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The impact of being listed as a global systemically important bank on the risk-resistance capabilities of China's four major commercial banks

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The impact of being listed as a global systemically important bank on the risk-resistance capabilities of China's four major commercial banks

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Abstract

This paper studies the impact of the four central commercial banks listed as global systemically important on the resilience and robustness of China's four major commercial banks (Bank of China, Industrial and Commercial Bank of China, Agricultural Bank of China, and China Construction Bank). This paper uses regression analysis and difference-in-difference (DID) model to study banks' capital adequacy ratio, core capital adequacy ratio, and weighted risk asset ratio. The regression linear model results show that the relationship between banks listed as internationally systemically important banks and banks' capital adequacy ratio and core capital

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adequacy ratio is significantly positive. The robustness test used causality analysis. The difference-in-difference model is used to test the parallel trend to verify the causality between the central and the result variable. The results of the parallel trend test in robustness detection show that the central variable and the result variable are not significant before the event occurs, and the relationship after the event is significant. This shows that when China's four central commercial banks are listed as global systemically important banks, their risk resistance and robustness significantly improve. In addition, the results of the study also have reference significance for China's current banking supervision.

Keywords: Global systemically important banks, Commercial banks, China, risk-resistance capabilities.

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1. Introduction

Banks have become an essential part of life for People in China and China. A bank is an intermediary between the depositor, who borrows money from the bank, and the borrower (Gobat, 2021). At the same time, the supervision and regulation of critical sectors of the State is an essential tool to promote the stability and soundness of the financial industry (Hirtle et al., 2020). In November 2011, the Financial Stability Board issued a comprehensive set of policy measures to address systemic and ethical risks associated with systemically important financial institutions (SIFI). In the publication, the FSB identified a group of 29 Global Systemically Important Banks (G-SIBs). This is the first time that the concept of systemically important banks has been proposed. In November of each year, the FSB updates the list of globally systemically important banks.

Basel III was proposed in the wake of the 2007-2009 financial crisis, and the Basel Committee on Banking Supervision (BCBS) needs to identify specific issues, and the annual update is designed to identify critical tasks to prevent their recurrence (McNamara et al., 2019.). In Basel III, there is a global voluntary regulatory framework for bank capital adequacy, stress testing, and market liquidity risk. The additional capital requirements for banks with essential systems in the system are 1% — 3.5%. Only the fourth and fifth groups of banks have different capital requirements of 1 percent or more in this draft, which is a relatively low level. In addition, China's four largest state-owned commercial banks, including Industrial and Commercial Bank of China, Agricultural Bank of China, Bank of China, and China Construction Bank, are included in the global system of essential banks and are required to implement Basel, which imposes additional capital buffers of between 1% and 1.5%. Three main areas of recommendations were made in Basel III to address: 1) capital reform, 2) liquidity standards, and 3) systemic risk and relevance (McNamara et al., 2015). Regulation can attempt to reduce global or domestic systemically important financial institutions (G-SIBS or D-SIBs) (Poledna et al. 2017).

According to the characteristics of different commercial banks and their corresponding requirements, this paper analyzes the positive impact of Basel III on the ability and robustness of China's four major commercial banks. I used the regression line linear model to analyze the impact of the four major commercial banks listed as international systemically important banks on the risk-putting ability of China, among which the capital adequacy ratio, core capital adequacy ratio, and risk-weighted asset ratio of the target bank are used as the result variables. The regression linear model results show that the relationship between banks listed as internationally systemically important banks and banks' capital adequacy ratio and core capital adequacy ratio is significantly positive. However, after the control variables are added, the significance of the relationship

between the central variable and the result variables disappears. So I started from three angles, first of all, the control variables lag a period, and then regression analysis to test the lag of the effect, followed by the control variable's lagging phase as a tool variable for regression analysis to test the endogenously between variables, and finally used dynamic panel regression, the previous period of CAR, CCAR and RWAR added to the explanatory variable to verify the result variable when affected by the previous period of the result variable. The results show that there is a strong self-correlation between the result variables. The robustness test used causality analysis. The difference-in-difference model is used to test the parallel trend to verify the causality between the central and the result variable. The results of the parallel trend test in robustness detection show that the central variable and the result variable are not significant before the event occurs, and the relationship after the event is significant.

The analysis in this paper shows that the relationship between banks classified as global systemically important banks and banks' capital adequacy ratios and core capital adequacy ratios is significantly positive, which also means that banks' risk resistance and robustness increase significantly when banks are classified as global systemically important banks and implement Basel III regulatory requirements. This is of reference to China's banking regulators to improve the assessment methods and regulatory measures of systemically important banks.

The structure of the text is as follows: Section 2 lists and combs the relevant studies on the evaluation, regulatory measures, and impact of systemically important banks. Section 3 provides an overview of the samples, data, and regression methods used in this article. Section 4 analyzes regression results and robustness check. Section 6 provides summaries and recommendations based on regression results and robustness testing.

2. Literature Review and Hypotheses Development

As the new banking prudential framework, Basel III is the Basel Committee on Banking Supervision's response to the causes and consequences of the global financial crisis. Its main objective is to improve the banking sector's financial stability and minimize the likelihood of another crisis of this magnitude. (Danila, 2012). In the wake of the 2008 financial crisis, the world established measures to deal with bank failures, the regulation of banks mentioned in Basel III. Global systemically important global banks (G-SIBs) are defined by the Basel Committee Regulations. According to Silvia and Sebastiano (2020), G-SIBs are divided into five risk-sorting buckets, corresponding to different loss absorption requirements, based on the barrel-based approach. There are 30 banks on the G-SIBs list, including four banks, Bank of China, Industrial and Commercial Bank of China, China Construction Bank, and Agricultural Bank of China. After consulting the FSB's list of the world's most essential and systematic banks from 2011 to 2020, I learned that Bank of China was listed as G-SIBs in 2011; Industrial and Commercial Bank of China was listed as G-SIBs in 2013; Agricultural Bank of China was listed as G-SIBs in 2014; China Construction Bank was listed as G-SIBs in 2015.

