Financial Development, Public Debt and Economic Growth

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I, Jingzhu Chen, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the work.

Chapter 1 was undertaken as joint work with Dr Yuemei Ji.

Abstract

This thesis consists of three essays that centre on the finance-growth nexus from a macroeconomic to microeconomic perspective.

Chapter 1 focuses on China and explores the finance-growth relationship at the local level. It uses a sample of 275 Chinese cities during 2009-2018. This chapter constructs a comprehensive financial depth index which measures the level of bank loans to enterprises and households by excluding bank loans to local governments through local government financing vehicles (LGFVs). Financial deepening in the form of a higher loan-to-GDP ratio is found to lead to lower economic growth. This negative relationship may be caused by the lending discrimination of China's state-ruled banking system, housing market bubbles and the unbalanced growth between real and financial sectors.

Using a sample of Chinese listed firms, Chapter 2 empirically examines the effect of local government debt expansions on firm financing structure after the large fiscal stimulus program in late 2008. We find that an increase in local government debt significantly crowded out firms' short-term debt, but crowded in long-term debt. We also find that state-owned enterprises (SOEs) are less sensitive to the crowding-out effect. To identify the different responses of SOEs and non-SOEs to the crowding-out effect, we use two external policies---- the 2019 local government financing relaxation program and the 2016 deleveraging reform--- as two quasi-natural experiments.

Chapter 3 examines the role of macroprudential policies in shaping the finance-growth relationship. It distinguishes the effect of macroprudential policies in the short- and long-run. We find that, in the long run, the growth-enhancing effect of financial development (i.e. measured by private credit-to-GDP ratio) has deteriorated significantly in both emerging and advanced countries during 2000-2017. This negative finance-growth relationship can be mitigated by macroprudential policies. To account for endogeneity, the standard system generalised methods of moments (GMM) methodology is employed.

Impact Statement

This thesis explores the finance-growth relationship in advanced and emerging economies. The knowledge derived from this thesis could exert a beneficial influence inside and outside academia.

Impacts Inside Academia

Our study has made significant contributions within Academia.

Chapter 1 reviews the finance-growth nexus and extends the understanding of the "vanishing" growth effect of financial deepening. Recent studies provide overwhelming evidence on an inverse U-shaped finance-growth nexus (e.g. Arcand, Berkes et al. (2015), Maliszewski, Arslanalp et al. (2016)), but fail to explain why financial deepening can hinder economic growth. To fill this gap, we use the largest emerging country, China, as an example, to empirically explore several channels that may account for this negative finance-growth relationship.

Chapter 2 adds to an emerging literature which examines the effect of public debt on firm finance. In China's unique political, state-owned and private firms are differently affected by the crowding-out effect of local government debt. Innovatively, we utilise two policies ---- namely, the 2009 local government financing relaxation program and the 2016 deleveraging reform--- as two quasi-natural experiments to analyse this empirical question.

Chapter 3 introduces a macroprudential framework for the analysis of finance-growth transmission. This analysis provides a new understanding of the interactive effect of macroprudential policies and financial development on real sector growth. We categorise various macroprudential tools according to their different objectives. This research has been overlooked in previous studies. But it is essential to obtain a conclusive result.

Finally, putting all the aforementioned factors together, we contribute to the economics and finance literature by providing a holistic analysis framework from the macro to micro level. Moreover, this thesis employs a series of advanced econometric methods to solve statistical issues, such as the endogeneity issue and cross-entity heterogeneity. Our toolkits include the Instrumental Variable (IV) approach,

Generalised Method of Moments (GMM) technique, Pooled Mean Group (PMG) estimator, Autoregressive Distributed Lag (ADL) technique, Difference-in-Difference (DiD) and Propensity Score Matching (PSM) estimates.

Impacts Outside Academia

The conclusions drawn from this thesis are valuable outside academia. Our findings provide practical suggestions for policymakers who care about improving financial efficiency and reducing financial vulnerabilities through financial development. Policy implications derived from this thesis alert policymakers that, aggressive private and public debt expansions can disturb real sector activities and ultimately lead to low economic growth.

Chapter 1 identifies several credit misallocation channels that may lead to an adverse effect of finance on economic growth in China. This research raises an early alarm for other emerging countries which would suffer similar credit misallocation problems in their dysfunctional financial system. Chapter 2 demonstrates that a quick economic recovery in China after the global financial crisis was achieved at the cost of deteriorations in financial efficiency and credit allocation. The lesson from China has great practical relevance for other economies that have accumulated significant public debt. Chapter 3 illustrates that effective macroprudential instruments can reduce the harmful finance-growth transmission. Thus, policymakers should design a macroprudential framework to minimise financial volatility during the process of financial deepening.

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List of Abbreviation

ADL - Autoregressive Distributed Lag

CCDI - Central Commission for Discipline Inspection

CCER - Center of China Economic Research Services Database

CCSY - China City Statistical Yearbook

CCP - Chinese Communist Party

CSMAR – China Stock Market Trading Database

DiD - Difference-in-Difference

EC - Error Correction

FD - Financial Development

GFC - Global Financial Crisis

GMM - Generalized Methods of Moments

IV - Instrumental Variable

LGFVs - Local Government Financing Vehicles

LTV - loan-to-value

MPs - Macroprudential Policies

NAO - National Audit Office

NBSC - National Bureau of Statistics of China

PMG - Pooled Mean Group

PSM - Propensity Score Matching

SOEs - State-Owned Enterprises

ST - Special Treatment

UIB - Urban Investment Bond

WTO - World Trade Organization

Chapter 1
Is Finance Good for Growth? New Evidence from China[1]

1 Introduction

In the wake of the 2007-2008 global financial crisis (GFC), China launched a series of policy measures and reforms which are designed to boost domestic investment and relieve the negative impact of the 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 state-ruled banks to expand loans to the economy. This policy shift helped China recover quickly and structurally shaped its growth model from an export-led model to an investment-led one. As a result, China's financial sector, dominated by banks, underwent remarkable development and expansion. However, there is a rising concern about the ongoing banking woes in China, such as the unprecedented credit expansion and its sustainability in promoting economic growth.

This study examines the finance-growth nexus using a panel dataset of 275 cities from 2009-2018. The widely-used financial depth indicator in China is the ratio of total loans in the financial system to GDP (e.g. Aziz and Duenwald (2002), Chen (2006), Hasan, Wachtel et al. (2009), Zhang, Wang et al. (2012)). However, the loan-to-GDP ratio covers the information about a large amount of off-balance-sheet government loans, and thus significantly overestimates the actual level of private loans. Our new financial development index excludes government-related loans from the total loans, and hence becomes a more accurate measurement of the private credit to GDP ratio. To address potential endogeneity in the finance-growth nexus analysis, we adopt the two-step system generalised method of moments (GMM) and the Instrumental Variable (IV) approach with two external instruments, i.e. colonisation index and bank branch density index.

[1] This chapter is based on joint work with Dr. Yuemei Ji.

Our study suggests that China's local financial development (in the form of a higher loan-to-GDP ratio) negatively impacts local economic growth 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 institution development hinders GDP growth (e.g. Boyreau-Debray (2003), Allen, Qian et al. (2005), Zhao and Gong (2021)). 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 (e.g. Chen (2006), Hasan, Wachtel et al. (2009), Huang and Wang (2011)).

We provide three credit misallocation channels to explain the negative finance-growth nexus in China. Firstly, a widely-identified mechanism of credit misallocations in China is bank discrimination against private firms (e.g. Boyreau-Debray (2003), Allen, Qian et al. (2005)). China's state-dominated banking sector provides privileged access for SOEs to obtain loans, but limits lending to private enterprises. Consequently, more productive private enterprises are unable to receive sufficient loans to invest and grow, ultimately hindering real sector growth. The second problem we investigate is capital misallocation in the real estate sector. As investment in this sector was one of the primary engines for China to reach its growth target after GFC, housing booms and bubbles in the real estate sector have attracted excessive resources and inevitably crowded out investment in other sectors. Thirdly, a fast-growing financial industry can produce high rents and draw excessive resources (e.g. skilled workforce and productive assets) away from non-financial sectors (e.g. Santomero and Seater (2000), Ductor and Grechyna (2015), Bolton, Santos et al. (2016)). Thus, a disproportionally large financial sector can dampen the growth-facilitate role of financial development.

Our study is also related to the financial stability literature. 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 and Wang (2011), Huang

and Ge (2019)). However, with the rapid financial liberalisation, the old mode of financial intermediation that worked quite well earlier may no longer deliver similar beneficial outcomes in recent years. China's experience may be helpful for other emerging economies. Unlike advanced countries, these countries often have weak legal and financial institutions, constraining the banks' ability to make 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 and failing to serve the growth of the real economy.

The rest of this paper is organised as follows. Section 2 reviews the finance-growth nexus literature. Section 3 describes the empirical model and data, and presents the baseline OLS regression results. Section 4 addresses the endogeneity issues and presents the GMM and IV results. Section 5 provides several robustness checks. Section 6 discusses possible explanations related to the negative finance-growth relationship. Section 7 concludes this paper.

2 Literature review

Financial intermediaries are crucial determinants of economic growth as they facilitate the savings-investment process. Abundant theoretical frameworks have been employed to examine the finance-growth nexus. One key research question in the literature is whether financial deepening has a favourable impact on economic growth. Economists' views on the role of financial deepening vary greatly. The optimistic view describes a positive effect of financial deepening on growth. This is because a well-developed financial system may: (1) mobilise savings and optimise the allocation of capital (Bencivenga and Smith (1991), Levine (1997)); (2) facilitate information sharing and reduce agency costs (Blackburn and Hung (1998)); (3) facilitate diversification and management of risk (Greenwood and Jovanovic (1990), Sahay, Čihák et al. (2015)). There is extensive empirical literature documenting a positive effect of financial development on economic growth. See multi-country studies such as Beck and Levine (2004), Ranciere, Tornell et al. (2006), and Quinn, Schindler et al. (2011). Empirical evidence based on regional data also reveals that local financial development can boost local economic growth (e.g. Jerzmanowski (2017) on evidence from the US states).

Since the global financial crisis, there is a growing literature which stresses the uncertainty about the validity of the positive link between financial deepening and economic growth. Rousseau and Wachtel (2011) reveal that the growth-enhancing effect of financial deepening has been weakened in recent years in comparison to earlier studies focusing on the 1960-1989 period. It raises concerns about the growth-reducing effect of financial vulnerability and financial crises in conjunction with excessive financial deepening (e.g. Allen and Gale (2004), Allen and Carletti (2006), Festić, Kavkler et al. (2011), Gennaioli, Shleifer et al. (2012)).

There is also evidence of a non-linearity in the finance-growth nexus. Based on cross-country data, Arcand, Berkes et al. (2015), Law and Singh (2014), and Samargandi, Fidrmuc et al. (2015) all recognise that financial development only helps growth up to a certain point, after which additional financial deepening starts to hurt growth. One important mechanism underlying this non-linear relationship is credit misallocation. For example, Cecchetti and Kharroubi (2015) argue that high-collateral but low-productivity programmes are given preference when applying for bank loans. They establish a model where the financial sector expands faster than the real economy and conclude that too much finance can increase the financial burden of R&D-intensive industries that are typically financially dependent. Another mechanism is linked to the fact that the financial sector might generate high costs (e.g. Santomero and Seater (2000)). Related, Philippon and Reshef (2012) find that, after 1985, ongoing financial liberalisations resulted in a dramatic rise in skill intensity, job complexity, and wages in financial industries. This has contributed to attracting highly skilled human capital into the financial sector at the expense of other sectors of the US economy.

The finance-growth nexus studies in China also give mixed results. Most 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 a sample covering early financial reforms since the mid-1990s tend to support that financial development contributes to China's strong economic growth. Since 1994, financial reforms such as interest rate liberalisations, relaxations on ownership takeovers, and market entry deregulations significantly increased the efficiency and independence of the banking sector. For example, Chang,

Jia et al. (2010) focus on the period when financial reforms went into operation during 1995-2003, and reveal that financial liberalisation was a crucial driver for economic growth. They further add that the positive effect is mainly driven by the formal banking system, while the development of the informal financial sector is less and even negatively correlated with GDP growth. Zhang, Wang et al. (2012) explore the finance-growth nexus after China's access to the World Trade Organization (WTO) by using a variety of indicators of financial development at the city level. As WTO created many opportunities in China's tradeable sector, they find that financial development played an important role in supporting the rapid growth in China during the six years after its entry into WTO. Similarly, Yao (2010) finds a positive finance-growth relationship during 2002-2006 by employing a GMM approach. The author attributes this positive relationship to the improvement of banks' independence in loan decision-making.

Empirical studies based on other periods of China's economy do not support the positive finance-growth nexus hypothesis. In contrast, many find a significantly negative relationship in China. For example, Chen (2006) shows that credit expansions have no benefits for economic growth at the provincial level during 1985–1999 due to inefficient financial intermediaries[2]. Boyreau-Debray (2003) also uses province-level data and finds that financial intermediation exerted a detrimental impact on local economic growth over 1990–1999 (see also Allen, Qian et al. (2005), Hasan, Wachtel et al. (2009)). Zhao and Gong (2021) use a GMM approach and provide more recent evidence on the negative relationship at the city level during 2007-2014.

These scholars all point out a fundamental problem in China. As China's legal and banking systems are too weak to enforce sound governance, its financial development cannot sustain a positive effect in stimulating growth. They also attribute the negative impacts to decisive government interventions. The state-ruled banking sector in China intensively supports loss-making state-owned enterprises disregarding the financing need of more productive private corporations, leading to a decrease in economic growth (e.g. Aziz and Duenwald (2002), Boyreau-Debray (2003)). Guariglia and Poncet (2008) distinguish different growth effects of financial development driven

[2] However, the mobilisation of savings and the substitution of loans for budget appropriation play a positive role in growth. Other studies support the positive finance-growth relationship, such as Liu and Li (2001) and Aziz and Duenwald (2002), but they need to use a more robust empirical methodology.

by government interventions or market forces. They employ two separate sets of financial development indicators. Their results demonstrate that during 1989-2003, the indicators measuring political intervention were negatively associated with economic growth, whereas the market-driven financial development indicators were favourably associated with growth.

There is little empirical evidence on the finance-growth nexus in China for the period after the global financial crisis, even though China has already established itself as a significant participant in the world financial system, and its investment-led economy has become more dependent on the financial sector. To our knowledge, there are some exceptions, such as Zhao and Gong (2021) who have done an empirical analysis based on the period of 2007-2014. Chen, Guo et al. (2022) claim an inverted U-shaped finance-growth nexus by using the city-level data over 2003-2016. However, the dependent variable they use is problematic. They use the level of real per capita GDP instead of the growth rate of real per capita GDP. This creates a strong non-stationarity in their data.

The purpose of our paper is to fill this gap in empirical research by using more recent data and robust methodology. We are the first to construct a comprehensive financial development index which appropriately measures the level of loans extended by banks to enterprises and households. Existing studies simply attribute the negative growth effect of financial development to the distorting state-ruled nature. We aim to explore different mechanisms working behind the finance-growth nexus.

3 OLS model, data, and basic results

3.1 Basic OLS model

This study is based on a panel data for 275 Chinese cities[3] from 2009 to 2018. Unlike previous studies that primarily used provincial data, we employ city-level data as it contains a large number of local observations, which allows us to exploit the rich heterogeneity of local economies. We use 2009 as our starting year due to a structural shift in China's financial system soon after the global financial crisis. After GFC, banks

[3] Please see Appendix 1.1 for the list of cities.

enjoyed remarkably fast development and credit expansions driven by growth momentum from fiscal stimulus program.

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

Equation 1.1

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

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

$\boldsymbol{FinDev_{c,t}}$ proxies for the level of financial development at the city level. A widely-used financial depth index in China is the ratio of total loans to GDP (e.g. Boyreau-Debray (2003), Chen (2006), Hasan, Wachtel et al. (2009), Zhang, Wang et al. (2012)). However, this measure tends to overestimate the level of loans to enterprises and households as it includes a significant proportion of implicit government loans (i.e. LGFVs loans). To account for China's unique politico-financial institution, we construct a new financial depth index which appropriately measures the financial depth of enterprises and households. We will discuss this in Section 3.2.

$X_{c,t}$ is a vector of city-level control variables, including $Initial\ GDP$ (lagged GDP) to capture the tendency for the convergence effect, $PopGro$ to control for the growth of labour force, $GovtExp$ to capture city government size, $Openess$ to capture the degree of economic openness, $Investment$ to measure investment in physical capital, $Education$ to measure human capital accumulation, $Inflation$ (at the provincial level) to control for the stability of macroeconomic and business environment. We also control for land transfer income ($LandTrans$). It is an important indicator of economic development in China as most of its income is used for urban development. As an essential source of government revenue, it also measures local governments' debt-paying ability (Zhong and Lu (2015)) and thus is related to government debt (i.e. $GovtDebt$, see the definition in Section 3.2).

Most of our data are obtained from the China City Statistical Yearbook. See Table 1.1 for the definitions and sources of our variables, and Table 1.2 for their descriptive statistics. Table 1.2 is the summary statistic which reveals considerable cross-city variations in the variables we use.

Table 1.1 Variable construction

Variable	Description	Sources
$GDPGro$	Real per capita GDP growth rate per capita (%)	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
$GovtCredit$	Government loans (measured as LGFV loans) by financial institutions to GDP ratio (%)	Wind and author's construction
$FinDev$	Private loans (measured as 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

Table 1.2 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	118.204

Note: Variable definitions are given in Table 1.1.

3.2 Measurement of financial development

China's geographically segmented credit markets present an ideal experiment to examine the finance-growth at the prefecture level. Two features are responsible for the geographical credit segmentation of the Chinese banking system. Firstly, local banks (i.e. city and rural financial institutions) were officially prohibited from conducting business beyond their local region. Despite the 2006-09 reforms which permitted local banks to operate across provincial boundaries, only a small number of local banks were granted intra-province licenses. Secondly, nationwide policy banks and commercial banks generally engage in local business. It has been found that, the local branches of nationwide banks at the prefectual level are empowered with a high degree of autonomy, which is exacerbated by local government interventions in their lending decision[4] (Gao, Ru et al. (2019), Huang, Pagano et al. (2020), Fan, Liu et al. (2022)).

Most finance-growth literature uses the ratio of private credit to GDP as a proxy for financial development (e.g. Levine (1999), Beck, Levine et al. (2000)). An essential assumption behind this indicator is that credit expansions in the private sector are positively associated with the efficiency of financial services. The private credit used in cross-country studies usually includes loans, nonequity securities, trade credits and other accounts receivable. However, corporate finance in China heavily relies on loans (Song and Xiong (2018)), and the related statistical data does not provide information on non-loans financing to enterprises and households. As a result, 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 (e.g. Aziz and Duenwald (2002), Chen (2006), Hasan, Wachtel et al. (2009), Zhang, Wang et al. (2012)).

However, this financial depth index (denoted as $FinDev_{c,t}^{original}$ in this paper) overestimates the amount of enterprises and household loans as it includes a large proportion of implicit government loans. Zhou (2017) sheds light on the situation and points out that China's local governments obtained a large amount of off-balanced-sheet loans through their connected financing platforms, leading to extremely high

[4] In China, the career promotion of bank managers is heavily influenced by local government officials, resulting in a greater influence of local governments in local lending than credit officers at the headquarters.

corporation leverage during the post-GFC period. Local government financing vehicles (LGFVs) are government-controlled firms which can borrow from banks and spend on behalf of the corresponding local government.

We consider that LGFVs' loans should be excluded from the calculation of the financial depth index for the following reasons. Firstly, LGFVs in China are provided with implicit government guarantees and thus face fewer financing constraints than other enterprises and households (Huang, Pagano et al. (2020)). Secondly, as many of the projects financed by LGFVs are related to social welfare (such as new public infrastructures and social housing), the state-dominated bank sector in China is less rigorous in implementing professional risk management practices when expanding loans to LGFVs in the public sector than state-owned enterprises (SOEs) or private enterprises (Akimov, Wijeweera et al. (2009), Zhang, Zhu et al. (2015)).

No public source provides explicit information on government debt in the form of LGFVs' debt. Following Huang, Pagano et al. (2020), we use the ratio of total LGFVs' loans to GDP to measure the implicit government credit that will be used to calculate our financial depth index. We take advantage of the official requirement that all organisations seeking approval to issue bonds in a particular year t should disclose their most recent and historical financial statement to the public (at least for the previous three years). In other words, if a company decides to issue a bond in year t, we can retrieve its debt-related information dating back to year $t-3$. We collect the bank loan data of LGFVs from their financial sheets listed in China Bond and the Wind Information Co. (WIND) database[5]. We measure the level of local government-related bank loans ($GovtCredit_{c,t}$) in city c in year t by aggregating the bank loans of all LGFVs headquartered in city c in year t, scaled by GDP. In Appendix 1.2, we show that our LGFVs data is very similar to that of Huang, Pagano et al. (2020). For the detailed construction of the off-balance-sheet government credit ($GovtCredit_{c,t}$) and the context of government LGFVs, also see Appendix 1.2..

Table 1.2 shows that average government loans account for 13.6% of total GDP during 2009-2018. Government loans account for about 15% of total bank loans on

[5] WIND (https://www.wind.com.cn/en/about.html) categorises urban investment bond issuance (UIBs), namely LGFV bond issuance, in line with the ChinaBond (https://www.chinabond.com.cn/d2s/cbData.html). The UIB classification of ChinaBond differs from that of the National Audit Office (NAO). We choose ChinaBond (and thus WIND) due to: (1) market participants frequently use ChinaBond's classifications; (2) The data listed on NAO does not contain any prefectural-level information. In addition, the data of LGFV's liability reported by NAO is only available for June 2013.

average. It indicates that the financial depth index $FinDev^{original}$ which includes the implicit government debt (i.e. $GovtCredit$), substantially overestimates the actual level of financial development at the local level. To adjust this, we remove implicit government loans from total loans, and construct a new financial development index, namely $FinDev_{c,t}$. The new index is computed as the difference between $FinDev^{original}$ and $GovCredit$.

Table 1.3 displays the correlation coefficient of 0.6946 between our new index (i.e. $FinDev_{c,t}$) and the previous index ($FinDev^{original}$). This relatively low correlation coefficient suggests that our new indexing method can be better tailored to our data which comprises a substantial proportion of government loans.

Table 1.3 The correlation matrix

	$FinDev$	$GovtCredit$	$FinDev^{original}$
$FinDev$	1		
$GovtCredit$	0.3763	1	
$FinDev^{original}$	0.9221	0.6946	1

Table 1.4 Finance-growth nexus: OLS Estimates

Dep. Variable: $GDPGro$	**(1)**	**(2)**
$FinDev$	-0.028***	
	(0.003)	
$GovtCredit$	-0.002	0.026***
	(0.008)	(0.008)
$FinDev^{original}$		-0.025***
		(0.003)
$Initial\ GDP$	-0.930***	-0.851***
	(0.326)	(0.326)
$GovtExp$	-0.014	-0.016
	(0.013)	(0.013)
$Openness$	-0.012**	-0.013**
	(0.006)	(0.006)
$Investment$	0.026***	0.026***
	(0.003)	(0.003)
$Inflation$	0.409***	0.419***
	(0.115)	(0.115)
$LandTrans$	0.043***	0.042***
	(0.015)	(0.015)
$Education$	0.022	0.021
	(0.045)	(0.045)
$PopGro$	-0.554***	-0.544***
	(0.140)	(0.140)
Observations	2491	2491
Adjusted R-squared	0.644	0.642

Note: Robust standard errors in parentheses. *** Significant at the1% level. ** Significant at the 5% level. * Significant at the10% level.

3.3 OLS regression results

Table 1.4 shows the OLS estimates for Equation 1.1. It reveals a negative relationship between $FinDev$ and $GDPGro_{c,t}$, as well as between $FinDev^{original}$ and $GDPGro_{c,t}$. A one standard deviation increase (i.e. 40.6%) in our new financial development index is associated with a 1.14% decrease in the local GDP growth rate (Column (1)). An increase of one standard deviation in $FinDev^{original}$ decreases GDP growth rate by 1.33% at the prefectural level. This negative impact is quantitatively important, given the average GDP growth rate of 9.7%. However, the negative impact of financial development in our study is much smaller than that in Chen (2006) which uses a similar FD proxy (i.e. the ratio of the banking sector's loans outstanding relative to GDP)[6]. The difference in the negative impact can be attributed to the different sample periods used. Chen (2006) concentrates on the period from 1985 to 1999 during which financial liberalization was incomplete. Since the early 2000s, China has embarked on a series of measures commonly referred to as financial liberalization. For example, an important milestone in this process was the admission of foreign financial institutions after China's accession to the WTO in 2001.

Our OLS regression results are contrary to the positive growth-driven function of financial development found in the early finance-growth literature, and suggest that the financial system development (at least judging from private loans to GDP level) is not associated with higher local economic growth. The coefficients of control variables are consistent with what we expected. In particular, there is a positive relationship between $GovtCredit$ and $GDPGro$ as shown in column 2 of Table 1.4. This finding is quite intuitive: as China is still at the development stage with a great demand for public infrastructures and services, government loans financing these public areas become vital to boost local economic growth. Although the coefficients estimated by OLS are negative for trade openness ($Openess$) and government expenditure ($GovtExp$), their coefficients become positive after correcting for endogeneity. We will show these results in Section 4.

[6] The empirical analysis of Chen (2006) suggests that, a one-percentage point increase in the financial development index is associated with a reduction in GDP growth rate of 0.172 percentage points.

4 Endogeneity issues

The finance-growth studies show that there can be a two-way causality between financial development and economic growth (e.g. Demetriades and Hussein (1996), Ahmed (1998), Shan, Morris et al. (2001)). On the one hand, the supply-leading hypothesis proposes a causality from financial development to economic growth. It argues that financial systems can facilitate mobilising funds for investment, and hence benefit the rest of the economy. On the other hand, the demand-following hypothesis proposed by Patrick (1966) proposes that financial sectors may respond endogenously to economic growth. As the real economy grows, increasing demand for financial services induces an expansion in the financial industry.

The reverse causality may generate biases in the OLS estimates shown in Table 1.4. That is, if financial deepening reacts positively to growth expectations, the error term in the growth regression would be positively correlated with financial development, leading to an upward bias for OLS coefficients (Favara 2003, Wait, Ruzive et al. 2017). It is also possible that the reverse causality is negative during the post-GFC period. When economic growth slows down or the economy experiences a recession, governments may launch a stimulus programme through banking systems, leading to an increase in the loan-to-GDP ratio. To address reverse causality, we will use the GMM approach in Section 4.1, and the instrumental variable approach in Section 4.2.

4.1 GMM

The generalised method of moments (GMM) has been widely applied in the finance-growth literature (e.g. Beck, Levine et al. (2000), Chen (2006), Arcand, Berkes et al. (2015)) to address potential endogeneity by using lagged observations of financial depth as internal instruments. Using lagged observations of explanatory variables can alleviate the endogeneity problem caused by financial development and other conditional variables. We use system GMM estimators proposed by Arellano and Bond (1991). The system GMM is more efficient than first-difference estimators that only use the first difference series[7]. Furthermore, to obtain more asymptotic efficient

[7] The latter estimator can generate poor results when lagged levels of a persistent series prescribe weak instruments for the successive first difference series (Arellano and Bover 1995, Blundell and Bond 1998).

estimates, we deploy a two-step system GMM estimator rather than a one-step system GMM (see discussion in Roodman (2006), Ganda (2019)).

Table 1.5 Regressions correcting for endogeneity

Dep. Variable: $GDPGro$	**(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			
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[b]-15%		11.59	8.96	8.96
StockYogo[b]-10%		19.93	16.38	16.38
LM statistic		17.252***	4.523**	12.083***
Sargan-Hansen test (P values)		0.538	-	-

Note: [a] AR(1) and AR(2) tests are the Arellano–Bond test for serial correlation of order one and two, respectively.
[b] StockYogo-15% and StockYogo-10% are Stock, Yogo et al. (2005) weak identification test with critical values for 10% and 15%, respectively. The instrument assessment reported in Stock, Yogo et al. (2005) is as follows: Cragg-Donald F statistic >10% maximal IV size: very powerful instrument; 10% <Cragg-Donald F statistic <15% maximal IV size: powerful instrument;15% <Cragg-Donald F statistic <20% maximal IV size: medium instrument; 20% <Cragg-Donald F statistic <25% maximal IV size: weak instrument.
Robust standard errors in parentheses. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

In Column (1) of Table 1.5, the GMM estimation reveals a negative $FinDev$ coefficient, which is consistent with the negative finance-growth nexus estimated by OLS in Table 1.4. The coefficient of $FinDev$ estimated by GMM is more negative than

the one estimated by OLS. We also conduct the second-order serial correlation and Hansen tests to examine the validation of GMM estimates. The null hypothesis of AR(2) is accepted, indicating no autocorrelation of order two. Hansen's test confirms the overall validity of our model as its p-values exceed the conventional significance levels.

4.2 Instrumental Variables Two-Stages Least Squares (IV-2SLS)

Our GMM estimation provides the first step to addressing the endogeneity. The GMM estimation imposes a strong assumption that the internal use of lagged explanatory variables should not have any direct causal effect on the dependent variable or unobserved confounders. But this strong assumption is not generally adequate. This section uses an instrumental variable approach as an alternative method. It includes two external instruments, i.e. colonisation intensity index and bank branch density. We discuss these two instruments as follows and present IV results in Table 1.5.

