		0.037			0.032	
AR(2) test (*p*-value)		0.868		0.833		0.540			0.132	
AR(3) test (*p*-value)[a]		-		-						

TABLE 7 (Continued)

	(1) SOEs' fixed capital investment/GDP		(2) Non-SOEs' fixed capital investment/GDP		(3) Real estate investment GDP ratio			(4) Non-real-estate investment GDP ratio		
	Fixed effects	GMM	Fixed effects	GMM	Fixed effects	GMM	IV	Fixed effects	GMM	IV
IV test[b]										
Cragg-Donald *F* statistic							65.159			54.423
LM statistic							95.970***			79.846***
Sargan-Hansen test (*p* values)							0.165			0.269

	(5) Housing price			(6) $g_{c,t}^{financial\ sector} - g_{c,t}^{real\ sector}$		
	Fixed effects	GMM	IV	Fixed effects	GMM	IV
FinDev	0.029***	0.020***	0.051*	1.161***	0.311**	0.166**
	(0.003)	(0.005)	(0.028)	(0.066)	(0.143)	(0.081)
GovtCredit	0.014***	0.017**	−0.010	0.697***	−0.394**	−0.127**
	(0.005)	(0.008)	(0.019)	(0.173)	(0.157)	(0.060)
GDPGro	0.012	−0.010	0.149	−1.363***	−0.393	−2.627***
	(0.050)	(0.056)	(0.130)	(0.357)	(1.757)	(0.436)
GovtExp	−0.017	−0.112***	−0.115**	1.843***	−1.489*	0.679
	(0.015)	(0.025)	(0.049)	(0.228)	(0.790)	(0.576)
Openness	0.025***	0.065***	0.045***	0.089	−0.209	0.029
	(0.004)	(0.012)	(0.015)	(0.097)	(0.352)	(0.045)
Investment	0.000	0.011**	0.008	0.005	−0.057	−0.044
	(0.004)	(0.004)	(0.009)	(0.062)	(0.158)	(0.076)
Inflation	−0.509	−0.570	−0.051	4.776**	1.290	4.278
	(0.372)	(0.367)	(0.724)	(1.888)	(9.936)	(2.803)
LandTrans	0.248***	0.221***	0.243**	0.162	2.359*	0.194
	(0.027)	(0.062)	(0.094)	(0.275)	(1.425)	(0.329)
Education	−0.052	0.235	−0.402**	−0.220	−4.985	−0.420
	(0.087)	(0.208)	(0.170)	(0.725)	(3.047)	(0.604)
PopGro	0.471*	0.101	1.373**	−1.741	5.680	−3.537**
	(0.252)	(0.332)	(0.581)	(2.417)	(12.944)	(1.727)

(Continues)

TABLE 7 (Continued)

	(5) Housing price			(6) $g_{c,t}^{financial\ sector} - g_{c,t}^{real\ sector}$		
	Fixed effects	**GMM**	**IV**	**Fixed effects**	**GMM**	**IV**
obs	980	981	917	2168	2168	1880
Adjusted *R*-squared	0.542					
GMM test						
Hansen test (*p*-value)		0.100			0.280	
AR(1) test (*p*-value)		0.083			0.046	
AR(2) test (*p*-value)		0.670			0.042	
AR(3) test (*p*-value)[a]		-			0.865	
IV test[b]						
Cragg-Donald *F* statistic			45.409			44.045
LM statistic			20.101***			66.352***
Sargan-Hansen test (*p* values)			0.096			0.770

Note: Robust standard errors in parentheses.

[a]If there is evidence of serial correlation of order two in the differenced residuals, we restricted the instrument set to lags three and deeper (Roodman, 2006a).

[b]The instrumental variables for the financial development index (*FinDev*) include the colonization intensity index ($Colonization_c$) and bank density index ($\frac{Branch_{c,2008}}{Population_{c,t-1}}$).

*Significant at the 10% level.

