Hacienda Pública Española/Review of Public Economics 238-(3/2021): 81-99

https://dx.doi.org/10.7866/HPE-RPE.21.3.4

Local Financing Platform Loan and Performance of City Commercial Banks: Evidence from City Commercial Banks in China*

WEI KONG**

WENXIU HU***

Xi'an University of Technology

KAICHENG LIAO****

Tongji University

XIAOQIANG MA*****

Northwestern University

Received: June, 2019
Accepted: July, 2020

Abstract

This paper investigates the relationship between optimum local financing platform loan and the performance of CCBs using data of 68 CCBs during 2010 to 2018. Our results derived from panel threshold regression model show a positive and significant impact of local financing platform loan on the performance of CCBs before the upper estimated thresholds. Once the local financing platform loan moves above the upper threshold level, then its impact becomes negative. Further, the same relationship is conducted in sub-samples of eastern, central and western regions. Our findings suggest the policymakers that maintains ideal local financing platform loan is effective to encourage the performance of CCBs.

Keywords: Local financing platforms, Loan, Performance, CCBs.

JEL Classification: G21, H21.

---

* *Acknowledgements:* We are grateful to the two anonymous referees for providing helpful comments and suggestions. We also grateful to the Professor HU Wenxiu of the Xi'an University of technology for his suggestions on the study.

** ORCID ID: 0000-0002-9009-4076.

*** ORCID ID: 0000-0003-4969-8350.

**** ORCID ID: 0000-0002-3083-2030.

***** ORCID ID: 0000-0002-8614-6769.

1. Introduction

City commercial banks (CCBs) shoulder the historical mission of local economic construction, and have made outstanding contributions to the development of local economy through unremitting efforts (Rahman and Islam, 2019). With the rapid development of the national economy, a large number of bad debts have appeared in Chinese banks, most of which are related to over lending to real estate and local financing platforms (Sun *et al.*, 2013). The precise assessment of the impact of local financing platform loan on the performance of CCBs is therefore of great importance.

CCBs, as the name suggests, were originally allowed to operate only within the city from which they originated. Therefore, in the past 10 years of urbanization, CCBs have lent a lot of money to local financing platforms with the help of government credit endorsement, which not only meets the needs of local economic development and construction, but also achieves rapid growth of performance (Ferri, 2009; Lin *et al*., 2015). However, in recent years, local governments have reached the limit of over borrowing relying on local financing platforms and other means, and the average debt ratio has reached over 150%. Moreover, the debt ratio of local financing platforms in some cities has exceeded 400% (Chen *et al*., 2020), some local financing platforms in slow economic development cities have already defaulted (Pan *et al.*, 2017). Therefore, the continuous accumulation of debt risks of local financing platforms also causes risks for CCBs. Thus, the significance of the question of the ideal or optimum local financing platform loan which maximizes the performance of CCBs has emerged an important issue in the past (Gu and Li, 2013; Zhao *et al*., 2013). However, to our knowledge there has been no empirical work on this issue. This paper begins to fill this gap.

Scholars at home and abroad have conducted a more in-depth study on the relationship between government financing and bank performance, and generally come to the conclusion that government financing loans will reduce bank performance. Abbas *et al*. (2007) found that in low-income countries and emerging markets, government public loans play a negative role in bank efficiency and undermine economic growth. Similar to this, Hauner (2009) in developing countries, a large number of public loans can significantly increase the profits of banks in the short term, but in the long term, they reduce the operating efficiency of banks and hinder the healthy development of financial markets. Bonis and Stacchini (2010) also found a negative correlation between government debt and bank credit level in OECD countries. In China, scholars mainly use the local financing platform loan to represent the local government debt, and also draw the conclusion that there is a negative relationship between the local debt and the performance of commercial banks. Li and Chen (2013) and Xu (2016) local financing platform loans have a negative impact on the operating efficiency of commercial banks. Ji *et al*. (2014) local financing platform loans had a negative impact on the operating efficiency of commercial banks, reduced the power of non-interest income business development, and was adverse to the long-term development goals under the trend of interest rate marketization in the future. In addition, two scholars explained the reasons behind the negative relationship. Chen *et al*. (2018) the government raised funds to stimulate economic development through bank loans, result in increased the proportion of non-performing loans

of banks, and put pressure on banks to recover loans. This paper asks whether a relationship except the negative linear relationship exist between the local financing platform loan and the performance of CCBs.

We analysed the relationship for 68 CCBs between 2010 and 2018. We think CCBs play an important role in the construction of urban modernization, so a negative correlation seems to negate the significance of CCBs lending for local financing platform. We ask whether there is a complex nonlinear relationship between the local financing platform loan and the performance of CCBs. Our estimation strategy follows a large empirical literature pioneered by Hansen (1999, 2000) . Based on the research results of others (Donald and Fang, 2016; Liu *et al*., 2017), we designed basic model and heterogeneity model study the relationship between local financing platform loans and CCBs performance.

We build on Zhao *et al*. (2013), who use 2005-210 data to show that local financing platform loans reduce the performance of CCBs, because the local government as a big shareholderplays tunneling of the CCBs, which increase the non-performing loan rate of CCBs and reduce their performance. Our data (2010-2018) just behind Zhao *et al*. (2013) data sample, more truly reflect the reality that local financing platforms are booming and CCBs exhibit more performance, which is a more valuable stage of sample research.

We make a contribution to the literature. We are the first to our knowledge to evaluate the effect of local financing platform loan on CCBs' performance. Only a few similar articles have studied the impact of local government debt or local government bonds on the performance of CCBs, and their data all based on the city level. In this paper, CCBs are taken as the research sample, and other variables are collected from the annual report of the CCBs.

In addition to the contribution cited above, our work also find that, compared with the eastern and western regions, the central region's local financing platform loan play the largest role in promoting the performance of CCBs. Once the central region's financing platform loan exceed the reasonable threshold, it also has the greatest damage to the performance of CCBs.

As we consider most of the local financing platform loan have exceeded the reasonable threshold. We confirm that we need to control the loan scale of local financing platforms and make local financing platforms benefit for CCBs. The government departments need to strengthen the supervision of the local financing platform to prevent the occurrence of systemic financial risks.