The Basel Committee on Banking Supervision (BCBS) determines that G-SIB's official methodology is based on indicators including size, relevance, irreplaceability, complexity, and cross-jurisdictional activities (Markus & Alexander, 2021). According to Paul and Bert (2015), the significance of these indicators is that if the big banks fail, they will pose a threat to global financial stability. Similarly, China has clarified the evaluation method, scope, evaluation process, and division of China Systemically Important Banks by reference to the international method for evaluating systemically important banks and established the evaluation index system of China's

systemically important banks from four dimensions. In identifying systemically important banks, Xu (2011) considers market and indicator methods to be the primary methods of identification. Ba and Gao (2012) evaluated systemically important banks in China's listed banks using several indicators in the Indicators Act.

In contrast, Mao (2011) uses networking to analyze. Zheng and Chen (2012) used entropy to measure the system importance of banks and calculated the systemic importance index. In the end, the results of these analyses are slightly different. The most accurate assessment methodology was proposed on 1 January 2021 in the Official Systemically Important Bank Assessment Methodology. Furthermore, in October 2021, the People's Bank of China, The Bank of China Insurance Regulatory Commission, and the China Securities Regulatory Commission finally announced China's systemically important banks, including 15 of the country's top four commercial banks.

According to empirical analysis by Moenninghoff et al. (2015), is officially included in G-SIBs can positively impact banks, although strict regulations can hurt the market value of large banks. Malgorzata et al. (2010) paper show that capital adequacy ratio (CAR) determines the ratio of a bank's core capital to assets and risk-weighted unbalanced liabilities. It can thus be deduced that the core capital adequacy ratio is the ratio of the total core capital and risk-weighted assets and that regulations require the core capital adequacy ratio to reach 6%. In addition, banks are required to maintain a minimum capital level associated with their risk-weighted assets, as stipulated in Basel III and the Systemic Important Banking Supplement (Trial)(Navas, 2020). Xiong and Zhang (2020) also highlight the impact of regulatory measures on systemically important banks on their business strategies.

Based on the above observations, we propose the hypothesis:

Hypothesis 1: The measures proposed in Basel III require globally systemically important banks to continuously improve their capacity in times of crisis to prevent severe and irreversible impacts on the international financial environment. I think these measures will have a significant impact on banks' ability to withstand risk. So I suspect that it is listed as a global systemically important bank that will significantly increase the risk resilience of China's four largest commercial banks.

3. Data and Methodology

In order to study the impact of being listed as a global systemically important bank on the risk-taking and robustness of China's four central commercial banks, this article uses bank data from 2010 to 2020. In addition to China's four central commercial banks, the data also includes China's 15 top-ranked banks for systemic importance, with a total of 209 observations. All data comes from the WIND database. The four significant businesses in China refer to Bank of China, Industrial and Commercial Bank of China, Agricultural Bank of China, and China Construction Bank. The 15 top-ranked banks for system importance are Bank of Communications, China Merchants Bank, Industrial Bank, Shanghai Pudong Development Bank, China CITIC Bank, China Minsheng Bank, China Postal Savings Bank, Ping An Bank, China Everbright Bank, Huaxia Bank, China Guangfa Bank, and Bank of Ningbo, Bank of Shanghai, Bank of Jiangsu, Bank of Beijing.

When studying the risk tolerance and robustness of banks, this article focused on the capital adequacy ratio (CAR), core capital adequacy ratio (CCAR), and risk-weighted asset ratio (RWAR). The data used in this article is the annual data of 19 banks in the WIND database from 2010 to 2020, and a total of 209 observations are obtained

Capital adequacy ratio (CAR) refers to the total capital divided by its risk-weighted assets (Adam, 2020). The core capital adequacy ratio (CCAR) refers to the ratio of core capital to risk-weighted assets (RWA). The core capital adequacy ratio (CCAR) is the sum of paid-in capital, capital accumulation, surplus accumulation, unallocated profit, and minority shareholders' equity. Moreover, It is obtained by calculating the core capital ratio to RWA (Yang, 2011). Capital adequacy ratios (CAR) and core capital adequacy ratios (CCAR) measure the available capital of banks, thus measuring their stability. Risk-weighted assets (RWA) are the minimum amount of capital a bank must hold to reduce the risk of bankruptcy. Numerically, an increase in capital adequacy ratios (CAR) and core capital adequacy ratios (CCAR) implies an increase in banks' risk tolerance. Therefore, the CAR and the CCAR are regarded as essential measures.

In this paper, *CAR, CCAR,* and *RWAR* measure bank risk resistance and robustness of indicators, whether to list G-SIBs as the central variable. In addition, five control variables are added, including bank size, deposit-to-total asset ratio (*DAR*), loan-to-total asset ratio (*LAR*), cost-to-income ratio (*CIR*), and non-interest income ratio (*NIIR*).