**Significant at the 5% level.

***Significant at the 1% level.

5.2 | Real estate investment and housing market bubbles

The government stimulus programs implemented during 2008–2009 and channelled through the banking system, may have exacerbated the problem of capital misallocation at the local level, resulting in asset booms and bubbles. We examine the relationship between local financial development and investment patterns, specifically focusing on whether the former is associated with higher levels of investment in the real estate sector and lower levels of investment in other sectors.

In column (3)–(4) in Table 7 we show direct evidence that, at the city level, there is a significant positive relationship between the loan-to-GDP ratio and the real estate investment GDP ratio. Conversely, we find a significant negative relationship between the loan-to-GDP ratio and the non-real estate investment GDP ratio. The Fixed effects, GMM and IV regressions all confirm that an increase in the loan-to-GDP ratio is associated with a higher proportion of investment in the real estate sector and a lower proportion of investment in non-real estate sectors. Our findings suggest that China's banking sector plays a positive role in the real estate sector, while it has a detrimental impact on non-real estate sectors.

As previously discussed, the capital misallocation between the real estate and non-real estate sectors can be attributed to housing bubbles. To examine whether bank loans contribute to these housing booms and bubbles, we analyze by regressing the average local housing price on the loan-to-GDP ratio. The average housing price in cities at the prefecture level is obtained from a prominent real estate website in China, Anjuke.com.

In Column (5) of Table 7, we present the results of fixed effects, GMM, and IV regressions. These results consistently indicate that financial development, as represented by a higher loan-to-GDP ratio, positively contributes to housing price booms at the city level. This finding provides further evidence of the impact of bank loans on the housing market.

5.3 | Imbalance in growth between the real and financial sectors

In line with the discussion in Section 2, we explore whether China's financial development has resulted in an imbalance in growth between financial and real sectors, potentially leading to a decline in overall economic growth.

To measure the pace of financial development, we use the growth rate of *FinDev* (namely, $g_{c,t}^{financial\ sector}$). We use the growth rate of industrial value added (denoted as (namely, $g_{c,t}^{real\ sector}$) as an indicator of the growth of the real sector development. The data on industrial value added at the city level is collected from China City Statistical Yearbook.

To examine the relationship between financial development and sectoral imbalances, we regress the difference between the two growth rates (i.e., $g_{c,t}^{financial\ sector} - g_{c,t}^{real\ sector}$) on *FinDev* along with a set of control variables. In Column (6) of Table 7, we present the results of fixed effects, GMM, and IV regressions. The findings consistently demonstrate a significantly positive coefficient for *FinDev*. This suggests that financial development, in the form of a higher loan-to-GDP ratio, leads to a disproportionately rapid growth of the financial sector relative to the real sector. It is worth noting that in Appendix E we investigate whether financial development may play a positive role in driving the growth of real estate GDP. However, we find a weak and insignificant correlation between the real estate GDP growth and the real estate loans to GDP ratio. This indicates that the financial development in the real estate sector may not lead to real growth in that sector either.

To summarize, Section 5 examines the three mechanisms through which finance, specifically higher private loan-to-GDP ratio, may result in lower local growth.

First, the negative relationship between finance and growth may stem from China's banking sector being heavily influenced by the government, which leads to distortions and capital misallocation. We find that higher loan-to-GDP ratio is positively associated with the investment levels of SOEs while it is negatively associated with the investment level of non-SOEs. Our research provides evidence supporting the notion that banks exhibit discriminatory practices by favouring SOEs over non-SOEs in their lending activities.

Second, we find that China's capital misallocation problem was exacerbated by a large-scale stimulus program that funnelled funds through the banking sector to support investments in the real estate sector. The expansion of loans facilitated by the stimulus program is also found to increase the housing prices which may result in significant crowding-out effects. In other words, investments are predominantly directed towards the real estate sector at the expense of investments in non-real estate sectors.

Third, our study highlights the concern about the mounting financial risks that have accumulated within the banking system. We find that the expansion of loans has further intensified the imbalance in growth between the real and financial sectors.