The remainder of this article is structured as follows. In the following section we combs the current situation and literature of local government and local financing platform, local government and CCBs, as well as local government, local financing platform and CCBs. Section 3 presents our methodology and data sources. Section 4 sets out our empirical results and discussions the effects of local financing platform loans on the performance of CCBs, and make a heterogeneity analysis between local financing platform loans and the performance of CCBs of eastern, central and western regions. The last section concludes.

2. A literature review

2.1. Local government and local financing platform

Since the implementation of the tax sharing system reform in 1994, local governments have been faced with the dilemma of huge fiscal expenditure and shortage of fiscal revenue. There is a huge financial gap in the process of city economic construction (especially infrastructure construction) (Huang *et al*., 2012). At the same time, the 1994 budget law does not allow local governments to borrow directly. To solve this contradiction, local governments innovatively set up local financing platform, which integrating financing, construction, operation and debt repayment, and take it as the main financing channel (Fei *et al*., 2016). Therefore, the local financing platform has the following characteristics: First, the local financing platform is set up by the local government and is absolutely controlled by the local government, and the person in charge of the platform company is appointed by the local government and receives its direct leadership. Second, the local financing platform directly participates in the local infrastructure construction and operation. Third, local governments inject state-owned assets ,such as financial funds or land use rights into financing platform companies as collateral for financing in the financial market. Fourth, local governments provide guarantee or implicit guarantee commitment for financing platform.

2.2. Local government and CCBs

The predecessor of CCB is city credit union, because of the system, management and other reasons, a large number of risks accumulated in the development of city credit union seriously threaten the security of the national financial system. In order to avoid risks, in 1995, the State Council established the Urban Cooperative Bank (renamed as the CCB in 1998) by absorbing local finance and enterprises as shares on the basis of urban credit cooperatives. CCBs are established by local government, which is strongly supported by the local government in the development. Local government finance also obtains the holding position in the CCBs through the form of shareholding. Generally, local government finance is the largest shareholder, holding about 30%. After 2002, through introducing strategic investors, the CCBs have rapidly improved its comprehensive strength in terms of capital, products, talents and market, but no one can replace the government's control over CCBs. Actually, local government finance also make CCBs the "money bag" of urban development and construction through holding the CCBs (Qian *et al*., 2015).

2.3. Local government, local financing platform and CCBs

In 2008, China central government implemented "four trillion" economic stimulus plan to cope with the global financial crisis. Meantime, local governments need to obtain a large number of loans by means of local financing platforms, so local governments began to form their own financing platform companies in large quantities By the end of September 2011, there were more than 10000 financing platforms in China, with a loan balance of 9.1 trillion

yuan, and led to the rapid expansion of local government debt scale (Bai *et al*., 2016; Song and Xiong, 2018). Local financing platform loans come from CCBs, trust, securities, insurance and other financial institutions, most of which come from CCBs. For example, the top ten loan customers of Bank of Beijing are all local financing platform companies (Cao and Song, 2013). Therefore, CCBs as the main lenders of local financing platform also make a lot of money in the process of local government debt scale expansion.

With the rapid expansion of loan scale of local financing platforms and the exposure of local government debt risk in some areas, the policy guidance of central government to local financing platform has changed from encouraging to tightening and controlling. In 2010, for the first time, the State Council required a comprehensive clean-up of the loan of financing platform companies. A variety of regulatory measures let CCBs turn away local financing platforms. In a short period of time, a series of policy documents had been issued intensively to clean up and regulate the loan of local financing platforms, made many projects under construction lost opportunity to renew loan, such as subway and expressways projects , and became uncompleted projects, thus may result in bad debts of CCBs (Berger *et al*., 2005; Clarke *et al*., 2005; Williams and Nguyen, 2005; Micco *et al*., 2007; Ferri,2009). At the same time, local governments also looking for other financing channels besides CCBs, such as the social capital side in the PPP model, which will gradually replace the opportunity of CCBs to lend to local financing platform. In a word, the local government has restricted the loan amount of CCBs to local financing platforms, which is not conducive to the growth of CCBs performance, but conducive to CCBs control of loan risk.

3. Methodology and data sources

As early as 1955, Kuznets put forward the "inverted U-shaped" curve about the relationship between economic development and income inequality, which later generations called "Kuznets Curve" (Kuznets, 1955). On the basis of Kuznets' research, some scholars have further deepened the relationship between financial development and income inequality. As a kind of financial innovation, local financing platform not only promotes the development of local economy, but also enlarges the development imbalance between cities. The local financing platforms seem to act as both a promoter of urban construction and a financial intermediary to provide financial resources. So will local financing platform loan, as Kuznets expected, show an inverted U-shaped structure on the performance of CCBs? This needs empirical method to solve.

3.1. Fixed effect model and random effect model

We are interested in examining the causal relationship between local financing platform loan and performance of CCBs. For simplicity, we assume a linear relationship between and the explanatory variables, which can be written as,

$$performance_{it} = \sum_{t=1}^{n} \alpha_i x_{it} + \beta_1 loan_{it} + \beta_2 loansq_{it}\mu_i + u_{ij} + \lambda_{ij} + \varepsilon_{it} \qquad (1)$$

where $performance_{it}$ is measured as ROE (Return on Equity) of CCBs $i \in \{1, N\}$, in year $t \in \{2010,2018\}$; β_1 and β_2 are coefficient vectors to be estimated; $loan_{it}$ is the main explanatory variable; $loansq_{it}$ is the quadratic term of the main explanatory variable; $\sum_{t=1}^{n} x_{it}$ is control variable , include debt1, debt10, gov, HC, size, leverage, growth. Debt1 stands for proportion of the largest customer loans. Debt10 is proportion of top ten customers' loans. Gov measured as '1' if the largest shareholder is local government, otherwise '0'. HC is measured as the proportion of the first largest shareholder minus the proportion of the second largest shareholder. Size is measured as the natural logarithm of the total assets of CCBs. Leverage is measured as ratio of total liabilities to total assets. Growth is measured as ratio of current main business income minus previous main business income to previous main business income; λ_{it} is a vector of time-varying control variables; u_{ij} is a vector of individual control variables; ε_{it} is an error term so that $E(\varepsilon_{ij}\mu, \lambda) = 0$, where $E(\cdot)$ is the expectation operator.