Based on the above information, we can get the specific form of my regression model:

$$y_{i,t} = \alpha + \theta_1 G_{i,t} + \beta_1 Size_{i,t} + \beta_2 LAR_{i,t} + \beta_3 DAR_{i,t} + \beta_4 CIR_{i,t} + \beta_5 NIIR_{i,t} + \varepsilon_{i,t} \quad (1)$$

In regression model (1), $y_{i,t}$ refers to the result of bank *i* when the time is *t*. Where $Size_{i,t}$ is the first set of control variables that represent each bank over time, it represents the size of the selected bank. The $LAR_{i,t}$ is the second control variables that means the ratio of loan-to-total asset. The $DAR_{i,t}$ is the third control variables that means the ratio of deposit-to-total asset. The $CIR_{i,t}$ is the fouth set of variables, it represents the ratio of cost to revenue over time. The $NIIR_{i,t}$ is the

last set of control variables means the ratio of non-interest income. In addition, the model $y_{i,t}$ represents three main dependent variables: the *CAR*, *CCAR,* and *RWAR* are used to measure the bank's ability to resist risk and robustness. And the $G_{i,t}$ is a represents the core variable, if the bank is listed as a global systemically important bank then the value of *i* is 1, otherwise it is 0. The coefficients θ_1 indicates the extent to which banks classified as G-SIBs have an impact on their resilience and robustness. β_1 to β_5 indicates the degree to which the corresponding control variables affect the bank's robustness and risk resistance.

4. Results and Discussions

4.1. Main Results

In solving the problem using the regression model, descriptive statistics are first carried out, showing the number of observations, average, standard deviation, minimum value, value at 25%, value at 50%, value at 75%, and maximum value. Among them, *G-SIBs* represent the core variable in the regression analysis of this paper, i.e., if the bank is listed as a global systemically important bank, the value is 1. Otherwise, it is 0. *CAR, CCAR,* and *RWAR* are dependent variables in regression analysis, also known as result variables. In addition, this article measures the correlation between variables (such as Table 2). Table 3 shows the results of regression processing, where no control variables are added. Regression analysis is designed to verify that when banks are included in the global systemically important banks, they significantly impact banks' resilience and robustness. *G-SIBs* and *CAR,* and *CCAR* are significantly positively correlated through regression result analysis. This result represents an increase in *CAR* and *CCAR* when banks are

listed as globally systemically important, i.e., when the value of the core variable *G-SIBs* changes from 0 to 1. There is no significant relationship between *G-SIBs* and *RWAR,* but this does not mean any relationship between the two.

4.2. Additional Results

After that, five control variables are added before regression analysis is performed. (As in Table 4). Regression analysis is designed to verify whether the inclusion of banks in the Global Systemically Important Bank after the addition of five control variables still has a significant impact on banks' risk resilience and robustness. However, according to the results, after adding the control variable, the influence between the core variable *G-SIBs* and the resulting variables *CAR* and *CCAR* became less significant. There are three possible reasons why this article suggests that the results become less significant.

One reason may be that the effect of other variables on the resulting variables *CAR* and *CCAR* is not the current effect but the effect of the lag phase. Therefore, in Table 5, I lag all the control variables for one period and then do regression analysis, whether the results of the study variables are significantly related to the core variables. According to the regression study of the lag phase of the control variable, the relationship between the result variable *CAR* and the core variable *G-SIBs* is still not significant, while the relationship between the result variable *CCAR* and the result variable *G-SIBs* becomes significantly correlated. Moreover, the coefficients for both are still positive. Therefore, the result is relatively robust.

The second reason may be that there is endogenously between variables, i.e., they may be mutually determining. Therefore, this paper uses the lag phase of the control variable as a tool variable to carry out regression analysis. The results of Table 6 are similar to Table 5, i.e., the

relationship between the result variable *CAR* and the core variable *G-SIBs* is not significant, while the relationship between the result variable *CCAR* and the resulting variable *G-SIBs* is significantly related. Furthermore, most of the relationships between control variables and result variables *CAR* and *CCAR* are not significantly related. This shows that the effect of control variables on result variables is almost non-existent.

The third reason is that *CAR* and *CCAR*'s explanatory variables may be affected by the previous explanatory variables *CAR* and *CCAR*. Therefore, dynamic panel regression is used in this paper. The previous issue of *CAR, CCAR*, and *RWAR* is added to the explanatory variable before performing regression analysis. The results of regression analysis show (Table 7), the result variables *CAR, CCAR,* and *RWAR* of the previous period are significantly related to the significant result variables of the current period. Therefore, it can be seen that there is a strong self-correlation between the result variables, i.e., the current result variables *CAR, CCAR,* and *RWAR* are significantly affected by the previous period of the result variables *CAR, CCAR,* and *RWAR*.

Moreover, after adding the result variables from the previous period, the relationship between the central variable *G-SIBs* and the result variables *CAR* and *CCAR* became significant. However, the relationship between the central variable *G-SIBs* and the resulting variable *RWAR* is still not significant. So the impact on banks' *RWAR* is fragile after they are listed as globally systemically important.

After explaining three reasons, it can be found that the dynamic panel regression model is correct, i.e., the third is correct. *CAR* and *CCAR*'s explanatory variables may be affected by the explanatory variables *CAR* and *CCAR* in the previous period. This also means that the regression analysis of uncontrolled variables is correct.

4.3. Robustness Checks

Finally, to verify the causality between the central variable and the result variable, the difference-in-difference model is used to test the parallel trend. (as in Table 8). Table 8 uses a year-to-year sequence from the three years before the event to the five years after the event to conduct a parallel trend test. Where t0 represents the time of the event. t-1 to t-3 represents three years before the event, and t1 to t5 represents five years after the event. The results of the parallel trend test show that the central variable and the result variable were not significant before t0 (the event occurred), and the relationship after the event was significant. According to Figure 1, for the result variable *CAR*, the relationship between the central variable *G-SIBs* and the result variable *CAR* becomes significantly positively correlated during the event period, whereas before the event occurs, the relationship is not significant. This shows the causality of both. Also, after the event, the significant relationship between the two is incremental and then decreasing. According to Figure 2, for the result variable *CCAR,* the relationship between the central variable *G-SIBs* and the result variable *CCAR* is not significant during the event, and the relationship between the two becomes significantly positive after the event. Moreover, in the next five years, the significance of the relationship between the two is also the first increase and then decrease. According to Figure 3, for the result variable *RWAR,* the relationship between the central variable *G-SIBs* and the result variable *RWAR* is not significant during the event period. However, the relationship between the two increased significantly over the next five years.