6 | CONCLUSIONS

We conducted a study to examine the influence of China's financial development on local economic growth using a

sample of 275 cities from 2009 to 2018. Our research involves constructing a new financial development index that provides a more accurate measure of bank loans to local enterprises and households. By employing GMM and IV estimates, we find a significant and negative relationship between financial development and economic growth during the specified period. Various robustness tests, including different model specifications, alternative measures, and subsamples, further confirm the existence of this negative relationship between finance and growth.

Additionally, our investigation reveals three underlying mechanisms that contribute to this negative finance-growth relationship. These mechanisms include discrimination in bank lending, such as lending preferences towards SOEs over non-SOEs, the bank-lending-induced real estate booms and bubbles, and an imbalance in growth between real and financial sectors. These findings raise concerns about China's financial system, particularly the role of the banking sector in exacerbating capital misallocations between non-productive and productive sectors, ultimately leading to slower local economic growth.

The implications of these findings are significant for policymakers. First, in addressing the problem of excessive finance, characterized by a high loan-to-GDP ratio, China's policymakers should focus on tackling moral hazard issues and excessive risk-taking activities within the banking system. Promoting deleveraging and strengthening bank supervision, especially regarding bank lending to SOEs and the real estate sector would be crucial. A re-evaluation of China's investment-led growth model is necessary at this stage. China's experience should serve as a warning for policymakers in other developing and emerging economies that rely massively on investment to grow, urging them to monitor and manage alarmingly high levels of private debt to avoid potential macroeconomic and financial instability.

Second, it is important to improve the access of small and medium-sized private enterprises to bank loans so that these enterprises can increase the level of their productive investments. Simultaneously, China should develop its capital markets to support the growth of medium and large private firms.

Third, unlike advanced countries, China's weak legal and financial institutions limit the banks' ability to make independent commercial lending decisions that would support productive private sectors. Hence, in the long term, promoting greater independence for banks under a clear regulatory framework (Rousseau & Wachtel, 2011) is recommended.

It is important to acknowledge the limitations of our study. First, our research only focuses on the relationship between finance and growth. We admit that there is a large land finance literature which recognizes the positive role of China's banking sector in promoting urbanization and local development (see Gyourko et al., 2022), which we do not cover in this study. Second, our measure of the total private loan-to-GDP ratio may not fully capture China's financial development due to the difficulty in estimating local government loans, as well as in estimating a large and complex banking sector. Hence, we advocate for further research in this area to gain a better understanding of the extent of the banking sector's influence on China's financial development, and to examine how finance (in different forms) may impact growth.

Another limitation of our study is the focus on city-level data, without delving into firm-level information about SOEs and non-SOEs. We believe that analysing the financing constraints faced by non-SOEs is an important area of future research. For example, more research using firm-level data should be done to assess the negative effects of credit constraints on growth-enhancing activities, such as capital investment, adoption of new technologies, and innovations.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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ENDNOTES

[1] WIND (https://www.wind.com.cn/en/about.html) categorizes urban investment bond issuance (UIBs), namely LGFV bond issuance, in line with the ChinaBond (https://www.chinabond.com.cn/d2s/cbData.html).

[2] The null hypothesis of AR(2) is accepted which indicates no autocorrelation of order two. The Hansen's test confirms the overall validity of our model as its p-values exceed the conventional significance level.

[3] We collect the bank branches' data from the China Banking and Insurance Regulatory Commission. Its official website provides information on the financial licence information of more than 0.2 million commercial bank branches, including the establishment time and office location of each branch.

[4] This IV is slightly different from the one used in Section 4. It is defined as the ratio of bank branches scaled by population in 2008, namely $\frac{Branch_{c,2008}}{Population_{c,2008}}$.

[5] This result confirms that there is no downward bias concern (see Arcand et al., 2015).

[6] LGFVs provide off-balance-sheet quasi-fiscal support for local governments and become increasingly important in promoting China's infrastructure and social housing development. They raise capital mainly through bank loans and corporate bonds which are secured by local government endorsements and assets (e.g., land use rights). LGFVs have a long history which can be traced back to the tax-sharing reform in 1994 but only started to experience a surge following the global financial crisis.