3.2. Unit root test

The study uses both Levin *et al*. (2002, referred as LLC) and Im *et al*. (2003, referred as IPS) panel unit root investigates the properties of the variables. It is believed that IPS yield more robust results as compare to LLC by allowing heterogeneous coefficients. IPS panel unit root test t bar test statistic is based augmented Dickey-Fuller statistics averaged across the clubs. LLC test has little power, unlike IPS, to produce consistent results when the deterministic term is present in the analysis. The regression for a sample of N groups over T time periods, the IPS panel unit root regression can be written as:

$$\Delta y_{i,t} = \alpha_i + \pi_i t + \beta_i y_{i,t-1} + \sum_{j=1}^{k} \psi_{i,j} \Delta y_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

where y denotes the variable, Δ is a difference operator. $\varepsilon_{i,t}$ is an error term for $i = 1, 2, ..., N$, and $t = 1, 2, ..., T$. The $\Delta y_{i,t}$ terms on the right-hand side in Eq. (2) allows serial correlation.

Table 1

Panel unit root results. ROE is the return on equity of CCBs. Loan denotes the loan scale of local financing platform. Loan_ is the proportion of loans of local financing platform. Debt1 stands for proportion of the largest customer loans. Debt10 is proportion of top ten customers' loans. Gov measured as '1' if the largest shareholder is local government, otherwise '0'. HC is measured as the proportion of the first largest shareholder minus the proportion of the second largest shareholder. Size stands for the scale of CCBs. Leverage is the leverage ratio. Growth stands for growth rate of main business. LLC and IPS refer the Levin, Lin, and Chu and Im, Pesaran, and Shin respectively. Results show that all the series are stationary. ***, **, * denotes the 1%, 5% and 10% level of significance. T-values are given in the parenthesis.

Variables	LLC				IPS			
	Constant		As Constant with trend		Constant		Constant with trend	
ROE	15.33***	(0.00)	14.38**	(0.00)	15.997*	(0.00)	14.83**	(0.00)
loan	17.88	(1.00)	16.03	(1.00)	18.03	(1.00)	16.87	(1.00)

(*Continued*)

Variables	LLC				IPS			
	Constant		As Constant with trend		Constant		Constant with trend	
loan_	13.29	(1.00)	4.90	(1.00)	16.66	(1.00)	6.47	(1.00)
debt1	17.92***	(0.00)	17.90***	(0.00)	15.27***	(0.00)	15.05***	(0.00)
debt10	3.98***	(0.00)	0.75	(0.22)	6.90***	(0.00)	4.33***	(0.00)
gov	3.14***	(0.00)	3.81***	(0.00)	4.16***	(0.00)	5.34***	(0.00)
HC	4.27***	(0.00)	4.19*	(0.00)	3.95**	(0.00)	3.67*	(0.00)
size	11.27**	(0.00)	11.18*	(0.00)	13.82**	(0.00)	12.37***	(0.00)
leverage	5.48**	(0.00)	5.89***	(0.00)	6.37***	(0.00)	6.99**	(0.00)
growth	3.47***	(0.00)	3.28	(0.00)	4.81**	(0.00)	4.63**	(0.00)

3.3. Threshold model

Next, we apply a threshold regression model proposed by Hansen (1999, 2000) to attain the goal of this paper. The panel thresholds model is widely used (see, for example, Narayan, and Sharma, 2011; Noor *et al*., 2014; Surjaningsih *et al*., 2014). It produces more satisfactory outcome as compared to "cross-sectional" and "time-series models" (Hajamini and Falahi, 2018). This model is based on multiple (J) thresholds. The numerous threshold (J) regression is written as follows:

$$performance_{it} = \sum_{t=1}^{n} \alpha_i x_{it} + \beta_1 loan_{it} \cdot I(loan_{it} \leq \gamma_1) + \beta_2 loan_{it} \cdot$$
$$I(\gamma_1 \prec loan_{it} \leq \gamma_2) \ldots + \beta_{m+1} loan_{it} \cdot I(loan_{it} \succ \gamma_m) + \varepsilon_{it} \quad (3)$$

Where $I(\cdot)$ represents the index function, and γ_i stands for thresholds. The error term is given as $\varepsilon_{it} = \mu_i + \lambda_t + \nu_{it}$ where λ_{it} is a vector of time-varying control variables, u_{ij} is a vector of individual control variables. ROE stands for *performance* of CCBs. Loan denotes the loan scale of local financing platform. *Loan_* is the proportion of loans of local financing platform. The variables included in $\sum_{t=1}^{n} x_{it}$ are defined in Section 3.1.

3.4. Data source

This study covers a sample of 68 CCBs taking the period from 2010 to 2018. All data are collected from annual report published of CCBs. We compile all series in a common unit for our analysis.

Table 2
SUMMARY STATISTICS OF AVERAGE DATA BY WINDOWS

Variables	Total	Min.	Max.	Median	Mean	Std. dev.
ROE	612	-0.0218	0.4382	0.1263	0.1337	0.0729
ROA	612	-0.0528	0.5619	0.1139	0.1272	0.0533

(*Continued.*)

Variables	Total	Min.	Max.	Median	Mean	Std. dev.
loan	612	0.0113	0.8395	0.1054	0.1082	0.0735
loan_	612	0.0131	0.8252	0.1032	0.1257	0.0612
debt1	612	0.0027	0.2835	0.0272	0.0381	0.0577
debt10	612	0.0137	0.8837	0.1548	0.1639	0.1834
gov	612	0	1	0	0.5700	0.5013
HC	612	0.0000	0.8837	0.1139	0.1253	0.1835
size	612	6.1388	23.5068	11.3884	13.9937	2.6381
leverage	612	83.0382	113.5378	88.2861	90.6703	2.3728
growth	612	-0.0283	0.1912	0.0182	0.02334	2.1630

Source: Annual reports of each CCBs.

The average value of loan_ is 0.1257, indicates that the proportion of local financing platform loans in CCBs is 12.57%, which is very dangerous for the local banks. Normally the four major banks in China, like China Construction Bank, control the loan of local financing platform within proportion of 10%, so variable of loan_ shows that the loan scale of local financing platform is too large. The largest customer of local financing platform is usually local government or local state-owned enterprise, and the average value of debt1 is 0.0381, which indicates that the largest customer is very important to the performance of CCBs.