IV: Colonization intensity index

Our first external instrument for financial development is the colonisation intensity index. To understand this, it is necessary to look back at the historical development of the bank sector in China. The inception of China's modern bank can be traced back to the year 1897[8], when its first modern bank was established. However, in the nascent phase of the bank industry's development, the sector was subjected to government monopolization[9], which imposed limitations on domestic banks' ability to engage in independent commercial activities. However, since the late Qing Dynasty (1840–1911), foreign colonial powers have largely undermined the unrestricted privileges of the Qing government to monopolise the domestic banking system. Following a series of military defeats, including two Opium Wars with Great Britain, the Sino-Japanese War of 1894–1895, and the Boxer Rebellion, the Qing government was compelled to sign unequal treaties, including territorial concessions. To service

[8] Before 1897, early Chinese banking institutions were composed of piaohao and qianzhuang, which were early banking institutions primarily focused on commercial banking services that were based on close familial and personal relationships. The working capital of these institutions predominantly relied on the float resulting from short-term money transfers, rather than long-term demand deposits.

[9] The consolidation of government control over the banking industry was reinforced by government authorities appointing bank officers who were aligned with political affiliations, rather than prioritizing candidates with financial expertise.

the growing number of foreign trade firms in these territorial concessions, foreign powers effectively established a considerable number of bank branches, such as Germany's Deutsch-Asiatische Bank, France's Banque de l'Indochine bank. The foreign powers reduced the Qing government's arbitrary use of power over financial sectors, and established a market-oriented, legalised, and internationalised financial environment in the colonised areas. This financially open atmosphere facilitated financial liberalisation and development in the colonised areas in the long run.

We conjecture that the previously colonised cities in China were more likely to experience higher financial development as they have inherited informal institutions and environments to 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 colonisation intensity index as an external instrument to explain differences in financial development across cities. The colonisation intensity index is constructed as follows:

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

Where $C_{c,m}$ is the duration of colonial power m in the city c. Our colonisation intensity index[10] is the logarithm of aggregate colonisation durations of all colonial powers in city c. The colonisation intensity index is zero for cities without any colonisation history. The information on the history of colonial cities is collected from Wang and Luo (2022) (see details in Appendix 1.3). This instrument variable could be considered as exogenous as the concessions and treaty ports are historically set by foreign forces.

Anecdotal evidence suggests that, the economic effect of colonisation was critically determined by the motives behind such colonization. In China, Western colonizers were mainly motivated by trade facilitation, whereas the Japanese invasion was triggered by expansionism. The high civilian casualties resulting from Japanese colonisation had a long-term negative impact on international trade and investment

[10] We also use the colonization dummy as an external instrument for financial development. It gives a robust result. Our colonization intensity index has some advantages over the colonization dummy variable. This index captures two important factors of the colonization experience which are ignored by the dichotomous setting. Firstly, some cities and provinces had multiple foreign concessions. Secondly, the duration of the occupation is different. Those two factors influence the spread of foreign financial culture 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 located in coastal areas, using the intensity index can relieve the concern of geographic endogeneity in the dichotomous setup.

(Che, Du et al. (2015), Wang, Fidrmuc et al. (2020)). Despite the military invasion, Japanese colonisation made considerable investments in local financial institutions. For example, Japan's Yokoham Specie Bank created 16 branches in China during Japanese territorial occupation, and played a pivotal role in trade finance in colonial areas. Hence, similar to the Western colonisations, Japan's investment in financial infrastructures can promote future financial development in its colonial domains. In this respect, we distinguish the Western and Japanese colonisation experiences to construct two colonisation indexes, and use them as two additional IVs respectively.

IV: Bank branch density

We use the bank branch density as another instrument variable for financial development. Deliberate creations of financial institutions and markets increase the supply of financial services, and thus promote financial development (Calderón and Liu (2003), Guiso, Sapienza et al. (2004), Yang, Guariglia et al. (2022)). We use the density rather than the number of bank branches as the former can better measure the financial access per capita. The bank branch density is computed as the ratio of the total number of bank branches[11] to the total population in city c in year t, denoted as $\frac{Branch_{c,t}}{Population_{c,t}}$.

While set-ups of bank branches in China heavily relies on exogenous political factors such as administrative divisions (Almanac of China's Finance and Banking, 1999), it is still possible that $\frac{Branch_{c,t}}{Population_{c,t}}$ are not strictly exogenously as the establishment of new bank branches can reflect the local economic environment and growth opportunities in their located areas (King and Levine (1993), De Gregorio and Guidotti (1995), Jayaratne and Strahan (1996)). To correct this, we construct an alternative IV using predetermined lagged variables, denoted as $\frac{Branch_{c,2008}}{Population_{c,t-1}}$. This

[11] We collect the bank branches' data from the website of the China Banking and Insurance Regulatory Commission (https://xkz.cbirc.gov.cn/jr/). Its website provides information on the financial license information of more than 0.2 million commercial bank branches, including the establishment time and office location of each branch. We searched and downloaded the financial license information of all commercial bank branches according to prefecture-level cities, and counted the number of all branches of commercial banks in each region accordingly.

instrument is strictly exogenous as it is unlikely to be affected by any other unobserved shocks in year t.

IV estimation results

We use the colonisation intensity index and bank branch density as two external instruments for the financial depth index ($FinDev$). A one standard deviation increase (i.e. 40.6%) in our new financial development index would translate to a reduction in the GDP growth rate of 1.3% (column (2) of Table 1.5). After addressing the endogeneity problem, our IV regression gives a more negative effect than the OLS version in Table 1.4.

To verify the appropriateness of our IV-2SLS estimates, several diagnostic analyses are conducted. The first-stage IV regressions (see Appendix 1.4) validate our conjecture for the relevance of the instrument: the colonization intensity index and bank branch density are powerful predictors of financial development in the cross-city dimension. The under-identification test (i.e. Kleibergen-Paap rk LM statistic) is rejected, which validates our identification strategy. The Cragg-Donald F-statistics for the weak IV test is 55.6, which is greater than the critical value of 19.9 under the 10% margin of error suggested by Stock, Yogo et al. (2005). It indicates our instrument variables are a powerful instrument set. The Sargan-Hansen over-identification test is not rejected, which implies that our external instruments do not directly affect the dependent variable.

The last two columns of Table 1.5 present the IV estimation results for colonisation intensity index and bank branch density (i.e. $\frac{Branch_{c,2008}}{Population_{c,t-1}}$), respectively. 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 construct alternative branch density IVs based on a specific year during 2005-2007, namely $\frac{Branch_{c,m}}{Population_{c,t-1}}, m\sim(2005,2007)$. Still, IV results using these alternative exogenous instruments provide a robustly negative growth effect of financial development on growth (see Appendix 1.5).

Finally, we distinguish the Western and Japanese colonisation experiences and construct two separate colonisation indexes. Appendix 1.6 presents the IV-2SLS results by using the two alternative IVs. The significant coefficients of the first-stage IV regressions validate our conjecture for the relevance of the two instruments. Consistent with our baseline result, the second-stage IV regressions show negative finance-growth nexus in China[12].

5 Robustness Checks

5.1 Long-term relationship

We examine the finance-growth nexus in the long run. To do so, our dependent and explanatory variables are averaged over 2009–2018. The cross-sectional regression model is:

Equation 1.2

$$GDPGro_c = \alpha + \beta * FinDev_c + \delta * GovtCredit_c + \gamma * X_c + \varepsilon_c$$

The OLS estimation of Equation 1.2 gives similar results as our basic panel analysis. It indicates a long-run negative growth effect of financial development . As discussed in the previous section, we also employ an IV approach to alleviate the endogeneity issue by using the branch density in 2008[13] and the colonisation intensity index as relevant instruments. The IV estimation gives a larger negative coefficient of financial development, which is consistent with the findings in Section 4.

5.2 Nonlinearities

Recent studies find a nonlinear finance-growth nexus (e.g. Shen and Lee (2006), Law and Singh (2014), Samargandi, Fidrmuc et al. (2015)). These papers claim that financial development only benefits economic growth up to a certain point before it starts to hinder growth. If this is the case, the finance-growth relationship should be nonlinear, specifically an inverted U-shaped one (Arcand, Berkes and Panizza (2015)). To estimate this nonlinear relationship, we use the model as follows:

[12] Using the Western colonisation index as IV, the 2nd stage result presents an insignificant coefficient of financial development. However, this coefficient can be biased due to the weak instrument problem, as indicated by the Cragg-Donald F-statistics.

[13] 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 $\frac{Branch_{c,2008}}{Population_{c,2008}}$.

Equation 1.3

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

The OLS and GMM estimates for Equation 1.3 show a negative coefficient of financial depth ($FinDev$) and a positive coefficient of its quadratic term (see Column (2) of Table 1.6). It indicates the finance-growth relationship in our study is not an inverted U-shaped but a U-shaped one. This U-shaped finance-growth relationship has a turning point at around 204.4%. Only about 2% (i.e. 54 out of 2491) of our $FinDev$ observations exceed this value. As we have too few observations for the upward-sloping part of this non-linear relationship, we maintain our finding that financial development and economic growth are negatively correlated at the Chinese city level.

5.3 Additional robustness tests

Two alternative financial development indicators at the city level are used as a robustness check. Firstly, we use the ratio of total loans and deposits in the financial system to GDP, namely $FD_{c,t}^{Loan\&Deposit}$. This indicator gauges the overall size of the financial institutions and approximates the financial interrelation ratio (Goldsmith (1969)). The second indicator is the ratio of total household savings to local GDP, namely $FD_{c,t}^{savings}$, which measures China's financial development in terms of mobilizing household savings (Guariglia and Poncet (2008), Zhang, Wang et al. (2012), Zhang, Zhu et al. (2015)). Both GMM and IV estimates, as well as OLS estimates in Columns (3)-(4) of Table 1.6, show that the coefficients of the two alternative financial development indicators is consistently negative. Additionally, our dependent variable (i.e. real GDP growth rate per capita) is replaced by the real GDP growth rate. The OLS, GMM and IV estimates in Column (5) of Table 1.6 give a robust negative finance-growth nexus.

We also check whether the negative finance-growth relationship is consistent in all the years during our sample period. We divide our sample period into five periods, and then create four dummies, i.e. $Year_{2009,2010}$, $Year_{2011,2012}$, $Year_{2013,2014}$, $Year_{2015,2016}$. For example, $Year_{2009,2010}$ is a dummy variable: one for years 2009-2010, and zero for other years. The regression model is:

Equation 1.4

$$GDPGro_{c,t} = \alpha + \beta_1 * FinDev_{c,t} + \beta_2 * \sum_{y=2009,2011,2013,2015} Year_{y,y+1} * FinDev_{c,t} + \delta * X_{c,t} + \vartheta_t + \mu_c + \varepsilon_{c,t}$$

Equation 1.4 is estimated by the OLS technique with fixed effects. Column (6) of Table 1.6 shows that the finance-growth relationship is consistently negative for all five two-year periods. The size of the negative relationship is considerably large during 2009-2010 and 2011-2012, but decreases significantly afterwards. A possible reason for the weakening effect is that, although the massive 2008 stimulus program triggered deteriorations in credit allocations in China's financial system (see discussion in section 6), those distortions were corrected by macroprudential and monetary policies in the subsequent years.

Another robustness check is conducted to examine whether the negative finance-growth nexus is robust across different regions. Our sample is divided into three different geographic regions, i.e. eastern, central and western. The results in Appendix 1.7 show a robustly negative finance-growth nexus across those three regions.

Table 1.6 Robustness checks

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

Robustness checks (continued)

	(4) $FD_{c,t}^{savings}$			(5) Y= Real GDP growth			(6) $Year_{y,y+1} * FinDev$
	OLS	GMM	IV	OLS	GMM	IV	OLS
$FinDev$				-0.028***	-0.038***	-0.038***	-0.021***
				(0.003)	(0.009)	(0.012)	(0.004)
$FD_{c,t}^{savings}$	-0.057***	-0.076***	-0.031***				
	(0.005)	(0.019)	(0.010)				
$Year_{2009,2010} * FinDev$							-0.025***
							(0.004)
$Year_{2011,2012} * FinDev$							-0.022***
							(0.004)
$Year_{2013,2014} * FinDev$							-0.016***
							(0.004)
$Year_{2015,2016} * FinDev$							-0.010***
							(0.004)
$GovtCredit$	0.016**	0.014	0.022***	-0.001	0.007	0.036***	-0.014
	(0.008)	(0.016)	(0.004)	(0.008)	(0.012)	(0.008)	(0.008)
$Initial\ GDP$	-1.249***	-0.652	-1.053***	-0.939***	1.829*	0.259	-0.646**
	(0.326)	(1.343)	(0.342)	(0.327)	(0.981)	(0.331)	(0.328)
$GovtExp$	-0.000	0.148	-0.013	-0.014	0.186***	0.036	-0.003
	(0.013)	(0.110)	(0.014)	(0.013)	(0.064)	(0.026)	(0.013)
$Openness$	0.003	0.027	0.004	-0.012**	0.009	0.006	-0.008
	(0.006)	(0.025)	(0.003)	(0.006)	(0.017)	(0.005)	(0.006)
$Investment$	0.023***	0.003	0.019***	0.026***	-0.023**	0.016***	0.029***
	(0.003)	(0.014)	(0.003)	(0.003)	(0.011)	(0.004)	(0.003)
$Inflation$	0.439***	-0.464	0.752***	0.405***	1.542**	0.840***	0.423***
	(0.113)	(0.899)	(0.194)	(0.115)	(0.661)	(0.254)	(0.114)
$LandTrans$	0.034**	0.211	0.048***	0.043***	0.116	0.077***	0.041***
	(0.015)	(0.161)	(0.016)	(0.015)	(0.143)	(0.025)	(0.015)
$Education$	0.004	-0.162	0.079*	0.022	-0.364	0.138**	0.011
	(0.045)	(0.332)	(0.047)	(0.045)	(0.344)	(0.058)	(0.045)
$PopGro$	-0.654***	-1.298	-0.694***	0.533***	3.196***	0.693***	-0.596***
	(0.139)	(1.163)	(0.169)	(0.140)	(0.792)	(0.142)	(0.139)
obs	2487	2487	2129	2491	2491	2133	2491
Adjusted R-squared	0.652			0.645			0.650
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		
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: [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 2006).
Robust standard errors in parentheses. *** Significant at the 1% level. ** Significant at the 5%level. * Significant at the10% level.

6 Discussion

It is without any doubt that a well-functioning banking sector is imperative to economic growth. However, China's experience revealed in this study provides a counterexample of this common insight. We find that cities with higher financial development (i.e. a higher ratio of total loans to GDP) tend to grow more slowly during 2009-2018. This negative finance-growth relationship is not unique to our study. Early finance-growth studies also find that financial development may not play a vital role in China's economic miracle during the 1990s (e.g. Allen, Qian et al. (2005), Chen (2006), Hasan, Wachtel et al. (2009)).

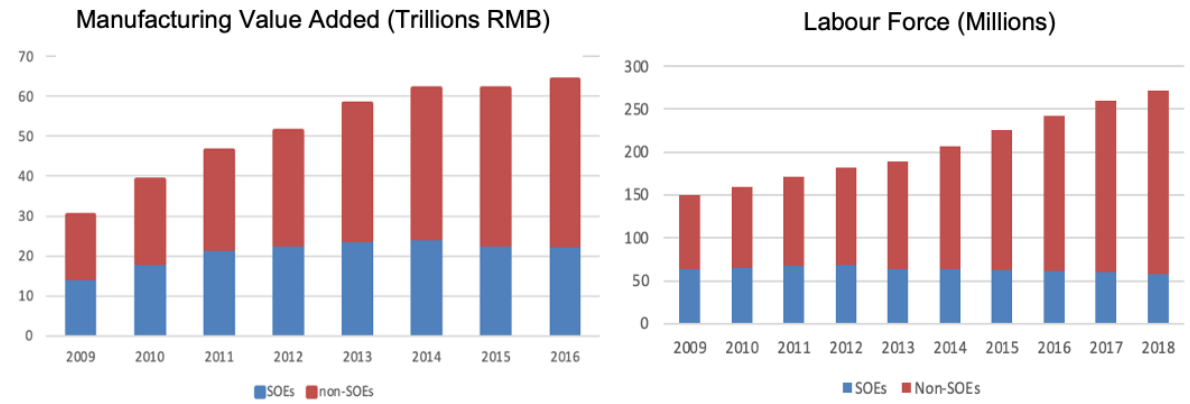
This negative nexus between finance and growth reflects two significant problems related to capital misallocation. Firstly, China's bank-dominated financial sector is influenced by strong political interventions from local and central governments, constraining banks' ability to make independent commercial decisions to fund productive private corporations and households. For example, while small and medium enterprises (SMEs) are the engine of China's rapid economic growth (Cunningham (2011), Tsai (2015)), they are typically discriminated against in loan financing and are imposed with a higher interest rate than SOEs (Bai, Hsieh et al. (2016), Deng, Jiang et al. (2020), Huang, Pagano et al. (2020)). This is a long-term problem for China as recognised by the existing literature. A direct outcome of this problem is that more productive private firms may invest less relative to SOEs. We will investigate this issue in Section 6.1.

Secondly, after GFC, expansionary policies through the financial system aggravated capital misallocations, leading to asset bubbles during the post-crisis period. We will provide two pieces of evidence on this issue. Firstly, the booming real estate sector overwhelmingly attracted a large volume of financial resources and investments, leading to a fast increase in housing prices and overinvestment in the real estate sector. We will discuss this issue in Section 6.2. Secondly, in the wake of the stimulus program, rapid credit expansions were not effectively channelled into productive non-financial sectors (Song and Xiong (2018)). Section 6.3 provides evidence of deteriorations in financial efficiency by examining whether credit expansions caused faster financial growth relative to the real sector's growth.

6.1 Bank discrimination against non-SOEs

Bank lending preferences cause a severe problem of capital misallocation between SOEs and private firms. Bank discrimination in China imposes stricter credit constraints for private firms (Bai, Hsieh et al. (2016), Deng, Jiang et al. (2020), Huang, Pagano et al. (2020)), and hence prevents private firms from reaching an efficient level of investment. Although private firms act as an essential growth engine of China's economic growth, private enterprises in China rely heavily on informal financial channels and self-financing, and only account for one-third of all corporate debt (CADTM 2022). The share is disproportionately small, considering that non-SOEs account for a much larger percentage of manufacturing output and general employment than SOEs (see Figure 1.1). As a result, financing discrimination hinders the investment and growth of more productive non-SOEs, and ultimately economic growth.

Figure 1.1 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/)

In China, banks, especially state-owned commercial banks, continuously support loss-making SOEs in slow-growing sectors due to political considerations (e.g. Biggeri (2003), Chen (2006), Hasan, Wachtel et al. (2009)). A large proportion of SOEs relies on blood transfusions from state banks (Lam, Schipke et al. (2017)). These zombie SOEs, particularly those in heavy industries, are unable to generate profits, invest in research and development, or develop new products. Ultimately, they face overcapacity problems and become progressively obsolete. In connection to this, SOEs with easy financial access to cheap loans are found to make unproductive

investments, leading to overinvestment and excessive economic capacity (Boyreau-Debray (2003), Cull and Xu (2003), Cull and Xu (2005), Liu, Pan et al. (2018), Zhao and Gong (2021)). It has also been found that SOEs often use a significant part of cheap loans for speculative purposes through high-interest rate lending to other entities (HANDLEY (2017)). These speculative activities exerted high financing costs on the economy, particularly in non-SOE enterprises, and thus hindered economic growth.

We examine whether bank lending preferences ultimately affect the investment level of non-SOEs and SOEs differently. A direct way to test this hypothesis is to analyse the relationship between aggregate investment and local financial development. We use the aggregate investment data for SOEs and non-SOEs at the provincial level[14]. The provincial investment data is collected from the National Bureau of Statistics of China (NBSC). The OLS and GMM results (columns (1)-(2) of Table 1.7) show that there is a significant negative correlation between non-SOEs' total fixed capital investment-to-GDP ratio and the provincial financial development level. At the same time, there is a significantly positive relationship between SOEs' total fixed capital investment-to-GDP ratio and the financial development indicator. These results are consistent with the view that the banking sector tends to lend excessively to SOEs, but fails to support non-SOEs investments.

An interesting finding is that, non-SOEs' investment is negatively associated with financial development in the form of a higher private[15] credit-to-GDP ratio. The economic intuition underlying this finding is: the increase in the credit-to-GDP ratio only benefits the SOEs, which in turn drives up the interest rate for the non-SOEs, leading to a crowding-out effect on the investment level of these non-SOEs. This crowding-out effect has been supported by Harrison, Meyer et al. (2019) who analysed a comprehensive dataset of medium and large Chinese enterprises during 1998-2013. The study suggests that the interest rate of private firms was more than 1% higher than that of SOEs. Moreover, the interest rate differential increased to more than 3%

[14] Note that, the investment data for SOEs and non-SOEs are only available at the province level. In our regression, our city-level variables, such as the financial depth index, are averaged at the province level. We also provide a robustness check by aggregating these city-level variables within the same province.

[15] The private credit in our study includes both SOEs' and nonSOEs' borrowings, and excludes LGFVs' borrowings. According to the controlling shareholder, LGFVs should be a type of SOEs. However, the primary objective of LGFVs is to finance local infrastructure on behalf of local governments. Hence, we categorise LGFVs' loans as government borrowings, while leaving SOEs' borrowings as a type of private borrowings.

after the GFC when the Chinese government launched a trillion-dollar stimulus package. The average interest deferential becomes larger when small private enterprises are considered.

6.2 Housing market booms

The real estate booms and bubbles may also contribute to the negative finance-growth nexus. The average housing prices roughly tripled during the decade following the global financial crisis. The steep increase in the housing price-to-income ratio in urban China has pushed that ratio above the average level observed in developed economies in recent years (Shen (2012), Sun (2020)). Fixed investment in the real estate sector is an important contributor to the post-crisis economic momentum. However, booms and bubbles in this sector attract too much finance and investment, leading to underinvestment in other sectors. This credit misallocation between the real estate sector and other sectors can deteriorate the traditional finance-growth nexus (Chen, Liu et al. (2017)).

In columns (3)-(4) in Table 1.7, we show direct evidence that the bank loan-to-GDP ratio significantly increases the investment-to-GDP ratio in the real estate sector, but substantially decreases the investment-to-GDP ratio in other sectors. The investment data is collected from China City Statistical Yearbook. The OLS, GMM and IV regressions all confirm 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.

The reason for such capital misallocation between real estate and other 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 prioritise lending to the real estate sector (Chen, Ren et al. (2016), Song and Xiong (2018)), which crowds out 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, Liu et al. (2017)). Finally, there is a collateral effect. The soaring housing and land prices can help land-holding firms obtain more bank loans by pledging land use rights as collateral, which strengthens investment demand in the real estate sector.

To test whether bank loans fuel house price booms and bubbles in China, we regress average local housing price on the financial depth indicator (i.e. $FinDev$). The average housing price at the prefectural level is obtained from China's major real estate website (Anjuke.com)[16]. The OLS, GMM and IV results in Column (5) of Table 1.7 show that financial development in the form of loan-to-GDP ratio positively contributes to the housing price booms during 2009-2018.

6.3 Unbalanced growth of financial and real sectors

During the recovery process after GFC, rapid loan expansions did not effectively support the growth of productive real sectors (Song and Xiong (2018), Huang and Ge (2019)). Empirical evidence has shown that lending decisions of state-ruled banks in China demonstrate serious moral hazard issues (e.g. Zhang, Cai et al. (2016), Jiang and Yuan (2022)). Specifically, state-owned commercial and under-capitalized banks tend to aggressively expand loans and undertake considerably high risk, deteriorating the problem of non-performing loans in China's financial system.

The runaway credit growth leads to unbalanced growth of the financial and non-financial sectors. According to Ductor and Grechyna (2015), balanced development of financial and real sectors is crucial to sustaining economic growth in the long run. A competitive real sector can make less efficient projects unprofitable and reduces credit misallocations to less productive projects. Thus, a sufficiently fast-growing real sector can maintain a high demand for financial funds and sustain relatively high funding costs, leading to an increase in credit efficiency to sustain long-run economic growth (e.g. Cheng and Degryse (2010), Beck, Degryse et al. (2014)). 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 (e.g. Santomero and Seater (2000), Ductor and Grechyna (2015), Bolton, Santos et al. (2016)). This inefficient resource allocation raises a threat to achieving optimal growth potential.

To investigate this issue, we examine whether China's financial development can trigger an unbalanced growth between real and financial sectors. The growth of

16 This website was chosen as it is one of the most used online platforms in China for buying, selling, and renting real estate in most of China's cities.

the financial sector is measured as the growth rate of the private credit-to-GDP ratio (namely, $\boldsymbol{g}_{c,t}^{\boldsymbol{financial\ sector}}$). We use the growth rate of industrial value added (namely, $\boldsymbol{g}_{c,t}^{\boldsymbol{real\ sector}}$) 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. The difference between the two growth rates (i.e. $\boldsymbol{g}_{c,t}^{\boldsymbol{financial\ sector}} - \boldsymbol{g}_{c,t}^{\boldsymbol{real\ sector}}$) is regressed on our financial depth index ($FinDev$) and a set of control variables. The OLS, GMM and IV results in column (6) of Table 1.7 present a significantly positive coefficient of $FinDev$. Our findings support that, the financial deepening in the form of loan-to-GDP ratio has led to a disproportionately fast-growing financial sector relative to the real sector.

Table 1.7 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	
IV Test[a]:										
Cragg-Donald F statistic							65.159			54.423
LM statistic							95.970***			79.846***
Sargan-Hansen test (P values)							0.165			0.269

(continued...)

	(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)
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)[b]		-			0.865	
IV Test[a]:						
Cragg-Donald F statistic			45.409			44.045
LM statistic			20.101***			66.352***
Sargan-Hansen test (P values)			0.096			0.770

Note: [a] The instrumental variables for financial development index ($FinDev$) includes colonization intensity index ($Colonization_c$) and bank density index ($\frac{Branch_{c,2008}}{Population_{c,t-1}}$). [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 (Roodman 2006).
Robust standard errors in parentheses. *** Significant at the 1% level. ** Significant at the 5%level. * Significant at the10% level.

7 Conclusion

We study the impact of China's financial development on local economic growth using a sample of 275 cities. We construct a new financial development index that accurately measures the level of bank loans to local enterprises and households. Using the GMM and IV estimates, we find a negative growth role of financial development during 2009-2018. Various robustness tests using different model specifications and subsamples confirm the negative finance-growth relationship.

The mechanisms behind the negative relationship are related to credit misallocations in the state-ruled banking sector in China. We find evidence that banks in China affect the investment level of SOEs and non-SOEs differently, which supports the common view that China's state-ruled banking sector discriminates against non-SOEs and favour SOEs in their lending. We also find that China's capital misallocation problem was worsened by the spectacular growth of the real estate sector. The aggressive loan expansions during the expansionary stage after GFC are found to have fuelled housing booms. As a result, the real estate sector attracted excessive resources that should be optimally invested in non-real estate sectors, leading to a crowding-out effect.

Our study raises an early alarm about the increasing financial risks and distortions built up in the banking system. Loan expansions are found to have aggravated the unbalanced growth of the financial sector relative to the growth of the real sector. This finding is related to the recent literature on excessive finance. Without a necessary judicial or regulatory framework, excessive financial deepening could exacerbate the problem of capital misallocation (Rousseau and Wachtel (2011)). The rapid credit expansions in China triggered banks' speculative motivations and reduced financial efficiency, which proses a threat to financial instability and the outbreak of a financial crisis. We call for more research to understand the interactive effect of credit expansions and financial volatility on China's local economic growth.

Chapter 2
Government debt and firm leverage

1 Introduction

In the wake of the 2007-2008 Global Financial Crisis (GFC, hereafter), government authorities resorted to a deficit-financed stimulus plan to assist economic recovery[17], accumulating a significant amount of public debt. However, aggressive public debt expansions also led to several adverse outcomes. One of the attendant disadvantages is that public debt crowded out corporate financing access. An increasing number of studies provide empirical evidence about the crowding-out effect in advanced countries such as the US and European countries (e.g. Graham, Leary et al. (2014), Becker and Ivashina (2018), Demirci, Huang et al. (2019), Lugo and Piccillo (2019)). As one of the emerging countries with rapid government debt expansion, relevant empirical evidence of the crowding-out effect in China has been limited. To fill the gap, we investigate the effect of government debt on firm leverage in China.

We use a sample of Chinese nonfinancial listed firms[18], and distinguish the term structure of their indebtedness. This distinguishment is essential in our study as the immature banking system in China is more inclined to expand short-term rather than long-term loans to minimise default risk and improve liquidity management (Fan, Titman et al. (2012), Cheng, Chiao et al. (2020)). Our outcomes demonstrate that the local government debt expansion leads to maturity restructure of firms' capital. It crowds out firms' short-term debt, and crowds in their long-term debt during 2007-2018. We also find that state-owned enterprises (SOEs) are less prone to the crowding-out effect of local government debt. In China's unique political institution,

[17] Such as, the American Recovery and Reinvestment Act of 2009 (ARRA) by the US authority, and 2008 European Union stimulus plan by the European Commission.

[18] Compared to non-listed firms that are generally small firms with limited access to debt financing, using a sample of listed firms can provide us a clear identification of the crowding-out effects in the credit market due to two reasons. Firstly, listed firms in China intensively rely on bank loans as they have sufficient tangible assets to pledge as collateral. Secondly, in responding to the supply shock of government securities, listed firms are more financially flexible and face less switching costs between debt and equity (Demirci, Huang et al. 2019).