5. Conclusions

Using linear regression analysis and DID method, this paper analyzed the impact of the four central commercial banks listed as global systemically important on the robustness of China's four major central commercial banks (Bank of China, Industrial and Commercial Bank of China, Agricultural Bank of China and China Construction Bank). I used the target bank's capital adequacy ratio, core capital adequacy ratio, and risk-weighted asset ratio as the result variables. The regression results show that banks classified as global systemically important capital adequacy ratio are significantly positively correlated with the core capital adequacy ratio. In other words, when banks are classified as globally systemically important, their risk resistance and robustness are significantly improved under Basel III regulations. The target bank's capital adequacy ratio, core capital adequacy ratio, and risk-weighted asset ratio are used as the resulting variables. The regression linear model results show that the relationship between banks listed as internationally systemically important banks and banks' capital adequacy ratio and core capital adequacy ratio is significantly positive. After the control variables are added, the significance of the relationship between the central variable and the result variable disappears. So I started from three angles, first of all the control variables lag a period, and then regression analysis to test the lag of the effect, followed by the control variable's lagging phase as a tool variable for regression analysis to test the endogenously between variables, and finally use dynamic panel regression, the previous period of CAR, CCAR and RWAR added to the explanatory variable to verify the result variable when affected by the previous period of the result variable. The results show that there is a strong self-correlation between the result variables. The robustness check used causality analysis. The difference-in-difference model is used to test the parallel trend to verify the causality between the central and the result variable. The results of the parallel trend test in robustness detection show

that the central variable and the result variable are not significant before the event occurs, and the relationship after the event is significant. Therefore, I concluded that when banks are classified as globally systemically important, their risk resistance and robustness are significantly improved under Basel III regulations.

In Basel III, G-SIBs are regulated in capital adequacy and market liquidity to reduce the financial vulnerability of systemically important banks. In other words, regulation is designed to keep banks running and prevent them from failing because they are vital to national and global finance. Therefore, from the perspective of bank supervision, the systemically important bank's ability to resist risk and soundness is related to a country's economy's healthy and stable development. Therefore, the results of this paper are of reference to China's banking regulators to improve the evaluation methods and regulatory measures of systemically important banks. First, the assessment process and final list confirmation of China's systemically important banks need to consider the impact on the bank's robustness and resilience. Secondly, the subsequent regulatory measures and regulations for systemically important banks should be considered in many ways.

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Figure 1 Paralle trend test for CAR

The figure shows the result of paralle trend test for *CAR*. The *CAR* refers to the capital adequacy ratio, i.e., the total amount of capital divided by its risk-weighted assets. The time of "event" means the happened time of being listed as the global systemically important banks.