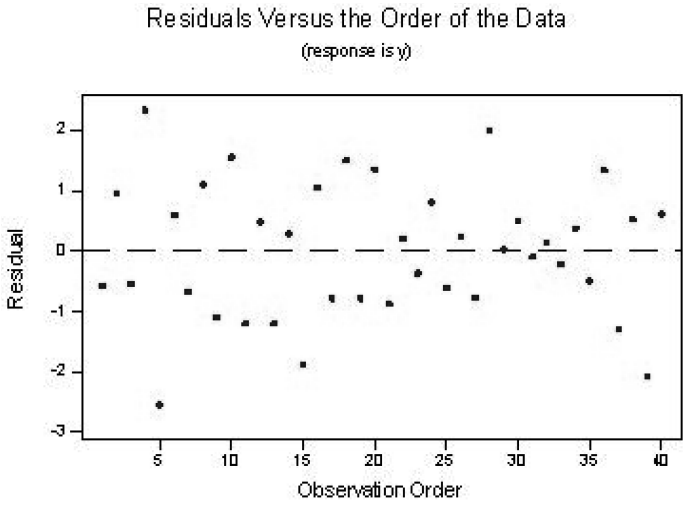
4. Empirical results and discussions

4.1. Fixed effect model and random effect model test

Firstly, this paper establishes the fixed effect and random effect model of panel data to test the relationship between local financing platform loan and the performance of CCBs. Before the empirical regression, the model is tested by sequence autocorrelation, and the residual distribution is shown in Figure 1. The residual distribution shows that there is no sequence autocorrelation problem in this paper, so the following regression results are reliable.

Table 3 show the regression results of fixed effect model and random effect model. Column 1 reports the fixed effect relationship between local financing platforms loan and performance of CCBs without control variables; Column 2 reports the fixed effect relationship between local financing platforms loan and performance of CCBs without control of time and individual; Column 3 reports the fixed effect relationship between local financing platforms loan and performance of CCBs with control of time and individual. The regression results in column (1)-(3) show that in the fixed effect model, the regression coefficients of loan are positive and significant, while those coefficients of loansq are negative and significant.

Figure 1
RESIDUAL DISTRIBUTION



Column 4 reports the random effect relationship between local financing platforms loan and performance of CCBs without control variables; Column 5 reports the random effect relationship between local financing platforms loan and performance of CCBs without control of time and individual; Column 6 reports the random effect relationship between local financing platforms loan and performance of CCBs with control of time and individual. The regression results in column (4)-(6) show that in the random effect model, the regression coefficients of loan are positive and significant, and those coefficients of loansq are negative and significant too. Therefore, we can preliminarily judge that the local financing platform loan may have a non-linear relationship with the performance of CCBs, which provides the possibility for the later use of threshold model to make further study.

Through the regression results of fixed effect and random effect model, we can conclude that the local financing platform loan is a high-quality lending resources for the CCBs, which increases the performance of the CCBs, but when the loan scale of the local financing platform increases to a certain extent, the loan structure of the CCBs will change, and the increase of non-performing loan risk will have a negative impact on the performance of the CCBs. This is in line with the economic principle of Kuznets inverted U-curve, and also shows that CCBs need to strengthen the management of cash flow and non-performing loans to avoid credit risk escalation.

From the regression results of control variables, there is a significant positive correlation between debt1, debt10 and the performance of CCBs. The loan scale of important customers can effectively increase the performance of CCBs. Gov showed positive correlation with the performance of CCBs, means that the management mode of local government as a major shareholder is conducive to the performance growth of CCBs, that's because local govern-

ment shareholding can introduce high-quality government investment targets for CCBs, at least ensure the performance of CCBs to maintain a stable level. Leverage has a significant negative correlation with the performance of CCBs, it shows that we should reduce the leverage ratio of CCBs and slow down the development speed of CCBs. Growth has a significant positive correlation with the performance of CCBs, this shows that at present, CCBs are right in the direction of main business selection and development, and should continue to develop the main business of CCBs. Size has a not significant correlation with the performance of CCBs, this may be because the performance of CCBs is affected by many factors, and the bank scale expansion may face many uncertainties, such as unit cost and management cost increase, so the impact on performance is not significant.

Table 3

Results of Fixed effect model and random effect model for panel data. ROE is the return on equity of CCBs. Loan denotes the loan scale of local financing platform. Loansq is the square term of loan. Debt1 stands for proportion of the largest customer loans. Debt10 is proportion of top ten customers' loans. Gov measured as '1' if the largest shareholder is local government, otherwise '0'. HC is measured as the proportion of the first largest shareholder minus the proportion of the second largest shareholder. Size stands for the scale of CCBs. Leverage is the leverage ratio. Growth stands for growth rate of main business. Results presented in Table3 that show a positive and significant relationship of loan for full sample. However, showed a negative and significant relationship of loansq. ***, ** and * denotes the significance level at 1%, 5% and 10%, respectively. T-values are given in the parenthesis.

Variables	**FE**	**FE**	**FE**	**RE**	**RE**	**RE**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
loan	0.004**	0.006**	0.012***	0.004*	0.014**	0.074*
	(2.010)	(1.960)	(2.740)	(1.924)	(2.483)	(1.927)
loansq	-0.056*	-0.082***	-0.102***	-0.033*	-0.0972*	-0.240**
	(-1.927)	(-3.26)	(-3.540)	(-1.794)	(-1.913)	(-3.028)
debt1		0.121**	0.177*		0.122***	0.147*
		(2.498)	(1.822)		(3.973)	(1.928)
debt10		0.362*	0.302*		0.370*	0.508*
		(1.919)	(1.873)		(1.784)	(1.834)
gov		0.477***	0.392***		0.210*	0.329**
		(3.574)	(3.784)		(1.878)	(1.998)
HC		0.263	0.255		0.286*	0.263*
		(1.472)	(1.254)		(1.925)	(1.922)
size		1.337	1.330		0.039	0.054
		(1.284)	(1.309)		(1.333)	(1.020)
leverage		-0.037*	-0.085**		-0.029*	-0.037**
		(1.833)	(2.479)		(-1.907)	(-1.987)
growth		0.248**	0.264*		0.337*	0.307**
		(2.294)	(1.734)		(1.725)	(2.028)
constant	1.335	1.045	1.120**	1.577	1.239	1.037**
	(1.472)	(1.280)	(2.272)	(1.634)	(1.301)	(2.029)
Time fixed effect	Yes	No	Yes	Yes	No	Yes
Individual fixed effect	Yes	No	Yes	Yes	No	Yes
Observations	612	612	612	612	612	612
Adj R	0.392	0.401	0.477	0.302	0.492	0.485

4.2. Threshold model test

Before investigating the local financing platform loan and performance of CCBs, first, we check the endogeneity between loan, loan_ and ROE. Our results presented in Table 4 show that there is no evidence of endogeneity since the coefficient of error of loan and loan_ is turn to be insignificant. Hence, a non-dynamic threshold can provide consistent results in the absence of endogeneity.