SOEs have privileged access to bank financing as they are endowed with implicit government guarantees and stable political ties (Brandt and Li 2003). We use a fixed-effect model controlling for various time-varying firm-specific and macroeconomic variables, as well as city- and year-fixed effects. But the fixed-effect model cannot address the endogeneity concern related to government debt. For example, corporations may adapt their financing structures corresponding to macroeconomic fluctuations that are directly tied to public debt supply. To address the endogeneity concern, we employ an instrumental variable (IV) approach using the ratio of agency credit ratings and the number of arrested officers as external instruments.

During 2007-2018, two essential policy shocks caused fluctuations in the responses of SOEs and non-SOEs to the crowding-out effect. We use two external policies ---- namely, the 2009 local government financing relaxation program and the 2016 deleveraging reform--- as two quasi-natural experiments. They are exploited by the methodology of Difference-in-Differences (DiD) and Propensity Score Matching (PSM). The 2009 relaxation policy incentivised local governments to rely on local government financing vehicles (LGFVs) to obtain “off-budget” finance for quasi-fiscal expansions. Our results show that the relaxation program exacerbated the crowding-out effect of government debt on firms’ short-term leverage after 2009, especially for non-SOEs which are heavily discriminated against by China’s state-ruled banking sector. We use the 2016 deleverage reform as our second quasi-natural experiment. Our results show that, compared to non-SOEs, SOEs were more actively engaged in the deleveraging process. After the deleveraging reform, SOEs became more susceptive to the crowding-out effect of local government debt as the reform hardened their budget constraints.

China’s setting presents an ideal experiment to examine the crowding-out effect. Taking advantage of China's geographically segmented credit markets, we can use a sizeable dataset to explore large variations of the crowding-out effect across cities. While cross-city borrowing is not officially prohibited in China, prefectural-level statistical data in China indicates that financial markets have been segmented across cities (Gao, Ru et al. (2019), Huang, Pagano et al. (2020), Fan, Liu et al. (2022)). In this geographically segmented credit market, banks inevitably absorb prefectural governments’ debt issuance in the locality. Due to interest rate ceilings, local banks’

lending transactions cannot push local interest rates up and would not arouse a sharp reaction of local savings. In contrast, in an integrated and nationwide market, increasing the supply of subnational government debt may lead to a higher local interest rate as it attracts funds from the rest regions and potentially boosts local savings. Ultimately, the large quantity of outstanding local government debt would be absorbed by national investors. Consequently, the crowding-out effect of firm financing would be perceived at the country level.

Our paper mainly contributes to a growing study that explores the effect of government debt expansions on corporate finance in China (e.g. Huang, Pagano et al. (2020), Fan, Liu et al. (2022)). Our paper is related to Liang, Shi et al. (2017), which documents that government debt issuances in China can crowd out financial access of non-SOEs rather than SOEs. Similar to their findings, our outcomes demonstrate that SOEs are less prone to the crowding-out effect. We find that this advantage of SOEs is only detected for corporations' short-term debt. This paper exploits two necessary external shocks on the crowding-out effect of local government debt, which provides a more precise identification strategy. Using the DiD-PSM techniques can also enable us to build a causal relationship from public debt to firm financing, which is another significant contribution of our study.

The rest of the paper proceeds as follows. Section 2 discusses related literature. Section 3 presents the dataset, variable constructions and summary statistics. Section 4 describes our baseline model and the estimation techniques, as well as the results. Section 5 adopts two quasi-natural experiments. Section 6 concludes.

2 Literature review and institution background

The debate on the crowding-out effect of government debt on corporations' activities can date back to the 1970s (e.g. Friedman (1972), Blinder and Solow (1973), Barro (1974), Tobin and Buiter (1976)). Earlier studies suggest two contrasting effects in the real sector --- "real crowding-out" and "real crowding-in" effects. On the one hand, New Keynesian theory maintains that if prices and wages are sticky, government deficit financing in the form of tax cuts or increasing fiscal spending adds to aggregate demand, and eventually stimulates income and output, leading to a "real crowding-in effect". On the other hand, when resources are fully employed, governments can only

scramble more proportions of output at the expense of the private sector, leading to a "real crowding-out" effect.

Several studies explain the financial mechanism of the "real crowding-out effect". From a macroeconomic perspective, if the increase in private savings and capital inflows cannot fully offset government debt issuance, government debt expansions would raise interest rates and thus reduce corporation investment by rising interest rates[19] (e.g. Barth, Iden et al. (1984), Barth, Iden et al. (1991), ELMENDORF, MANKİW et al. (1998), Gale and Orszag (2003), Engen and Hubbard (2004), Hubbard (2012)). From a microeconomic perspective, Friedman (1978) introduces the investors' portfolio optimisation theory to asset markets to explore the "financial crowding-out" effect. The "financial crowding-out" theory maintains that if the wealth effect is presented in investors' portfolio decisions and asset markets are differentiated beyond money and capital, government debt issuance would change the relative asset returns responding to the relative substitutability of different securities in investors' portfolios. Thus, government debt expansions can crowd out private debt by competing for investors' funding. Friedman (1986) suggests that the increasing supply of Treasury triggers more fluctuations in prices of its close substitute (e.g. firm debt) than other security that is a poor substitute (e.g. firm equity). Correspondingly, the price fluctuations of close substitutes would change corporations' investment and financing strategies.

In conjunction with the wealth effect proposed by Friedman (1986), a growing group of studies explore the financial crowding-out effect with consideration of market frictions that can lead to an imperfectly elastic demand curve for corporate borrowings. For example, McDonald (1983) explores how investors with different tax statuses can influence the financial crowding-out effect of government debt. The increasing supply of taxable government bonds, on the one hand, can trigger a rise in corporate bond yield, which compensates investors with a high tax rate. On the other hand, it can increase the after-tax cost of corporate debt relative to equity, leading to a decrease in firm borrowings. In a related study, Taggart Jr (1985) adds additional assumptions on investors' risk appetites and transaction costs. The author finds that the new

[19] However, a small group of studies find no relationship between government debt and interest rates (e.g. Engen and Hubbard (2005), Traum and Yang (2015)).

issuance of public debt must be absorbed by investors with less interest to hold it, which would increase private debt yield and eventually decrease its issuance.

Greenwood, Hanson et al. (2010) propose that the relative yields of firm debt with different maturities are susceptive to the Treasuries' maturity as corporations are macro liquidity providers. To absorb the supply shock caused by Treasuries, corporations always issue more debt to reduce the gap of expected returns between long-term and short-term debt. Their results provide a negative relationship between corporate debt and government debt maturity. Badoer and James (2016) undertake a similar study. They maintain that this gap-filling is more influential for corporate debt with longer maturities.

Krishnamurthy and Vissing-Jorgensen (2012) propose that, in the presence of investors' liquidity and safety preferences, government debt issuance would alter the price of corporate debt relative to government debt. Government debts are endowed with a "convenience" component of high liquidity and safety. The increasing supply of Treasury securities would reduce the opportunity cost of holding liquid assets. Therefore, when the increasing supply of Treasure reduces the liquidity premium, investors would like to hold more government bonds and their substitutes.

Those works explain some related channels of the financial crowding-out hypothesis. However, it is less explored whether fluctuations in government debt supply and its attendant wealth effect can affect firms' financing strategy. After the GFC, the rapid accumulation of government debt raises a concern about the crowding-out effect of government borrowings on corporation financing incentives.

Recent studies provide overwhelming evidence on the crowding-out effect of public debt on firm leverage across countries. For example, Demirci, Huang et al. (2019) explore the crowding-out effect using a sample of 40 countries during 1990-2014, and provide evidence of the crowding-out effect on firm financing. They further add that the difference in financial environment is an essential factor in explaining across-countries variations of the crowding-out effect. Becker and Ivashina (2018) examine the effect of government debt expansions on European firms after the European sovereign debt crisis. They suggest that Eurozone countries have accumulated a large amount of government debt since the debt crisis, worsening the crowding-out effect on private capital formation. Using a sample of European countries

in a longer time horizon, Lugo and Piccillo (2019) also find a negative correlation between public and private debt. Echoing Krishnamurthy and Vissing-Jorgensen (2012), they attribute the crowding-out effect to the high liquidity and safety component of government debts.

Some studies explore the crowding-out effect in an individual country. One of the outstanding studies is Graham, Leary et al. (2014), which uses novel data from listed firms in the US unregulated industry during 1920-2012. Their results show that public debt is negatively associated with firms' borrowings and investment, but positively associated with firms' liquidity.

The crowding-out hypothesis has also been examined in the context of China, particularly at the prefectural level. Local governments in China are prohibited from directly issuing bonds and borrowing from banks due to the 1994 tax-sharing reform. But they can run implicit deficits by establishing LGFVs[20] to obtain external finance (Bai, Hsieh et al. (2016), Chen, He et al. (2020)). LGFVs' securities are implicitly guaranteed by local governments as part of their financial liabilities. Broadly, existing studies define local government debt as LGFV debt[21] at the city level (Liang, Shi et al. (2017), Huang, Pagano et al. (2020), Gao, Ru et al. (2021)).

LGFVs are tightly monitored by the central government before GFC to hinder the accumulation of local government debt. However, to facilitate the stimulus programme after GFC, the Chinese authority initiated a relaxation program[22] on local government debt to motivate local governments to expand their borrowings through LGFV. After those relaxation policies, municipals intensively rely on LGFVs to finance local infrastructure investments and other commonweal projects (Bai, Hsieh et al. (2016), Chen, He et al. (2020)). After the relaxation program, aggressive expansions of local government debt have attracted several scholars to examine its subsequent economic influence. For example, using the prefectural-level data, Fan, Liu et al. (2022) find that local government debt expansions can crowd out corporation financing and raise corporation capital costs[23].

[20] An LGFV is an SOE with the corresponding local government as the only or dominant shareholder.
[21] In the following empirical analysis, we use the terms "local government debt" and "LGFV debt" interchangeably.
[22] The relaxation program is signalled by two policies enacted in 2009, i.e. the No. 92 Document by CBRC and No. 631 Document issued by Ministry of Finance.
[23] Also in an emerging market setting, Ağca and Celasun (2012) illustrate an insignificant relationship between public debt and corporate finance costs.

In China's unique political institutions, there is active government intervention in the state-ruled financial system. As naturally associated with stable political ties, SOEs have preferential access to external financing, particularly from banks. The preferential financial access of SOEs is enhanced by extensive land endowment (i.e. used as collateral) and implicit government guarantees (Brandt and Li 2003). However, this privileged access to SOEs can cause distortions in the credit reallocation process (e.g. Cull and Xu (2000), Cull and Xu (2003), Maliszewski, Arslanalp et al. (2016)). Building on China's experience of capital misallocation between SOEs and non-SOEs, Liang, Shi et al. (2017) find that the rapid accumulation of local government debt during post-GFC significantly crowded out the leverage of non-SOEs, but crowded in that of SOEs. In a related paper, Huang, Pagano et al. (2020) suggest that the high-speed expansion of local government debt significantly tightened financing constraints of private firms and eventually crowded out private investment, while leaving SOEs' investment less affected.

3 Data and variables

3.1 Data and sample

The data used in this study are collected from three sources: (1) firm-level financial data from the China Stock Market Trading Database (CSMAR); (2) LGFV debt data from the Wind database; (3) The city-level data from China City Statistical Yearbook.

Our sample includes all listed firms on the Shanghai and Shenzhen stock exchanges from 2007-2018. Following the common practice, we deleted firms from the financial industry, and also that are flagged with Special Treatment (ST). Concerning the state-ownership data, we collect information on the controlling shareholder of each firm from the Center of China Economic Research Services Database (CCER). SOEs are enterprises with governments as the largest shareholder.

To remove outliers, we winsorise all variables at the 1st and 99th percentiles. Our sample is an unbalanced panel data because firms could enter or exit, and some cities have a shorter time series for local government debt bonds. Our final sample comprises 13547 firms covering 212 cities from 2007 to 2018.

3.2 Variables

A. City-level and firm-level data

This study mainly focuses on bank-financed corporate debt (i.e. bank loans) which is the primary financing channel for Chinese firms (Allen, Qian et al. 2005). Our main dependent variable is the ratio of total bank loans to total assets ($BankDebt$). Then we distinguish the term structure of firms' debt by dividing their bank debt into long-term ($BankDebt^{long}$) and short-bank loans ($BankDebt^{short}$). The summary statistic listed in Table 2.1 presents that the capital structure of China's listed firms is dominated by short-term debt. On average, short-term loans account for almost three-quarters of total bank loans.

We compute several firm characteristic variables which are related to firm leverage (e.g. Graham, Leary et al. (2014), Liang, Shi et al. (2017), Demirci, Huang et al. (2019)). To be specific, $Tangibility$ is defined as the ratio between the value of property, plant, and equipment (PPE) to total assets. Firm size ($SIZE$) is defined as the logarithm of firms' assets. Return on assets (ROA) is defined as operating income scaled by total book assets. Market-to-book ($Growth\ Opportunity$) ratio is defined as the ratio between the market value and the book value of total assets. To control for financial needs, we include cash holdings divided by total assets ($CASH$). We also include prefectural government characteristics such as the GDP growth rate ($GDPGro$) and total fiscal expenditure to GDP ratio ($GovtExp$).

B. Local government debt in China

Concerning our primary explanatory variable, official data on local government debt at the city level is not available. However, many studies provide a valid way to estimate local government debt (e.g. Bai, Hsieh et al. (2016), Huang, Pagano et al. (2020), Gao, Ru et al. (2021), Fan, Liu et al. (2022)). Before going to the measurement of government debt, we first explain the mechanism through which local governments issue debt. China's Budget Law (2014) prohibited prefectural governments from borrowing from banks or issuing bonds directly. To circumvent this restriction, local governments mainly instruct LGFVs to raise funds on the behalf of them. Generally, LGFV raises capital mainly through bank loans and corporate bonds that are secured by local government endorsements and assets (e.g. land use rights). Consistent with

prior research (e.g. Huang, Pagano et al. (2020), Fan, Liu et al. (2022), our local government debt index is calculated by aggregating LGFV debt data at the prefectural level.

We obtain financial data of LGFVs from the Wind database. As the principal off-balance-sheet financing sources of local government are bank loans and bonds, we define the total local government debt ($GovtDebt$) as the sum of total outstanding bank loans and bonds, scaled by the prefectural GDP. Then, we divide $GovtDebt$ into bank-financed government debt ($GovtDebt^{loan}$) and bond-financed government debt ($GovtDebt^{bond}$). To estimate total LGFV debt at the city level, we match firm-level LGFV debt data based on their registered location address.

Table 2.1 Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
$BankDebt$	13547	0.1903	0.1538	0	0.6059
$BankDebt^{long}$	13547	0.0555	0.0856	0	0.4161
$BankDebt^{short}$	13547	0.1340	0.1143	0	0.4569
$GovtDebt$	13547	0.3409	0.3507	0	1.7234
$GovtDebt^{loan}$	13547	0.2877	0.3020	0	1.4841
$GovtDebt^{bond}$	13547	0.0537	0.0622	0	0.3273
ROA	13547	0.0416	0.0476	-0.1306	0.1954
$SIZE$	13547	22.0928	1.2482	19.8132	26.1990
$Tangibility$	13547	0.2471	0.1709	0.0025	0.7341
$Growth\ Opportunity$	13547	1.8312	1.5445	0.1669	6.7218
$CASH$	13547	0.1915	0.1430	0.0099	0.6098
$GDPGro$	13547	0.0981	0.0300	0.0349	0.1696
$GovtExp$	13547	0.1300	0.0491	0.0670	0.3931

Note: This table shows the summary statistics for all city-level and firm-level variables. Their definitions are given in Section 3.

Once our local government debt statistic is scaled to the national level, it can be comparable with the official figure published by the National Audit Office (NAO). Our dataset shows that the total local government debt was 15.8 trillion Yuan in 2013, slightly lower than the official figure (i.e. 17.89 trillion) in the NAO report[24]. One possible reason for the difference is that our financial data is only available for LGFVs which have disclosed their financial information. Generally, LGFVs are not compelled

[24] It is the latest official report available on local government debt, and no further report has been published.

to publish their financial statements but must disclose their balance sheets when they request approval for new bond issuances. Another possible reason is that the NAO report includes all contingent government debt, while our statistics only account for LGFV bank and bond liabilities. Table 2.1 presents that the primary financing source of local government is bank loans (i.e. 84.4% of the total LGFV debt). It is close to the figure reported by the NAO 2010 (i.e. 80%).

4 Crowding in or crowding out effect

4.1 Baseline specification

Following the government and firm financing literature, we first employ an empirical approach to examine the crowding-out or crowding-in effect of local government financing on firm finance structure. The model is as follows:

Equation 2.1

$$Y_{cit} = \alpha + \beta * GovtDebt_{ct} + \gamma * X_{cit} + \delta * M_{ct} + \rho_c + \sigma_t + \varphi_i + \tau_k + \varepsilon_{cit}$$

Where our dependent variable is the leverage ratio of firm i in city c and year t. We distinguish the term structure of bank loans, including $BankDebt$, $BankDebt^{long}$, $BankDebt^{short}$. $GovtDebt_{ct}$ represents local government debt in city c and year t. SOE is a state ownership dummy, which equals 1 for SOEs and 0 for non-SOEs. X_{cit} is a set of firm-specific characteristics that may influence corporate financing ability, including $Tangibility$, $SIZE$, ROA, $Growth\ Opportunity$, $CASH$. M_{ct} is a vector of prefectural government characteristics, including $GDPGro$ and $GovtExp$. See Section 3 which provides details on how these variables are constructed. We also add ρ_c, σ_t, φ_i and τ_k to control for city, year, firm, and industry fixed effects, respectively.

In China's unique political institutions, the state always has a strong influence on the credit reallocation process. As naturally associated with stable political ties, SOEs often gain privileged access to external financing, in particular from banks (Brandt and Li 2003). This preferential access of SOEs is largely strengthened by the administrative government which forces state-controlled banks to channel cheap "policy lending" to target state-owned sectors regardless of the commercial and profit assessment. This preferential access is also improved by the aligned interest between

state-owned banks (SOBs) and SOEs, as both have a dual objective in their daily operations--- profit maximisation and social stabilisation (Lin, Lu et al. 2020).

Given the implicit guarantee and policy supports often received by SOEs from the government, we would expect the non-market reallocation can relieve the crowding-out effect for SOEs. To examine whether SOEs are less subject to the crowding-out effect than non-SOEs, Equation 2.1 is augmented by the interaction term between government debt and SOE[25].

Equation 2.2

$$Y_{cit} = \alpha + \beta_1 * GovtDebt_{ct} + \beta_2 * GovtDebt_{ct} * SOE + \gamma * X_{cit} + \delta * M_{ct} + \rho_c + \sigma_t + \varphi_i + \tau_k + \varepsilon_{cit}$$

Both equations 2.1 and 2.2 are estimated by the fixed-effect method, controlling for firm-specific and economic factors. The first three columns of Table 2.2 present the estimation results of Equation 2.1 which illustrate how government debt influences firm capital structure. Columns (1)-(2) present that government debt is negatively correlated with short-term corporate debt, but positively associated with corporate long-term corporate debt. Our results provide strong evidence of the crowding-out effect on firms' short-term debt. This crowding-out effect is consistent with the findings in Graham, Leary et al. (2014), Demirci, Huang et al. (2019), Fan, Liu et al. (2022). In the meantime, we find that local government debt can crowd in firm's long-term debt.

Column (3) of Table 2.2 provides that local government debt is negatively related to our aggregate firm debt index (i.e. $BankDebt$), but this negative relationship is not significant. It indicates that, government borrowing leads to firms' capital restructuring towards long-term debt. It is probably better for firms to have more long-term funding rather than short-term funding, because it gives them more stability in terms of their financial structure.

The three right columns of Table 2.2 provide the estimates of Equation 2.2, controlling for fixed effects. The coefficient of government debt is significantly negative on the short-term leverage of firms, but positive on the long-term leverage. This finding is consistent with the findings estimated by Equation 2.1 (i.e. local government debt crowded out short-term bank-finance debt, but crowded in long-term bank debt). The coefficient of the interaction term between $GovtDebt$ and SOE is positive and

[25] SOE dummy is excluded in our equations as not doing so would result in collinearity with the firm fixed effect.

significant for $BankDebt^{short}$, while it is negative and insignificant for $BankDebt^{long}$. This result suggests that short-term debt of SOEs were less subject to the crowding-out effect found in non-SOEs.

One interesting finding in our empirical results is that government debt expansions mainly crowded out short-term corporation debt. One possible reason is the different risk assessments for the short-term and long-term debt in China's bank sector. In China's immature credit system, banks are more inclined to grant short-term rather than long-term loans to minimise default risk and improve liquidity management (Fan, Titman et al. (2012), Cheng, Chiao et al. (2020)). Thus, in response to rising financial uncertainties, Chinese banks primarily tighten borrowing restrictions on short-term loans to minimise default risk, and accumulate more government securities to increase safety. The shift in risk preference increases the sensitivity of firms' short-term debt to government debt supply shocks.

Another interesting finding is that government debt expansions mainly crowded in firms' long-term debt. One possible reason behind it is that expansionary government expenditures would stimulate investment opportunities and market demand, reduce uncertainty, and hence increase firms' long-term investments financed by long-term debt. It is important to note that the crowding-in and crowding-out effects are not mutually exclusive. The positive sign of $GovtDebt$ coefficient does not mean the nonexistence of the crowding-out effect.

The local government debt in China can be decomposed into bank-financed and bond-financed debt. We distinguish these two types of local government debt and regress corporate financing variables on them individually. Their results in Appendix 2.1 are consistent with our baseline results. The bank- and bond-financed local government debt crowded out short-term corporate debt, but crowded in long-term debt. Consistently, SOEs are less subject to the crowding-out effect caused by the bank- and bond-financed government debt.

Table 2.2 Baseline regression

	(1)	(2)	(3)	(4)	(5)	(6)
	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$
$GovtDebt$	-0.021***	0.016***	-0.004	-0.040***	0.020***	-0.021***
	(0.005)	(0.004)	(0.006)	(0.007)	(0.005)	(0.008)
$GovtDebt * SOE$				0.029***	-0.006	0.026***
				(0.007)	(0.005)	(0.009)
ROA	-0.359***	-0.140***	-0.508***	-0.361***	-0.139***	-0.510***
	(0.017)	(0.013)	(0.020)	(0.017)	(0.013)	(0.020)
$SIZE$	0.010***	0.028***	0.038***	0.011***	0.027***	0.039***
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
$Tangibility$	0.047***	0.009	0.053***	0.048***	0.008	0.054***
	(0.008)	(0.006)	(0.009)	(0.008)	(0.006)	(0.009)
$Growth\ Opportunity$	-0.004***	-0.000	-0.004***	-0.004***	-0.000	-0.004***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
$CASH$	-0.122***	-0.055***	-0.178***	-0.124***	-0.054***	-0.181***
	(0.006)	(0.005)	(0.007)	(0.006)	(0.005)	(0.007)
$GDPGro$	-0.068*	0.044	-0.018	-0.065	0.044	-0.015
	(0.040)	(0.029)	(0.045)	(0.040)	(0.029)	(0.045)
$GovtExp$	0.054**	-0.055***	-0.003	0.052**	-0.055***	-0.005
	(0.026)	(0.019)	(0.030)	(0.026)	(0.019)	(0.030)
obs	13547	13547	13547	13547	13547	13547

Note: This table reports the estimation results for the fixed-effects specification using the firm panel. Variable definitions are given in Section 3. All regressions include firm-, industry-, year- and city-fixed effects. "*", "**" and "***" denote significance at the 10%, 5%, and 1% level, respectively.

4.2 Addressing the endogeneity problem

Our fixed-effect estimates in Section 4.1 can be biased by the endogeneity problem as enterprises may restructure their financing preference responding to government debt-related economic conditions. For example, governments generally increase deficit spending during economic downturns when private investment opportunities are weak. Correspondingly, the lack of investment opportunities reduces firms' financing needs. Thus, the association between government debt and firm leverage can reflect fluctuations in latent investment opportunities. To deal with the endogeneity problem, this study employs an instrument variable (IV) approach using two external instruments for our government debt variable.

Corruption index

Firstly, we innovatively use the number of arrested city governors[26] as an instrument, namely $Arrest$. The intuition is that government activities are likely to be disrupted when major governors are caught and penalised in a city, leading to an increase in the default risk of LGFV debts that heavily rely on the local governments' implicit guarantee (Depken and Lafountain (2006), Butler, Fauver et al. (2009), Qian (2018)). Thus, we would expect that municipalities with more arrested corruption investigations can reduce local LGFVs' creditability and hence their external financing competence. This instrument is strictly exogenous as the arrest warrant is confidential before becoming publicly known.

The great effort of the anti-corruption campaign in China provides an excellent chance to study our corruption-related instrument. In 2012, the Chinese Communist Party (CCP) launched an anti-corruption campaign which was the most intensive and protracted in China's history. The campaign investigated a large number of officials from township-level "flies" to high-ranking "tigers" (Wedeman (2016), Wang and Dickson (2022)). To the end of our sample, more than 400 officials were named in the graft investigations. The corruption-related investigation data are collected from China's Central Commission for Discipline Inspection (CCDI) which directs the anti-corruption campaign. To check the accuracy and integrity of the information, we also consult principal news agencies through Tencent and BaiduBaike.

Our corruption index could be considered as exogenous. Firstly, the launch of the anti-corruption campaign is an exogenous shock, and not related to any economic factors. Secondly, the anti-corruption campaign in China provides a good way to mitigate the causality from economic development to corruption. The agency directly charged with overseeing the campaign is the CCDI and the judicial organs, such as the Supreme People's Procuratorate proceed to charge the accused with criminal wrongdoing and move the case to trial, which is independent of any economic factors.

[26] Here, the city governors include city secretaries and mayors as they have the major political power to veto important decisions and supervise the functioning of the government body.

Agency credit rating

Our second IV is the average LGFVs' credit rating ratio[27]. Credit rating, as a proxy for credit risk, is based on a range of factors, such as corporate governance, financial structure, solvency, operating efficiency and growth prospects (Ang, Bai et al. (2016), Chen, He et al. (2020)). LGFVs with high credit ratings are perceived to have low default risks and incur a relatively low-interest cost in bond and bank financing. Thus, China's local governments which are generally under fiscal stress, would rely on high-rated LGFVs to obtain more low-interest debt. To measure the credit risk for each city, we use the average credit rating ratio for all LGFVs located at city c, namely $Credit\ Rate_{c,t}$. Credit rating data of bond issuers is collected from the Wind database[28]. We assign numerical values to quantify the categorial rating data (for more details see Appendix 2.2). Our IV could be considered exogenous as the credit rating is assessed by independent credit rating agencies.

A potential concern is the endogeneity problem resulting from the procyclicality of LGFVs' credit ratings. The assessment of firms' credit risk by credit rating agencies may be influenced by the business cycle (Nickell, Perraudin et al. (2000), Amato and Furfine (2004)), leading to procyclicality that exhibits temporal variation but remains consistent across firms within a particular geographic location. To mitigate this problem may arise, we control for the year-fixed effect which may reduce the endogeneity bias associated with this concern, i.e. procyclicality of firms' credit ratings.

Results

Consistent with our baseline results in Table 2.2, the 2SLS-IV regressions summarised in Table 2.3 indicate local government expansions cause the

[27] Note that, we use the overall credit evaluation of the bond-issuing enterprise itself rather than the credit rating of individual bonds due to two reasons. Firstly, we use the outstanding amount of LGFV Bond at the firm level, which makes it hard to assign an appropriate weight for each bond's rating in a specific time. Secondly, while bond credit rating only measures the default risk of a specific bond, issuers' credit rating measures the overall default risks of the enterprises. Thus, it is a more appropriate indicator to capture the overall credit risk of our LGFV debt variable which includes both bank loans and bonds.

[28] Bonds are rated at issue by one of the five major credit rating agencies: (i) the China Chengxin International Credit Rating Co., Ltd. (a joint venture with Moody's); (ii) the China Lianhe Credit Rating Co. Ltd. (a joint venture with Fitch Ratings); (iii) the Dagong Global Credit Rating Co., Ltd.; (iv) the Pengyuan Credit Rating Co., Ltd.; and (v) the Shanghai Brilliance Credit Rating & Investors Service Co., Ltd. (see Ang, Bai and Zhou, 2016).

restructuring of firms' capital maturities. Local government debt crowded out firms' short-term debt but crowded in long-term debt. The contrasting effects of local government debt expansions are considerable. A one standard deviation increase in local government debt is associated with a 3.64% decrease in firms' short-term debt (column(1)), and a 4.03% increase in long-term debt (column(2)). The positive crowding-in effect is quantitatively important, given the average $BankDebt^{long}$ ratio is 5.55%. Non-SOEs' short-term debt were more sensitive to the crowding-out effect. The 2SLS-IV results for bank-financed and bond-financed government debt also show a robust pattern (see Appendix 2.3).

Table 2.2 shows no effect of government debt expansions on the firms' total bank loans (i.e. $BankDebt$). But Fan, Liu et al. (2022) shows a significant crowding-out effect. The difference is due to the different sample periods used. Our study covers the period between 2007 and 2018, which is much longer than that used in Fan, Liu et al. (2022) (i.e. 2007-2012). The post-GFC stimulus programme triggered a dramatic increase in local governments' borrowing activities through LGFVs, which accumulated excessive risks. To curtail the rapid growth of LGFV debt, China has stepped up restrictions[29] on LGFVs grabbing low-interest bank loans since 2014. Thus, the crowding-out effect of government debt expansion has been weakened in more recent years.

