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How Deposit Insurance Systems Impact the Risk Levels of Commercial Banks: An Empirical Analysis Using the Difference-in-Differences Method on A-Share Listed Banks

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Abstract: *This paper investigates the impact of China's deposit insurance system on the risk levels of A-share listed commercial banks, offering policy recommendations. The deposit insurance system, implemented in 2015, is vital for financial stability and depositor protection. Using a difference-in-differences (DID) empirical analysis on data from 2007 to 2023, the study finds that the deposit insurance system significantly reduces non-performing loan (NPL) ratios among commercial banks. The analysis reveals that larger banks experience a diminishing impact of the system on risk levels, indicating a significant marginal diminishing effect. Regional factors do not significantly affect the reduction in NPL ratios, demonstrating the policy's uniform effectiveness nationwide. The findings provide guidance for risk management and contribute to the stability of China's financial system, offering relevant policy recommendations for regulators, insurance institutions, and commercial banks.*

Keywords: *Deposit Insurance System, Commercial Bank Risk Levels, Non-Performing Loan Ratio, Difference-in-Differences Model*

1. Introduction

The deposit insurance system, defined by the Basel Committee as one of the three major tools of the financial safety net, plays a critical role in the entire financial industry[1]. In the late 19th century, the U.S. Congress began discussing the topic of deposit insurance, with 14 U.S. states establishing deposit insurance systems between 1829 and 1917. In the 1930s, to rescue the banking system on the verge of collapse due to the economic crisis, the U.S. Congress passed the Glass-Steagall Act in 1933. The Federal Deposit Insurance Corporation (FDIC), a government agency providing deposit insurance for banks, was established in 1933 and began implementing deposit insurance in 1934[2]. This initiative aimed to prevent bank runs and ensure the stability of the banking system, pioneering the world's first and truly meaningful deposit insurance system.

As shown in Table 1, China's deposit insurance system was established with the promulgation of the "Deposit Insurance Regulations" on February 17, 2015, and was formally implemented on May 1 of the same year[3]. Prior to this, China adhered to an implicit deposit insurance system. Although no related legal provisions were introduced, China had been exploring legislative aspects of the deposit insurance system since 1993[4].

Table 2 compares explicit and implicit deposit insurance systems, highlighting key differences in compensation authority, premium payment, market conditions, and guarantee capacity. The explicit system involves a formal agency and premium payments with high guarantee strength, while the implicit system relies on government discretion with no premiums and lower guarantee strength.

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Table 1: Milestones in the Establishment of China's Deposit Insurance System.

Year	Event
1993	The State Council issued the "Decision on Financial System Reform" and began exploring the establishment of a deposit insurance system.
1997	The People's Bank of China led the formation of a special research group on deposit insurance.
April 2024	The Deposit Insurance Division of the Financial Stability Bureau of the People's Bank of China was established.
December 2004	The initial draft of the "Deposit Insurance Regulations" began to be drafted.
2006	The People's Bank of China issued an official document clarifying the role of the deposit insurance system and the preparation and deployment arrangements for its establishment.
2007	The National Financial Development Conference was held, marking the transition of China's deposit insurance system from theoretical design to practical implementation.
2014	The Third Plenary Session of the 18th Central Committee of the Communist Party of China proposed strategic goals for financial reform and conducted preliminary explorations and attempts related to the deposit insurance system.
March 2015	The State Council officially issued the "Deposit Insurance Regulations."
May 2015	The "Deposit Insurance Regulations" were formally implemented.

Table 2: Comparison between Explicit and Implicit Deposit Insurance Systems.

Item	Explicit Deposit Insurance System	Implicit Deposit Insurance System
Compensation Authority	Typically a deposit insurance agency	Typically the government or central bank
Premium Payment	Requires payment of premiums	Government-guaranteed, no premium required
Time Frame	Before May 1, 2015	From May 1, 2015
Market Conditions	Requires a comprehensive market support system, including information disclosure, market constraints, legal construction, etc.	Requires relatively fewer market conditions and support systems; more applicable in markets with less developed systems
Guarantee Capacity	High guarantee strength, compensation determined by the insurance contract	Low guarantee strength, compensation determined by government discretion

As of the end of 2023, a total of 3,939 banking financial institutions across China participated in the deposit insurance scheme. In 2023, premiums collected amounted to 54.977 billion RMB, with interest income of 3.7454 billion RMB and dividend distributions of 0.3475 billion RMB. As illustrated in Table 3, in 2023, the Deposit Insurance Fund's main income included RMB 549.77 billion in premiums, RMB 37.454 billion in interest, and RMB 3.475 billion in dividends. The main expenditures were RMB 115 billion for risk disposal and RMB 215.133 billion for repayment of the Financial Stability Re-loan.