Table 4

Results of endogeneity test for panel data. Loan denotes the loan scale of local financing platform. Loan_ is the proportion of loans of local financing platform. There is no endogeneity in the data.

	Coefficient	p-value	H0:there is no endogeneity
loan	-0.21	0.33	We do not reject the null hypothesis of endogeneity
loan_	-0.16	0.28	We do not reject the null hypothesis of endogeneity

We test how many thresholds are significant for full sample using the Hansen panel threshold regression model. The results in Table 5 show the existence of two significant thresholds (or two significant optimum variable of loan or loan_) exist for full samples, as we reject the triple threshold since P-statistic values are insignificant. The finding suggests that the lower and upper optimum for variable loan is found to be 3.10% and 9.80%, and the lower and upper optimum for variable loan_ is found to be 2.80% and 8.30%.

Table 5

Test for single/double/triple threshold. Loan denotes the loan scale of local financing platform. Loan_ is the proportion of loans of local financing platform. Results show the existence of two significant thresholds for full sample. ***, ** and * denotes the significance level at 1%, 5% and 10%, respectively. p-values are given in the parenthesis.

	Threshold model	F-stat	P-stat	1%	5%	10%	Threshold estimate	95% confidence interval
γ_{loan}	Single threshold	21.059***	0.000	14.010	9.285	6.625	0.031	[0.030,0.031]
	Double threshold	7.966**	0.033	12.644	6.825	4.671	0.098	[0.042,0.222]
	Triple threshold	10.274	0.180	18.745	11.926	8.996	0.204	[0.105,0.371]
$\gamma_{loan\_}$	Single threshold	18.077***	0.000	12.130	8.245	5.829	0.028	[0.019,0.028]
	Double threshold	6.381**	0.041	10.566	5.128	4.592	0.083	[0.056,0.131]
	Triple threshold	9.371	0.201	15.294	12.196	9.177	0.134	[0.121,0.207]

Based on the estimated two thresholds, the local financing platform loan can be divided into three sections use variable of loan and loan_ respectively: low threshold section ($loan * I(loan \leq 0.031)$, $loan\_ * I(loan\_ \leq 0.028)$, medium threshold section ($loan * I(0.031 < loan \leq 0.098)$, $loan\_ * I(0.028 < loan\_ \leq 0.083)$) and high threshold section ($loan * I(loan > 0.098)$, $loan\_ * I(loan\_ > 0.083)$).

According to the division of local financing platforms loan, the number of samples are divided according to the threshold interval is listed in Table 6. We can see that with loan and

loan_ as the threshold variable, the samples of low loan of local financing platforms account for 27.2% and 25.1% respectively, the samples of middle loan in local financing platforms account for 34.1% and 37.2% respectively, the samples of high loan of local financing platforms account for 38.7% and 37.3% respectively.

Table 6

Total and proportion of samples in different threshold areas. The model with variable loan as the threshold is divided into three intervals, such as $loan * I(loan \leq 0.031)$, $loan * I(0.03 < loan \leq 0.098)$ and $loan * I(loan > 0.098)$. The model with loan_ as the threshold is divided into three intervals, such as $loan * I(loan \leq 0.028)$, $loan * I(0.028 < loan \leq 0.083)$ and $loan * I(loan > 0.083)$.

	γ_{loan}		
Threshold interval	$loan * I(loan \leq 0.031)$	$loan * I(0.031 < loan \leq 0.098)$	$loan * I(loan > 0.098)$
Total number of samples	167	209	236
Sample proportion	0.272	0.341	0.387
	$\gamma_{loan\_}$		
Threshold interval	$loan * I(loan \leq 0.028)$	$loan * I(0.028 < \text{loan} \leq 0.083)$	$loan * I(loan > 0.083)$
Total number of samples	154	228	230
Sample proportion	0.251	0.372	0.377

Next, the relationship between optimum local financing platform loan and performance of CCBs is established with the help of threshold regressions, and results are presented in Table 7. The results show that 1% increase in the loan leads to an increase of 6.6% in ROE when loan is below 3.1%, and 1% increase in the loan leads to an increase of 13.1% in ROE when loan is between 3.1% and 9.8%. However, above the upper estimated threshold, the coefficient of performance of CCBs is contrary which implies that larger local financing platforms loan weakens the performance of CCBs due to accumulated debt risk and rising non-performing loan ratio (Zhao *et al*., 2020). Further, the same relationship is conducted in case of threshold of loan_, means the similar findings are noticed for threshold of loan_. The other control variables like debt1, debt10, gov, HC, size, leverage and growth, basically consistent with the regression results of control variables in Table 3.

Table 7

Regression estimate of single/double threshold model for loan and loan_. ROE is the return on equity of CCBs. Loan denotes the logarithm of loan scale of local financing platform. Loan_ is the proportion of loans of local financing platform. Debt1 stands for proportion of the largest customer loans. Debt10 is proportion of top ten customers' loans. Gov measured as '1' if the largest shareholder is local government, otherwise '0'. HC is measured as the proportion of the first largest shareholder minus the proportion of the second largest shareholder. Size stands for the scale of CCBs. Leverage is the leverage ratio. Growth stands for growth rate of main business. Results presented in this that show a positive and significant relationship of loan and loan_ with ROE before the upper thresholds for full sample. However, above the upper thresholds level, the coefficients of loan and loan_ show a negative and significant relationship. ***, ** and * denotes the significance level at 1%, 5% and 10%, respectively. T-values are given in the parenthesis.