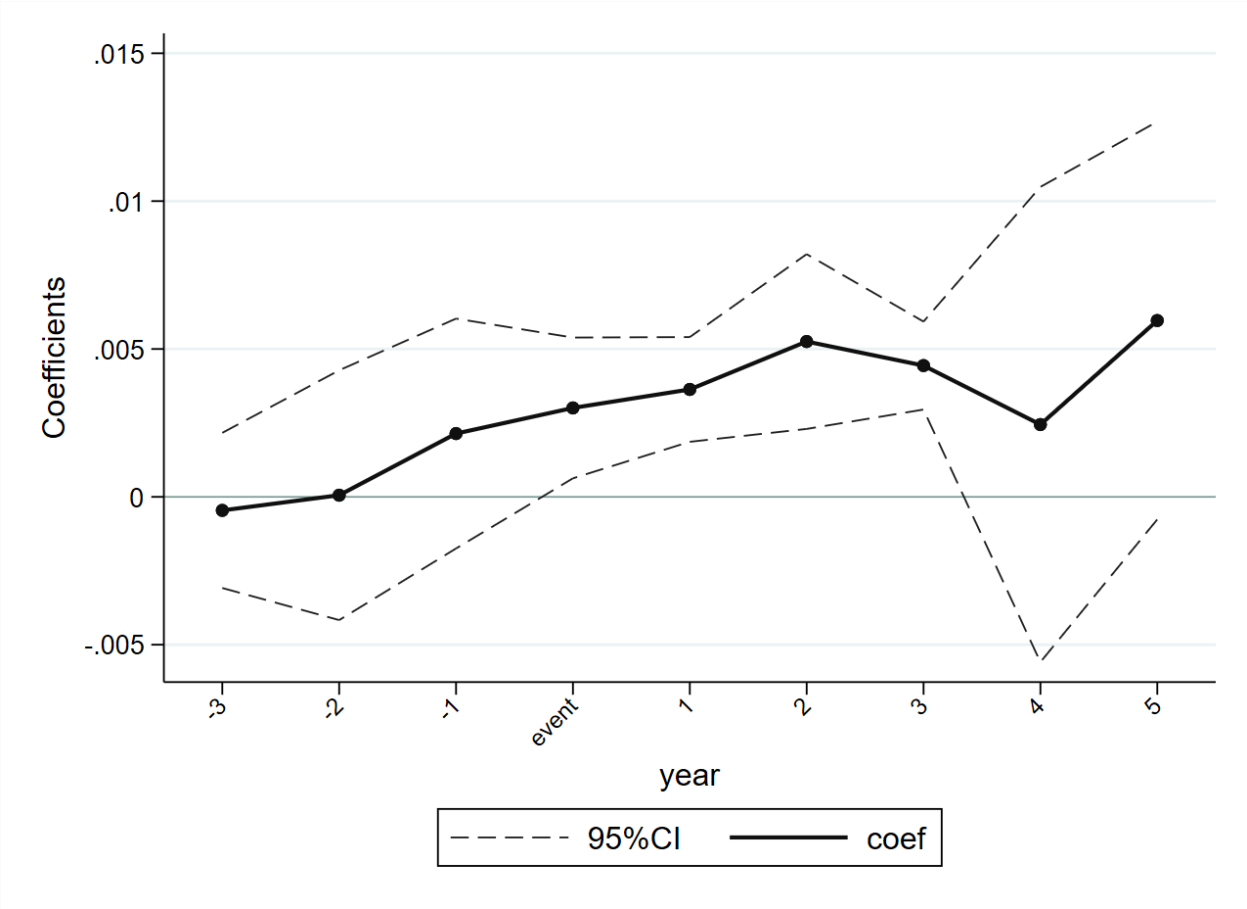

Figure 2 Paralle trend test for CCAR

The figure shows the result of paralle trend test for *CCAR*. *CCAR* is the core capital adequacy ratio, the ratio of core capital to risk-weighted assets. The time of "event" means the happened time of being listed as the global systemically important banks.

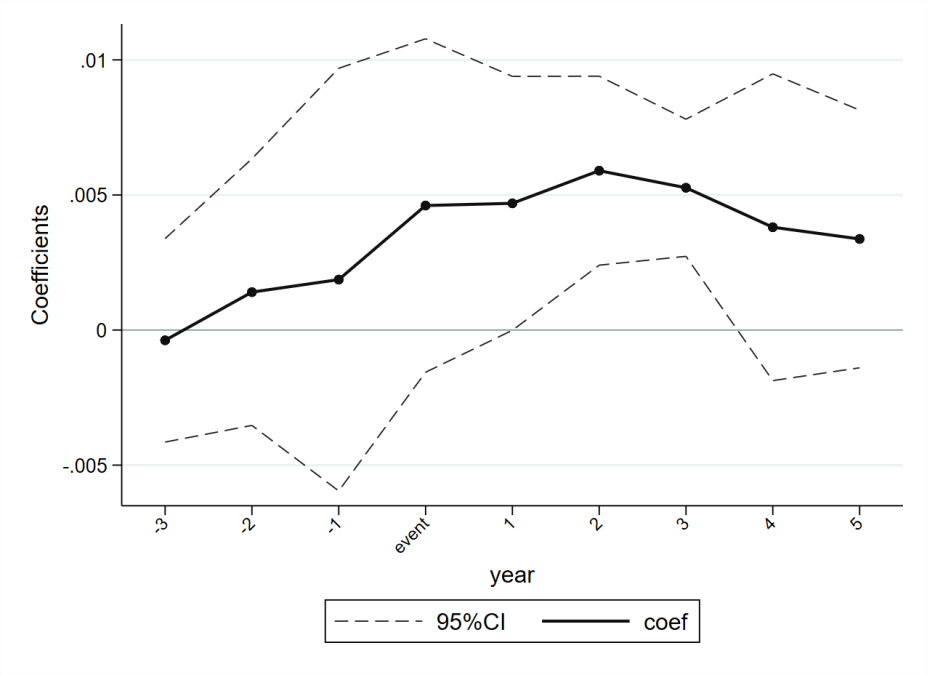

Figure 3 Paralle trend test for RWAR

The figure shows the result of paralle trend test for *RWAR*. *RWAR* is the weighted risk asset ratio, the ratio of weighted risk assets to bank loan balances. The time of "event" means the happened time of being listed as the global systemically important banks.