Table 3: Main Income and Expenditure of the Deposit Insurance Fund in 2023.

Item	Amount (RMB)
Main Income	
1. Premium	549.77 billion
2. Interest	37.454 billion
3. Dividend Distribution	3.475 billion
Main Expenditure	
1. Risk Disposal	115 billion
2. Repayment of Financial Stability Re-loan	215.133 billion

2. Research Significance

Since the onset of the COVID-19 pandemic, especially from 2023 onwards, the global economic downturn has become evident, and systemic financial risks have gradually emerged. Many commercial banks, represented by Silicon Valley Bank in the United States and United Bank of Switzerland, have experienced soaring risk levels, leading to bankruptcy and restructuring[5]. Concurrently, under the pressure of economic downturn and systemic financial risks, Chinese commercial banks are also facing

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certain operational risks and pressures. This year marks the ninth year since the formal implementation of the deposit insurance system in China. This paper focuses on examining whether the establishment of the deposit insurance system can effectively reduce the risk levels of commercial banks. The findings of this study have reference and guidance value for the development of Chinese commercial banks and the stability of the financial system.

3. Empirical Study

3.1. Indicator Selection

3.1.1. Explained Variable

We focus on the non-performing loan ratio (NPL) as a risk measurement indicator. If the borrower delays repayment for three months, the loan is considered a non-performing loan. When a bank determines that a non-performing loan is unrecoverable, it should be written off from profits. When a loan is expected to be unrecoverable but not yet determined, a provision for bad debt losses should be made on the books. Non-performing loans are usually classified into five categories based on risk: normal, special mention, substandard, doubtful, and loss[6]. The NPL ratio can be directly calculated using the following formula, and it is a key indicator that must be disclosed in the financial reports of listed commercial banks. The specific calculation formula is as follows:

$$Non\text{-}performing\ Loan\ Ratio = \left(\frac{Substandard\ loans + Doubtful\ loans + Loss\ loans}{Total\ loans}\right) \times 100\%$$

NPL ratio directly reflects the level of credit risk faced by banks in their loan business. It also has the characteristics of wide applicability and quantifiability. The NPL ratio refers to the proportion of non-performing loans to the total loan balance of financial institutions. Whether it is the internal governance and management of commercial banks in China, the financial regulator CBIRC, or third-party regulators such as investors and the media, this indicator is used as an important measure of commercial bank risk levels. Therefore, using the NPL ratio as an indicator of commercial bank risk levels is reasonable.

3.1.2. Explanatory Variables

We use the estimated variables of the difference-in-differences (DID) model as explanatory variables, mainly represented by the interaction term $Treat \times Time$.

To avoid the impact of related factors on the NPL ratio, control variables are introduced in the model construction, including changes in the NPL ratio of commercial banks before and after the promulgation of the Deposit Insurance Regulations.

As is shown in Table 4, at the micro-level (enterprise level), company size (Size), leverage ratio (Lev), loan-to-deposit ratio (LDR), capital adequacy ratio (CAR), return on assets (ROA), and growth (Growth) are used; At the meso-level (industry level), the RMB deposit reserve ratio (RDRR) and the banking industry prosperity index (BCI) are used; At the macroeconomic level, the year-on-year growth rate of money supply (M_2) and China's GDP growth rate (GDP) are used.

Table 4: Variable Definition.

Variable Type	Variable Name	Variable Meaning
Explained Variable	NPL	Non-performing Loan Ratio
Main Explanatory Variables	Treat	Enterprise Dummy Variable (1 for Big Five Banks, 0 for Non-Big Five Banks)
	Time	Time Dummy Variable (0 for 2007-2015, 1 thereafter)
Control Variables	Size	Company Size
	Lev	Leverage Ratio
	LDR	Loan-to-Deposit Ratio
	CAR	Capital Adequacy Ratio
	ROA	Return on Assets
	Growth	Growth
	RDRR	RMB Deposit Reserve Ratio
	BCI	Banking Industry Prosperity Index
	GDP	China’s GDP Growth Rate
	M_2	Year-on-Year Growth Rate of Money Supply