Variables	γ_{loan}	$\gamma_{loan\_}$
	(1)	**(2)**
$loan * I(loan \leq 0.031)$	0.066^{*}	
	(1.848)	

(*Continued*)

Variables	γ_{loan}	$\gamma_{loan\_}$
	(1)	**(2)**
$loan * I(0.031 < loan \leq 0.098)$	0.131***	
	(3.609)	
$loan * I(loan > 0.098)$	-0.121**	
	(2.077)	
$loan\_ * I(loan\_ \leq 0.028)$		0.102*
		(1.918)
$loan\_ * I(0.028 < loan\_ \leq 0.083)$		0.668**
		(2.484)
$loan\_ * I(loan\_ > 0.083)$		-0.351**
		(-2.247)
debt1	0.356***	0.552**
	(3.034)	(2.258)
debt10	0.036**	0.060***
	(1.977)	(3.680)
gov	0.352**	0.499***
	(2.220)	(3.890)
HC	0.125*	0.107***
	(1.839)	(3.520)
size	-0.085***	-0.097**
	(-3.657)	(-2.503)
leverage	-0.126*	-0.155
	(-1.822)	(-1.033)
growth	0.121**	0.224*
	(2.227)	(1.788)
constant	0.134	0.188*
	(1.250)	(1.882)
Time fixed effect	Yes	Yes
Individual fixed effect	Yes	Yes
Observations	612	612
R square	0.599	0.575
F value	3.355***	3.767***

4.3. Heterogeneity analysis

In the next stage, a similar analysis is repeated for eastern, central and western regions. The eastern, central and western regions represent three levels of China's financial development, analysis of heterogeneity from these three aspects show whether there are differences in the impact of local financing platform loans on the performance of CCBs under different financial development levels.

The results presented in Table 8 show that there is an existence of two thresholds for all the regions. Table 8 shows that no matter in the eastern, middle, western regions, when the

threshold value is less than γ_2, local financing platform loans increase the performance of CCBs; when the threshold value is greater than γ_2, local financing platform loans reduce the performance of CCBs. At the same time, we found that the positive and negative effects of local financing platform loans on the performance of CCBs in the central region are greater, followed by the eastern region, and then the western region.

This may be because central regions of China are in the period of catching up with and surpassing the eastern developed regions, the central region has a large number of infrastructure construction to be made up, the urbanization construction is far from reaching the bottleneck period like eastern region, and local financial institutions and government give sufficient support to local financing platforms. In contrast, the western region is located in the interior of China, and has not formed the situation of relying on local financing platforms to carry out infrastructure construction, thus it is impossible to form the mutual promotion of industrial investment and financial development. The eastern region, as a coastal region, it has "taken the first step" in financing platform business and there is not much room for investment and construction relying on local financing platforms. CCBs in the eastern region which engaged in local financing platform business has entered a slow development stage now.

Table 8

Regression estimate of double threshold model for eastern, central and western regions. ROE is the return on equity of CCBs. Loan denotes the logarithm of local financing platform loan scale. Loan_ is the proportion of loans of local financing platform. Debt1 stands for proportion of the largest customer loans. Debt10 is proportion of top ten customers' loans. Gov measured as '1' if the largest shareholder is local government, otherwise '0'. HC is measured as the proportion of the first largest shareholder minus the proportion of the second largest shareholder. Size stands for the scale of CCBs. Leverage is the leverage ratio. Growth stands for growth rate of main business. Results presented in this that show a positive and significant relationship of loan and loan_ with ROE before the upper thresholds for eastern, central and western regions. However, above the upper thresholds, the coefficients of loan and loan_ show a negative and significant relationship. ***, ** and * denotes the significance level at 1%, 5% and 10%, respectively. T-values are given in the parenthesis.

Variables	**Eastern**		**Central**		**Western**	
	γ_{loan}	$\gamma_{loan\_}$	γ_{loan}	$\gamma_{loan\_}$	γ_{loan}	$\gamma_{loan\_}$
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
$loan * I(loan \le \gamma_1)$	0.177**		0.152***		0.171**	
	(2.000)		(3.210)		(2.030)	
$loan * I(\gamma_1 < loan \le \gamma_2)$	0.170***		0.180***		0.107***	
	(6.400)		(3.752)		(3.508)	
$loan * I(loan > \gamma_2)$	-0.005*		-0.057**		-0.015*	
	(-1.731)		(-2.508)		(-1.774)	
$loan\_ * I(loan\_ \le \gamma_1)$		0.041***		0.120***		0.034***
		(4.650)		(5.230)		(4.887)
$loan\_ * I(\gamma_1 < loan\_ \le \gamma_2)$		0.104*		0.129**		0.010**
		(1.824)		(2.088)		(2.571)
$loan\_ * I(loan\_ > \gamma_2)$		-0.002***		-0.032**		-0.017***
		(-3.029)		(-2.395)		(-3.810)
debt1	0.013***	0.233***	0.005	0.003	0.057*	0.084**
	(3.114)	(3.221)	(1.057)	(1.337)	(1.919)	(2.073)

(*Continued*)

Variables	Eastern		Central		Western	
	γ_{loan}	$\gamma_{loan\_}$	γ_{loan}	$\gamma_{loan\_}$	γ_{loan}	$\gamma_{loan\_}$
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
debt10	0.405***	0.166***	0.287***	0.354*	0.155**	0.130***
	(3.117)	(3.082)	(2.835)	(1.901)	(2.493)	(3.789)
gov	0.017***	0.574**	0.015***	0.184**	0.199*	0.070***
	(2.645)	(2.452)	(3.112)	(2.285)	(1.858)	(3.605)
HC	0.277	0.304**	0.245*	0.302*	0.328**	0.247*
	(1.356)	(2.487)	(1.921)	(1.899)	(2.470)	(1.935)
size	-0.123**	-0.001***	-0.045**	-0.021*	-0.032**	-0.115***
	(-2.013)	(-3.010)	(-2.379)	(-1.925)	(-2.055)	(-3.812)
leverage	-0.039*	0.040	0.036**	0.038*	0.047	0.058**
	(1.921)	(1.583)	(2.277)	(1.937)	(1.558)	(1.984)
growth	0.389*	0.251**	0.274*	0.322***	0.587***	0.553*
	(1.798)	(2.551)	(1.924)	(3.571)	(3.660)	(1.922)
constant	0.016**	0.020*	0.288*	0.302**	0.230***	0.224*
	(2.200)	(1.773)	(1.841)	(1.977)	(2.677)	(1.719)
Time fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Individual fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	612	612	612	612	612	612
R square	0.617	0.554	0.623	0.479	0.610	0.637
F value	3.299***	3.108***	3.471***	3.204***	3.218***	3.274***