To verify the appropriateness of our IV-2SLS estimates, several diagnostic analyses are conducted. First, our IV estimation rejects the null of the LM test, indicating that our 2SLS-IV equations are not underidentified. Second, the Sargan-Hansen test is provided to test overidentifying restrictions. Our results show that the null of the Sargan-Hansen test is accepted, indicating our instruments are valid, i.e. uncorrelated with the error term. Third, we test whether our IVs suffer from any weak instrument issues. Our IV estimates of Equation 2.1 do not have any weak instrument problem: the values of the Kleibergen-Paap F test are larger than the Staiger and Stock (1994) rule of thumb value of 10. However, there is a weak instrument concern for the IV estimates of Equation 2.2. We will tackle this problem in Section 5. Finally,

[29] Such as Document 43 in 2014, Document 88 in 2016, and Document 50 in 2017 issued by the State Council of China (SCC). Those restrictions

the first-stage IV regressions (see Appendix 2.4) validate our conjecture for the relevance of the instrument: the corruption index and agency credit rating are powerful predictors of local government debt in the cross-city dimension.

Table 2.3 IV estimates

	(1)	(2)	(3)	(4)	(5)	(6)
	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$
$GovtDebt$	-0.104*	0.115**	0.010	-0.165**	0.149**	-0.023
	(0.060)	(0.051)	(0.068)	(0.077)	(0.068)	(0.089)
$GovtDebt * SOE$				0.163*	-0.049	0.114
				(0.095)	(0.081)	(0.110)
ROA	-0.355***	-0.112***	-0.481***	-0.361***	-0.111***	-0.486***
	(0.031)	(0.023)	(0.036)	(0.032)	(0.024)	(0.036)
$SIZE$	0.020***	0.028***	0.048***	0.024***	0.027***	0.051***
	(0.004)	(0.003)	(0.005)	(0.005)	(0.004)	(0.006)
$Tangibility$	0.047***	-0.006	0.042**	0.051***	-0.007	0.044**
	(0.015)	(0.018)	(0.019)	(0.015)	(0.018)	(0.019)
$Growth\ Opportunity$	-0.003***	0.000	-0.003***	-0.002**	0.000	-0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$CASH$	-0.123***	-0.065***	-0.188***	-0.137***	-0.061***	-0.198***
	(0.011)	(0.008)	(0.013)	(0.013)	(0.010)	(0.015)
$GDPGro$	0.039	-0.076	-0.029	0.000	-0.080	-0.067
	(0.081)	(0.067)	(0.095)	(0.089)	(0.072)	(0.102)
$GovtExp$	0.017	-0.016	-0.004	0.019	-0.013	-0.000
	(0.031)	(0.023)	(0.036)	(0.031)	(0.024)	(0.035)
obs	10452	10452	10452	10452	10452	10452
Kleibergen F Stat	10.315	10.315	10.315	7.212	7.212	7.212
LM statistic	27.811***	27.811***	27.811***	15.204***	15.204***	15.204***
Hansen J	4.974	5.057	6.561	0.333	0.019	0.299
Hansen J (p values)	0.174	0.168	0.087	0.564	0.890	0.584

Note: This table reports the estimation results for the IV estimator using two external instruments--- corruption index and issue rating. Corruption index is measured as the number of arrested city governors at prefectural level. Issue rating, namely $Credit\ Rate_{c,t}$, is measured by the average credit rating ratio for all LGFVs located at the city level. Definitions of other variables are given in Section 3. The standard errors are clustered at both the firm and year levels. "$*$", "$**$" and "$***$" denote significance at the 10%, 5%, and 1% level, respectively.

4.3 Selection bias: PSM

The aim of Equation 2.2 is to explore whether state ownership can affect the size of the crowding-out effect. However, there is some observational difference between SOEs and non-SOEs, which can introduce selection bias in our estimations. For example, the former is typically larger, less profitable, older firms. Ideally, we should reduce this bias by randomly assigning SOEs and non-SOEs. But it is infeasible. To minimise the impact of selection bias, we use the Propensity Score Matching method (PSM, Abadie and Imbens (2011)) to do 1:1 nearest neighbour matching based on observed firm characteristics. The specification is:

Equation 2.3

$$SOE = \alpha + \beta * PVar + \sigma_t + \tau_k + \varepsilon_{cit}$$

A logit regression based on Equation 2.3 is used to estimate propensity scores (i.e. the predicted probability). Equation 2.3 includes a vector of firm characteristics, including $Tangibility$, $SIZE$, ROA, $Growth\ Opportunity$, $CASH$, $lnAge$, as well as industry τ_k and year dummies σ_t. $lnAge$ is the natural logarithm of one plus the number of years since the firm's IPO. The propensity scores of the pre-match panels are used as a reference to perform nearest neighbour 1:1 matching between SOEs and non-SOEs. PSM diagnostic tests[30] in Appendix 2.5 suggest that our matching procedure mitigates significant differences in firms' fundamental characteristics between SOEs and non-SOEs.

Table 2.4 provides the estimates of Equation 2.2 for the matched sample after PSM. It reveals a significant crowding-out effect for short-term debt, and a significant crowding-in effect for long-term debt. Our regression result also confirms that state ownership significantly reduced the crowding-out effect for short-term debt, while having no impact on long-term debt.

4.4 Robustness check

Two robustness checks are conducted. Firstly, our baseline estimations are repeated for sub-samples of different regions. According to the development level, mainland China can be divided into East, Central and West regions. The most developed region is the East region on the coast, in which most cities adopted the reform and opening-up policy at the early stage. The second developed one is the Central region, followed by the West region. Appendix 2.6 illustrates that relationships between local government debt and firm financing structure in the three regions are found to be similar to the ones found in the whole sample. One interesting finding is that the importance of state ownership in relieving the crowding-out effect is more pronounced in less developed regions. This finding is quite intuitive as the financial system in more developed regions is more mature and open, and hence is less likely to be intervened by the government.

[30] The logit estimates in Panel (A) show that most significant coefficients in the "pre-match" column become no or marginally significant in the "post-match" column. The t-test results in Panel (B) suggest no systematic difference in means between SOEs and non-SOEs after matching for all our conditioning variables. The Rubin's B statistic is less than 25, and Rubin's R statistic is between 0.5 and 2, which is line with Rubin (2001) for the samples to be sufficiently balanced.

In another robustness check, we use a new government debt index to account for municipal bonds. Local governments had been forbidden to issue municipal bonds directly until the amended 2014 Budget Law. To account for issuances of municipal bonds, we construct a new government debt index by aggregating the amount of LGFV debt and municipal bonds, scaled by GDP. Our data show that, during our sample period, municipal bonds kept quite a low amount and did not displace LGFV bonds. Appendix 2.7 presents the regression results using the new index. These results are consistent with our baseline results.

Table 2.4 PSM estimates

	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$
$GovtDebt$	-0.035***	0.014*	-0.024*
	(0.012)	(0.008)	(0.014)
$GovtDebt * SOE$	0.037***	-0.001	0.040***
	(0.013)	(0.009)	(0.015)
ROA	-0.320***	-0.137***	-0.474***
	(0.035)	(0.025)	(0.041)
$SIZE$	0.019***	0.026***	0.045***
	(0.003)	(0.002)	(0.004)
$Tangibility$	0.036**	0.008	0.043**
	(0.018)	(0.012)	(0.020)
$Growth\ Opportunity$	-0.004***	-0.000	-0.004***
	(0.001)	(0.001)	(0.002)
$CASH$	-0.135***	-0.060***	-0.193***
	(0.014)	(0.010)	(0.016)
$GDPGro$	-0.065	0.033	-0.035
	(0.079)	(0.055)	(0.092)
$GovtExp$	0.060	0.000	0.046
	(0.046)	(0.033)	(0.054)
obs	4125	4125	4125

Note: This table reports the estimation results for fixed-effect estimators after the PSM method proposed by Abadie and Imbens (2011). Variable definitions are given in Section 3. The definitions of our main and control variables are given in Section 3. All regressions include firm-, industry-, year- and city-fixed effects. "*", "**" and "***" denote significance at the 10%, 5%, and 1% level, respectively.

5 Case studies: Policy shocks, local government debts and crowding-out effects

5.1 Difference-in-Difference

The findings in Section 4 illustrate that SOEs and non-SOEs were affected by the crowding-out effect to a different extent during 2007-2018. But their responses were not always identical across our sample period. There are two remarkable policy shocks which caused fluctuations in their responses to the crowding-out effect. In this section, we use the two external policies ---- namely, the 2019 local government financing relaxation program and the 2016 deleveraging reform--- as two quasi-natural experiments.

The 2009 local government financing relaxation program

The history of LGFVs can date back to 1992 when the first LGFV was established in Shanghai. Principally, LGFVs were established to support off-balance-sheet programs for local governments. Before 2009, there were strict restrictions on LGFVs' financing activities. However, to propel the four-trillion stimulus program after GFC, the Chinese central government effectively loosened the financing restrictions on LGFVs and appealed to local governments to issue LGFV securities. After that, the number and size of LGFVs quickly increased. The relaxation of LGFV borrowings was signalled by the No. 92 Document by CBRC (March 18, 2009) and the No. 631 Document issued by the Ministry of Finance (October 12, 2009). For simplicity, we use the term "the 2009 local government financing relaxation" program to describe this policy.

The relaxation program initiated in 2009 dramatically increased the reliance of local governments on LGFVs to obtain "off-budget" finance and to construct quasi-fiscal expansions. With explicit encouragement from Beijing, LGFVs intensively issued bonds and borrowed from bank loans on behalf of local governments (Chen, He et al. 2020). Figure 2.1 illustrates the explosion of government debt during the stimulus period. Given a limited supply of "cheap" funds in China's banking system, rapid expansions of government debt can increase the borrowing cost of private firms. Thus, it demotivates private firms to borrow, leading to a more substantial crowding-out effect

for private firms. In contrast, SOEs are less prone to this crowding-out effect as they are granted privileged access to bank finance. Figure 2.1 provides some preliminary evidence. It shows that the loan-to-asset ratio of non-SOEs dramatically decreased during the stimulus period, but the ratio of SOEs shows an opposite trend.

This quasi-natural experiment can act as an alternative strategy to deal with the endogeneity issue. Section 4 uses the IV technique to account for the possible endogeneity issues related to local government debt. But the IV estimate has some defects. For example, the IV diagnostic tests indicate a potential weak instrument problem. This section uses the 2009 local government financing relaxation program as an external shock to build a causality from government debt to firm financing.

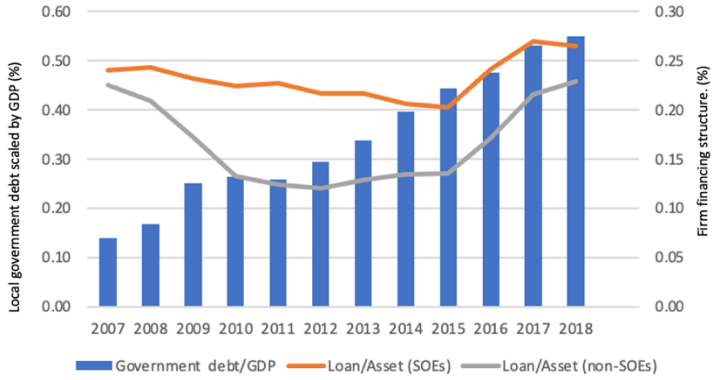
The 2016 deleverage reform

China has witnessed a high-speed growth of bank credit and a rapid accumulation of corporate and government debt since the Global Financial Crisis. In response to this challenge, the Chinese authority initiated a deleveraging strategy in 2016. The deleverage reform is signalled by the Document *Opinion of the State Council on actively and safely reducing corporate leverage* (No. 54, State Council, September 2016). This reform is actively endorsed by SOEs naturally with the objective of social stabilisation. This deleveraging process of SOEs was further strengthened by the SOE reform[31] with the objective to improve SOEs' efficiency at the same time. These programs largely weakened political connections and implicit government guarantees for SOEs to gain privileged access to external finance. Figure 2.1 and Figure 2.2 shows that the gap in the loan-to-asset ratio between SOEs and non-SOEs narrows, especially for short-term corporation loan. The deleverage program hardened the borrowing constraint of SOEs, which can make SOEs more exposed to the crowding-out effect. In our quasi-natural experiment, we should expect, after the 2016 deleveraging program, SOEs to become more susceptive to the crowding-out effect.

[31] The SOE reform announced ten pilot programs in 2016 with several selected SOEs, focusing on mixed-ownership reforms and professional management through recruitment, compensation, and board of directors.

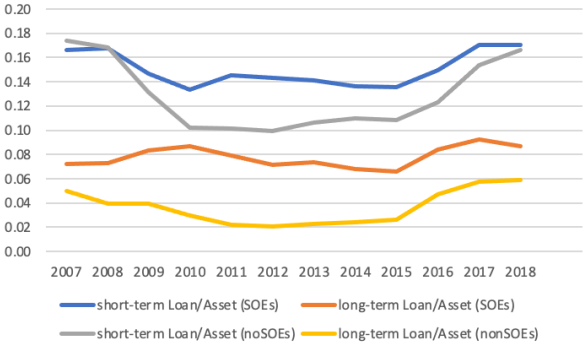
One concern in our DiD setting is that the performance of the deleveraging process in the first year after the deleverage reform is opposite to what we expected. Although the loan-to-asset ratio of SOEs increased from 2016 to 2017, the gap in the leverage ratio between SOEs and non-SOEs narrowed after 2016 (see Figure 2.1). The reducing gap suggests that SOEs were more actively engaged in the deleveraging process, which validates our identification strategy to compare the different responses between SOEs and non-SOEs.

Figure 2.1 The trend of government debt and listed firms' leverage



Source: Authors' calculation from the Wind database

Figure 2.2 The trend of listed firms' financing structure



Source: Authors' calculation from the Wind database

DiD-PSM estimates

The two exogenous policy shocks allow us to use the difference-in-difference (DiD) method and analyse different responses of SOEs and non-SOEs to the

crowding-out effect, as discussed in the previous section. The findings in Section 4 illustrate that SOEs and non-SOEs are affected by the crowding-out effect of local government debt to a different extent, which provides us with a natural identification strategy. We use SOEs which have privileged access to bank loans as our treatment group, and consider non-SOEs as control group firms. Treatment variable SOE is a dummy variable which equals one for firms with governments as the controlling shareholder. Next, we create two dummies: $Current$ equals 1 in the policy enactment year (i.e. the year 2009 and 2016); $Post$ equals 1 in subsequent years following the enactment year. We then estimate the following DiD model:

Equation 2.4

$$Y_{cit} = \alpha + \beta_1 * GovtDebt_{ct} * SOE * Current + \beta_2 * GovtDebt_{ct} * SOE * Post + \beta_3 * GovtDebt_{ct} * SOE + \beta_4 * GovtDebt_{ct} * Current + \beta_5 * GovtDebt_{ct} * Post + \beta_6 * SOE * Current + \beta_7 * SOE * Post + \beta_8 * GovtDebt_{ct} + \gamma * X_{cit} + \delta * M_{ct} + \rho_c + \sigma_t + \varphi_i + \tau_k + \varepsilon_{cit}$$

X_{cit} and M_{ct} are a set of firm and city characteristics, which are defined as the same as those in our baseline model.[32] To filter out potential contamination effects by other policies, we focus on a two-year window after the policy enactment year.

In our DiD analysis, firms in the control and treatment groups should be observationally identical except for a difference in financial access due to their ownership nature. Comparing our sampled SOEs and non-SOEs, we observe that SOEs are normally older, larger, and less profitable firms with more tangible assets and fewer cash holdings[33]. As a result, those observational disparities could bias our main results. Ideally, randomly allocating companies to the treatment and control groups would reduce this selection bias. But this random assignment is infeasible. An alternative way is to use a propensity score matching method (PSM, Abadie and Imbens (2011)). PSM can create a matched sample of SOEs and non-SOEs with similar characteristics based on propensity scores. A logit model is used to estimate propensity scores by regressing SOE dummy on several firms' fundamental characteristics in the previous year before the policy shock. Those firm-specific variables can cause observationally differences between SOEs and non-SOEs, including $Tangibility$, $SIZE$, ROA, $Growth\ Opportunity$, $CASH$, $lnAge$, as well as

[32] We do not include $current$ and $post$ dummies in the model because doing so would introduce collinearity with the year-fixed effects.

[33] See Appendix 2.5. The differences in the means of all the above-mentioned variables in the treatment and control firms were statistically significant at the 5% level.

industry dummies. Next, we perform a one-to-one nearest neighbour matching with replacement[34], which allows us to match each SOE with the most similar non-SOEs according to their propensity scores (Rosenbaum and Rubin 1985). To reduce matching bias, we impose common support[35] and a caliper matching method within a caliper[36] of 1%.

5.2 Empirical results

Equation 2.4 presents the DID-PSM estimate based on our two quasi-natural experiments. The estimates are presented in Table 2.5. The first three columns provide the DiD estimates of the 2009 local government financing relaxation program. Column (1) reports the estimates for short-term corporation debt, and shows a negative coefficient for the interaction term between $GovtDebt$ and $Post$. As expected, it indicates a deterioration of the crowding-out effect on firm's short-term leverage after the 2009 relaxation program. Another interesting result is related to the interaction term $SOE * GovtDebt$ and the triple interaction between the $SOE * GovtDebt * Post$. The former one is insignificant, but the triple interaction is significantly positive. It indicates that after 2009 SOEs are less susceptive to the crowding-out effect than non-SOEs. Column (2) of Table 2.5 presents no relationship between local government debt and long-term corporate leverage. Only the interaction term $SOE * Post$ is significantly positive, indicating an increase in SOEs' long-term leverage after 2009. The intuition behind it is that, echoing the four-trillion stimulus program, SOEs conducted counter-cyclical activities and increased borrowing for investment after 2009.

The last three columns of Table 2.5 provide the results using the 2016 deleverage reform as a quasi-natural experiment. Column (4) presents the DiD outcomes for short-term corporation debt. During the pre-reform period, local government debt crowded out short-term corporate debt, which was more pronounced for non-SOEs. This finding is consistent with our baseline results. As expected, we find that, after the 2016 deleverage reform, SOEs became more sensitive to the

[34] Comparison units can be used as matches more than once if necessary. Rajeev and Wahba (1998) illustrate that matching with replacement reduces bias compared to matching without replacement.
[35] Restricting the sample to common support means removing some treated observations whose propensity scores are higher than the maximum or lower than the minimum of the propensity score of untreated firms.
[36] Caliper refers to the difference in the predicted probabilities between the treatment and control firms.

crowding-out effect, as indicated by the negative sign of $SOE * GovtDebt * Post$. Our result also presents a positive term of $Post * GovtDebt$, indicating a decreasing trend of the crowding-out effect. One possible reason for the weakening crowding-out effect is that Chines authority initiated several policies to facilitate private borrowings after they realised the negative impact of government debt expansions on the private sector.

Column (5) presents the outcomes of long-term debt. The positive term of $GovtDebt$ indicates an average crowding-in effect of government debt on long-term corporate debt. But this crowding-in effect was reduced after 2016, as indicated by the negative sign $Post * GovtDebt$. The outcome is quite intuitive: Chinese local governments intensely financed the stimulus during the GFC-recovery stage, leading to a significant crowding-in effect. But, during the post-stimulus period, local governments gradually reduced their efforts to facilitate private investment, leading to a reduction in the crowding-in effect. Another interesting finding is related to the triple interaction term $SOE * GovtDebt * Post$. This significantly positive triple interaction indicates that the crowding-in effect was mainly reduced for non-SOEs rather than SOEs.

The empirical results in Table 2.5 are estimated by the DID technique on a matched sample. We also provide the DID estimates before PSM (See Appendix 2.7). Most coefficients of our main interested terms are in the same direction for both pre- and post-PSM estimates.

5.3 Diagnostic tests

We conduct two crucial diagnostic tests for our DiD-PSM estimates. Firstly, similar to Leuven and Sianesi (2003), variable-specific balancing tests are employed to evaluate the matching quality (see Table 2.6). Logit regression results in Panel A present that significant variables in the "pre-match" column become statistically insignificant in the "post-match" column. Panel B presents the mean of firm variables that are used to generate propensity scores in the logit model. The t-statistics indicate that differences in the means across the two groups are statistically significant before matching, but become insignificant for the matched sample. Rubin's B statistic is less than 25, and Rubin's R statistic is between 0.5 and 2. It suggests that our matching procedure mitigates observational differences between SOEs and non-SOEs in terms of meaningful firm-specific characteristics.

Secondly, we examine whether the parallel trend assumption is valid in our DiD-PSM estimates. The parallel trend assumption maintains that the sensitivity of corporate financing to government debt expansions for SOEs should be similar to that for non-SOEs in the absence of exogenous policy shocks. To check whether our DiD estimates capture any pre-existing trend, we replaced the triple interaction term in Equation 2.4 with the following interaction terms: $\sum_{m=t-5}^{t+2} Year_m * GovtDebt * Treat$. $Year_m$ is a dummy variable based on individual years. We exclude the term $Year_{t-1} * GovtDebt * Treat$ for the year that precedes the policy enaction year (i.e. 2008 and 2015), thereby estimating the dynamic effect relative to the year that immediately precedes exogenous policy shocks (t –1).

Figure 2.3 validates the parallel trend assumption that our DiD approach relies on. It demonstrates that coefficients of the triple interaction term $Year_m * GovtDebt * Treat$ are all insignificant before the policy shocks. In other words, there are no observable differences in the crowding-out or crowding-in effects between SOEs and non-SOEs before the 2009 relaxation, as well as the 2016 deleverage policy shocks.

Table 2.5 DiD-PSM estimates

	(A) The 2009 LGFV relaxation policy			(B) The 2016 deleverage reform		
	(1)	(2)	(3)	(4)	(5)	(6)
	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$
$GovtDebt$	0.060	0.047	0.099	-0.042***	0.017*	-0.038**
	(0.059)	(0.043)	(0.061)	(0.014)	(0.010)	(0.016)
$SOE * GovtDebt$	-0.075	-0.041	-0.103	0.050***	-0.017	0.043**
	(0.074)	(0.054)	(0.076)	(0.016)	(0.012)	(0.019)
$SOE * Current$	0.006	0.006	0.011	0.026***	-0.002	0.023**
	(0.013)	(0.010)	(0.014)	(0.009)	(0.006)	(0.010)
$Current * GovtDebt$	-0.031	-0.018	-0.049	0.012	-0.000	0.024**
	(0.040)	(0.029)	(0.041)	(0.011)	(0.008)	(0.012)
$SOE * GovtDebt * Current$	0.038	0.002	0.035	-0.022	0.008	-0.030*
	(0.051)	(0.037)	(0.053)	(0.014)	(0.010)	(0.016)
$SOE * Post$	-0.015	0.024***	0.009	0.023***	-0.025***	0.005
	(0.011)	(0.008)	(0.011)	(0.007)	(0.005)	(0.008)
$Post * GovtDebt$	-0.065*	-0.008	-0.069*	0.019**	-0.014**	0.004
	(0.037)	(0.027)	(0.038)	(0.009)	(0.006)	(0.010)
$SOE * GovtDebt * Post$	0.096**	-0.011	0.078	-0.028**	0.024***	-0.005
	(0.047)	(0.034)	(0.049)	(0.011)	(0.008)	(0.013)
ROA	-0.443***	-0.105**	-0.594***	-0.294***	-0.142***	-0.438***
	(0.060)	(0.044)	(0.062)	(0.028)	(0.020)	(0.032)
$SIZE$	0.059***	0.018***	0.078***	0.014***	0.020***	0.033***
	(0.009)	(0.007)	(0.009)	(0.003)	(0.002)	(0.003)
$Tangibility$	0.101**	0.057**	0.157***	0.026*	0.040***	0.069***
	(0.040)	(0.029)	(0.041)	(0.014)	(0.010)	(0.016)
$Growth\ Opportunity$	0.001	-0.001	-0.000	-0.018***	0.000	-0.023***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
$CASH$	-0.169***	-0.051**	-0.214***	-0.053***	-0.041***	-0.062***
	(0.034)	(0.025)	(0.035)	(0.011)	(0.007)	(0.012)
$GDPGro$	-0.088	-0.008	-0.058	-0.085	0.003	-0.092
	(0.138)	(0.100)	(0.142)	(0.065)	(0.047)	(0.074)
$GovtExp$	0.237*	0.154*	0.343***	0.071**	-0.031	0.044
	(0.129)	(0.093)	(0.132)	(0.035)	(0.025)	(0.040)
obs	1279	1279	1279	4967	4967	4967

Note: This table reports the estimation results for the difference-in-differences (DiD) estimation conducted on matched samples. All specifications were estimated using a fixed-effects estimator. The sample period is 2007-2011 for the 2009 LGFV relaxation policy, and 2011-2018 for the 2016 deleverage policy. Variable definitions are given in Section 3. All regressions include firm-, industry-, year- and city-fixed effects. "$*$", "$**$" and "$***$" denote significance at the 10%, 5%, and 1% level, respectively.

Table 2.6 PSM diagnostic tests
Panel A: Logit model

	(A) The 2009 relaxation policy		(B) The 2016 deleverage reform	
	Pre-match	Post-match	Pre-match	Post-match
ROA	-2.072	0.653	-6.569***	1.099
	(1.685)	(2.568)	(1.365)	(1.621)
$SIZE$	0.457***	-0.017	0.429***	-0.018
	(0.095)	(0.146)	(0.077)	(0.089)
$Tangibility$	2.273***	-0.500	2.167***	-0.474
	(0.541)	(0.845)	(0.396)	(0.485)
$Growth\ Opportunity$	-0.213***	-0.024	-0.247***	-0.020
	(0.067)	(0.103)	(0.051)	(0.060)
$CASH$	1.116	0.115	2.279***	-0.578
	(0.808)	(1.242)	(0.632)	(0.743)
$lnAge$	0.757***	-0.060	2.476***	-0.240
	(0.217)	(0.326)	(0.213)	(0.268)
obs	824	269	1597	796

Note: This table reports the estimation results for the logit specification. Variable definitions are given in Section 3. All regressions include firm-, industry-, year- and city-fixed effects. "*", "**" and "***" denote significance at the 10%, 5%, and 1% level, respectively.

Panel B: Mean (SOEs) -Mean(non-SOEs)

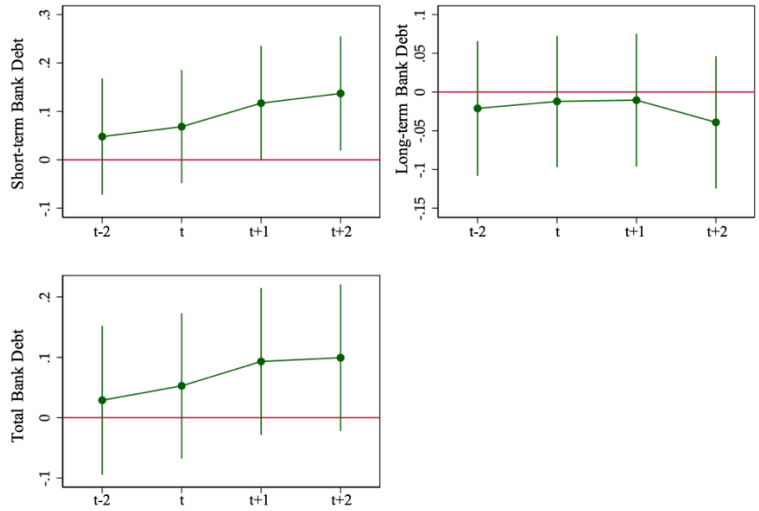
	(A) The 2009 relaxation policy		(B) The 2016 deleverage reform	
	Pre-match	Post-match	Pre-match	Post-match
ROA	-0.0159***	0.0019	-0.0198***	0.0016
$SIZE$	0.6631***	-0.0110	0.8479***	0.0301
$Tangibility$	0.0711***	-0.0130	0.0678***	-0.0078
$Growth\ Opportunity$	-1.1432***	0.0011	-1.5524***	-0.0463
$CASH$	-0.0467***	0.0043	-0.0180***	-0.0034
$lnAge$	0.2294***	-0.0064	0.2511***	-0.0135
B-statistic	19.6		10.5	
R-statistic	0.81		1.10	

Note: This table reports the means of firm characteristics used in the matching process for the treated and control firms after matching, as well as the t- statistics for whether the differences in the means between the two groups of firms are statistically significant. "*", "**" and "***" denote significance at the 10%, 5%, and 1% level, respectively.

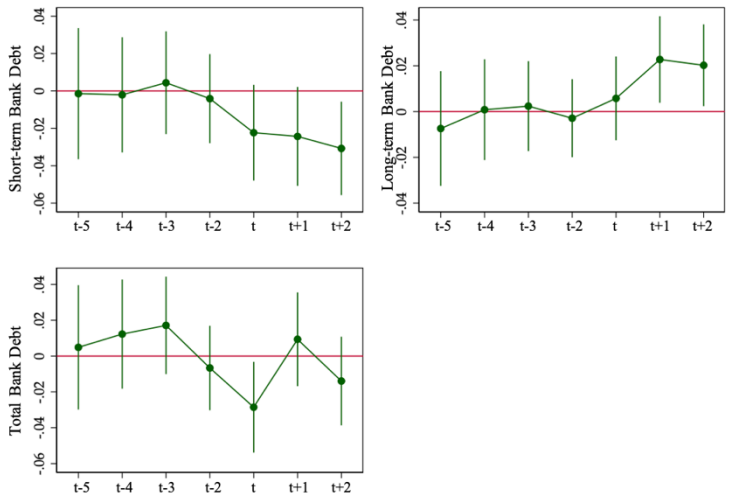
Figure 2.3 Testing for the parallel trend assumption

The figure plots the dynamic impact of the 2009 relaxation policy and the 2016 deleverage reform on the crowding-out effect for SOEs and non-SOEs. As our key coefficients are those associated with the triple interactions, we only report the coefficients associated with the interactions between $GovtDebt$, SOE, and the $year$ dummies. The dynamic effect of the policy shocks is represented by the dots. The solid lines around the dots represent 90% confidence intervals. Due to the data availability, the starting year of panel A is t-2, namely 2007.