Calculation Methods for Important Variables

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$$Non\text{-}performing\ Loan\ Ratio = \frac{Non\text{-}performing\ loans}{Total\ loan\ balance}$$

$$Size = \ln(Total\ assets\ per\ year)$$

$$Leverage\ Ratio = \frac{Fixed\ assets}{Total\ assets}$$

$$Loan\text{-}to\text{-}Deposit\ Ratio = \frac{Bank\ deposits}{Loans}$$

$$Capital\ Adequacy\ Ratio = \frac{Capital}{Risk\ assets}$$

$$Return\ on\ Assets = \frac{Net\ profit}{Total\ assets}$$

$$Growth = \frac{Total\ operating\ income\ of\ the\ year - Total\ operating\ income\ of\ the\ previous\ year}{Total\ operating\ income\ of\ the\ previous\ year}$$

$$GDP\ Growth\ Rate = \frac{GDP\ of\ the\ year - GDP\ of\ the\ previous\ year}{GDP\ of\ the\ previous\ year}$$

$$M2\ Growth\ Rate = \frac{M2\ of\ the\ year - M2\ of\ the\ previous\ year}{M2\ of\ the\ previous\ year}$$

This choice of variables helps to eliminate confounding factors that might lead to misleading conclusions. By considering multiple related factors, it is possible to more clearly distinguish the causal relationships between the non-performing loan ratio and other variables. This also helps to mitigate endogeneity issues, where variables in the study might mutually influence each other.

Table 5: Correlation Test Result.

Variables	NPL	did	LDR	CAR	Size	Lev	Growth	ROA	BCI	GDP	M_2	RDRR
NPL	1.000											
did	-0.047	1.000										
LDR	-0.010	0.392*	1.000									
CAR	-0.235**	0.145	0.107***	1.000								
Size	-0.082**	0.088**	0.360*	0.016	1.000							
Lev	0.367*	-0.275**	-0.360*	-0.782**	0.001	1.000						
Growth	0.046	-0.418*	-0.331*	-0.124	-0.266**	0.266*	1.000					
ROA	-0.218	-0.435*	-0.162**	0.202***	-0.095**	-0.162	0.253*	1.000				
BCI	0.105***	-0.574***	-0.281**	-0.164	-0.279*	0.321	0.504*	0.277**	1.000			
GDP	0.210**	-0.569***	-0.354*	-0.232**	-0.282**	0.357***	0.529**	0.225**	0.752*	1.000		
M_2	0.080**	-0.622***	-0.304***	-0.228***	-0.265**	0.327***	0.234**	0.228*	0.686*	0.531**	1.000	
RDRR	-0.112***	-0.625***	-0.500***	-0.184**	-0.173***	0.242***	0.346***	0.447**	0.340**	0.385**	0.242***	1.000

t statistics in parentheses

$^{*}p < 0.1,\ p < 0.05,\ ^{*}p < 0.01$

The correlation analysis results (Table 5) exhibit the following notable characteristics:

● There exists a very strong correlation between macroeconomic indicators, meso-level industry indicators, and micro-level indicators of individual banks. About 80% of the macro and meso-level indicators show a strong correlation with micro-level indicators, with a p-value < 0.01. This highlights the close relationship between commercial banks' financial performance and indicators and the overall macroeconomic performance.

● At the micro-level, overall, except for the strong correlations between CAR and NPL, and CAR and LDR, the correlations among other indicators are not strong.

Thus, it can be concluded that the correlation analysis indicates that the provided data conditionally supports the next stage of research.

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3.2. Empirical Model Design

3.2.1. Difference-in-Differences (DID) Model

As exemplified in Figure1, the Difference-in-Differences (DID) model can effectively verify the impact of exogenous policy shocks under complex transmission mechanisms and is widely used for evaluating the effectiveness of public policies. By performing two differences on the sample groups before and after the policy, we can compare the banks directly affected by the policy (the treatment group) with the unaffected samples (the control group) to assess the impact of the policy, as is

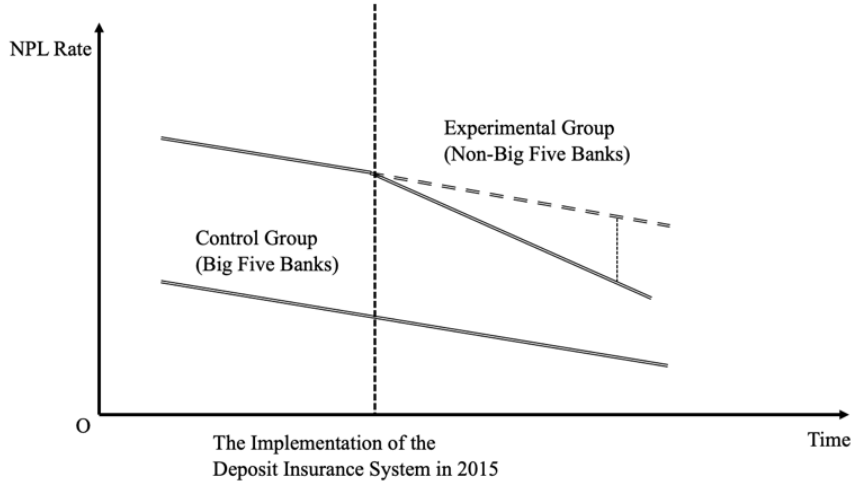

Figure 1: The diagram of the Difference-in-Differences (DID) Model.