[7] Short-term debt (Unit: RMB) refers to loans that have not been returned for 1 year or less. Long-term debt (Unit: RMB) refers to loans that the company borrows from banks or other financial institutions for a period of more than 1 year. Noncurrent liabilities due within a year (Unit: RMB) are the company's noncurrent liabilities that will mature within 1 year.

[8] The data on the Audit Office only covers the 'official' debt of LGFVs, which is defined as 'the debt that government has a responsibility to repay or the debt to which the government would fulfil the responsibility of guarantee or for a bailout when the debtor encounters difficulty in repayment' (National Audit Office, 2011).

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APPENDIX A

There have been many attempts to estimate the amount of off-balance-sheet regional government debt (Zhang & Barnett, 2014), but no public source offers the debt data for provincial or city governments. Following Huang et al. (2016), we proxy local government credit in a city by the sum of bank loans of all LGFVs[6] located in this city.

We collect LGFVs' loan data by retrieving the publicly available financial statements for those with new bond issuances (see Ambrose et al., 2015; Ang et al., 2018). We take advantage of the requirement that all organizations seeking approval to issue bonds in a particular year t disclose their past financial statements to the public (at least for the previous 3 years). In other words, if a LGFV decides to issue a bond in year t, its debt-related information dating back to year $t-3$ can be retrieved. We collect the bank loan obligations of LGFVs from their financial sheets listed in China Bond and the Wind Information Co. (WIND) database. The bank loan liability of each LGFVs includes short-term debt, long-term debt, and noncurrent liabilities due within a year.[7] Then, the local government-related bank loans ($GovtCredit_{c,t}$) in city c is measured by aggregating bank loans of all LGFVs headquartered in city c.

The information of regional government bank loans is available for 306 prefecture-level cities. Our data show that China's radical response (i.e., a fiscal stimulus package of RMB 4) to the 2007–08 crisis resulted in a proliferation of LGFV debts (see Figure A1). Between 2005 and 2009, total outstanding regional government debt grew more than five-fold, going from RMB 1.35 to RMB 7.43 trillion, and nearly trebled relative to GDP, from 7.2% to 21.3%. After 2009, it continued to grow, and accounts for 46.47% of GDP by the end of 2018. It is noticeable that bank loans account for the majority of total LGFVs' debt. The aggregated LGFVs level shown in Figure A1 is larger than the official data by the National Audit Office (NAO) but it is similar to that of Huang et al. (2020) shown in Figure A2. The 2013 NAO[8] report indicates that total LGFV debt as the contingent liability of the government stood at 13.1% of 2012 GDP by the end-June 2013, and it is around 30% in our estimation. The difference between the official level and our estimates is due to the fact that the figure used by the NAO is only a subset of the total debt of the LGFVs. For example, the collateral loans secured by the transferred 'high-quality' assets such as public land are not accounted for in the Audit Office's report (see discussion in Jin & Rial, 2016).

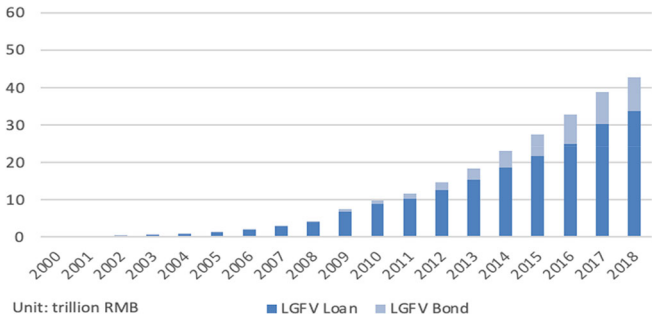

FIGURE A1 LGFV debt over 2000–2018. *Data source*: authors' calculation. [Colour figure can be viewed at wileyonlinelibrary.com]

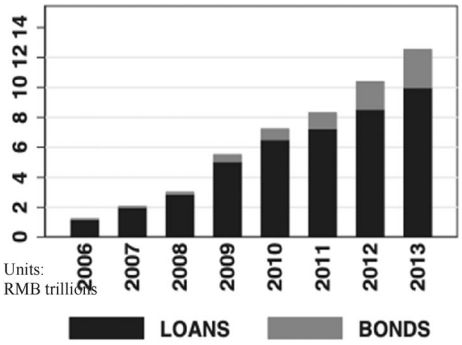

FIGURE A2 LGFV debt (2006–2013). *Data source*: Huang et al. (2020).