Panel A: The 2009 restriction policy



Panel B: The 2016 deleverage reform



6 Conclusion

In the wake of the global financial crisis, local governments in China aggressively expanded their debt, particularly in the form of implicit government debt, to support public investment and economic recovery. The rapid accumulation of public debt perceivably caused disturbances in macroeconomic factors. In the meantime, at the micro level, corporate data illustrate that deteriorations in firm financial performance were related to aggressive government debt expansions. This study examines the effect of local government debt expansions on corporate capital structure based on a sample of Chinese nonfinancial listed firms during 2007-2018. Based on data from 212 China's cities, we find that local government debt is closely correlated with firms' capital restructure: it crowds out short-term corporate debt, and crowds in long-term debt. Local government debt expansion motivates private corporations to replace short-term debt with long-term debt. In China's unique political institutions, we also find that, SOEs are less prone to the crowding-out effect. Those findings are consistent by using the fixed effect estimate and IV approach.

During our sample period, two crucial policies---- namely, the 2009 local government financing relaxation program and the 2016 deleveraging reform---changed the reaction of SOEs and non-SOEs to the crowding-out effect. We use two external policies as two quasi-natural experiments and conduct a DiD-PSM method. The 2009 relaxation policy incentivised local governments to obtain "off-budget" finance for fiscal stimulus, worsening the crowding-out effect on short-term corporate leverage, particularly for non-SOEs which are discriminated against by the state-ruled banking sector. Then, we use the 2016 deleverage reform as our second quasi-natural experiment. Compared to non-SOEs, SOEs were more engaged in the deleveraging process as the reform tightened SOEs' budget constraints. Our results show that, after the 2016 deleveraging reform, SOEs became more sensitive to the crowding-out effect of local government debt.

Our work complements existing studies with a negative view of government debt expansions. The conclusions derived from this study are helpful for policy implications. Given the excessive indebtedness of local governments, an early

economic recovery in China after the GFC was achieved at the cost of reducing credit and investment efficiency. Those problems were aggravated in China which is characterised by a bank-centric financial system, a state-dominated banking system, and a large number of SOEs. To avoid a bad equilibrium of "the State-Owned Advancing with the Private-Owned Retreating", China's authority should tighten SOEs' soft budget constraints and update the pricing system in the credit market.

This study reveals that non-SOEs' finance is more susceptive to the crowding-out effect of local government debt. In major economies, private firms are the primary source of innovation and technological advancement. Thus, it is essential to explore how government debt expansions affect firms' innovation in conjunction with the financial crowding-out effect. We leave it to future studies.

Chapter 3

Macroprudential policies and the finance-growth transmission[37]

1 Introduction

Since the 1980s, there has been a growing consensus on the growth-enhancing effect of financial development to facilitate savings-investment transmission. However, the collapses of the banking sector during 2007-08 reveal that aggressive credit expansions can accumulate excessive financial risks, and ultimately trigger financial crises and economic recessions, which calls for the needs of banks' prudential regulation. After GFC, macroprudential policies have been widely embodied in both developed and emerging countries. It is well explored the effect of macroprudential policies (MPs) to dampen excessive credit growth, but it has yet to study the macroprudential effect on the sustainability of credit expansions. To fill this gap, this study explores the effect of macroprudential policies on the finance-growth transmission.

Our study is motivated by the literature on the effect of macroprudential policies on financial activities. In the short run, macroprudential instruments would smooth credit growth (e.g. Sánchez and Röhn (2016), Alam, Alter et al. (2019), Richter, Schularick et al. (2019)). In the long run, macroprudential policies provide appropriate supervision in the credit market to mitigate the misallocation of resources resulting from banks' runaway credit and excessive risk-taking (e.g. Mendicino, Nikolov et al. (2020), Chen, Kang et al. (2022)). The improvement in the financial institutions in terms of less credit misallocation is critical for sustaining positive finance-growth transmission. Thus, we expect that macroprudential policies have a profound influence on finance-growth transmission in the long run.

Using a sample of 52 emerging and advanced countries during 2000-2017, we investigate the effect of macroprudential policies on finance-growth transmission in the long and short term. To distinguish both long-term and short-term effects, we use the

[37] I would like to thank Professor Julia Korosteleva for her comments which helped revision of this chapter.

Autoregressive Distributed Lag (ADL) model estimated by the Pooled Mean Group (PMG) estimation. This advanced dynamic panel heterogeneity analysis by Pesaran, Shin et al. (1999) also allows us to take cross-country heterogeneity into account. We find that, in the long run, contractionary macroprudential regulations can facilitate the sustainability of financial deepening to generate higher economic growth. But this facilitating role is not perceived in the short run. To correct the endogeneity bias, we use the system Generalised Methods of Moments (GMM) methodology. Based on these estimates, we explore the average marginal effect of financial development on growth according to the frequency of macroprudential policies. It shows that contractionary macroprudential policies are effective in correcting the negative finance-growth transmission, but not sufficient to improve the positive finance-growth nexus.

We also explore whether this relationship is homogeneous in terms of different macroprudential policies on the borrower and lender sides. Compared to lender-based tools, borrower-based macroprudential instruments are harder to be conducted. Firstly, the unavailability of mortgage loan data poses a challenge to calibrating borrower-targeted measures, and thus reduces the feasibility of those tools. Secondly, there are political pressures (e.g. electoral concerns) to impose financial restrictions on borrowers (Apergis, Aysan et al. (2022), Beck (2022)). Therefore, it is valuable to distinguish borrower- and lender-based tools for policy implications. We find that, both measures are effective to improve the finance-growth nexus in advanced countries, while only lender-targeted tool is effective in emerging countries.

This study contributes to the finance-growth literature. An earlier view on this subject supports the critical role of financial institutions in efficiently allocating resources between households and enterprises. However, burgeoning studies have found that the growth-enhancing effect of financial intermediation finance-growth link has deteriorated considerably over time (e.g. Rousseau and Wachtel (2011), Beck, Degryse et al. (2014)). Using more recent data, this study provides new evidence of the deterioration in the growth-enhancing role of financial deepening. We incorporate the macroprudential framework into the analysis of the finance-growth relationship. We contribute to the literature by finding that macroprudential policies improve the efficiency of finance-growth transmission.

Our work is also related to studies on macroprudential policies. Existing studies extensively explore the effect of macroprudential policies on the credit market and real sector. By and large, recent studies show that contractionary macroprudential policies would drive financial institutions to be more conservative in extending credit, leading to a short-term output loss (e.g. Sánchez and Röhn (2016), Kim and Mehrotra (2018), Alam, Alter et al. (2019), Richter, Schularick et al. (2019)). Those studies examine the macroprudential effect on credit growth and economic growth individually. Our study maps the interdependence between financial deepening, macroprudential policies and economic growth, and examines the interactive effect of macroprudential tools and financial deepening on growth. This has been neglected in previous studies.

The rest of the paper is organised as follows. Section 2 provides the literature review. In Section 3, we describe the model, data, and variables. The ADL and GMM estimators are explained in Section 4. Section 5 concludes the paper.

2 Literature review

Pioneering research emphasises that financial sector development plays a critical role in stimulating economic growth, leading to a positive finance-growth nexus (Goldsmith (1969), McKinnon (1973)). According to WorldBank (2017), financial development can facilitate economic growth through “capital accumulation and technological progress by increasing the savings rate, mobilising and pooling savings, producing investment information, facilitating and encouraging the inflows of foreign capital, as well as optimising the allocation of capital”. As financial development is a vast concept, existing studies explore different dimensions of the finance-growth nexus, most of which focus on the effect of financial deepening on economic growth. One of the most influential empirical studies on this subject is King and Levine (1993), which provides empirical evidence on the financial-facilitator role by using various indicators of financial deepening.

The financial facilitator view has long been well-accepted by academics, motivating tremendously financial deepening in the 1990s and 2000s. However, the outbreak of the 1997 Asian financial crisis, as well as the 2007-08 global financial crisis, renewed the interest in the positive role of financial deepening on growth. Financial intermediation is beneficial for economic growth in general, but this consensus is not

valid for different periods and economies. For example, Rousseau and Wachtel (2011) examine the link between financial deepening and growth over a long horizon from 1960 to 2004. Their results suggest that the finance-growth link has weakened considerably over time and even become negative. Similarly, Beck, Degryse et al. (2014) suggest that the finance-growth nexus changes significantly according to countries' income levels. In their empirical investigation, the relationship between financial intermediation and growth seems negative but not significant.

More recent empirical studies elaborate on a non-linear relationship between finance and growth. They argue that the growth-facilitating effect of financial intermediation has a limit beyond which the finance-growth nexus weakens and even vanishes. For example, Rioja and Valev (2004) divide the across-country dataset into three subgroups according to quartiles of financial development level. They find a decreasing growth-enhancing effect of financial development from a middle-developed financial market to a high-developed market. Law and Singh (2014) quantify the threshold value for the non-linear finance-growth nexus using a dynamic panel threshold method for 87 countries during 1980–2010. They demonstrate that private credit has no growth-enhancing effect when it exceeds 88% of GDP. A similar threshold value (i.e. 90% of GDP) is found in Cecchetti and Kharroubi (2012). Focusing on a sample of high-income countries, Arcand, Berkes et al. (2015) suggest a larger threshold value (i.e. 110% of GDP) beyond which private credit can hinder growth. A similar non-monotonic relationship can be found in middle-income countries (e.g. Samargandi, Fidrmuc, and Ghosh (2015)).

Those non-monotonic studies suggest that current credit levels in major countries have exceeded their 'optimal' financial deepening. This issue has also been recognised by authorities in many countries. In this case, they have implemented a series of policies to defend against excessive credit, among which macroprudential policies are in the first line. Macroprudential policies are primarily designed to mitigate the systemic risk of banking systems. In the meantime, they can indirectly affect aggregate economic activity through various channels.

In the short run, contractionary macroprudential policies can reduce credit supply and demand, which ultimately hinders aggregate economic activity. For example, Richter, Schularick et al. (2019) use a local projection approach to quantify

the effect of changes in macroprudential policies on economic and credit growth. They find a negative effect of the loan-to-value (LTV) measure on GDP growth. But the negative effect is perceived for a very short horizon immediately after the implementation of LTV. A similar negative effect on credit growth and GDP growth can be found in Kim and Mehrotra (2018) and Alam, Alter et al. (2019). They provide several channels for the negative effect of macroprudential policies on real output in the short run: (1) The fundamental function of macroprudential policies is to curb credit growth, which would automatically demotivate investment and consumption; (2) As following contractionary macroprudential policies can curb the rise in asset prices, consumption and investment can be reduced by the attendant wealth effect; (3) Several instruments, such LTV actions, would drive households to save more to become eligible for loan applications, leading to a decrease in household consumption.

Macroprudential policies can stimulate long-term economic growth. One of the outstanding studies is Boar, Gambacorta et al. (2017) which investigate the long-run output effects of macroprudential policies. They use the dynamic GMM panel methodology to treat the reverse causality problem, and show that countries with high-frequency macroprudential policies can generate higher GDP growth with less output volatility. Boar, Gambacorta et al. (2017) suggest that macroprudential policies can generate a long-term growth effect by reducing the probability of financial volatilities and crises which generally cause output losses. MPs may affect the real sector through their impact on credit misallocations. Contractionary macroprudential policies provide appropriate supervision in the financial system to reduce resource misallocation stemming from excessive bank credit and risk-taking (Mendicino, Nikolov et al. (2020)). From a macroeconomic perspective, many studies suggest that macroprudential policies can reduce distortions in bank credit at the aggregate level (Habermeier, Kokenyne et al. (2011), Zhang and Zoli (2014), Cerutti, Claessens et al. (2015), Alam, Alter et al. (2019), Bergant, Grigoli et al. (2020)). Given that the macroprudential framework provides meaningful financial supervision to reduce credit misallocation, it is interesting to examine the effect of macroprudential policies on the deteriorating finance-growth relationship.

To our knowledge, our study is the first paper to investigate the interactive effect between macroprudential policies and financial intermediation on economic growth.

However, the complementarities between macroprudential interventions and financial development have already been perceived in existing macroprudential studies. For example, Boar, Gambacorta et al. (2017) illustrate that macroprudential measures are more practical when financial development is sufficiently high. Similarly, Aizenman, Chinn et al. (2020) and Kim and Mehrotra (2022) suggest that the level of financial development can affect the macroprudential response to credit shocks.

3 Data, variables, and summary statistics

3.1 Data and variable construction

This study examines the effect of macroprudential measures on the finance-growth transmission from 2000 to 2017 in 52 emerging and advanced economies.

A. The classification of country groups

Before going to the classification of emerging markets (EM), it is worth understanding what defines an emerging market. There is no official definition of an emerging market (IMF 2021). In a broad sense, countries classified as emerging market economies are those with some, but not all, of the characteristics of a developed market. Characteristics of developed markets may include strong economic growth, high per capita income, liquid equity and debt markets, accessibility by foreign investors, and a dependable regulatory system.

While there are no commonly agreed parameters on which the countries can be classified as "Emerging Economies", some organisations set several methodologies to identify emerging economies. As our study focuses on the level of financial development, we mainly distinguish developed and emerging markets according to the development of financial intermediations. In this regard, IMF[38], MSCI[39], and J.P. Morgan[40] provide the most appropriate classifications. Hence, emerging markets in our study are those listed as emerging markets in any of the three sources. The full list of country groups is listed in Appendix 3.1.

[38] http://www.imf.org/external/pubs/ft/weo/2015/02/pdf/text.pdf
[39] https://www.msci.com/our-solutions/indexes
[40] "Emerging Markets Bond Index Monitor March 2016"

However, four EM countries (i.e. Czechia, Korea, Israel, and Greece) in our list are normally considered as high-income developed countries. In Appendix 3.2, we take into account this alternative categorization, and provided several robustness checks.

B. Macroprudential index

One important variable in our analysis is the macroprudential index. We construct the MP index based on the iMaPP database compiled by Alam, Alter et al. (2019). The iMaPP database provides extensive coverage for existing macroprudential databases, including Lim, Krznar et al. (2013) and Shim, Bogdanova et al. (2013). It documents the dummy-type policy action indicators for 16 tools between 1990 and 2018. Each macroprudential tool index can take on three different values: loosening actions (i.e. -1), tightening actions (i.e. 1), or no change (i.e. 0). This dummy-type variable captures any yearly change. We construct a cumulating MPI index to account for the fact that binding constraints of macroprudential regulations can exert a long-run influence on borrowers and lenders until their next modification over one year. Our cumulating MP index is constructed by summing up the tightenings net of easings of individual policy since 1990 (i.e. the initial year recorded in the iMaPP database).

The iMaPP database includes 16 macroprudential tools[41]. In a common way, those macroprudential tools can be categorised into borrower- and lender-oriented tools. The former covers tools that directly affect borrowers, including limits to the loan-to-value (LTV) and the debt-service-to-income (DSTI) ratios. The remaining 14 instruments are lender-oriented macroprudential measures. Once we have constructed the cumulative indicator variables for individual measures in each country, we create aggregate cumulative indexes for all macroprudential tools (MP^{all}), as well as borrower- ($MP^{borrower}$) and lender-oriented (MP^{lender}) tools. Each of the macroprudential tools is assigned equal weight implicitly.

Our MP indexes have a shortcoming as it is based on the indicator-type index to record the tightening and loosening of macroprudential tools rather than the intensity

[41] See Appendix 3.3 for MP tools classification.

of their movement. Although the measurement imprecision can affect the significance of our empirical results, it would not drive spurious estimates in our empirical analysis. As the instruction of each macroprudential intervention varies considerably across countries and over time, assigning a value to the intensity of a specific action inevitably entails subjectivity which we wish to minimise in this study.

C. Dependent and control variables

The growth rate of real GDP per capita is our dependent variable ($GDPGro$). Following the finance-growth literature, we use private credit by deposit money banks, scaled by GDP, to measure the level of financial depth (FD).

We include a set of control variables that are widely used in the economic growth literature, including population growth rate ($PopGro$), investment ($Investment$) measured by gross capital formation to GDP, trade openness ($Openness$) by the sum of exports and imports of goods and services to GDP), and government expenditure ($GovtExp$) measured by general government final consumption expenditure to GDP.

3.2 Summary statistics

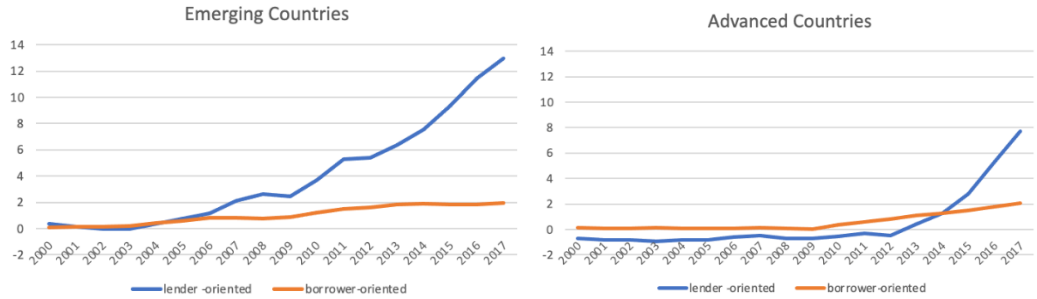
Table 3.1 provides the summary statistics. The average credit-to-GDP ratio is 73.9%, with a large variance across countries. Contractionary lender-targeted MPs are more frequently used than borrower-targeted MPs. Figure 3.1 shows the time variance of our MP cumulative indexes averaged among our sampled countries. The figures show that macroprudential measures, including borrower- and lender-based MPs, are increasingly used in emerging and advanced countries. They received renewed attention after the Great Recession in 2007-08. The lender-targeted MPs are more frequently used than borrower-targeted tools. The average lender-oriented MP index in advanced countries was below zero before 2013. The negative ratio is driven by the extensive and frequent loosenings of macroprudential tools targeting systemic liquidity and funding risk in the late 1990s in European countries. For example, in 1991, the bank of England lowered the cash ratio from 0.45% to 0.4 % on eligible liabilities. In the same year, the authorities in Ireland and Norway reduced the liquidity requirement ratio by 2%.

Table 3.1 Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
$GDPGro$	936	2.444	3.376	-14.3794	15.9892
FD	936	73.857	43.206	6.3921	259.0936
MP^{all}	936	3.435	8.085	-11	59
$MP^{borrower}$	936	0.823	2.013	-3	11
MP^{lender}	936	2.612	6.854	-11	51
$Openness$	936	98.892	79.576	19.798	442.620
$Investment$	936	23.616	5.502	10.217	46.660
$PopGro$	936	0.870	1.021	-2.171	6.028
$GovtExp$	936	17.155	4.942	0.952	30.003

Note: The detailed constructions and sources are given in Appendix 3.4.

Figure 3.1 Comparison of our cumulative MP indexes in emerging and advanced countries, 2000-2017



Source: The iMaPP database compiled by Alam, Alter et al. (2019); authors' calculation

4 The short- and long-run effect ---- ADL model

4.1 Model

To examine whether macroprudential policies had a persistent impact on the finance-growth nexus during 2000-2017, we run a preliminary regression using the fixed-effect model as follows:

Equation 3.1

$$GDPGro_{i,t} = \alpha + \beta_1 * FD_{i,t} + \beta_2 * FD_{i,t} * MP_{i,t} + \beta_3 * MP_{i,t} + \gamma * M_{i,t} + \vartheta_i + \mu_t + \varepsilon_{i,t}$$

Where, $GDPGro_{i,t}$ is the GDP growth rate per capita in country i and year t. $FD_{i,t}$ is measured as the private credit-to-GDP ratio. $MP_{i,t}$ proxy for the composite macroprudential index, as well as the borrower- and lender-based macroprudential variables (see definition in Section 3). $M_{i,t}$ is a K*1 vector of control variables. μ_i and ϑ_i control for country and time effects. $\varepsilon_{i,t}$ is the error term.

Our study builds on research on the effect of macroprudential policies on financial and economic activities. In the long run, macroprudential policies provide

appropriate supervision in the credit market to mitigate the misallocation of resources resulting from runaway bank credit and risk-taking (e.g. Mendicino, Nikolov et al. (2020), Chen, Kang et al. (2022), Habermeier, Kokenyne et al. (2011), Zhang and Zoli (2014), Cerutti, Claessens et al. (2015), Alam, Alter et al. (2019), Bergant, Grigoli et al. (2020))). Thus, we would expect that, in the long run, macroprudential measures can facilitate the finance-growth transmission by reducing credit misallocations.

In the short run, macroprudential instruments are used to smooth credit growth to achieve an 'optimal' financial level. According to the threshold effect[42] found in many studies (e.g. Sánchez and Röhn (2016), Alam, Alter et al. (2019), Richter, Schularick et al. (2019)), the current credit levels of many countries are too high to stimulate growth found in finance-growth studies (e.g. Rousseau and Wachtel (2011), Cecchetti and Kharroubi (2012), Law and Singh (2014), Arcand, Berkes et al. (2015)). Echoing the "too much finance" concern, macroprudential instruments are appropriate tools to reduce excessive bank credit. But whether short-term reductions in bank credit can improve the finance-growth nexus remains an empirical issue.

To distinguish the long- and short-run effects of macroprudential policies on financial-growth transmission, we use the autoregressive distributed lag ADL (p,q) technique proposed by Pesaran, Shin et al. (1999):

Equation 3.2

$$\Delta GDPGro_{i,t} = \Phi_i\left(GDPGro_{i,t-1} - \beta_0^i - \beta_1^i X_{i,t-1}\right) + \sum_{j=1}^{p-1} \lambda_{i,j} \Delta GDPGro_{i,t-j} + \sum_{j=0}^{q-1} \sigma_{i,j} \Delta X_{i,t-j} + \tau_i + \epsilon_{i,t}$$

Where, $GDPGro_{i,t}$ is the GDP growth rate per capita in country i and year t. $X_{i,t}$ is a K*1 vector of explanatory variables (i.e. accumulative MP index, financial depth variable, and their interactive term), and control variables. σ_i is country-specific effect and $\varepsilon_{i,t}$ is the error term. λ and σ are short-run coefficients of lagged dependent and independent variables, respectively. β represents the long-run coefficients, and Φ is the coefficient of the speed of adjustment to the long-run equilibrium. The terms in the bracket of Equation 3.2 present the long-run growth equation derived from the following regression:

Equation 3.3

$$GDPGro_{i,t} = \beta_0^i + \beta_1^i X_{i,t} + \varepsilon_{i,t}$$

[42] Financial development positively facilitates economic growth up to a threshold, after which it has no or negative effect on economic growth

The ADL model can be estimated by three estimation techniques which impose different flexibility on the coefficient heterogeneity across countries, including the Pooled Mean Group (PMG), Mean Group (MG), and Dynamic Fixed Effects (DFE). At one extreme, the DFE estimator requires equal slope coefficients but allows for different intercepts over cross-countries. At the other extreme, the MG allows for heterogeneity in intercepts, slope coefficients, and error variances economies. Between the two extremes is the requirement of the PMG estimator proposed by Pesaran, Shin et al. (1999). It requires cross-countries homogeneity in long-run coefficients, but allows for heterogeneity in intercepts, short-run coefficients, and error variances.

The pooled mean group (PMG) technique is prior in our study for two reasons. Firstly, it is consistent with our economic institutions. In our empirical setting, we would expect that different sample groups (i.e. advanced and emerging countries) to be homogenous in terms of economic growth, financial development and macroprudential policies. In contrast to the long-run homogeneity, we would expect short-run heterogeneity as the short-run adjustment depends on country-specific factors, macroeconomic fundamentals, and institutions. Secondly, compared to the alternative two estimates, the pooled mean group (PMG) technique provides the best compromise between consistency and efficiency. PMG is more consistent than DFE estimation as DFE imposes strict restrictions on short-run homogeneity (that is inconsistent with the economic intuitions). PMG estimate is more efficient than the MG estimate (Pesaran, Shin et al. 1997) as the long-run cross-country homogeneity restriction imposed by PMG outperforms the heterogeneous estimator imposed by MG. To further prove the validity of the PMG estimator, we use Hausman tests to explore the homogeneity restrictions.

We use the EC-ADL model to distinguish the long-run and short-run macroprudential contributions on the finance-growth nexus. Besides this primary objective, the EC-ADL model has additional advantages. Firstly, this approach can be used when the underlying variables are integrated of I(0), I(1), or a combination of both (Pesaran 1997). The unit test displays that some long-time series in our sample are nonstationary (see Table 3.3). Thus, using the EC-ADL approach can reduce the

concern of the unit root bias. Secondly, the EC-ADL model can account for our heterogeneous panels covering many countries and periods.

Table 3.2 Fixed effects results

	Emerging Countries				Advanced Countries			
	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FD	-0.099***	-0.105***	-0.104***	-0.106***	-0.018***	-0.019***	-0.018***	-0.018***
	(0.011)	(0.012)	(0.012)	(0.012)	(0.004)	(0.004)	(0.004)	(0.004)
MP		-0.369	-1.811	-0.440		-0.171	3.651**	-1.275
		(0.423)	(1.778)	(0.488)		(0.835)	(1.824)	(0.947)
$FD * MP$		0.004	0.024	0.010*		0.002	-0.018	0.010*
		(0.003)	(0.019)	(0.005)		(0.005)	(0.012)	(0.006)
$Openness$	-0.806	-1.279	-1.241	-1.562	-10.799***	-11.274***	-11.439***	-11.096***
	(0.998)	(1.236)	(1.105)	(1.140)	(1.327)	(1.438)	(1.405)	(1.391)
$Investment$	0.016*	0.018*	0.018*	0.019**	0.024***	0.024***	0.025***	0.023***
	(0.009)	(0.009)	(0.010)	(0.009)	(0.005)	(0.005)	(0.005)	(0.005)
$PopGro$	0.198***	0.196***	0.197***	0.189***	0.245***	0.240***	0.224***	0.249***
	(0.031)	(0.032)	(0.031)	(0.032)	(0.033)	(0.035)	(0.034)	(0.033)
$GovtExp$	-2.788***	-2.773***	-2.771***	-2.754***	-0.897***	-0.869***	-0.823***	-0.890***
	(0.276)	(0.278)	(0.279)	(0.277)	(0.179)	(0.184)	(0.183)	(0.181)
obs	504	504	504	504	432	432	432	432

Note: Macroprudential policies indexes are divided by 10 to ease the visualization of the coefficients.
*** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

4.2 Results

As a preliminary analysis, Table 3.2 shows that financial development in the form of private credit-to-GDP negatively contributes to GDP growth during 2000-2017. Lender-targeted macroprudential policies can reduce the negative finance-growth transmission, as indicated by the positive interaction term. Borrower-targeted tools have a moderate effect on the finance-growth relationship. The negative finance-growth nexus, as observed in our study, contradicts the previous financial facilitator view advocated by Goldsmith (1969), McKinnon (1973), King and Levine (1993), Rajan and Zingales (1996), Beck, Levine et al. (2000). Nevertheless, a growing number of studies are providing support for the negative finance-growth nexus after the outbreak of recent financial crises, such as Rajan (2006), Ergungor (2008), Hassan, Sanchez et al. (2011), Rousseau and Wachtel (2011), Demirguc-Kunt, Feyen et al. (2012), Beck, Degryse et al. (2014), Ductor and Grechyna (2015). Various factors may account for the negative finance-growth nexus[43]. Firstly, if the financial sector fails to

[43] The intricacies of the negative relationship between finance and growth are multifaceted. While we provide a generalized explanation for our cross-country sample, it is imperative to thoroughly examine the particular factors contributing to this phenomenon on a case-by-case basis for individual nations.

allocate capital to its most productive uses (e.g. real estate speculation and short-term speculation), the economic growth may not be adequatly supported (Hsieh and Klenow (2009), Restuccia and Rogerson (2013)). Secondly, the financial sector dominance, particularly in developed economies with a large and influential financial sector, could contribute to the negative finance-growth nexus by promoting rent-seeking behavior, whereby financial institutions extract rents from the rest of the economy without contributing to productive investment (Rajan and Lines (2010), Arcand, Berkes et al. (2015)). Thirdly, a lack of regulation in the financial sector may result in risky lending practices, leading to increasing financial instability and ultimately lowering economic growth (Levine (1997), Rajan and Zingales (2003), Claessens and Van Horen (2015)).

To distinguish the long- and short-run effect of macroprudential policies on the finance-growth nexus, we next use an ADL technique is employed. There are some crucial issues to be addressed before applying ADL. Firstly, one of the pre-conditions of the ADL method is that the series cannot be integrated at I(2) or higher order. We use two Unit Root tests, including Im, Pesaran et al. (2003) (IPS) and Levin, Lin et al. (2002) (LLC)[44]. Their results in Table 3.3 reveal that all our variables are integrated at I(0) or I(1). Secondly, the ADL lag structure should be determined by some consistent information criterion on a country-by-country basis. Pesaran et al. (1999) recommend applying a uniform lag structure across all entities. In accordance with the Schwartz-Bayesian Criterion and our data characteristics, we impose one lag for all our explanatory variables.