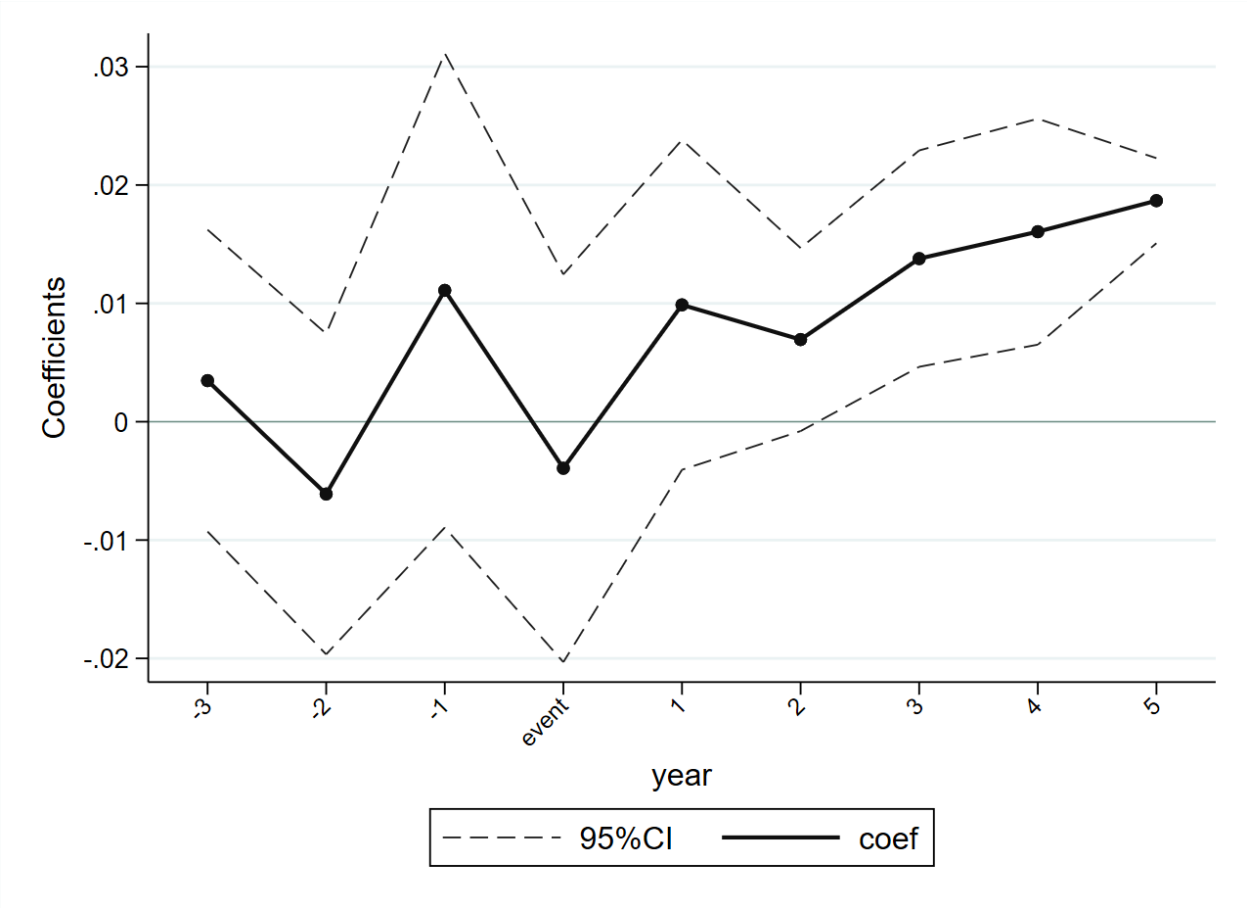

Table 1: Descriptive statistics

The table is the descriptive statistics that show the number of observations, averages, standard deviations, minimums, values ranked at 25%, values ranked at 50%, values ranked at 75%, and maximum values. Among them, *G-SIBs* represent the core variable in the regression analysis of this paper, i.e., if the bank is listed as a global systemically important bank, the value is 1. Otherwise, it is 0. *CAR, CCAR,* and *RWAR* are dependent variables in regression analysis, also known as result variables. *CAR* refers to the capital adequacy ratio, i.e., the total amount of capital divided by its risk-weighted assets. *CCAR* is the core capital adequacy ratio, the ratio of core capital to risk-weighted assets. *RWAR* is the weighted risk asset ratio, the ratio of weighted risk assets to bank loan balances. The remaining five are control variables in regression analysis, *Size* refers to the size of the bank, *LAR* is the ratio of loans to total assets, *DAR* is the ratio of deposits to total assets, *CIR* is the ratio of cost to revenue, and *NIIR* is the ratio of non-interest income.

Variable	*Number*	*Mean*	*StdDev*	*Min*	*25%*	*50%*	*75%*	*Max*
GSIBs	209	0.150	0.360	0	0	0	0	1
CAR	209	0.130	0.020	0.080	0.110	0.120	0.140	0.180
CCAR	209	0.100	0.010	0.070	0.090	0.090	0.100	0.140
RWAR	209	0.630	0.080	0.310	0.590	0.630	0.680	0.780
SIZE	209	29.04	1.070	26.290	28.290	29.020	29.760	31.140
LAR	209	0.500	0.080	0.250	0.450	0.510	0.560	0.620
DAR	209	0.670	0.110	0.440	0.570	0.660	0.740	0.950
CIR	209	0.320	0.080	0	0.270	0.300	0.340	0.730
NIIR	209	0.240	0.110	0.030	0.160	0.230	0.310	0.620

Table 2 Correlations

The table shows the correlations between the variables. Among them, *G-SIBs* represent the core variable in the regression analysis of this paper, i.e., if the bank is listed as a global systemically important bank, the value is 1. Otherwise, it is 0. *CAR, CCAR,* and *RWAR* are dependent variables in regression analysis, also known as result variables. *CAR* refers to the capital adequacy ratio, i.e., the total amount of capital divided by its risk-weighted assets. *CCAR* is the core capital adequacy ratio, the ratio of core capital to risk-weighted assets. *RWAR* is the weighted risk asset ratio, the ratio of weighted risk assets to bank loan balances. The remaining five are control variables in regression analysis, *Size* refers to the size of the bank, *LAR* is the ratio of loans to total assets, *DAR* is the ratio of deposits to total assets, *CIR* is the ratio of cost to revenue, and *NIIR* is the ratio of non-interest income. I use * to express when p is less than 0.1, while ** describes the situation when p is less than 0.05 and *** represents p is less than 0.01.

	G-SIBs	*CAR*	*CCAR*	*RWAR*	*SIZE*	*LAR*	*DAR*
G-SIBs	1						
CAR	0.541***	1					
CCAR	0.621***	0.848***	1				
RWAR	-0.086	0.024	-0.177**	1			
SIZE	0.638***	0.476***	0.552***	-0.061	1		
LAR	0.288***	0.375***	0.283***	0.475***	0.322***	1	
DAR	0.263***	-0.060	0.124*	-0.614***	0.268***	0.092	1
CIR	0.174**	-0.351***	-0.285***	-0.581***	-0.142**	-0.304***	0.593***
NIIR	0.0900	0.287***	0.171**	0.523***	0.304***	0.267***	0.522***

Table 3 Regression processing

The table shows the results of regression processing, where no control variables are added. Regression analysis is designed to verify that when banks are included in the global systemically important banks, they significantly impact banks' resilience and robustness. In the table, *G-SIBs* represent the core variable in this regression analysis, i.e., the value is one if the bank is listed as a globally systemically important bank, otherwise, it is 0. *CAR, CCAR*, and *RWAR* are dependent variables in regression analysis, also known as result variables. *CAR* refers to the capital adequacy ratio, i.e., the total amount of capital divided by its risk-weighted assets. *CCAR* is the core capital adequacy ratio, the ratio of core capital to risk-weighted assets. RWAR is the weighted risk asset ratio, the ratio of weighted risk assets to bank loan balances. *G-SIBs* and *CAR,* and *CCAR* are significantly positively correlated through regression result analysis. This result represents an increase in *CAR* and *CCAR* when banks are listed as globally systemically important, i.e., when the value of the core variable *G-SIBs* changes from 0 to 1. There is no significant relationship between *G-SIBs* and *RWAR.* I use * to express when p is less than 0.1, while ** describes the situation when p is less than 0.05 and *** represents p is less than 0.01.