Our estimation method has some limitations as it does not allow us to account for the debt liability of LGFVs which do not issue bonds. As a result, our estimate of the level of bank loan obtained by local government may be conservative. Consequently, our method provides a lower bound estimation for government loans at the prefectural level. This limitation could potentially introduce a reporting bias, particularly for cities with a significant number of LGFVs that rarely or never issued bonds. However, we mitigate this reporting bias to a large extent by incorporating city dummies into our analysis, which helps account for the variations among different cities.

APPENDIX B

TABLE B1 China's cities and colonization history.

Colonization	Foreign enclave	Location (modern name)	Established	Dissolved	Duration
Austria-Hungary	Beijing legation quarter	Beijing	1861	1945	85
Austria-Hungary	Austro-Hungarian concession in Tianjin	Tianjin	1902	1917	16
Belgium	Beijing legation quarter	Beijing	1861	1945	85
Belgium	Belgian concession in Tianjin	Tianjin	1902	1931	30
France	French concession in Shanghai	Shanghai	1849	1946	98
France	Beijing legation quarter	Beijing	1861	1945	85
France	Gulangyu island	Xiamen	1903	1945	43
France	French concession in Tianjin	Tianjin	1861	1946	86
France	French concession in Shamian island, Guangzhou	Guangzhou	1861	1946	86
France	French railway, Kunming	Kunming	1904	1940	37
France	French concession in Hankou	Hankou/Wuhan	1896	1946	51
France	French concession in Kouang-Tcheou-Wan	Port of Zhanjiang/Zhanjiang	1889	1946	58
Germany	Frechn concession in Shanghai	Shanghai	1849	1946	98
Germany	Beijing legation quarter	Beijing	1861	1945	85
Germany	Gulangyu island	Xiamen	1903	1945	43
Germany	German concession in Tianjin	Tianjin	1895	1917	23
Germany	German concession in Hankou	Hankou/Wuhan	1895	1917	23
Germany	Kiautschou bay leased territory	Qingdao	1898	1914	17
International	Shanghai international settlement	Shanghai	1863	1945	83
International	Beijing legation quarter	Beijing	1861	1945	85
International	Gulangyu island	Xiamen	1903	1945	43
Italy	Shanghai international settlement	Shanghai	1863	1945	83
Italy	Beijing legation quarter	Beijing	1861	1945	85
Italy	Gulangyu island	Xiamen	1903	1945	43
Italy	Italian concession in Tianjin	Tianjin	1901	1947	47
Japan	Japanese Manchukuo	Qitaihe	1931	1945	15
Japan	Japanese occupation of Shanghai	Shanghai (full control in later stage of 2nd Sino-Japanese War)	1937	1945	9
Japan	Japanese Manchukuo	Dandong	1931	1945	15
Japan	Partially-controlled in 2nd Sino-Japanese War	Jiujiang	1940	1945	6
Japan	Japanese Manchukuo	Yichun	1931	1945	15
Japan	Japanese Manchukuo	Jiamusi	1931	1945	15
Japan	Japanese Manchukuo	Xinganmeng	1931	1945	15
Japan	Beijing legation quarter	Beijing	1861	1945	85
Japan	Partially-controlled in 2nd Sino-Japanese War	Xiamen	1937	1945	9

(Continues)

TABLE B1 (Continued)