Table 3.3 Unit root test

	level		1st difference	
	Levin-Lin-Chu test	Im-Pesaran-Shin test	Levin-Lin-Chu test	Im-Pesaran-Shin test
$GDPGro$	-9.7608***	-11.1205***	-18.2673***	-16.5909***
FD	-8.1087***	1.7389	-13.7549***	-7.8904***
$Openness$	-6.8867***	-5.1510***	-11.7195***	-14.0226***
$Investment$	-6.1417***	-4.4922***	-13.0320***	-13.3340***
$PopGro$	-22.1247***	0.1672	-23.6955***	-7.5979***
$GovtExp$	-6.4849***	-2.0490***	-16.0921***	-12.8518***
MP^{all}	16.5579	-	-4.1968***	-
$MP^{borrower}$	3.2355	-	-2.1622**	-
MP^{lender}	16.0391	-	-4.8057***	-

Note: *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

[44] The results of IPS and LLC panel unit root tests at the level and first difference with intercept. The results are similar if both intercept and trend are considered.

Panel A of Table 3.4 presents the results estimated by the PMG estimator. Columns (1)-(8) show that, the growth rate of GDP per capita is negatively related to financial development and macroprudential policies in emerging and advanced countries in the long and short run. But the negative growth effect of financial intermediation seems to be moderate in the short run.

Columns (2) and (6) present the joint effect of macroprudential policies and financial development on economic growth. The impact of macroprudential policies on the finance-growth is moderate in the short run, as indicated by the insignificant short-run coefficient of interaction terms. Our findings suggest that, although macroprudential policies can smooth short-term credit bubbles, they are ineffective in improving the finance-growth nexus. Then, we examine the long-run effect. The error-correction coefficients are significantly negative, indicating the existence of long-run relations. Most importantly for our purposes, there is a positive long-run coefficient of the interaction terms between FD and MPI^{all} indexes in emerging and advanced economies. As expected, it means that macroprudential instruments can improve the growth-enhancing effect of financial intermediation in the long run.

We then examine whether the positive macroprudential contribution is consistent for both borrower- and lender-oriented tools. The borrower-targeted macroprudential interventions have no effect on the finance-growth nexus in emerging countries (Column (3)), but have a significantly positive long-run effect in advanced countries (Column (7)). One possible reason for the different effects is that, borrower-based measures are more effective in advanced countries due to their highly elastic credit supply (IMF 2014). Our results also show that, in the long run, lender-oriented tools can facilitate finance-growth transmission in both emerging and advanced countries (Columns (4) and (8)).

The bottom two lines in panel A of Table 3.4 lists the Hausman chi-square test. In most cases, the PMG estimator is preferred in terms of consistency and efficiency. Some of them indicate that the FE estimate is more efficient than PMG (Columns (6) and 7)). But, for them, the positive effect of macroprudential policies is consistently perceived in both DFE and PMG estimates (see Panel B of Table 3.4 for the DFE estimates).

Figure 3.2 plots the marginal effect of the financial development index on growth based on the PMG estimates in Panel A of Table 3.4. It shows that the negative growth effect of financial deepening in terms of private credit-to-GDP becomes insignificant right after a small number of contractionary macroprudential policies are imposed. However, it requires a considerably large amount of contractionary macroprudential tools to improve the growth-enhancing effect of financial development[45]. The intuition behind the findings is simple. Macroprudential policies impose strict restrictions on banking lending to reduce credit distortions, which is an effective way to correct harmful finance-growth transmission caused by credit misallocations. But, in the finance-growth framework, macroprudential effects in terms of reducing credit misallocations are essential but not sufficient for promoting growth. Other conditions must be met, such as better bank sector efficiency.

We also use an alternative country classification which recategorizes four EM countries (i.e. Czechia, Korea, Israel, and Greece) as advanced countries. The fixed-effect regression in Appendix 3.5 and ADL estimates in Appendix 3.6 give a similar result to our baseline finding: macroprudential instruments can improve the growth-enhancing effect of financial intermediation. However, the positive effect of macroprudential tools varies with their objectives, and the feature of financial markets.

[45] Except for the lender-based macroprudential tools in advanced countries.

Table 3.4 ADL results

This table presents the results of the ADL model conducted on PMG, DFE, MG estimates. Estimations are done by using (xtpmg) routine in Stata, which requires all the panels to be strongly balanced. The null of Hausman test (A) is the PMG estimator is more efficient than the MG estimator. The null of Hausman test (B) is the DFE estimator is more efficient than the PMG estimator. Macroprudential policies indexes are divided by 10 to ease the visualization of the coefficients. Robust standard errors are in parentheses. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Panel A: PMG estimates

	Emerging Countries				Advanced Countries			
	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Long-run coefficients								
FD	-0.045***	-0.053***	-0.058***	-0.056***	-0.025***	-0.022***	-0.012***	-0.024***
	(0.009)	(0.010)	(0.008)	(0.011)	(0.003)	(0.003)	(0.003)	(0.003)
MP	-0.576***	-1.586***	0.668	-1.594***	0.964***	-1.390**	-3.451*	-1.522*
	(0.183)	(0.360)	(1.635)	(0.408)	(0.181)	(0.645)	(1.998)	(0.888)
$FD * MP$		0.008***	-0.006	0.008**		0.018***	0.029**	0.019***
		(0.003)	(0.018)	(0.003)		(0.004)	(0.012)	(0.007)
$Openness$	-0.010	-0.000	-0.000	-0.000	0.001	0.004	-0.002	0.003
	(0.007)	(0.008)	(0.006)	(0.008)	(0.003)	(0.003)	(0.003)	(0.004)
$Investment$	0.151***	0.115***	0.128***	0.117***	0.181***	0.209***	0.222***	0.202***
	(0.035)	(0.041)	(0.035)	(0.040)	(0.028)	(0.028)	(0.031)	(0.029)
$PopGro$	-3.716***	-3.978***	-3.738***	-4.014***	-0.899***	-1.133***	-0.634***	-1.168***
	(0.387)	(0.384)	(0.385)	(0.364)	(0.164)	(0.188)	(0.167)	(0.191)
$GovtExp$	-0.083	-0.212***	-0.336***	-0.166**	-0.311***	-0.302***	-0.396***	-0.263***
	(0.086)	(0.082)	(0.083)	(0.080)	(0.057)	(0.061)	(0.058)	(0.061)
Error - correction	-0.831***	-0.837***	-0.825***	-0.864***	-0.976***	-1.002***	-0.991***	-0.996***
	(0.061)	(0.066)	(0.051)	(0.062)	(0.049)	(0.047)	(0.050)	(0.047)
Short-run coefficients								
ΔFD	-0.088*	-0.079	-0.057	-0.077	-0.059**	-0.044*	-0.066***	-0.031
	(0.046)	(0.064)	(0.045)	(0.067)	(0.025)	(0.026)	(0.022)	(0.029)
ΔMP	0.473	0.775	-24.667	-0.722	-0.045	4.177	-11.850	-8.711
	(1.368)	(3.661)	(19.964)	(3.856)	(0.896)	(5.897)	(22.190)	(11.190)
$\Delta(FD * MP)$		0.038	0.738	0.032		0.014	0.127	0.130
		(0.088)	(0.510)	(0.094)		(0.064)	(0.286)	(0.106)
$\Delta Openess$	0.040	0.037	0.015	0.038	0.064***	0.064***	0.054***	0.063***
	(0.043)	(0.043)	(0.029)	(0.043)	(0.020)	(0.019)	(0.017)	(0.020)
$\Delta Investment$	0.457***	0.440***	0.428***	0.467***	0.306***	0.333***	0.416***	0.270**
	(0.092)	(0.101)	(0.120)	(0.092)	(0.105)	(0.111)	(0.110)	(0.107)
$\Delta PopGro$	6.311	7.004	7.367*	6.376	0.701	0.677	0.677	0.577
	(5.534)	(5.325)	(4.120)	(5.297)	(0.774)	(0.826)	(0.891)	(0.854)
$\Delta GovtExp$	-0.769***	-0.670**	-0.482**	-0.681***	-1.234***	-1.179***	-0.997***	-1.325***
	(0.242)	(0.270)	(0.237)	(0.246)	(0.279)	(0.294)	(0.275)	(0.295)
obs	476	476	476	476	408	408	408	408
Hausman test (A)	1.01	0.05	0.87	0.01	0.12	0.03	0.01	0.01
Hausman test (B)	69.56***	32.78***	40.32***	19.74***	18.51***	7.21	3.91	14.58**

Panel B: DFE estimates

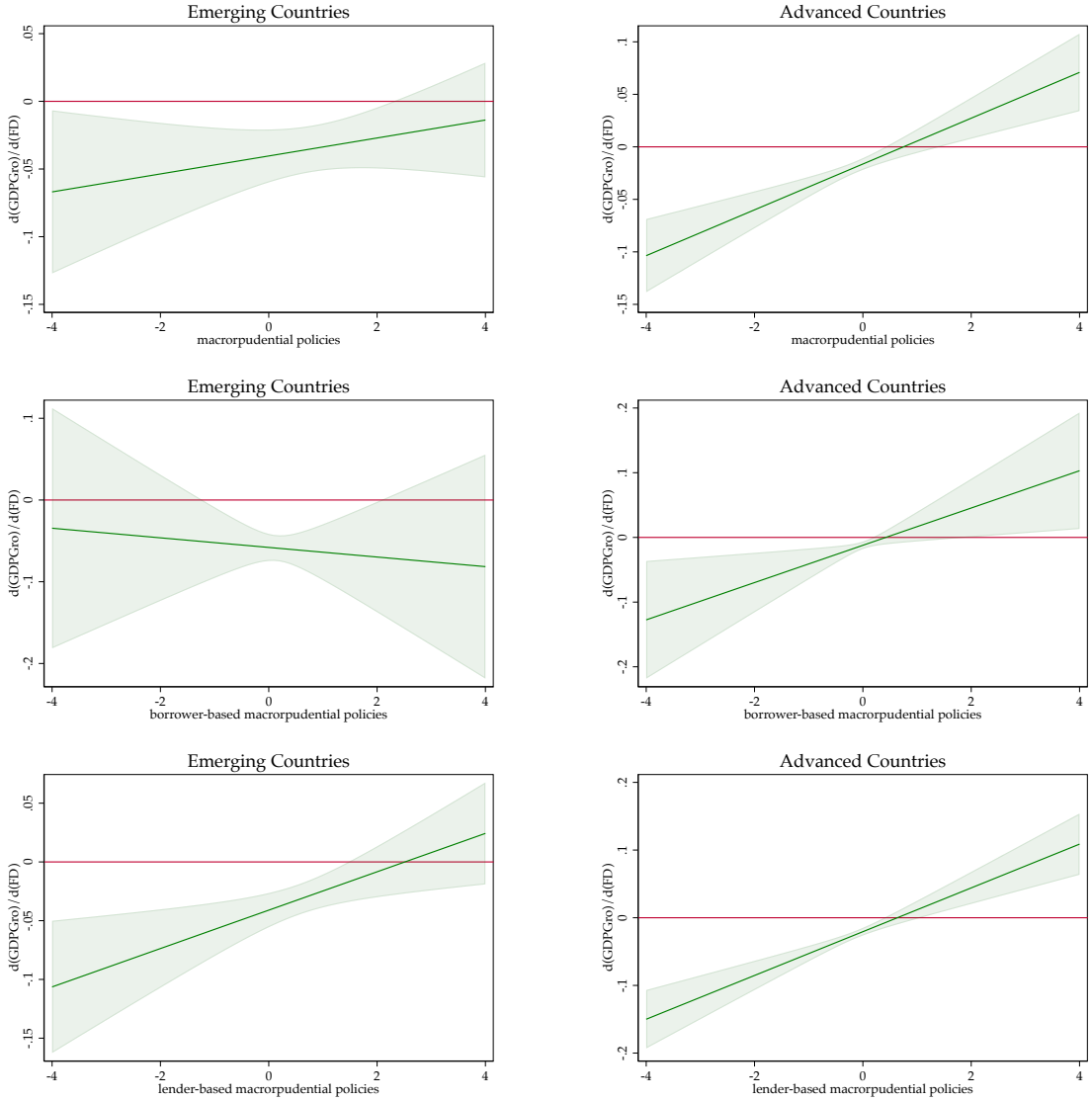
	Emerging Countries				Advanced Countries			
	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Long-run coefficients								
FD	-0.079***	-0.083***	-0.081***	-0.093***	-0.024***	-0.022***	-0.026***	-0.023***
	(0.012)	(0.012)	(0.012)	(0.011)	(0.005)	(0.005)	(0.005)	(0.005)
MP	-0.043	-0.674	-1.019	-0.839*	-0.199	-3.191***	-4.886**	-2.831**
	(0.222)	(0.423)	(2.211)	(0.430)	(0.338)	(0.937)	(2.098)	(1.230)
$FD * MP$		0.007	0.020	0.007*		0.024***	0.039***	0.021**
		(0.004)	(0.024)	(0.004)		(0.007)	(0.014)	(0.010)
$Openness$	0.013	0.018	0.015	0.017	0.001	0.001	0.005	0.001
	(0.012)	(0.012)	(0.013)	(0.011)	(0.005)	(0.005)	(0.005)	(0.005)
$Investment$	0.228***	0.226***	0.231***	0.224***	0.266***	0.277***	0.283***	0.268***
	(0.042)	(0.042)	(0.042)	(0.039)	(0.041)	(0.040)	(0.040)	(0.040)
$PopGro$	-2.485***	-2.457***	-2.492***	-2.501***	-0.973***	-1.096***	-0.988***	-1.034***
	(0.376)	(0.377)	(0.382)	(0.347)	(0.218)	(0.216)	(0.212)	(0.217)
$GovtExp$	-0.201*	-0.177	-0.191*	-0.259**	-0.262**	-0.281***	-0.266***	-0.273***
	(0.109)	(0.110)	(0.111)	(0.101)	(0.103)	(0.101)	(0.100)	(0.102)
Error - correction	-0.829***	-0.828***	-0.821***	-0.859***	-0.984***	-0.988***	-0.995***	-0.990***
	(0.043)	(0.043)	(0.043)	(0.042)	(0.039)	(0.039)	(0.039)	(0.039)
Short-run coefficients								
ΔFD	-0.111***	-0.116***	-0.114***	-0.100***	-0.024**	-0.025***	-0.023**	-0.024**
	(0.029)	(0.030)	(0.030)	(0.029)	(0.010)	(0.010)	(0.010)	(0.010)
ΔMP	1.048*	1.081	5.227	0.307	1.934**	9.777***	21.888***	7.418***
	(0.596)	(1.073)	(4.047)	(1.123)	(0.897)	(2.181)	(4.662)	(2.735)
$\Delta(FD * MP)$		0.006	-0.046	0.020		-0.068***	-0.174***	-0.043*
		(0.016)	(0.051)	(0.017)		(0.017)	(0.035)	(0.023)
$\Delta Openess$	0.002	-0.000	0.004	0.013	0.037***	0.044***	0.040***	0.040***
	(0.020)	(0.020)	(0.020)	(0.020)	(0.009)	(0.009)	(0.009)	(0.009)
$\Delta Investment$	0.428***	0.426***	0.439***	0.403***	0.149***	0.137***	0.147***	0.144***
	(0.054)	(0.054)	(0.053)	(0.051)	(0.051)	(0.050)	(0.050)	(0.051)
$\Delta PopGro$	0.423	0.443	0.365	0.349	0.266	0.308	0.197	0.297
	(0.495)	(0.494)	(0.498)	(0.472)	(0.260)	(0.256)	(0.254)	(0.260)
$\Delta GovtExp$	-0.629***	-0.639***	-0.625***	-0.615***	-1.734***	-1.675***	-1.695***	-1.706***
	(0.127)	(0.127)	(0.128)	(0.122)	(0.155)	(0.154)	(0.153)	(0.155)
obs	476	476	476	476	408	408	408	408

Panel C: MG estimates

	Emerging Countries				Advanced Countries			
	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Long-run coefficients								
FD	-0.385***	-84.345	0.228	-0.785	0.042	0.259	0.206	0.323
	(0.127)	(84.324)	(0.446)	(0.706)	(0.092)	(0.240)	(0.170)	(0.231)
MP	-5.433*	33043.116	-243.325	-45.243	-0.293	0.266	3.036	-39.574
	(3.090)	(32992.897)	(178.825)	(35.245)	(1.696)	(62.013)	(3.036)	(48.010)
$FD * MP$		-653.523	5.550	1.315*		0.119	0.047	0.592
		(653.291)	(4.148)	(0.772)		(0.686)	(0.330)	(0.556)
$Openness$	-0.075	-18.493	-0.295*	0.891	-0.018	0.142*	-0.558	0.079
	(0.126)	(17.989)	(0.154)	(0.667)	(0.062)	(0.082)	(0.341)	(0.072)
$Investment$	0.768***	-250.845	0.052	0.787	-0.208	-0.267	0.657	0.150
	(0.298)	(250.585)	(0.538)	(0.959)	(0.294)	(0.399)	(1.033)	(0.233)
$PopGro$	3.368	766.709	12.502	7.209	1.683	2.270	-0.412	-0.621
	(5.126)	(753.775)	(8.893)	(10.211)	(1.588)	(2.801)	(8.805)	(2.222)
$GovtExp$	-0.544	-181.306	-0.561	-0.978	-0.758	0.989	-3.621***	0.241
	(0.737)	(177.407)	(1.494)	(1.834)	(0.914)	(1.015)	(1.353)	(0.590)
Error - correction	-1.319***	-0.824***	-1.414***	-1.808**	-1.151***	-1.364***	-0.866**	-1.493***
	(0.084)	(0.264)	(0.174)	(0.747)	(0.068)	(0.119)	(0.374)	(0.119)
Short-run coefficients								
ΔFD	0.283	-0.271	0.314	-0.595	-0.026	-0.831	-0.413	-0.911
	(0.180)	(0.989)	(0.356)	(0.967)	(0.033)	(0.724)	(0.454)	(0.716)
ΔMP	1.922	30.569	174.779	-11.357	3.322**	317.204*	8.028	-43.534
	(2.082)	(78.470)	(191.272)	(28.558)	(1.339)	(191.997)	(8.028)	(260.116)
$\Delta(FD * MP)$		-0.152	-2.189	-0.199		-3.265	0.017	-0.177
		(1.309)	(3.888)	(0.696)		(2.050)	(0.304)	(2.547)
$\Delta Openess$	0.190*	0.680***	0.270	-0.566	0.022	-0.120	-0.061	-0.053
	(0.104)	(0.264)	(0.237)	(0.578)	(0.047)	(0.084)	(0.345)	(0.066)
$\Delta Investment$	-0.193	0.601	0.179	1.199	0.391*	0.669*	1.596	0.218
	(0.232)	(0.781)	(0.302)	(1.089)	(0.214)	(0.389)	(1.235)	(0.250)
$\Delta PopGro$	-17.170	-18.085	60.800	13.445	-2.105	2.608	1.822	2.423
	(20.386)	(32.413)	(45.643)	(16.966)	(1.878)	(4.405)	(12.543)	(2.098)
$\Delta GovtExp$	0.010	-0.481	0.166	-1.784	-1.476***	-2.320***	1.726	-1.612***
	(0.352)	(1.128)	(0.918)	(1.775)	(0.409)	(0.550)	(3.935)	(0.594)
obs	476	476	476	476	408	408	408	408

Figure 3.2 ADL estimation---Average marginal effect of financial development on economic growth

Note: Macroprudential policies indexes are divided by 10 to ease the visualization of the coefficients. The shade area represents the 95% confidence interval. This figure plots the marginal effect of financial development index on growth based on the GMM estimates of Table 3.4.



4.3 Endogeneity consideration

There is potential simultaneity between our primary explanatory variables and GDP growth. The most critical concern is that financial development may respond passively to economic growth (Patrick 1966), leading to a simultaneity bias. This endogeneity bias becomes more critical by considering that macroprudential policies may respond to macro-financial conditions in the country where they are employed.

ADL model can be robust to omitted variables bias and simultaneous determination of growth regressors, but it depends on the lag structure (Pesaran, Shin et al. (1999)). To strictly address the endogeneity concern, we next conduct a system GMM estimator using internal instruments (i.e. lagged independent variables). Not only can GMM deal with the endogeneity problems caused by financial development and macroprudential policies, but it also alleviates possible endogeneity for other control variables. To address the potential endogeneity, Equation 3.1 is estimated by the two-step system GMM estimator proposed by Arellano and Bond (1991). The system GMM estimator uses both levels and first differences, which is more efficient than the first difference estimator (Arellano and Bover (1995), Blundell and Bond (1998)). We use a two-step rather than one-step system GMM as the former is more asymptotically powerful (Roodman (2006), Ganda (2019)). We have quite a long sample period from 2000 to 2017, which allows us to generate nonoverlapping 3-year averages. Using the averages can reduce short-term fluctuations and guarantee that all sample entities are close to their steady state in the long run, which is an essential precondition of the GMM technique (Roodman 2006).

Table 3.5 provides results estimated by the GMM estimator. Column (1) and (5) shows a consistently negative finance-growth nexus in both emerging and advanced countries. The coefficients of macroprudential policies indexes show opposite signs in the different country groups, but both are moderately estimated. Then, as one of our most concerned terms, the $FD * MP$ interaction terms have a significant positive coefficient (columns (2) and (5)). The interaction terms are consistently positive for macroprudential toolkits targeting borrowers and lenders. In all GMM estimations, the Hansen and second-order serial correlation test statistics exceed the conventional significance level at 10%, indicating the validity of the internal instruments used in GMM. Figure 3.3 plots the marginal effect of the financial development index on growth based on the GMM estimates of Table 3.5. It shows that the joint effect between contractionary macroprudential policy and financial deepening can moderate the deterioration in the finance-growth nexus, but are not sufficient to generate an economic benefit.

We also use an alternative country classification which recategorizes four EM countries (i.e. Czechia, Korea, Israel, and Greece) as advanced countries. The GMM

results in Appendix 3.7 give a similar result to our baseline finding in Table 3.5: both lender- and borrower-targeted tools are effective in improving the finance-growth nexus in advanced markets, while only lender-based tools have a beneficial impact in emerging markets.

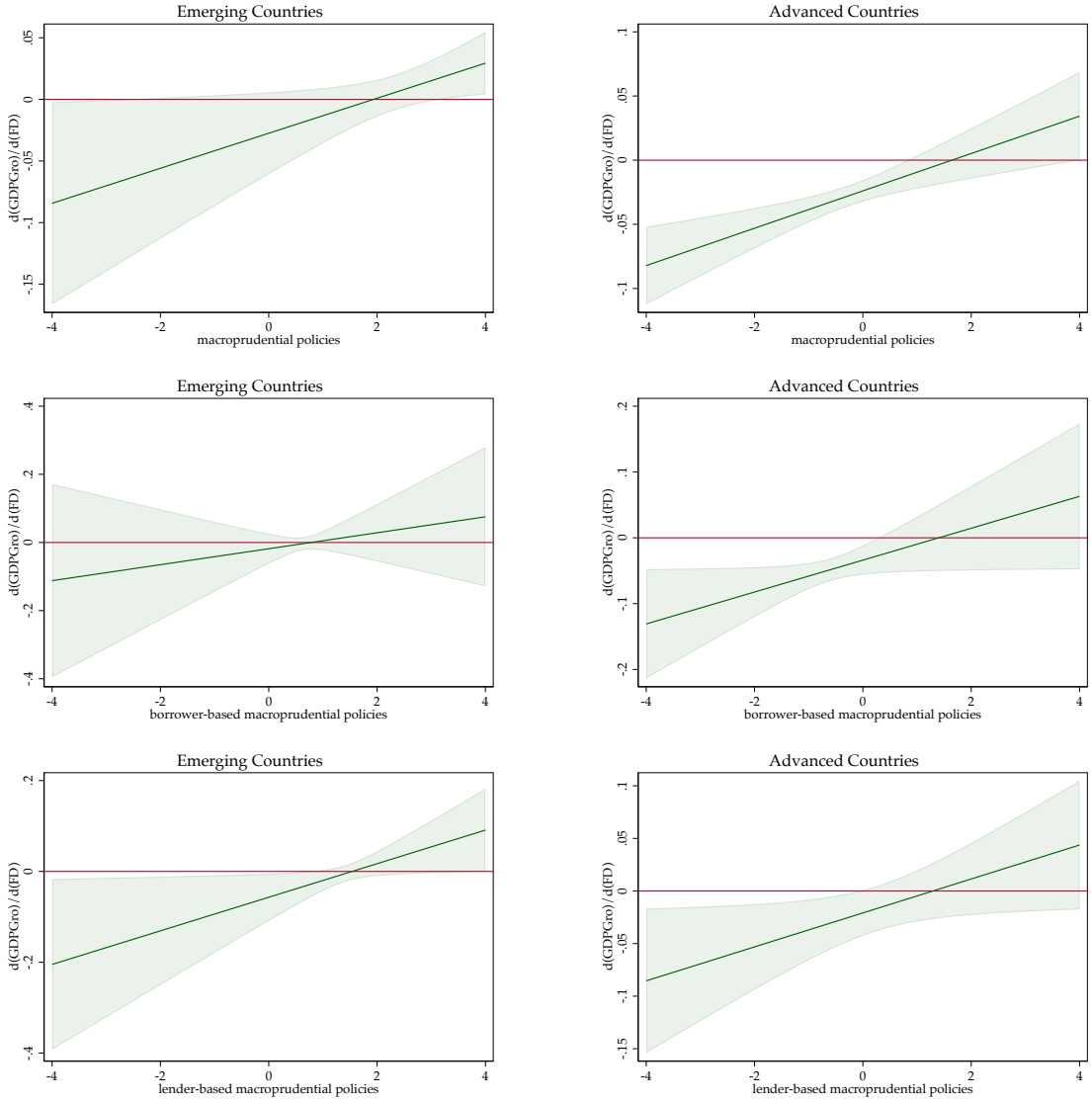
Table 3.5 GMM results (long-term effects)

	Emerging Countries				Advanced Countries			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$
FD	-0.027**	-0.027	-0.018	-0.057**	-0.015***	-0.024***	-0.034***	-0.021*
	(0.012)	(0.017)	(0.022)	(0.027)	(0.006)	(0.004)	(0.011)	(0.011)
MP	-0.142	-1.439**	-1.316	-2.347*	0.363	-3.579***	-4.933	-4.192***
	(0.491)	(0.676)	(1.696)	(1.328)	(0.376)	(0.905)	(3.099)	(1.613)
$FD * MP$		0.014**	0.023	0.037**		0.015***	0.024**	0.016**
		(0.006)	(0.031)	(0.018)		(0.004)	(0.012)	(0.008)
$Initial\ GDP$	0.472	1.032**	-0.062	0.606	-2.303***	0.681	-0.306	1.832
	(0.566)	(0.459)	(0.972)	(0.507)	(0.561)	(0.783)	(0.990)	(1.140)
$Openness$	0.006	0.005	0.005	0.000	0.004	0.009***	0.008**	0.013***
	(0.011)	(0.010)	(0.017)	(0.010)	(0.002)	(0.003)	(0.003)	(0.003)
$Investment$	0.207***	0.197***	0.144*	0.166***	0.040	0.247***	0.121*	0.462***
	(0.051)	(0.053)	(0.075)	(0.050)	(0.044)	(0.052)	(0.072)	(0.064)
$PopGro$	-0.929***	-0.897***	-0.572*	-0.814***	0.725	-0.641**	-0.910*	-1.462***
	(0.279)	(0.328)	(0.341)	(0.261)	(0.445)	(0.296)	(0.483)	(0.349)
$GovtExp$	-0.448***	-0.664***	-0.364**	-0.416***	0.024	-0.222**	-0.069	0.130
	(0.147)	(0.077)	(0.148)	(0.101)	(0.076)	(0.089)	(0.110)	(0.099)
obs	168	168	168	168	144	144	144	144
Hansen Test (p value)	0.535	0.377	0.307	0.959	0.745	0.697	0.685	0.497
AR(1) (p values)	0.060	0.084	0.056	0.076	0.143	0.021	0.043	0.066
AR(2) (p values)	0.126	0.116	0.153	0.217	0.834	0.729	0.209	0.809

Note: Macroprudential policies indexes are divided by 10 to ease the visualization of the coefficients. Robust standard errors in parentheses. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Figure 3.3 GMM estimation---Average marginal effect of financial development on economic growth

Note: Macroprudential policies indexes are divided by 10 to ease the visualization of the coefficients. The shade area represents the 95% confidence interval. This figure plots the marginal effect of financial development index on growth based on the GMM estimates of Table 3.5.



5 Conclusion

The aim of our study is to study to what extent macroprudential policies can improve the finance-growth transmission. Using an EC-ADL framework, we distinguish macroprudential contributions on the finance-growth transmission in the long and short run. Consistent with recent studies which criticise the optimistically growth-enhancing effect of financial development (Allen and Gale (2004), Allen and Carletti (2006), Festić, Kavkler et al. (2011), Gennaioli, Shleifer et al. (2012)), our results show financial

deepening in terms of private credit-to-GDP ratio cannot generate economic benefit in the long run. In our empirical strategy, we suggest the negative finance-growth feedback can be relieved by macroprudential interventions. To address potential endogeneity issues, we employ a system GMM estimator. The GMM results also show a positive interactive effect of macroprudential policies and financial deepening on economic growth. We visualise the marginal effect of financial development on growth estimated by the GMM. We find that contractionary macroprudential policies are effective in mitigating negative finance-growth transmissions, but not sufficient to facilitate the growth-enhancing role of financial development.

In emerging countries, only lender-targeted macroprudential tools can remedy the negative finance-growth nexus. This remediation effect, in advanced countries, can be perceived for both lender- and borrower-based tools. Our results have a great practical relevance particularly to policymakers. In advanced economics, there is political pressure (e.g. electoral concerns) to impose financial restrictions on borrowers (Apergis, Aysan et al. (2022), Beck (2022)). Given the substitutability between borrower- and lender-targeted instruments in facilitating finance-growth transmission, authorities in advanced countries can use more lender-targeted tools accompanied by less politically feasible problems. In addition, as the lender-based MPs were used less frequently in advanced than emerging countries, there is a zoom for implementation of lender-targeted tools in advanced countries.