4.4. Robustness tests

In this section we probe the robustness of our results to alternative variable. We re-run the regressions by replacing ROE with ROA (ROA is the return on total assets of CCBs) using threshold model. See columns (1) and (2) take loan and loan_ as threshold variable respectively, showed positive impact with ROA before the upper thresholds value. That is, the threshold interval as follows $loan \leq 0.027$, $0.027 < loan \leq 0.086$ and $loan\_ \leq 0.023$, $0.023 < loan\_ \leq 0.075$. And showed negative impact with ROA above the upper thresholds value, such as threshold interval like $loan > 0.086$ and $loan\_ > 0.075$. As expected, the regression results between ROA and the performance of CCBs are close to what we have obtained based on the ROE dependent variable.

Table 9

Regression estimate of double threshold model for ROA dependent variable. ROA is the return on total assets of CCBs. Loan denotes the logarithm of local financing platform loan scale. Loan_ is the proportion of loans of local financing platform. Debt1 stands for proportion of the largest customer loans. Debt10 is proportion of top ten customers' loans. gov measured as '1' if the largest shareholder is local government, otherwise '0'. HC is measured as the proportion of the first largest shareholder minus the proportion of the second largest shareholder. Size stands for the scale of CCBs. Leverage is the leverage ratio. Growth stands for growth rate of main business. Results presented in this that show a positive and significant relationship of loan and loan_ with ROA before the upper thresholds for eastern, central and western regions. However, above the upper thresholds level, the coefficients of loan and loan_

show a negative and significant relationship. ***, ** and * denotes the significance level at 1%, 5% and 10%, respectively. T-values are given in the parenthesis.

Variables	ROA	
	loan	*loan_*
	(1)	**(2)**
$loan * I(loan \leq 0.027)$	0.066*	
	(1.848)	
$loan * I(0.027 < loan \leq 0.086)$	0.531***	
	(3.609)	
$loan * I(loan > 0.086)$	-0.121**	
	(2.077)	
$loan * I(loan \leq 0.023)$		0.102*
		(1.918)
$loan * I(0.023 < loan \leq 0.075)$		0.668**
		(2.484)
$loan * I(loan > 0.075)$		-0.351**
		(-2.247)
debt1	0.356***	0.552**
	(3.034)	(2.258)
debt10	0.036**	0.060***
	(1.977)	(3.680)
gov	0.352**	0.499***
	(2.220)	(3.890)
HC	0.125*	0.107***
	(1.839)	(3.520)
size	-0.085***	-0.097**
	(-3.657)	(-2.253)
leverage	-0.126*	-0.155
	(-1.922)	(-1.033)
growth	0.121**	0.224*
	(2.068)	(1.885)
constant	0.134	0.188*
	(1.250)	(1.882)
Time fixed effect	Yes	Yes
Individual fixed effect	Yes	Yes
Observations	612	612
R square	0.599	0.575
F value	3.355***	3.767***

5. Conclusions

Though there is a wide range of literature study on the relationship between local financing platform loan and performance of CCBs, but the study on the link between optimum

local financing platform loan and performance of CCBs is scanty. To fill this research gap, this paper makes an attempt by examining the relationship between optimum local financing platform loan and performance of CCBs in the case of 68 CCBs using a panel thresholds regression model for the period 2010-2018.

Our findings are summarized as follows: First, we find a lower and upper significant threshold values between local financing platform loan and performance of CCBs. Second, when local financing platform loan lies before the upper thresholds, local financing platform loan showed positive and significant effects on the performance of CCBs; When local financing platform loan value exceed the upper value of the threshold, the coefficient of the local financing platform loan change to the opposite. This implies that CCBs may achieve higher performance if they maintain the local financing platform loan value before the upper thresholds. Third, we disaggregate the total samples into three sub-samples based on different regions. Our findings, again consistent with the main finding, which conducts a same relationship between three regions of local financing platform loan and the performance of CCBs within the threshold value. And the positive and negative effects of local financing platform loan in the central region are far greater than the effects in the eastern and western regions.

Therefore, the following suggestions are put forward, CCBs should strengthen the management of credit scale by maintaining an ideal local financing platform loan to attain high and sustainable performance of CCBs. Moreover, it is important for the CCBs to strengthen the marketization level and control the boundary of government intervention. Our results suggest that maintains ideal local financing platform loan is effective to encourage the performance of CCBs.

References

Andrew, L., Chien, F. L. and Chia, S. (2002), "Unit root tests in panel data: asymptotic and finite-sample properties", *Journal of Econometrics*, 108: 1-24.

Berger, A. N., Clarke, G. R. G., Cull, R., Klapper L. and Udell, G. F. (2005), "Corporate governance and bank performance: a joint analysis of the static, selection, and dynamic effects of domestic, foreign, and state ownership", *Journal of Banking and Finance*, 29: 2179-2221.

Bonis, R. D. and Stacchini, M. (2010), "What determines the size of bank loans in industrialized countries? The role of government debt", *Mo.fi.r.working Papers*.

Bai, C., Hsieh, C. and Song, Z. M. (2016), "The long shadow of China's fiscal expansion", *Brookings Papers on Economic Activity*, 2: 129-181.

Cao, X. Y. and Song, M. (2013), "Long-term Mechanism of Achievement and Protection of Commercial Bank Creditor's Right Research Based on Local Government Financing Platform", *Journal of Central University of Finance and Economics*, 1(010): 31-36.

Clarke, G. R. G., Cull, R. and Shirley, M. M. (2005), "Bank privatization in developing countries: a summary of lessons and findings", *Journal of Banking and Finance*, 29: 1905-1930.