Colonization	Foreign enclave	Location (modern name)	Established	Dissolved	Duration
Japan	Japanese Manchukuo	Shuangyashan	1931	1945	15
Japan	Japanese Manchukuo	Hulunbeier	1931	1945	15
Japan	Japanese Manchukuo	Harbin	1931	1945	15
Japan	Japanese Manchukuo	Siping	1931	1945	15
Japan	Kwantung Leased Territory/ South Manchuria Railway Zone	Dalian	1905	1945	41
Japan	Liaodong Peninsula	Dalian	1894	1895	2
Japan	Japanese concession in Tianjin	Tianjin	1898	1943	46
Japan	Japanese concession in Weihai	Weihai	1895	1898	4
Japan	Japanese Manchukuo	Chengde	1931	1945	15
Japan	Japanese Manchukuo	Fushun	1931	1945	15
Japan	Japanese Manchukuo	Chaoyang	1931	1945	15
Japan	Japanese Manchukuo	Benxi	1931	1945	15
Japan	Japanese concession in Hangzhou	Hangzhou	1897	1943	47
Japan	Japanese Manchukuo	Songyuan	1931	1945	15
Japan	Japanese concession in Hankou	Hankou/Wuhan	1898	1943	46
Japan	Japanese Manchukuo	Shenyang	1931	1945	15
Japan	Japanese Manchukuo	Mudanjiang	1931	1945	15
Japan	Japanese Manchukuo	Baicheng	1931	1945	15
Japan	Japanese Manchukuo	Baishan	1931	1945	15
Japan	Japanese Manchukuo	Panjin	1931	1945	15
Japan	Japanese Manchukuo	Suihua	1931	1945	15
Japan	Japanese concession in Suzhou	Suzhou	1897	1943	47
Japan	Japanese concession in Shashi	Shashi/Jingzhou	1898	1943	46
Japan	Japanese Manchukuo	Yingkou	1931	1945	15
Japan	Japanese Manchukuo	Huludao	1931	1945	15
Japan	Japanese Manchukuo	Chifeng	1931	1945	15
Japan	Japanese Manchukuo	Liaoyuan	1931	1945	15
Japan	Japanese Manchukuo	Tonghua	1931	1945	15
Japan	Japanese Manchukuo	Tongliao	1931	1945	15
Japan	Japanese concession in Chongqing	Chongqing	1897	1943	47
Japan	Japanese Manchukuo	Tieling	1931	1945	15
Japan	Japanese Manchukuo	Xilinguolemeng	1931	1945	15
Japan	Japanese Manchukuo	Jinzhou	1931	1945	15
Japan	Japanese Manchukuo	Changchun	1931	1945	15
Japan	Japanese Manchukuo	Fuxin	1931	1945	15
Japan	Kiautschou Bay leased territory	Qingdao	1914	1922	9
Japan	Japanese Manchukuo	Anshan	1931	1945	15
Japan	Japanese Manchukuo	Jixi	1931	1945	15
Japan	Japanese Manchukuo	Hegang	1931	1945	15
Japan	Japanese Manchukuo	Heihe	1931	1945	15
Japan	Japanese Manchukuo	Qiqihaer	1931	1945	15
Russia	Shanghai international settlement	Shanghai	1863	1945	83

TABLE B1 (Continued)

Colonization	Foreign enclave	Location (modern name)	Established	Dissolved	Duration
Russia	Beijing legation quarter	Beijing	1861	1945	85
Russia	Gulangyu island	Xiamen	1903	1945	43
Russia	Chinese eastern railway, Harbin	Harbin	1896	1952	57
Russia	Russian Dalian	Dalian	1889	1905	17
Russia	Soviet concession in Dalian	Dalian	1945	1955	11
Russia	Russian concession in Tianjin	Tianjin	1900	1924	25
Russia	Russian concession in Hankou	Hankou/Wuhan	1896	1924	29
UK	British concession in Shanghai	Shanghai	1846	1863	18
UK	British concession in Jiujiang	Jiujiang	1861	1927	67
UK	British concession in Amoy	Xiamen	1852	1930	79
UK	British concession in Dalian	Dalian	1858	1860	3
UK	British concession in Tianjin	Tianjin	1860	1943	84
UK	Weihaiwei leased territory	Weihai	1898	1930	33
UK	Liugong island	Weihai	1930	1940	11
UK	British concession in Shamian island, Guangzhou	Guangzhou	1861	1945	85
UK	British concession in Hankou	Hankou/Wuhan	1861	1927	67
UK	British concession in Zhanjiang	Zhanjiang	1861	1929	69
US	Shanghai international settlement	Shanghai	1863	1945	83
US	Beijing legation quarter	Beijing	1861	1945	85
US	Gulangyu island	Xiamen	1903	1945	43
US	American concession in Tianjin	Tianjin	1860	1902	43