Based on DID, the PSM-DID model uses Propensity Score Matching (PSM) to address potential selection bias. PSM helps match the observation units in the treatment and control groups, making their characteristic distributions more similar before treatment, thereby reducing the bias caused by the selection of observation units. This helps in more accurately estimating the treatment effect and is an ideal policy evaluation tool model. Due to the limitations of the author's level, a regular DID model is used for empirical analysis here.

It is worth noting that due to the large size and relatively strong operational capabilities of state-owned commercial banks, they are perceived by depositors as "too big to fall" and still enjoy an implicit deposit insurance system backed by the government. Their lower risk profile results in lower premium rates, and their strong operational capabilities allow them to maintain their original operational state despite changes in the external environment. Additionally, the deposit insurance system asymmetrically affects state-owned and city commercial banks. The implicit guarantee provided by the government has a smaller impact on state-owned banks. Lastly, the five major state-owned banks undertake some policy tasks and social responsibility goals, theoretically making them less affected by the implementation of the deposit insurance system, which can be considered negligible.

Following Cheng, Wang and He(2023)[7], We view the implementation of the deposit insurance system as a quasi-natural experiment, treating the five major state-owned banks (Bank of China, Bank of Communications, China Construction Bank, Industrial and Commercial Bank of China, and Agricultural Bank of China) as the control group and the 42 A-share listed commercial banks (excluding the five major banks) as the treatment group. The following standard DID model is set up:

$$NPL_{i,t} = \alpha_0 + \alpha_1(Treat \times Time) + \lambda Controls + year_i + \mu_{i,t} + \varepsilon_{i,t}$$

In this model, the interaction term $Treat \times Time$ is the core explanatory variable, where Treat indicates whether the bank belongs to the treatment group (1 for the treatment group, i.e., small and medium-sized commercial banks (excluding the five major banks); 0 for the control group, i.e., the five major state-owned commercial banks). The dummy variable *Time* represents the formal implementation time of the deposit insurance system policy (0 for 2015 and earlier, 1 for after 2015). The regression coefficient α_1 is the DID estimator, which reflects the impact of the implementation of the deposit insurance system on the profitability of commercial banks in China excluding the five major banks. This coefficient is the main focus of this paper. If the implementation of the deposit insurance system helps reduce the risk level (i.e., non-performing loan ratio, NPL) of banks excluding the five major banks, the coefficient α_1 should

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be significantly negative; otherwise, it would be insignificant or significantly positive. year_t represents time fixed effects, $\mu_{i,t}$ represents individual fixed effects, and $\varepsilon_{i,t}$ represents random disturbance terms.

3.2.2. Sample Selection and Sources

The deposit insurance system was officially implemented in May 2015, making 2015 the event point for this study. Considering the policy's lagged effects and the completeness and availability of data, the study period spans from 2007 to 2023, covering data from all 42 A-share listed commercial banks.

The data used in this study are sourced from the Wind database and iFinD database by Tonghuashun.

3.2.3. Data Sources and Processing

To select samples that meet the research needs, the sample variables were processed as follows:

- Samples with missing data were excluded to ensure a complete and consistent dataset.
- Outliers were handled by trimming at the 1% and 99% levels to avoid the influence of individual outliers on the empirical results.

According to the above criteria, the final sample included annual data from 42 A-share listed banks, totaling 641 panel data observations.

4. Empirical Results

4.1. Descriptive Statistics

By comparing the data from Table 6 and 7, it can be observed that after the implementation of the deposit insurance system in 2015, the core explanatory variable, namely the non-performing loan (NPL) ratio, showed a significant change. Specifically, the average NPL ratio decreased from 1.442 to 1.398, a reduction of about 8%. This downward trend reflects the positive impact of the deposit insurance system on the management of non-performing loans by banks.

At the same time, changes in other control variables can also be observed. Besides a significant increase in company size, there were decreases in corporate leverage, corporate growth, net profit of total assets, and capital adequacy ratio. These changes indicate a shift from rapid growth to high-quality development in banks and reflect a greater emphasis on risk management and reduction of risk capital proportion following the implementation of the deposit insurance system in 2015.