Chen. Z., He, Z. and Liu, C. (2018), "The Financing of Local Government in the People's Republic of China: Stimulus Loan Wanes and Shadow Banking Waxes", *Working Paper*.

Chen, Z., He, Z. and Liu, C. (2020), "The financing of local government in China: stimulus loan wanes and shadow banking waxes", *Journal of Financial Economics*, forthcoming.

Donald, C. and Fang, L. (2016), "The law of China's local government debt: local government financing vehicles and their Bonds", *American Journal of Comparative Law*, 12: 751-798.

Ferri, G. (2009), "Are new tigers supplanting old mammoths in China's banking system? Evidence from a sample of city commercial banks", *Journal of Banking & Finance* , 33: 131-140.

Gu, X. J. and Li, W. Q. (2013), "Research on the construction of local government investment and financing platform under the background of Urbanization", *Academic Journal of Zhongzhou*, 202(10): 39-42.

Hajamini, M. and Falahi, M. A. (2018), "Economic growth and government size in developed european countries: a panel threshold approach", *Economic Analysis & Policy*, 58: 1-13.

Hansen, B. E. (1999), "Threshold effects in non-dynamic panels: estimation, testing, and Inference", *Journal of Econometrics*, 93: 345-368.

Hansen, B. E. (2000), "Sample splitting threshold estimation", *Econometrica*, 68: 575-603.

Hauner, D. (2009), "Public debt and financial development", *Journal of Development Economics*, 88: 0-183.

Huang, J. T., Kuang-Ta, L. O. and She, P. W. (2012), "The impact of fiscal decentralization on tax effort of china's local governments after the tax sharing system", *Singapore Economic Review*, 57: 1-22.

Ji, Z. H., Zhou, L. A. and Wang, P. (2014), "Promotion incentive of local officials and bank credit: Empirical Evidence from Chinese City Commercial Banks", *Financial Research*, 403(01): 5-19.

Jiucheng, X. and Min, X. (2016), "Effect of local government financing platform loan on commercial bank efficiency in China", *World SCI-TECH R&D*, 2: 221-226.

Kuznets, S. (1955), "Economic Growth and Income Equality", *The America Economic Review*, 45(1): 1-28.

Kyung, S. I., Pesaran, M. H. and Shin, Y. (2003), "Testing for unit roots in heterogeneous panels", *Journal of Econometrics*, 115(1): 53-74.

Li, B. Q. and Chen, G. Y. (2013), "Research on the legal risk of local government financing platform – from the perspective of commercial bank loans", *Lanzhou Academic Journal*, (008): 212-214.

Lin, J. Y., Sun, X. and Wu, H. X. (2015), "Banking structure and industrial growth: evidence from China", *Journal of Banking & Finance*, 58: 131-143.

Liu, C. and Wang, X. (2018), "China's real estate market", *National Bureau of Economic Research Working Paper*.

Liu, C., Moldogaziev, T. T. and Mikesell, J. L. (2017), "Corruption and state and local government debt expansion", *Public Administration Review*, 77.

Micco, A., Panizza, U. and Yanez, M. (2007), "Bank ownership and performance: does politics matter?", *Journal of Banking and Finance*, 31: 219-241.

Narayan, P. K. and Sharma, S. S. (2011), "New evidence on oil price and firm returns", *Journal of Banking & Finance*, 35: 3253-3262.

Noor, M. N., Ibrahim, W. T. and Permata, M. I. (2014), "The impact of capital reversal and the threshold of current account deficit on rupiah", *Bulletin of Monetary Economics and Banking*, 16: 1-26.

Pan, F., Zhang, F. and Zhu, S. (2017), "Developing by borrowing? Inter-jurisdictional competition, land finance and local debt accumulation in China", *Urban Studies*, 54: 897-916.

Qian, X., Zhang, G. and Liu, H. (2015), "Officials on boards and the prudential behavior of banks: Evidence from China's city commercial banks", *China Economic Review*, 32: 84-96.

Rahman, M. A. and Islam, M. A. (2019), "Corporate social responsibility and sustainable development: a study of commercial banks in Bangladesh", *Applied Economics and Finance*, 6: 6-15.

Song, Z. and Xiong, W. (2018), "Risks in China's financial system", *Annual Review of Financial Economics*, 10: 261-286.

Sun, J., Harimaya, K. and Yamori, N. (2013), "Regional economic development, strategic investors, and efficiency of Chinese city commercial banks", *Journal of Banking & Finance*, 37: 1602-1611.

Surjaningsih, N., Maryaningsih, N. and Savitri, M. (2014), "Threshold of real exchange rate and the performance of manufacturing industry in Indonesia", *Bulletin of Monetary Economics and Banking*, 16: 1-22.

Williams, J. and Nguyen, N. (2005), "Financial liberalization, crisis, and restructuring: a comparative study of bank performance and bank governance in south east Asia", *Journal of Banking and Finance*, 29: 2119-2154.

Zhang, L. and Gong, G. (2020), "Real Estate Cycle, Local Government Fiscal Pressure and LGFVs' Land Purchasing", *Journal of Finance and Economics*, 463(06): 5-19.

Zhao, S. M., Shi, H. M. and Du, H. D. (2013), "The Tunneling of Local Government In City Commercial Bank: A Perspective of Local Government Financing Platform' Loan", *Management Review*, 25(012): 32-41.

Resumen

Este trabajo investiga la relación entre el nivel óptimo de préstamos de las plataformas de financiación local y el rendimiento de los Bancos Comerciales Locales (BCL) utilizando datos de 68 BCL durante el periodo 2010 a 2018. Nuestros resultados derivados del modelo de panel de regresión de umbral muestran un impacto positivo y significativo del préstamo de la plataforma de financiación local en el rendimiento de los BCLs antes de los umbrales superiores estimados. Una vez que el préstamo de la plataforma de financiación local supera el nivel del umbral superior, su impacto se vuelve negativo. Además, se observa la misma relación en submuestras de las regiones oriental, central y occidental. Nuestros resultados sugieren que el mantenimiento de los préstamos de la plataforma de financiación local es eficaz para fomentar el rendimiento de los BCLs.

Palabras clave: plataformas locales de financiación, préstamo, rendimiento, BCL.

Clasificación JEL: G21, H21.