APPENDIX C

TABLE C1 The robustness checks: Bank branch density.

	(1)	(2)	(3)
FinDev	−0.019	−0.012	−0.029**
	(0.014)	(0.014)	(0.014)
GovtCredit	0.024***	0.021**	0.029***
	(0.009)	(0.009)	(0.009)
Initial GDP	−0.019	−0.119	0.145
	(0.282)	(0.266)	(0.293)
GovtExp	−0.001	−0.011	0.016
	(0.026)	(0.025)	(0.025)
Openness	0.002	0.001	0.004
	(0.004)	(0.004)	(0.005)
Investment	0.021***	0.022***	0.019***
	(0.004)	(0.004)	(0.004)
Inflation	0.533***	0.537***	0.526***
	(0.160)	(0.157)	(0.169)

(Continues)

TABLE C1 (Continued)

	(1)	(2)	(3)
LandTrans	0.055**	0.048**	0.066***
	(0.024)	(0.023)	(0.025)
Education	0.021	0.007	0.044
	(0.052)	(0.052)	(0.054)
PopGro	−0.353**	−0.336**	−0.381***
	(0.142)	(0.143)	(0.144)
obs	2488	2488	2488
IV	$\frac{Branch_{c,2005}}{Population_{c,t-1}}$	$\frac{Branch_{c,2006}}{Population_{c,t-1}}$	$\frac{Branch_{c,2007}}{Population_{c,t-1}}$
Cragg-Donald *F* statistic	49.921	53.119	59.993
StockYogo-15%	8.96	8.96	8.96
StockYogo-10%	16.38	16.38	16.38
LM statistic	7.856***	9.031***	10.941***

Note: Robust standard errors in parentheses.
*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

APPENDIX D

TABLE D1 The robustness check—Across regions.

	(1) Eastern regions			(2) Central regions			(3) Western regions		
Dep. variable: *GDPGro*	**Fixed effects**	**GMM**	**IV**	**Fixed effects**	**GMM**	**IV**	**Fixed effects**	**GMM**	**IV**
FinDev	−0.041***	−0.114*	−0.053	−0.019**	−0.025***	−0.046**	−0.022***	−0.029***	−0.003
	(0.006)	(0.059)	(0.034)	(0.008)	(0.007)	(0.023)	(0.005)	(0.001)	(0.009)
GovtCredit	−0.035***	0.112	0.016	0.017	0.020	0.062***	0.004	0.020***	0.010
	(0.013)	(0.079)	(0.016)	(0.016)	(0.015)	(0.020)	(0.013)	(0.003)	(0.009)
Initial GDP	−3.416***	8.246	0.084	−2.625***	−2.048***	−0.786	−0.219	1.670***	−0.204
	(0.571)	(5.280)	(0.510)	(0.880)	(0.571)	(0.703)	(0.398)	(0.250)	(0.369)
GovtExp	0.039	0.996*	0.026	−0.018	−0.128**	−0.062	−0.026*	0.057***	−0.015
	(0.027)	(0.586)	(0.093)	(0.038)	(0.055)	(0.059)	(0.015)	(0.003)	(0.022)
Openness	−0.040***	−0.143	0.013	−0.004	0.054**	0.040***	0.012	−0.002	0.007
	(0.009)	(0.102)	(0.010)	(0.013)	(0.022)	(0.014)	(0.009)	(0.003)	(0.006)
Investment	0.065***	−0.128*	0.019*	0.009	−0.014***	0.010	0.018***	0.016***	0.010**
	(0.006)	(0.074)	(0.011)	(0.006)	(0.004)	(0.009)	(0.003)	(0.001)	(0.004)
Inflation	1.333***	0.751	1.351***	2.699***	4.032***	1.230*	−0.899***	−1.971***	−0.576*
	(0.180)	(3.667)	(0.496)	(0.372)	(0.487)	(0.658)	(0.157)	(0.127)	(0.340)
LandTrans	0.038	−0.545	0.182**	0.008	−0.011	0.049*	0.052	0.282***	0.146**
	(0.026)	(0.390)	(0.088)	(0.021)	(0.025)	(0.025)	(0.039)	(0.028)	(0.057)
Education	0.026	3.587**	0.146**	−0.087	−1.126***	−0.079	0.318***	0.742***	0.198
	(0.063)	(1.678)	(0.070)	(0.073)	(0.174)	(0.070)	(0.109)	(0.043)	(0.176)