Our findings are valuable for government authorities. It provides empirical support for the implementation of macroprudential tools, especially for economies encountering a dilemma of high financial deepening. It is also important to note that our empirical analysis has some important caveats. Due to the inherent limitations of the data we used, this study uses the dummy-type MP index which can capture the change of macroprudential tools but cannot account for the intensity of the changes. Future studies may construct the MP indexes using a narrative approach to address these issues.

Conclusions

The growth theory stressed the finance-growth nexus and highlighted the vital role of financial development on economic growth. Notably, a well-functional financial system can facilitate the savings-investment process and optimise capital allocation, which is essential for the sustainability of credit expansions. However, the outbreak of the 1997 Asian financial crisis, as well as the 2007-08 Global Financial Crisis, reveals that the efficiency of credit expansions has declined significantly in the previous two decades. This thesis explores the finance-growth nexus from both macroeconomic and microeconomic perspectives.

In the wake of the 2007-08 Global Financial Crisis (GFC), rapid credit growth in China during the economic recovery stage accumulated a lot of financial risks. Chapter 1 explores the finance-growth at the local level in China. It uses a sample of 275 Chinese cities during 2009-2018. This chapter finds that financial deepening in the form of a higher loan-to-GDP ratio leads to lower economic growth in China. This negative relationship may be caused by discrimination in bank lending, housing market bubbles and the unbalanced growth between real and financial sectors.

Echoing the long-term recovery plan of China's central government, a significant proportion of credit flowed to the public sector after GFC, leading to a rapid local government debt expansion. Chapter 2 empirically examines the effect of the local government debt expansion on firm financing structure after the large fiscal stimulus program in late 2008. This chapter finds that the local government debt expansion considerably changes firms' capital structures. It crowded out firms' short-term debt, and crowded in long-term debt. In China's unique political institution, we also find that State-Owned Enterprises (SOEs) are less sensitive to the crowding-out effect. To further identify the different responses of SOEs and non-SOEs to the crowding-out effect, we use the two external policies---- namely, the 2019 local government financing relaxation program and the 2016 deleveraging reform---as two quasi-natural experiments.

Based on analyses related to China, the first two chapters suggest a deterioration of financial deepening in the previous two decades. Complementing the first two chapters, Chapter 3 provides macroeconomic evidence on the finance-growth

nexus using a sample of advanced and emerging markets. Chapter 3 also examines the role of macroprudential policies in shaping the finance-growth transmission. It uses an autoregressive distributed lag ADL (p,q) technique to distinguish the macroprudential contributions in the short and long run. The results show that, the growth-enhancing effect of financial development in terms of private credit-to-GDP has deteriorated significantly using the most recent data during 2000-2017. In the long run, this negative finance-growth transmission can be improved by macroprudential interventions which can mitigate the misallocation of resources resulting from runaway bank credit and risk-taking.

Our research findings generate valuable policy implications. Firstly, it is worth noting that, there is strong empirical support that the growth-enhancing effect of financial deepening has been weakened in the last twenty years. Secondly, this study provides empirical support that macroprudential tools can be used to ensure economic growth, especially for economies encountering a dilemma of high financial deepening.

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6 Appendix

1 Chapter 1

Appendix 1.1 The list of cities

Eastern region			
anshan	huludao	qingdao	wuxi
baoding	huzhou	qingyuan	xiamen
benxi	jiangmen	qinhuangdao	xingtai
binzhou	jiaxing	quanzhou	xuzhou
cangzhou	jieyang	quzhou	yancheng
changzhou	jinan	rizhao	yangjiang
chaoyang	jinhua	sanming	yangzhou
chengde	jining	sanya	yantai
dalian	jinzhou	shantou	yingkou
dandong	langfang	shanwei	yunfu
dezhou	lianyungang	shaoguan	zaozhuang
dongguan	liaocheng	shaoxing	zhangjiakou
dongying	liaoyang	shenyang	zhangzhou
foshan	linyi	shenzhen	zhanjiang
fushun	lishui	shijiazhuang	zhaoqing
fuxin	longyan	suqian	zhenjiang
fuzhou	maoming	suzhou	zhongshan
guangzhou	meizhou	taian	zhoushan
haikou	nanjing	taizhou	zhuhai
handan	nanping	taizhou	zibo
hangzhou	nantong	tangshan	
hengshui	ningbo	tieling	
heyuan	ningde	weifang	
heze	panjin	weihai	
huaian	putian	wenzhou	
Central region			
anqing	huaibei	mudanjiang	xiangyang
anyang	huaihua	nanchang	xianning
baicheng	huainan	nanyang	xiaogan
baishan	huanggang	pingdingshan	xinxiang
bengbu	huangshan	pingxiang	xinyang
bozhou	huangshi	puyang	xinyu
changchun	jiamusi	qiqihaer	xinzhou
changde	jian	qitaihe	xuancheng
changsha	jiaozuo	sanmenxia	xuchuang
changzhi	jilin	shangqiu	yichang
chenzhou	jincheng	shangrao	yichun
chizhou	jingdezhen	shaoyang	yichun
chuzhou	jingmen	shiyan	yingtan
daqing	jingzhou	shuangyashan	yiyang
datong	jinzhong	shuozhou	yongzhou
ezhou	jiujiang	siping	yueyang
fuyang	jixi	songyuan	yuncheng
fuzhou	kaifeng	suizhou	zhangjiajie
ganzhou	liaoyuan	suzhou	zhengzhou
haerbin	linfen	taiyuan	zhoukou
hebi	liuan	tonghua	zhumadian
hefei	loudi	tongling	zhuzhou
hegang	luohe	wuhan	
heihe	luoyang	wuhu	
hengyang	maanshan	xiangtan	
Western region			
ankang	hechi	puer	yulin
anshun	hezhou	qingyang	yuxi
baise	huhehaote	qinzhou	zhangye
baiyin	hulunbeier	qujing	zhaotong
baoji	jiayuguan	shangluo	zhongwei
baoshan	jinchang	suining	zigong

baotou	jiuquan	tianshui	ziyang
bayannaoer	kelamayi	tongchuan	zunyi
bazhong	kunming	tongliao	
beihai	laibin	tongren	
bijie	lanzhou	weinan	
chengdu	lasa	wuhai	
chifeng	leshan	wulanchabu	
chongzuo	lijiang	wulumuqi	
dazhou	lincang	wuwei	
deyang	liupanshui	wuzhong	
dingxi	liuzhou	wuzhou	
eerduosi	luzhou	xian	
fangchenggang	meishan	xianyang	
guangan	mianyang	xining	
guangyuan	nanchong	yaan	
guigang	nanning	yanan	
guilin	neijiang	yibin	
guiyang	panzhihua	yinchuan	
hanzhong	pingliang	yulin	

Appendix 1.2 The construction of government debt

As the principal off-balance-sheet financing agency, local government financing vehicles (LGFVs) have become increasingly important in promoting China's infrastructure and economic development. They raise capital mainly through bank loans and corporate bonds secured by local government endorsements and assets (e.g. land use rights). LGFVs have a long history traced back to the tax-sharing reform in 1994 and experienced a surge following the 2007-2008 global financial crisis.

No public source offers the debt data for provincial or city governments in China. There have been many attempts to estimate the amount of off-balance-sheet regional government debt (e.g. Zhang and Barnett (2014)). LGFVs provide extensive quasi-fiscal support for regional governments, accumulating most of the off-balance-sheet local government debt (Huang, Pagano et al. 2016). Following Huang, Pagano et al. (2016), we proxy local government credit in a city by the sum of bank loans of all LGFVs located in this city.

A common way to collect LGFVs' loan data is to retrieve the publicly available financial sheets for those with new bond issuances (Ambrose, Deng et al. 2015, Ang, Bai et al. 2015). Similarly, we take advantage of the requirement that all organisations seeking approval to issue bonds in a particular year t should disclose their most recent and historical financial statement to the public (at least for the previous three years). In other words, if a company decides to issue a bond in year t, we can retrieve its debt-related information dating back to year $t-3$. We manually collect the bank loan obligations of LGFVs from their financial sheets listed in China Bond and the Wind Information Co. (WIND) database[46]. The bank loan liability of each LGFV includes short-term debt, long-term debt, and noncurrent liabilities due within a year[47]. 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.

[46] 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). The UIB classification of ChinaBond is different from that of NAO. We choose ChinaBond (and thus WIND) due to: (1) market participants frequently use ChinaBond's classifications; (2) The data listed on NAO does not contain any prefectural-level information. In addition, the data for LGFV's liability reported by NAO is only available for June 2013.

[47] Short-term debt (Unit: RMB) refers to loans that have not been returned for one 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 one year. Noncurrent liabilities due within a year (Unit: RMB) are the company's noncurrent liabilities that will mature within one year.

Figure A1 The trend of LGFV debt over 2000-2020

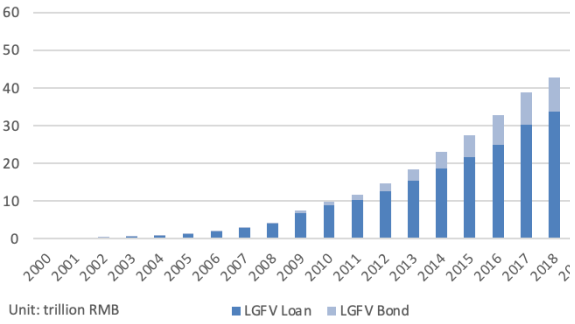
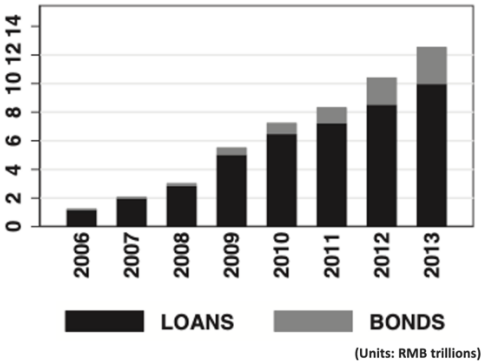


Figure A2 The trend of LGFV debt over 2000-2020



(Data source: Huang, Pagano et al. (2020))

Our data for regional government bank loans are available for 306 prefectural-level cities. Figure A1 shows that China's radical response to the 2007–08 GFC resulted in a rapid proliferation of LGFV debts, particularly after China's fiscal stimulus package of RMB 4 trillion during 2008-2009. 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%. It continued to grow after 2009, and finally accounted for 46.47% of GDP by the end of 2018. Notably, bank loans account for the majority of the total LGFVs' debt (see Figure A1). The aggregated LGFVs data listed in Figure A1 is much similar to that of Huang, Pagano et al. (2020) listed in Figure A2. However, our LGFVs debt data is larger than the official data by the National Audit Office (NAO). The 2013 NAO[48] report indicates

[48] The data on the Audit Office only covers the "official" debt of LGFVs, which the Audit Office defines 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)

that total LGFV debt as governments' contingent liability stood at 13.1% of 2012 GDP by the end-June 2013. It is around 30% in our dataset. The "official" debt by the audit office is only a subset of the total debt of the LGFVs. This is because the collateral loans secured by the transferred "high-quality" assets are not accounted for in the Audit Office's report. According to Jin and Rial (2016), regional governments mainly transfer some of their "high-quality assets" to LGFVs to improve their creditworthiness, such as public land.

Our measurement has some limitations. The methodology cannot account for the debt liability of LGFVs with no bond insurance. Thus, our measurement is conservative due to the loan obligations of hidden LGFVs (i.e. LGFVs that never issued bonds) are not included in our data. Therefore, our method only provides a lower bound for government loans at the prefectural level. It could create a reporting bias for cities with a large number of LGFVs which never or seldomly issued any bonds. But the reporting bias could be largely mitigated by our city dummies in terms of the cross-cities variances.

Appendix 1.3 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
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
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
UnitedKingdom	British concession in Shanghai	Shanghai	1846	1863	18
UnitedKingdom	British concession in Jiujiang	Jiujiang	1861	1927	67
UnitedKingdom	British concession in Amoy	Xiamen	1852	1930	79
UnitedKingdom	British concession in Dalian	Dalian	1858	1860	3
UnitedKingdom	British concession in Tianjin	Tianjin	1860	1943	84
UnitedKingdom	Weihaiwei leased territory	Weihai	1898	1930	33
UnitedKingdom	Liugong island	Weihai	1930	1940	11
UnitedKingdom	British concession in Shamian island, Guangzhou	Guangzhou	1861	1945	85
UnitedKingdom	British concession in Hankou	Hankou/Wuhan	1861	1927	67
UnitedKingdom	British concession in Zhanjiang	Zhanjiang	1861	1929	69
UnitedStates	Shanghai international settlement	Shanghai	1863	1945	83
UnitedStates	Beijing legation quarter	Beijing	1861	1945	85
UnitedStates	Gulangyu island	Xiamen	1903	1945	43
UnitedStates	American concession in Tianjin	Tianjin	1860	1902	43

Appendix 1.4 The 1st stage regression of IV-2SLS

Dep. Variable: $GDPGro$	(1)	(2)	(3)
$Colonization_c$	2.760*	3.297**	
	(1.549)	(1.499)	
$\frac{Branch_{c,2008}}{Population_{c,t-1}}$	12.858***		13.533***
	(4.893)		(4.935)
$GovtCredit$	0.514***	0.549***	0.512***
	(0.129)	(0.135)	(0.130)
$Initial\ GDP$	9.144**	15.582***	9.395**
	(4.390)	(4.252)	(4.584)
$GovtExp$	1.444***	1.638***	1.475***
	(0.197)	(0.183)	(0.201)
$Openness$	0.076	0.145**	0.087
	(0.079)	(0.069)	(0.081)
$Investment$	-0.147***	-0.171***	-0.162***
	(0.056)	(0.057)	(0.056)
$Inflation$	-0.687	-0.719	-0.634
	(2.400)	(2.506)	(2.387)
$LandTrans$	1.267***	1.102***	1.276***
	(0.418)	(0.402)	(0.427)
$Education$	1.986**	2.600***	1.706**
	(0.797)	(0.903)	(0.832)
$PopGro$	1.343	-1.033	0.046
	(1.994)	(1.894)	(2.073)
obs	2488	2491	2488
IV	$Colonization_c$ and $\frac{Branch_{c,2008}}{Population_{c,t-1}}$	$Colonization_c$	$\frac{Branch_{c,2008}}{Population_{c,t-1}}$

Appendix 1.5 the robustness check of IV-2SLS estimates: bank branch density

Dep. Variable: $GDPGro$	(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)
$LandTrans$	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 1% level. ** Significant at the 5%level. * Significant at the10% level.

Appendix 1.6 The robustness check – Western and Japanese colonisation indexes

	(1) Western colonisation		(2) Japanese colonisation		(3) Western colonisation+ Japanese colonisation	
	2nd stage	1st stage	2nd stage	1st stage	2nd stage	1st stage
$FinDev$	-0.019		-0.060*		-0.045*	
	(0.038)		(0.031)		(0.027)	
$GovtCredit$	0.004	0.537***	0.046**	0.564***	0.038**	0.556***
	(0.018)	(0.168)	(0.019)	(0.139)	(0.016)	(0.140)
$Initial\ GDP$	-0.625	15.919***	0.646	15.678***	0.413	15.508***
	(0.686)	(1.233)	(0.615)	(4.325)	(0.548)	(4.427)
$GovtExp$	-0.063	1.682***	0.068	1.632***	0.044	1.633***
	(0.085)	(0.209)	(0.054)	(0.251)	(0.047)	(0.249)
$Openness$	-0.004	0.155***	0.009	0.150*	0.007	0.145*
	(0.006)	(0.036)	(0.008)	(0.080)	(0.007)	(0.077)
$Investment$	0.028**	-0.188**	0.013*	-0.172**	0.016**	-0.172**
	(0.014)	(0.090)	(0.008)	(0.086)	(0.007)	(0.087)
$Inflation$	0.553	-0.532	0.502	-0.892	0.511	-0.796
	(0.689)	(3.129)	(0.394)	(3.966)	(0.370)	(3.938)
$LandTrans$	0.014	1.072	0.100**	1.127*	0.084**	1.106*
	(0.056)	(0.743)	(0.049)	(0.596)	(0.042)	(0.603)
$Education$	-0.064	2.245	0.116	2.772*	0.083	2.696*
	(0.091)	(1.525)	(0.105)	(1.506)	(0.094)	(1.488)
$PopGro$	-0.249	-2.802**	-0.463**	-0.558	-0.424*	-0.786
	(0.225)	(1.337)	(0.223)	(2.562)	(0.219)	(2.587)
$Colonization_c^{Western}$		2.738**				1.653
		(1.120)				(2.235)
$Colonization_c^{Japanese}$				4.046***		3.685**
				(1.490)		(1.525)
obs	2491		2491		2491	
IV	$Colonization_c^{Western}$		$Colonization_c^{Japanese}$		$Colonization_c^{Western}$ and $Colonization_c^{Japanese}$	
Cragg-Donald F statistic	5.970		29.184		3.564	
StockYogo-15%	8.96		8.96		11.59	
StockYogo-10%	16.38		16.38		19.93	
LM statistic	2.758*		4.075**		4.137	
Sargan-Hansen test (P values)	-		-		0.158	

Appendix 1.7 The robustness check – across regions

Dep. Variable: $GDPGro$	(1) Eastern regions			(2) Central regions			(3) Western regions		
	OLS	GMM	IV	OLS	GMM	IV	OLS	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)
$PopGro$	-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: [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 2006).

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

Robust standard errors in parentheses. *** Significant at the 1% level. ** Significant at the 5%level. * Significant at the10% level.

2 Chapter 2

Appendix 2.1 different government debt variables

Panel A: local government loans

	(1)	(2)	(3)	(4)	(5)	(6)
	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$
$GovtDebt^{loan}$	-0.023***	0.018***	-0.005	-0.048***	0.022***	-0.028***
	(0.006)	(0.004)	(0.007)	(0.009)	(0.006)	(0.010)
$GovtDebt^{loan} * SOE$				0.037***	-0.007	0.034***
				(0.010)	(0.007)	(0.011)
ROA	-0.359***	-0.139***	-0.509***	-0.361***	-0.139***	-0.510***
	(0.017)	(0.013)	(0.020)	(0.017)	(0.013)	(0.020)
$SIZE$	0.010***	0.028***	0.038***	0.011***	0.027***	0.039***
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
$Tangibility$	0.047***	0.009	0.053***	0.048***	0.008	0.054***
	(0.008)	(0.006)	(0.009)	(0.008)	(0.006)	(0.009)
$Growth\ Opportu$	-0.004***	-0.000	-0.004***	-0.004***	-0.000	-0.004***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
$CASH$	-0.122***	-0.055***	-0.178***	-0.124***	-0.055***	-0.180***
	(0.006)	(0.005)	(0.007)	(0.006)	(0.005)	(0.007)
$GDPGro$	-0.070*	0.046	-0.018	-0.066*	0.045	-0.015
	(0.040)	(0.029)	(0.046)	(0.040)	(0.029)	(0.046)
$GovtExp$	0.055**	-0.056***	-0.003	0.052**	-0.056***	-0.006
	(0.026)	(0.019)	(0.030)	(0.026)	(0.019)	(0.030)
obs	13547	13547	13547	13547	13547	13547

Panel B: local government bonds

	(1)	(2)	(3)	(4)	(5)	(6)
	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$
$GovtDebt^{bond}$	-0.075***	0.058***	-0.016	-0.139***	0.080***	-0.066**
	(0.019)	(0.014)	(0.021)	(0.025)	(0.019)	(0.029)
$GovtDebt^{bond} * SOE$				0.098***	-0.034*	0.076**
				(0.026)	(0.019)	(0.030)
ROA	-0.359***	-0.140***	-0.508***	-0.361***	-0.139***	-0.510***
	(0.017)	(0.013)	(0.020)	(0.017)	(0.013)	(0.020)
$SIZE$	0.010***	0.028***	0.038***	0.011***	0.027***	0.039***
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
$Tangibility$	0.047***	0.008	0.053***	0.048***	0.008	0.054***
	(0.008)	(0.006)	(0.009)	(0.008)	(0.006)	(0.009)
$Growth\ Opportu$	-0.004***	-0.000	-0.004***	-0.004***	-0.000	-0.004***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
$CASH$	-0.121***	-0.055***	-0.178***	-0.125***	-0.054***	-0.181***
	(0.006)	(0.005)	(0.007)	(0.006)	(0.005)	(0.007)
$GDPGro$	-0.077*	0.051*	-0.020	-0.074*	0.050*	-0.017
	(0.039)	(0.029)	(0.045)	(0.039)	(0.029)	(0.045)
$GovtExp$	0.058**	-0.058***	-0.003	0.059**	-0.059***	-0.001
	(0.026)	(0.019)	(0.030)	(0.026)	(0.019)	(0.030)
obs	13547	13547	13547	13547	13547	13547

Appendix 2.2 credit rating categories

Official rating	AAA+	AAA	AAA	AA+	AA	AA	A+	A	A	BBB+
Assigned value	1	2	3	4	5	6	7	8	9	10
Official rating	BBB	BBB	BB+	BB	BB	B+	B	B	CCC+	CCC
Assigned value	11	12	13	14	15	16	17	18	19	20
Official rating	CCC	CC+	CC	CC	C+	C	C			
Assigned value	21	22	23	24	25	26	27			

Appendix 2.3 IV estimates-- different government debt variables

Panel A: local government loans

	(1)	(2)	(3)	(4)	(5)	(6)
	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$
$GovtDebt^{loan}$	-0.119*	0.122**	0.001	-0.217**	0.192**	-0.034
	(0.069)	(0.061)	(0.079)	(0.103)	(0.089)	(0.118)
$GovtDebt^{loan} * SOE$				0.234*	-0.088	0.147
				(0.127)	(0.108)	(0.147)
ROA	-0.356***	-0.110***	-0.481***	-0.362***	-0.109***	-0.485***
	(0.031)	(0.023)	(0.036)	(0.032)	(0.024)	(0.036)
$SIZE$	0.020***	0.028***	0.048***	0.024***	0.027***	0.051***
	(0.004)	(0.003)	(0.005)	(0.005)	(0.004)	(0.005)
$Tangibility$	0.047***	-0.006	0.042**	0.051***	-0.007	0.044**
	(0.015)	(0.018)	(0.019)	(0.015)	(0.018)	(0.019)
$Growth\ Opportunity$	-0.003***	0.000	-0.003***	-0.002**	-0.000	-0.002**
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
$CASH$	-0.124***	-0.064***	-0.188***	-0.136***	-0.060***	-0.196***
	(0.011)	(0.008)	(0.013)	(0.012)	(0.010)	(0.014)
$GDPGro$	0.033	-0.060	-0.020	-0.005	-0.074	-0.067
	(0.079)	(0.066)	(0.092)	(0.087)	(0.069)	(0.099)
$GovtExp$	0.011	-0.012	-0.006	0.009	-0.003	-0.001
	(0.033)	(0.025)	(0.038)	(0.033)	(0.026)	(0.038)
obs	10452	10452	10452	10452	10452	10452
KleibergenFStat	8.938	8.938	8.938	6.413	6.413	6.413
Lmstatistic	22.414***	22.414***	22.414***	14.018***	14.018***	14.018***
hansenJ	5.070	6.115	6.921	0.362	0.000	0.242
hansenJ_p	0.167	0.106	0.074	0.547	0.997	0.623

Panel B: local government bonds

	(1)	(2)	(3)	(4)	(5)	(6)
	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$
$GovtDebt^{bond}$	-0.498	0.730***	0.222	-0.767**	0.678**	-0.113
	(0.318)	(0.262)	(0.367)	(0.378)	(0.338)	(0.431)
$GovtDebt^{bond} * SOE$				0.339	0.167	0.497
				(0.537)	(0.414)	(0.585)
ROA	-0.351***	-0.119***	-0.484***	-0.353***	-0.122***	-0.489***
	(0.031)	(0.024)	(0.036)	(0.035)	(0.027)	(0.039)
$SIZE$	0.020***	0.028***	0.048***	0.022***	0.030***	0.052***
	(0.004)	(0.003)	(0.005)	(0.006)	(0.005)	(0.007)
$Tangibility$	0.047***	-0.006	0.041**	0.050***	-0.005	0.045**
	(0.015)	(0.018)	(0.019)	(0.015)	(0.018)	(0.020)
$Growth\ Opportunity$	-0.004***	0.001	-0.003***	-0.003*	0.001	-0.002
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
$CASH$	-0.122***	-0.068***	-0.190***	-0.132***	-0.074***	-0.205***
	(0.011)	(0.009)	(0.013)	(0.023)	(0.019)	(0.026)
$GDPGro$	0.018	-0.084	-0.058	0.030	-0.092	-0.051
	(0.075)	(0.063)	(0.091)	(0.110)	(0.086)	(0.123)
$GovtExp$	0.046	-0.051**	-0.009	0.053*	-0.048*	0.001
	(0.028)	(0.024)	(0.033)	(0.030)	(0.025)	(0.034)
obs	10452	10452	10452	10452	10452	10452
KleibergenFStat	11.112	11.112	11.112	5.041	5.041	5.041
Lmstatistic	45.127***	45.127***	45.127***	9.902***	9.902***	9.902***
hansenJ	4.958	1.724	6.096	0.091	0.822	0.697
hansenJ_p	0.175	0.632	0.107	0.763	0.365	0.404

Appendix 2.4 The first-stage results of IV regressions

Column (1) provides the 1st stage result for the IV estimates for Equation 2.1. Column (2)-(3) provides the 1st stage results for the IV estimates for Equation 2.2.