	(1)	*(2)*	*(3)*
VARIABLES	*CAR*	*CCAR*	*RWAR*
GSIBs	0.01229***	0.01318**	-0.02005
	(4.43)	(2.85)	(-1.03)
Constant	0.12511***	0.09409***	0.63081***
	(303.95)	(137.11)	(218.26)
Observations	209	209	209
R-squared	0.833	0.769	0.818

Table 4 Regression processing with control variables

The table shows the results of regression processing, with five control variables added. Regression analysis is designed to verify that when banks are included in the global systemically important banks, they have a significant impact on banks' resilience and robustness. Among them, *G-SIBs* represent the core variable in the regression analysis of this paper, i.e., if the bank is listed as a global systemically important bank, the value is 1. Otherwise, it is 0. *CAR, CCAR,* and *RWAR* are dependent variables in regression analysis, also known as result variables. *CAR* refers to the capital adequacy ratio, i.e., the total amount of capital divided by its risk-weighted assets. *CCAR* is the core capital adequacy ratio, the ratio of core capital to risk-weighted assets. *RWAR* is the weighted risk asset ratio, the ratio of weighted risk assets to bank loan balances. The remaining five are control variables in regression analysis, *Size* refers to the size of the bank, *LAR* is the ratio of loans to total assets, *DAR* is the ratio of deposits to total assets, *CIR* is the ratio of cost to revenue, and *NIIR* is the ratio of non-interest income. I use * to express when p is less than 0.1, while ** describes the situation when p is less than 0.05 and *** represents p is less than 0.01.

	(1)	*(2)*	*(3)*
VARIABLES	*CAR*	*CCAR*	*RWAR*
G-SIBs	0.00522	0.00573	-0.01079
	(1.61)	(1.25)	(-0.55)
SIZE	-0.02347**	-0.03600**	0.10415**
	(-2.21)	(-2.66)	(2.19)
LAR	0.01772	-0.01794	0.73004***
	(0.47)	(-0.67)	(5.04)
DAR	-0.00197	-0.00793	0.03819
	(-0.09)	(-0.33)	(0.41)
CIR	-0.00112	-0.01194	-0.01573
	(-0.07)	(-0.67)	(-0.15)
NIIR	-0.00324	0.00932	0.06896
	(-0.21)	(0.80)	(0.92)
Constant	0.80132**	1.15614**	-2.79444*
	(2.47)	(2.86)	(-1.97)
Observations	209	209	209
R-squared	0.853	0.807	0.892

Table 5 Difference-in-difference regression processing

The table shows the regression results after a one-phase lag of all control variables. Among them, *G-SIBs* represent the core variable in the regression analysis of this paper, i.e., if the bank is listed as a global systemically important bank, the value is 1. Otherwise, it is 0. *CAR, CCAR,* and *RWAR* are dependent variables in regression analysis, also known as result variables. *CAR* refers to the capital adequacy ratio, i.e., the total amount of capital divided by its risk-weighted assets. *CCAR* is the core capital adequacy ratio, the ratio of core capital to risk-weighted assets. *RWAR* is the weighted risk asset ratio, the ratio of weighted risk assets to bank loan balances. The remaining five are the lag phase of the control variables in the regression analysis, *Size* refers to the size of the bank, *LAR* is the ratio of loans to total assets, *DAR* is the ratio of deposits to total assets, *CIR* is the ratio of cost to revenue, and *NIIR* is the ratio of non-interest income. I use * to express when p is less than 0.1, while ** describes the situation when p is less than 0.05 and *** represents p is less than 0.01.

	(1)	*(2)*	*(3)*
VARIABLES	*CAR*	*CCAR*	*RWAR*
GSIBs	0.00541	0.00831*	-0.00482
	(1.65)	(1.88)	(-0.23)
L.SIZE	-0.01799*	-0.02966***	0.12986**
	(-1.91)	(-3.17)	(2.64)
L.LAR	0.01721	-0.01790	0.61831***
	(0.50)	(-0.81)	(4.41)
L.DAR	0.00090	-0.02201	-0.05037
	(0.08)	(-1.64)	(-0.45)
L.CIR	0.00398	-0.00703	-0.10245
	(0.14)	(-0.28)	(-0.73)
L.NIIR	-0.00309	-0.00287	0.10087
	(-0.18)	(-0.22)	(1.31)
Constant	0.63883**	0.98138***	-3.38970**
	(2.23)	(3.45)	(-2.37)
Observations	190	190	190
R-squared	0.866	0.837	0.869

Table 6 Difference-in-difference regression

The table shows the results of regression analysis after a lag period is used as a tool variable for control variables. Among them, *G-SIBs* represent the core variable in the regression analysis of this paper, i.e., if the bank is listed as a global systemically important bank, the value is 1. Otherwise, it is 0. *CAR, CCAR,* and *RWAR* are dependent variables in regression analysis, also known as result variables. *CAR* refers to the capital adequacy ratio, i.e., the total amount of capital divided by its risk-weighted assets. *CCAR* is the core capital adequacy ratio, the ratio of core capital to risk-weighted assets. *RWAR* is the weighted risk asset ratio, the ratio of weighted risk assets to bank loan balances. The remaining five are control variables in regression analysis, *Size* refers to the size of the bank, *LAR* is the ratio of loans to total assets, *DAR* is the ratio of deposits to total assets, *CIR* is the ratio of cost to revenue, and *NIIR* is the ratio of non-interest income. We use * to express when p is less than 0.1, while ** describes the situation when p is less than 0.05 and *** represents p is less than 0.01.