TABLE D1 (Continued)

Dep. variable: *GDPGro*	(1) Eastern regions			(2) Central regions			(3) Western regions		
	Fixed effects	GMM	IV	Fixed effects	GMM	IV	Fixed effects	GMM	IV
PopGro	−0.809***	−0.746	−0.135	−0.656**	1.823***	−0.716***	−0.582***	−0.237**	−0.916***
	(0.219)	(1.937)	(0.227)	(0.304)	(0.406)	(0.238)	(0.196)	(0.112)	(0.235)
obs	850	850	739	860	860	719	781	781	675
Adjusted *R*-squared	0.719			0.624			0.712		
GMM test									
Hansen test (*p*-value)		0.517			0.256			0.286	
AR(1) test (*p*-value)		0.017			0.000			0.000	
AR(2) test (*p*-value)		0.877			0.046			0.361	
AR(3) test (*p*-value)[a]		-			0.412			-	
IV test[b]									
Cragg-Donald *F* statistic			7.469			17.683			58.316
StockYogo-15%			11.59			11.59			11.59
StockYogo-10%			19.93			19.93			19.93
LM statistic			2.901			10.212***			9.181**
Sargan-Hansen test (*p* values)			0.860			0.897			0.537

Note: Robust standard errors in parentheses.

[a]If there is evidence of serial correlation of order two in the differenced residuals, we restricted the instrument set to lags three and deeper (Roodman, 2006a).

[b]Instrument variables include $Colonization_c$ and $\frac{Branch_{c,2008}}{Population_{c,t-1}}$.

*Significant at the 10% level.

**Significant at the 5% level.

***Significant at the 1% level.

APPENDIX E

We do not have city-level data on the real estate industry. But we have found the provincial level data from the National Bureau of Statistics for GDP and bank loans which are generated by the real estate sector. They are denoted as $GDP^{real\ estate}$ and $Loan^{real\ estate}$ respectively. We calculate the financial development index pertaining to the real estate sector as follows:

$$FinDev^{real\ estate} = \frac{Loan^{real\ estate}}{GDP^{real\ estate}}$$

Table E1 provides the summary statistics regarding the real estate sector in China. We find that the correlation index between$GDPGro^{real\ estate}$ and $FinDev^{real\ estate}$ is 0.0215. Furthermore, the result of the fixed-effects regression analysis presented in Table E2 confirms a very weak and insignificant finance-growth nexus within the real estate sector.

TABLE E1 Summary statistics.

Variable	Obs.	Mean	Std. Dev.	Min	Max
$GDPGro^{real\ estate}$	310	15.358	10.608	−17.119	69.321
$FinDev^{real\ estate}$	308	51.771	30.346	0.510	187.051

TABLE E2 Fixed-effects regressions.

Dependent variable: $GDPGro^{real\ estate}$	
$FinDev^{real\ estate}$	−0.060
	(0.046)
Observations	308
Adjusted *R*-squared	0.1193
Year fixed effects	Yes
Province fixed effects	Yes