	(1)	(2)	(3)
	$GovtDebt$	$GovtDebt$	$GovtDebt * SOE$
$Credit\ Rate$	0.014***	0.375***	0.317***
	(0.004)	(0.072)	(0.104)
$Arrest$	-0.011*	-0.014**	-0.002
	(0.006)	(0.006)	(0.006)
$Credit\ Rate * SOE$		0.019***	0.012**
		(0.006)	(0.006)
$Arrest * SOE$		-0.017**	-0.028***
		(0.008)	(0.008)
ROA	0.032	0.030	0.057
	(0.043)	(0.043)	(0.042)
$SIZE$	-0.009	-0.009	-0.028***
	(0.008)	(0.008)	(0.007)
$Tangibility$	0.013	0.010	-0.021
	(0.030)	(0.030)	(0.033)
$Growth\ Opportunity$	-0.003*	-0.003*	-0.007***
	(0.002)	(0.001)	(0.001)
$CASH$	0.041**	0.043**	0.096***
	(0.017)	(0.017)	(0.015)
$GDPGro$	0.995***	1.013***	0.644***
	(0.117)	(0.117)	(0.111)
$GovtExp$	-0.183***	-0.184***	-0.098**
	(0.058)	(0.059)	(0.046)
obs	10452	10452	10452

Appendix 2.5 PSM diagnostic

Panel A: logit

	(1) Pre-match	(2) Post-match
ROA	-6.976***	1.046
	(0.551)	(0.736)
$SIZE$	0.561***	-0.074**
	(0.026)	(0.036)
$Tangibility$	1.216***	-0.012
	(0.189)	(0.261)
$Growth\ Opportunity$	-0.003	-0.024
	(0.021)	(0.028)
$CASH$	-0.806***	0.180
	(0.193)	(0.274)
$lnAge$	1.862***	-0.014
	(0.067)	(0.090)
obs	12830	4408

Panel B: Mean(SOE) -Mean(non-SOEs)

	(1) Pre-match	(2) Post-match
ROA	-0.0139***	0.0013
$SIZE$	0.7827***	-0.0172
$Tangibility$	0.0802***	-0.0027
$Growth\ Opportunity$	-0.6896***	-0.0135
$CASH$	-0.0617***	0.0039
$lnAge$	0.2543***	0.0092
B-statistic	18.4	
R-statistic	0.66	

Appendix 2.6 Robustness check – different regions

Panel A: East region

	East region					
	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$
$GovtDebt^{loan}$	-0.031***	0.019***	-0.011	-0.042***	0.016**	-0.012
	(0.008)	(0.006)	(0.009)	(0.009)	(0.007)	(0.011)
$GovtDebt^{loan} * SOE$				0.032***	0.007	0.002
				(0.011)	(0.008)	(0.013)
ROA	-0.366***	-0.112***	-0.482***	-0.321***	-0.112***	-0.482***
	(0.023)	(0.015)	(0.025)	(0.022)	(0.015)	(0.025)
$SIZE$	0.014***	0.028***	0.042***	0.009***	0.028***	0.042***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
$Tangibility$	0.055***	0.005	0.055***	0.048***	0.005	0.055***
	(0.011)	(0.007)	(0.013)	(0.011)	(0.007)	(0.013)
$Growth\ Opportunity$	-0.003***	-0.000	-0.004***	-0.011***	-0.000	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$CASH$	-0.127***	-0.050***	-0.180***	-0.072***	-0.050***	-0.181***
	(0.008)	(0.005)	(0.009)	(0.008)	(0.005)	(0.009)
$GDPGro$	-0.047	0.051	0.007	-0.094*	0.051	0.007
	(0.056)	(0.038)	(0.063)	(0.054)	(0.038)	(0.063)
$GovtExp$	0.074	-0.180***	-0.111*	0.086*	-0.180***	-0.110*
	(0.054)	(0.036)	(0.060)	(0.051)	(0.036)	(0.060)
obs	8488	8488	8488	8488	8488	8488

Panel B: Central region

	Central region					
	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$
$GovtDebt^{loan}$	-0.055***	0.038***	-0.018	-0.088***	0.059***	-0.031
	(0.013)	(0.010)	(0.015)	(0.020)	(0.015)	(0.023)
$GovtDebt^{loan} * SOE$				0.046**	-0.029*	0.018
				(0.021)	(0.016)	(0.024)
ROA	-0.323***	-0.211***	-0.533***	-0.325***	-0.210***	-0.533***
	(0.035)	(0.027)	(0.040)	(0.035)	(0.027)	(0.040)
$SIZE$	-0.003	0.029***	0.026***	-0.002	0.028***	0.026***
	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)
$Tangibility$	0.032**	0.030**	0.058***	0.034**	0.029**	0.059***
	(0.016)	(0.013)	(0.019)	(0.016)	(0.013)	(0.019)
$Growth\ Opportunity$	-0.007***	-0.000	-0.007***	-0.006***	-0.001	-0.007***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
$CASH$	-0.123***	-0.035***	-0.158***	-0.129***	-0.031***	-0.160***
	(0.014)	(0.011)	(0.016)	(0.014)	(0.011)	(0.016)
$GDPGro$	-0.185**	-0.105	-0.282***	-0.185**	-0.105	-0.282***
	(0.086)	(0.068)	(0.100)	(0.086)	(0.068)	(0.100)
$GovtExp$	0.245***	-0.030	0.216**	0.255***	-0.036	0.220**
	(0.076)	(0.060)	(0.088)	(0.076)	(0.060)	(0.088)
obs	3027	3027	3027	3027	3027	3027

Panel B: West region

	West region					
	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$
$GovtDebt^{loan}$	-0.011	0.020***	0.009	-0.048***	0.020*	-0.034**
	(0.008)	(0.007)	(0.010)	(0.012)	(0.011)	(0.015)
$GovtDebt^{loan} * SOE$				0.048***	0.000	0.055***
				(0.012)	(0.010)	(0.015)
ROA	-0.368***	-0.135***	-0.548***	-0.373***	-0.135***	-0.554***
	(0.043)	(0.037)	(0.053)	(0.043)	(0.037)	(0.053)
$SIZE$	0.013***	0.025***	0.040***	0.017***	0.025***	0.044***
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)
$Tangibility$	0.045**	-0.001	0.046**	0.046**	-0.001	0.047**
	(0.018)	(0.016)	(0.023)	(0.018)	(0.016)	(0.023)
$Growth\ Opportunity$	-0.005***	-0.000	-0.005**	-0.005***	-0.000	-0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$CASH$	-0.108***	-0.088***	-0.196***	-0.112***	-0.088***	-0.201***
	(0.016)	(0.014)	(0.020)	(0.016)	(0.014)	(0.020)
$GDPGro$	-0.026	0.080	0.059	-0.028	0.080	0.055
	(0.090)	(0.078)	(0.112)	(0.090)	(0.078)	(0.111)
$GovtExp$	0.000	-0.002	-0.008	0.000	-0.002	-0.009
	(0.035)	(0.031)	(0.044)	(0.035)	(0.031)	(0.044)
obs	2029	2029	2029	2029	2029	2029

Appendix 2.7 Robustness check—different government debt index

	(1)	(2)	(3)	(4)	(5)	(6)
	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$
$GovtDebt^{new}$	-0.009***	0.007***	-0.003	-0.018***	0.009***	-0.011**
	(0.003)	(0.002)	(0.003)	(0.004)	(0.003)	(0.004)
$GovtDebt^{new} * SOE$				0.014***	-0.003	0.012***
				(0.004)	(0.003)	(0.004)
ROA	-0.360***	-0.139***	-0.509***	-0.363***	-0.138***	-0.511***
	(0.017)	(0.013)	(0.020)	(0.017)	(0.013)	(0.020)
$SIZE$	0.010***	0.028***	0.038***	0.011***	0.027***	0.039***
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
$Tangibility$	0.047***	0.008	0.053***	0.047***	0.008	0.053***
	(0.008)	(0.006)	(0.009)	(0.008)	(0.006)	(0.009)
$Growth\ Opportunity$	-0.004***	-0.000	-0.004***	-0.004***	-0.000	-0.004***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
$CASH$	-0.122***	-0.055***	-0.178***	-0.124***	-0.054***	-0.181***
	(0.006)	(0.005)	(0.007)	(0.006)	(0.005)	(0.007)
$GDPGro$	-0.078**	0.052*	-0.019	-0.073*	0.051*	-0.015
	(0.039)	(0.029)	(0.045)	(0.039)	(0.029)	(0.045)
$GovtExp$	0.054**	-0.056***	-0.005	0.053**	-0.056***	-0.005
	(0.026)	(0.019)	(0.030)	(0.026)	(0.019)	(0.030)
obs	13547	13547	13547	13547	13547	13547

Appendix 2.8 DID before PSM

	(A) The 2009 relaxation policy			(B) The 2016 deleverage reform		
	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$	$BankDebt^{short}$	$BankDebt^{long}$	$BankDebt$
$GovtDebt$	-0.040	0.018	-0.025	-0.040***	0.020***	-0.020*
	(0.041)	(0.032)	(0.044)	(0.010)	(0.007)	(0.012)
$SOE * GovtDebt$	0.033	0.001	0.043	0.038***	-0.013	0.024*
	(0.046)	(0.036)	(0.049)	(0.012)	(0.009)	(0.014)
$SOE * Current$	-0.005	0.014**	0.008	0.024***	-0.004	0.020***
	(0.008)	(0.006)	(0.008)	(0.006)	(0.004)	(0.007)
$Current * GovtDebt$	-0.011	0.007	-0.004	0.011	0.003	0.015
	(0.026)	(0.020)	(0.028)	(0.008)	(0.006)	(0.010)
$SOE * GovtDebt * Current$	0.013	-0.023	-0.015	-0.020**	0.003	-0.023*
	(0.029)	(0.023)	(0.031)	(0.010)	(0.007)	(0.012)
$SOE * Post$	-0.007	0.016***	0.009	0.017***	-0.018***	0.001
	(0.007)	(0.005)	(0.007)	(0.005)	(0.004)	(0.006)
$Post * GovtDebt$	-0.017	-0.005	-0.020	0.010	-0.012**	-0.000
	(0.024)	(0.019)	(0.026)	(0.007)	(0.005)	(0.007)
$SOE * GovtDebt * Post$	0.009	0.000	0.004	-0.015*	0.011*	-0.000
	(0.027)	(0.021)	(0.029)	(0.008)	(0.006)	(0.009)
ROA	-0.403***	-0.166***	-0.586***	-0.283***	-0.115***	-0.412***
	(0.034)	(0.027)	(0.037)	(0.019)	(0.014)	(0.022)
$SIZE$	0.022***	0.041***	0.064***	0.010***	0.024***	0.033***
	(0.004)	(0.003)	(0.005)	(0.002)	(0.001)	(0.002)
$Tangibility$	0.038**	-0.002	0.032*	0.033***	0.023***	0.050***
	(0.016)	(0.013)	(0.017)	(0.009)	(0.007)	(0.011)
$Growth\ Opportunity$	-0.001	0.001	-0.000	-0.015***	-0.004***	-0.019***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$CASH$	-0.126***	-0.064***	-0.192***	-0.058***	-0.014***	-0.071***
	(0.017)	(0.013)	(0.018)	(0.007)	(0.005)	(0.008)
$GDPGro$	-0.068	0.055	-0.013	-0.076*	0.010	-0.062
	(0.074)	(0.058)	(0.079)	(0.044)	(0.031)	(0.050)
$GovtExp$	0.156*	0.052	0.188**	0.029	-0.018	0.010
	(0.081)	(0.063)	(0.087)	(0.026)	(0.019)	(0.030)
obs	3910	3910	3910	9869	9869	9869

Note: This table reports the estimation results for the difference-in-differences (DiD) estimation before the PSM. All specifications were estimated using a fixed-effects estimator. The sample period of the DID estimates is 2007-2011 for the 2009 LGFV relaxation policy, and 2011-2018 for the 2016 deleverage policy. Variable definitions are given in Section 3. All regressions include firm-, industry-, year- and city-fixed effects. "*", "**" and "***" denote significance at the 10%, 5%, and 1% level, respectively.

3 Chapter 3

Appendix 3.1 country classification

Emerging Countries (28)	Advanced Countries (24)
Bangladesh	
Brazil	
Bulgaria	Australia
Chile	Austria
China	Belgium
Colombia	Denmark
Czechia	Estonia
Greece	France
Hungary	Germany
India	Hong Kong
Israel	Iceland
Korea (the Republic of)	Ireland
Kuwait	Italy
Malaysia	Japan
Mauritius	Luxembourg
Mexico	Malta
Morocco	Netherlands (the)
Nigeria	Norway
Pakistan	Portugal
Peru	Singapore
Philippines (the)	Slovakia
Poland	Slovenia
Romania	Spain
Russian Federation (the)	Sweden
Saudi Arabia	United Kingdom of Great Britain and Northern Ireland (the)
South Africa	United States of America (the)
Turkey	
Ukraine	

Appendix 3.2 alternative country classification

This country classification is different from the list in Appendix 3.1. In this table, Czechia, Korea, Israel, and Greece are classified as advanced economies, which is the main difference.

Emerging Countries (24)	Advanced Countries (28)
	Australia
	Austria
Bangladesh	Belgium
Brazil	Czechia
Bulgaria	Denmark
Chile	Estonia
China	France
Colombia	Germany
Hungary	Greece
India	Hong Kong
Kuwait	Iceland
Malaysia	Ireland
Mauritius	Israel
Mexico	Italy
Morocco	Japan
Nigeria	Korea (the Republic of)
Pakistan	Luxembourg
Peru	Malta
Philippines (the)	Netherlands (the)
Poland	Norway
Romania	Portugal
Russian Federation (the)	Singapore
Saudi Arabia	Slovakia
South Africa	Slovenia
Turkey	Spain
Ukraine	Sweden
	United Kingdom of Great Britain and Northern Ireland (the)
	United States of America (the)

Appendix 3.3 MPI classification

Capital	Capital requirements for banks, which include risk weights, systemic risk buffers, and minimum capital requirements. Countercyclical capital buffers and capital conservation buffers are captured in their sheets respectively and thus not included here. Subcategories of capital measures are also provided, classifying them into household sector targeted (HH), corporate sector targeted (Corp), broad-based (Gen), and FX-loan targeted (FX) measures.
LVR	A limit on the leverage of banks, calculated by dividing a measure of capital by the bank's non- risk-weighted exposures (e.g. Basel III leverage ratio).
LLP	Loan loss provision requirements for macroprudential purposes, which include dynamic provisioning and sectoral provisions (e.g. housing loans).
Conservation	Requirements for banks to maintain a capital conservation buffer, including the one established under Basel III.
SIFI	Measures taken to mitigate risks from global and domestic systemically important financial institutions (SIFIs), which includes capital and liquidity surcharges.
Liquidity	Measures taken to mitigate systemic liquidity and funding risks, including minimum requirements for liquidity coverage ratios, liquid asset ratios, net stable funding ratios, core funding ratios, and external debt restrictions that do not distinguish currencies
LTD	Limits to the loan-to-deposit (LTD) ratio and penalties for high LTD ratios.
RR_DOM	Reserve requirements (domestic) for macroprudential purposes. Please note that this category may currently include those for monetary policy as distinguishing those for macroprudential or monetary policy purposes is often not clear-cut.
LTV	Limits to the loan-to-value ratios, including those mostly targeted at housing loans, but also include those targeted at automobile loans, and commercial real estate loans.
DSTI	Limits to the debt-service-to-income ratio and the loan-to-income ratio, which restrict the size of debt services or debt relative to income. They include those targeted at housing loans, consumer loans, and commercial real estate loans.
Tax	Taxes and levies applied to specified transactions, assets, or liabilities, which include stamp duties, and capital gain taxes.
LCG	Limits on growth or the volume of aggregate credit, the household-sector credit, or the corporate- sector credit by banks, and penalties for high credit growth. Subcategories of limits to credit growth are also provided, classifying them into household sector targeted (HH), corporate sector targeted (Corp), and broad-based (Gen) measures.
LoanR	Loan restrictions, that are more tailored than those captured in "LCG". They include loan limits and prohibitions, which may be conditioned on loan characteristics (e.g. the maturity, the size, the LTV ratio, and the type of interest rate of loans), bank characteristics (e.g. mortgage banks), and other factors. Subcategories of loan restrictions are also provided, classifying them into household sector targeted (HH), and corporate sector targeted (Corp) measures. Restrictions on foreign currency lending are captured in "LFC".
LFC	Limits on foreign currency (FC) lending, and rules or recommendations on FC loans.
LFX	Limits on net or gross open foreign exchange (FX) positions, limits on FX exposures and FX funding, and currency mismatch regulations.
RR_FCD	Reserve requirements (foreign currency) for macroprudential purposes. Please note that this category may currently include those for monetary policy as distinguishing those for macroprudential or monetary policy purposes is often not clear-cut.

Appendix 3.4 variables constructions

Indicator	Constructions	Data sources
$GDP\ Gro$	The growth rate of real GDP per capita (in percentage).	World Bank
FD	The ratio of private credit by deposit money banks to GDP.	Financial Structure Database
$Openness$	The sum of exports and imports of goods and services to GDP.	World Bank
$Investment$	Gross capital formation to GDP (%)	World Bank
$Pop\ Gro$	Population growth rate (%)	World Bank
$Govt\ Exp$	General government final consumption expenditure (% of GDP)	World Bank
$Inflation$	Inflation rate in percentage.	World Bank
$Bank\ Crises$	Dummy variable for Systemic Banking Crisis.	Laeven and Valencia (2018)

Appendix 3.5 Robustness Check - fixed effects results

This table use the country classification listed in Appendix 3.2 .

	Emerging Countries				Advanced Countries			
	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FD	-0.120***	-0.120***	-0.119***	-0.122***	-0.021***	-0.023***	-0.021***	-0.022***
	(0.014)	(0.015)	(0.015)	(0.015)	(0.004)	(0.004)	(0.004)	(0.004)
MP		-0.006	-0.935	-0.056		-0.153	1.847	-1.744*
		(0.446)	(2.038)	(0.596)		(0.579)	(1.410)	(0.981)
$FD * MP$		0.000	-0.017	0.005		0.004	-0.007	0.015*
		(0.004)	(0.023)	(0.008)		(0.004)	(0.010)	(0.008)
$Openness$	-0.007	-0.053	-0.553	-0.472	-8.965***	-9.856***	-9.552***	-9.318***
	(1.127)	(1.443)	(1.348)	(1.260)	(1.140)	(1.293)	(1.221)	(1.180)
$Investment$	0.012	0.012	0.009	0.013	0.024***	0.024***	0.025***	0.023***
	(0.010)	(0.011)	(0.011)	(0.011)	(0.005)	(0.005)	(0.005)	(0.005)
$PopGro$	0.219***	0.218***	0.225***	0.211***	0.286***	0.278***	0.273***	0.286***
	(0.036)	(0.037)	(0.037)	(0.037)	(0.031)	(0.032)	(0.032)	(0.032)
$GovtExp$	-2.758***	-2.757***	-2.766***	-2.737***	-0.962***	-0.910***	-0.901***	-0.948***
	(0.298)	(0.299)	(0.301)	(0.300)	(0.180)	(0.184)	(0.184)	(0.180)
obs	432	432	432	432	504	504	504	504

Note: Macroprudential policies indexes are divided by 10 to ease the visualization of the coefficients.
*** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Appendix 3.6 Robustness Check --- ADL results

This table use the country classification listed in Appendix 3.2. This table presents the results of the ADL model conducted on PMG, DFE, MG estimates. Estimations are done by using (xtpmg) routine in Stata, which requires all the panels to be strongly balanced. The null of Hausman test (A) is the PMG estimator is more efficient than the MG estimator. The null of Hausman test (B) is the DFE estimator is more efficient than the PMG estimator. Macroprudential policies indexes are divided by 10 to ease the visualization of the coefficients. Robust standard errors are in parentheses. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Panel A: PMG estimates

	Emerging Countries				Advanced Countries			
	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Long-run coefficients								
FD	-0.056***	-0.043***	-0.050***	-0.042***	-0.023***	-0.017***	-0.012***	-0.022***
	(0.010)	(0.012)	(0.008)	(0.009)	(0.003)	(0.003)	(0.003)	(0.003)
MP	-0.352	-0.276	2.275	-1.141**	1.197***	-1.726***	-3.846***	-2.067***
	(0.281)	(0.532)	(1.606)	(0.550)	(0.194)	(0.473)	(1.016)	(0.637)
$FD * \mathrm{MP}$		0.001	-0.001	0.014**		0.020***	0.029***	0.029***
		(0.006)	(0.019)	(0.006)		(0.003)	(0.007)	(0.005)
$Openness$	-0.004	-0.003	-0.011	-0.012	0.002	0.003	-0.001	0.000
	(0.007)	(0.009)	(0.007)	(0.008)	(0.003)	(0.004)	(0.003)	(0.004)
$Investment$	0.135***	0.058	0.032	0.017	0.160***	0.167***	0.247***	0.165***
	(0.039)	(0.043)	(0.037)	(0.036)	(0.028)	(0.029)	(0.029)	(0.026)
$PopGro$	-4.050***	-3.364***	-3.759***	-3.632***	-0.738***	-1.386***	-0.743***	-1.521***
	(0.394)	(0.378)	(0.377)	(0.375)	(0.152)	(0.185)	(0.161)	(0.177)
$GovtExp$	-0.005	-0.241***	-0.263***	-0.179**	-0.342***	-0.377***	-0.419***	-0.325***
	(0.092)	(0.087)	(0.080)	(0.081)	(0.054)	(0.053)	(0.055)	(0.050)
Error - correction	-0.834***	-0.860***	-0.851***	-0.875***	-0.936***	-0.976***	-0.980***	-0.975***
	(0.067)	(0.070)	(0.065)	(0.070)	(0.052)	(0.053)	(0.048)	(0.053)
Short-run coefficients								
ΔFD	-0.093*	-0.028	-0.033	-0.019	-0.060**	-0.016	-0.052**	0.000
	(0.054)	(0.073)	(0.055)	(0.083)	(0.024)	(0.029)	(0.021)	(0.038)
$\Delta \mathrm{MP}$	0.630	-2.447	-31.692	-2.587	-0.826	6.387	-5.782	-5.201
	(1.339)	(2.973)	(21.820)	(3.606)	(1.232)	(6.031)	(21.672)	(9.052)
$\Delta(FD * \mathrm{MP})$		0.032	0.891	-0.001		-0.006	0.082	0.093
		(0.099)	(0.585)	(0.108)		(0.072)	(0.314)	(0.099)
$\Delta Openess$	0.056	0.056	-0.006	0.067	0.057***	0.050**	0.058***	0.045*
	(0.048)	(0.042)	(0.033)	(0.043)	(0.020)	(0.023)	(0.016)	(0.025)
$\Delta Investment$	0.415***	0.415***	0.459***	0.477***	0.366***	0.408***	0.435***	0.337***
	(0.099)	(0.099)	(0.132)	(0.089)	(0.096)	(0.105)	(0.104)	(0.099)
$\Delta PopGro$	7.410	8.286	8.907	6.590	0.759	1.101	0.683	0.985
	(6.215)	(8.378)	(5.900)	(8.132)	(0.683)	(0.747)	(0.772)	(0.743)
$\Delta GovtExp$	-0.683***	-0.678***	-0.527**	-0.687**	-1.138***	-0.983***	-0.897***	-1.096***
	(0.236)	(0.243)	(0.219)	(0.269)	(0.275)	(0.266)	(0.277)	(0.275)
obs	408	408	408	408	476	476	476	476
Hausman test (A)	0.96	0.17	1.39	0.01	0.12	0.01	0.01	0.04
Hausman test (B)	117.47***	23.82**	26.7***	382.99***	14.39**	6.47	4.84	14.39**

Panel B: DFE estimates

	Emerging Countries				Advanced Countries			
	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Long-run coefficients								
FD	-0.089***	-0.093***	-0.089***	-0.107***	-0.026***	-0.027***	-0.028***	-0.026***
	(0.016)	(0.016)	(0.015)	(0.016)	(0.005)	(0.005)	(0.005)	(0.005)
MP	-0.021	-0.439	-1.378	-0.704	-0.085	-1.794**	-3.817**	-1.948*
	(0.353)	(0.561)	(2.527)	(0.572)	(0.346)	(0.798)	(1.659)	(1.174)
$FD * MP$		0.008	0.006	0.013		0.016***	0.033***	0.020**
		(0.007)	(0.028)	(0.009)		(0.006)	(0.012)	(0.010)
$Openness$	0.002	0.003	0.004	0.006	0.001	0.002	0.006	0.001
	(0.014)	(0.015)	(0.016)	(0.014)	(0.005)	(0.005)	(0.005)	(0.005)
$Investment$	0.268***	0.259***	0.281***	0.250***	0.289***	0.297***	0.296***	0.286***
	(0.052)	(0.052)	(0.053)	(0.048)	(0.039)	(0.038)	(0.038)	(0.039)
$PopGro$	-2.448***	-2.432***	-2.438***	-2.515***	-1.045***	-1.122***	-1.060***	-1.074***
	(0.417)	(0.417)	(0.425)	(0.378)	(0.227)	(0.227)	(0.222)	(0.228)
$GovtExp$	-0.228*	-0.210*	-0.208*	-0.295***	-0.272***	-0.275***	-0.281***	-0.290***
	(0.120)	(0.122)	(0.122)	(0.111)	(0.098)	(0.097)	(0.096)	(0.098)
Error - correction	-0.837***	-0.837***	-0.827***	-0.878***	-0.946***	-0.951***	-0.963***	-0.951***
	(0.048)	(0.048)	(0.048)	(0.047)	(0.038)	(0.038)	(0.038)	(0.038)
Short-run coefficients								
ΔFD	-0.145***	-0.140***	-0.147***	-0.117***	-0.035***	-0.033***	-0.031***	-0.033***
	(0.037)	(0.038)	(0.037)	(0.037)	(0.010)	(0.010)	(0.010)	(0.010)
ΔMP	1.445*	2.051	7.787*	1.201	1.852**	6.944***	15.197***	5.374**
	(0.740)	(1.307)	(4.614)	(1.372)	(0.826)	(1.813)	(3.526)	(2.483)
$\Delta(FD * MP)$		-0.009	-0.079	0.006		-0.047***	-0.132***	-0.029
		(0.022)	(0.063)	(0.024)		(0.016)	(0.031)	(0.021)
$\Delta Openess$	0.020	0.018	0.024	0.035	0.032***	0.038***	0.035***	0.037***
	(0.023)	(0.023)	(0.023)	(0.023)	(0.009)	(0.009)	(0.009)	(0.009)
$\Delta Investment$	0.388***	0.391***	0.396***	0.363***	0.194***	0.184***	0.192***	0.189***
	(0.060)	(0.060)	(0.060)	(0.058)	(0.049)	(0.049)	(0.049)	(0.049)
$\Delta PopGro$	0.251	0.263	0.161	0.215	0.271	0.306	0.236	0.281
	(0.537)	(0.538)	(0.539)	(0.512)	(0.262)	(0.261)	(0.260)	(0.264)
$\Delta GovtExp$	-0.529***	-0.541***	-0.537***	-0.513***	-1.534***	-1.499***	-1.520***	-1.513***
	(0.141)	(0.142)	(0.141)	(0.136)	(0.149)	(0.147)	(0.147)	(0.149)
obs[a]	408	408	408	408	476	476	476	476

Panel C: MG estimates

	Emerging Countries				Advanced Countries			
	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Long-run coefficients								
FD	-0.418***	0.098	0.382	-0.035	0.002	-83.890	0.223	-0.040
	(0.147)	(0.227)	(0.506)	(0.152)	(0.080)	(84.345)	(0.154)	(0.547)
MP	-6.376*	-23.012	-251.679	3.560	-0.644	33058.187	2.602	124.352
	(3.564)	(22.154)	(203.366)	(19.966)	(1.777)	(32994.207)	(2.602)	(175.120)
$FD * MP$		0.351	6.103	0.116		-653.747	0.113	-2.627
		(0.424)	(4.780)	(0.328)		(653.319)	(0.286)	(3.418)
$Openness$	-0.101	-0.386**	-0.308*	0.356	-0.017	-18.056	-0.393	-0.083
	(0.148)	(0.182)	(0.169)	(0.311)	(0.054)	(18.005)	(0.315)	(0.154)
$Investment$	0.816**	0.437	0.194	-0.051	-0.070	-251.919	2.077	-2.221
	(0.337)	(0.483)	(0.616)	(0.602)	(0.248)	(250.559)	(1.585)	(1.692)
$PopGro$	6.247	6.919	16.861*	8.169	0.811	760.906	1.588	3.101
	(6.513)	(9.438)	(10.076)	(7.075)	(1.387)	(753.982)	(7.668)	(4.595)
$GovtExp$	-0.551	0.824	-1.730	-0.241	-0.388	-180.116	-3.654**	-3.531
	(0.828)	(2.388)	(1.118)	(0.817)	(0.824)	(177.424)	(1.423)	(2.787)
							(0.629)	
Error - correction	-1.296***	-1.576***	-1.478***	-2.476***	-1.161***	-1.178***	-0.962***	-1.307***
	(0.089)	(0.395)	(0.196)	(0.900)	(0.064)	(0.125)	(0.338)	(0.112)
Short-run coefficients								
ΔFD	0.246	-0.069	0.338	-1.028	-0.001	-0.567	-0.327	-0.659
	(0.210)	(0.516)	(0.415)	(1.043)	(0.035)	(0.643)	(0.392)	(0.631)
ΔMP	3.156	84.556	181.772	-15.539	2.746**	239.389	6.881	-48.952
	(2.484)	(79.693)	(221.396)	(33.605)	(1.331)	(171.251)	(6.881)	(223.887)
$\Delta(FD * MP)$		-1.198	-2.096	-0.045		-2.248	-0.024	0.109
		(1.203)	(4.508)	(0.804)		(1.905)	(0.283)	(2.226)
$\Delta Openess$	0.249**	0.493**	0.317	-0.755	0.018	-0.086	-0.084	-0.079
	(0.119)	(0.200)	(0.275)	(0.673)	(0.049)	(0.081)	(0.296)	(0.071)
$\Delta Investment$	-0.330	-0.362	0.117	0.273	0.356*	1.087**	1.368	0.603
	(0.259)	(0.416)	(0.324)	(0.601)	(0.183)	(0.545)	(1.076)	(0.424)
$\Delta PopGro$	-22.125	2.416	70.069	9.464	-1.181	5.714	0.437	3.495
	(23.137)	(29.551)	(53.169)	(18.692)	(1.627)	(4.354)	(10.749)	(2.217)
$\Delta GovtExp$	0.216	1.439	0.582	-0.998	-1.515***	-1.589**	1.225	-0.936*
	(0.454)	(1.393)	(0.920)	(1.993)	(0.441)	(0.665)	(3.412)	(0.550)
obs[a]	408	408	408	408	476	476	476	476

Appendix 3.7 Robustness Check --- GMM results (long-term effects)

This table use the country classification listed in Appendix 3.2.

	Emerging Countries				Advanced Countries			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$	$MP = MP^{all}$	$MP = MP^{all}$	$MP = MP^{borrower}$	$MP = MP^{lender}$
FD	-0.009	-0.057**	-0.030	-0.053*	-0.016***	-0.029***	-0.024***	-0.024***
	(0.010)	(0.028)	(0.025)	(0.031)	(0.005)	(0.004)	(0.007)	(0.006)
MP	-0.394	-1.368**	-2.423	-1.831	0.136	-1.522***	-5.750	-4.735***
	(0.483)	(0.641)	(3.396)	(1.559)	(0.262)	(0.576)	(3.879)	(1.135)
$FD * MP$		0.021**	0.052	0.040**		0.005**	0.029***	0.014*
		(0.008)	(0.037)	(0.020)		(0.002)	(0.009)	(0.008)
$Initial\ GDP$	0.244	0.453	-0.743	0.818	-1.744***	1.405***	-0.973	0.495
	(0.914)	(0.546)	(0.943)	(1.057)	(0.458)	(0.458)	(0.675)	(0.504)
$Openness$	0.011	0.024**	0.040**	0.027*	0.002	0.003	0.007***	0.003
	(0.012)	(0.010)	(0.018)	(0.014)	(0.002)	(0.003)	(0.002)	(0.002)
$Investment$	0.232***	0.170**	0.229**	0.238***	0.049	0.183***	0.178***	0.320***
	(0.065)	(0.070)	(0.106)	(0.039)	(0.034)	(0.058)	(0.056)	(0.041)
$PopGro$	-1.124*	-0.426*	-0.129	-0.298	1.040***	-0.444	-0.893*	-1.021***
	(0.599)	(0.219)	(0.481)	(0.574)	(0.390)	(0.325)	(0.521)	(0.302)
$GovtExp$	-0.435***	-0.344***	-0.378**	-0.329***	0.063	-0.427***	-0.023	0.116**
	(0.122)	(0.065)	(0.189)	(0.120)	(0.074)	(0.082)	(0.082)	(0.047)
obs	144	144	144	144	168	168	168	168
Hansen Test (p value)	0.584	0.989	0.530	0.906	0.395	0.476	0.781	0.609
AR(1) (p values)	0.069	0.080	0.079	0.089	0.131	0.031	0.040	0.019
AR(2) (p values)	0.187	0.644	0.457	0.363	0.625	0.142	0.095	0.138