VARIABLES	*(1)* *CAR*	*(2)* *CCAR*	*(3)* *RWAR*
SIZE	-0.02653**	-0.03511***	0.11690*
	(-2.20)	(-3.73)	(1.85)
LAR	0.01639	-0.02044	0.73213***
	(0.54)	(-0.87)	(6.65)
DAR	0.02367	-0.02347	0.01643
	(0.69)	(-1.40)	(0.11)
CIR	0.00453	-0.00155	-0.12339
	(0.10)	(-0.05)	(-0.53)
NIIR	-0.00025	-0.00130	0.06856
	(-0.01)	(-0.05)	(0.53)
GSIBs	0.00429	0.00803*	-0.00656
	(1.63)	(1.94)	(-0.37)
Constant	0.96154***	1.24409***	-3.45121*
	(2.64)	(4.24)	(-1.80)
Observations	190	190	190
R-squared	0.870	0.845	0.896

Table 7 Dynamic panel regression

The table uses dynamic panel regression. The previous issue of *CAR*, *CCAR*, and *RWAR* is added to the explanatory variable before regression analysis is performed. The results of regression analysis show that there is a significant correlation between the result variables *CAR*, *CCAR* and *RWAR* in the previous period and the large result variables in the current period. Among them, *G-SIBs* represent the core variable in the regression analysis of this paper, i.e., if the bank is listed as a global systemically important bank, the value is 1. Otherwise, it is 0. *CAR, CCAR,* and *RWAR* are dependent variables in regression analysis, also known as result variables. *CAR* refers to the capital adequacy ratio, i.e., the total amount of capital divided by its risk-weighted assets. *CCAR* is the core capital adequacy ratio, the ratio of core capital to risk-weighted assets. *RWAR* is the weighted risk asset ratio, the ratio of weighted risk assets to bank loan balances. The remaining five are control variables in regression analysis, *Size* refers to the size of the bank, *LAR* is the ratio of loans to total assets, *DAR* is the ratio of deposits to total assets, *CIR* is the ratio of cost to revenue, and *NIIR* is the ratio of non-interest income. L.CAR, L.CCAR, and L.RWAR represents the result variable for the previous period. We use * to express when p is less than 0.1, while ** describes the situation when p is less than 0.05 and *** represents p is less than 0.01.

VARIABLES	*(1)* *CAR*	*(2)* *CCAR*	*(3)* *RWAR*
L.CAR	0.56738***		
	(10.76)		
SIZE	0.00407***	0.00083	-0.01449***
	(2.87)	(0.83)	(-2.87)
LAR	0.04708***	0.00962	0.30946***
	(4.01)	(1.25)	(6.32)
DAR	-0.01901	0.00625	-0.11267**
	(-1.52)	(0.71)	(-2.22)
CIR	0.01826	0.00086	-0.03272
	(1.37)	(0.09)	(-0.64)
NIIR	0.00737	0.00811	0.13392***
	(0.76)	(1.16)	(3.75)
GSIBs	0.00614*	0.00920***	-0.01821
	(1.87)	(3.74)	(-1.55)
L.CCAR		0.58091***	
		(11.27)	
L.RWAR			0.45761***
			(9.13)
Constant	-0.08076**	0.00429	0.67069***
	(-2.18)	(0.16)	(4.74)
Observations	190	190	190
Number of id	19	19	19

Table 8 Robust-check: Different-in-different paralle trend test

The table is to verify the causality between the central variable and the result variable, which uses the DID model to carry out parallel trend testing. Table 8 uses a year-to-year sequence from the three years before the event to the five years after the event to conduct a parallel trend test. Where t0 represents the time of the event. T-1 to t-3 represents three years before the event and t1 to t5 represents five years after the event. $G_{i,t}$ represents the central variable in the regression analysis of this paper, i.e., if the bank is listed as a global systemically important bank, the value is 1. I use * to express when p is less than 0.1, while ** describes the situation when p is less than 0.05 and *** represents p is less than 0.01.

	(1)	*(2)*	*(3)*
Time	*CAR*	*CCAR*	*RWAR*
G_{t-3}	-0.00046	-0.00038	0.00347
	(-0.37)	(-0.21)	(0.57)
G_{t-2}	0.00006	0.00140	-0.00611
	(0.03)	(0.60)	(-0.95)
G_{t-1}	0.00214	0.00187	0.01110
	(1.16)	(0.50)	(1.16)
G_{t0}	0.00301**	0.00461	-0.00393
	(2.65)	(1.57)	(-0.50)
G_{t1}	0.00363***	0.00469*	0.00988
	(4.31)	(2.10)	(1.49)
G_{t2}	0.00525***	0.00590***	0.00694*
	(3.73)	(3.54)	(1.89)
G_{t3}	0.00444***	0.00527***	0.01378***
	(6.27)	(4.36)	(3.17)
G_{t4}	0.00245	0.00381	0.01606***
	(0.64)	(1.41)	(3.53)
G_{t5}	0.00596*	0.00337	0.01868***
	(1.86)	(1.49)	(10.92)
Constant	0.11123***	0.08551***	0.58878***
	(31.06)	(19.81)	(47.84)
Observations	86	86	86
R-squared	0.891	0.828	0.792
Number of id	19	19	19