Moreover, from the meso and macro data perspective, several changes can be observed. GDP growth rate significantly slowed down from 9.136% to 5.735%; the growth rate of M_2 and the banking climate index also showed significant downward trends. This trend reflects China's economic transition period, with economic development shifting from high-speed growth to medium-to-high-speed high-quality development, alongside tightened monetary policy and the economic downturn trend since the COVID-19 pandemic in 2020. These macroeconomic and industry factors, compared to the period before 2015, have posed certain operational pressures and challenges to the banking industry.

Table 6 and 7 demonstrates the descriptive statistics before and after the implementation of the deposit insurance system in 2015.

Table 6: Descriptive Statistics before the Implementation of the Deposit Insurance System in 2015.

Variables	Number	Mean	Std. Dev.	min	max
NPL	345	1.442	1.588	0.12	13.97
LDR	345	64.70	9.954	26.32	83.78
CAR	345	12.55	3.188	3.400	40.30
Size	345	7.945	1.492	5.108	11.20
Lev	345	93.79	2.095	76.48	98.74
Growth	345	26.11	18.14	-31.09	127.1
ROA	345	1.087	0.321	0.148	2.135
BCI	345	78.93	8.779	60.50	89.10
GDP	345	9.136	2.031	7.041	14.23
M_2	345	16.21	4.482	12.20	27.68
RDRR	345	18.21	2.215	14.50	21

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Table 7: Descriptive Statistics after the Implementation of the Deposit Insurance System in 2015.

Variables	Number	mean	Std. Dev.	min	max
NPL	373	1.41	0.350	0.750	2.470
LDR	373	76.01	14.84	38.97	116.2
CAR	373	13.92	1.571	10.80	19.26
Size	373	9.472	1.672	6.701	12.89
Lev	373	92.46	1.049	89.67	95.80
Growth	373	8.523	8.558	-15.60	33.98
ROA	373	0.852	0.168	0.420	1.437
BCI	373	67.93	2.218	63.90	70.70
GDP	373	5.735	2.104	2.200	8.400
M_2	373	9.586	1.399	8.100	11.80
RDRR	373	13.79	2.285	11	17

4.2. Benchmark Regression Analysis Results

Two rounds of benchmark regressions were conducted, presented in Table 8. In the first round, only individual fixed effects were controlled, and the results showed that the regression coefficient of the DID on the non-performing loan (NPL) ratio of Chinese commercial banks was -0.217, which is negative and significant at the 5% level. In the second round, additional control variables were included: micro-level variables such as company size (Size), leverage ratio (Lev), loan-to-deposit ratio (LDR), capital adequacy ratio (CAR), return on assets (ROA), and growth rate (Growth); industry-level variables such as the reserve requirement ratio (RDRR) and banking climate index (BCI); and macroeconomic variables such as the year-over-year growth rate of money supply (M_2) and GDP growth rate (GDP).

The result showed that after adding these control variables, the R-squared value increased from 0.345 to 0.544, and the coefficient of the core explanatory variable (DID) was -0.202, which also passed the 5% significance level. As a proxy variable for the risk level of commercial banks, NPL represents the level of risk. Therefore, the conclusion that "the deposit insurance system has a significant suppressive effect on the risk level of Chinese commercial banks" is valid.

Table 8: Benchmark Regression Analysis Result.

Variables	*NPL*	*NPL*
did	-0.217	-0.202
	(-0.41)	(-0.83)
LDR		0.0258*
		-4.23
CAR		-0.103*
		(-3.44)
Size		0.0183
		-0.08
Lev		-0.0686
		(-1.28)
Growth		-0.00768
		(-2.07)
ROA		-1.588*
		(-7.38)
BCI		-0.113
		(-0.53)
GDP		0.156
		-0.78
M_2		0.208
		-1.15
RDRR		0.637
		-1.23
_cons		5.646
		-0.68
N	641	641
R2	0.345	0.544

t statistics in parentheses
* $p < 0.1$, $p < 0.05$, * $p < 0.01$

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4.3. Heterogeneity Analysis

4.3.1. Heterogeneity Test Based on Bank Nature

Considering that the impact of the deposit insurance system may vary depending on the nature and size of different banks, the 42 commercial banks can be categorized as follows: large state-owned commercial banks, national joint-stock commercial banks, city commercial banks, and rural commercial banks. Subsequently, a heterogeneity analysis is conducted to understand the impact of the deposit insurance system on different types of banks, as shown in Table 9.

The analysis yields the following conclusions: As the size of the bank increases, the impact of the deposit insurance system on its risk level (i.e., non-performing loan ratio) gradually decreases. This implies that large banks are relatively less affected by the deposit insurance system. This conclusion aligns with the initial hypothesis that in the DID model, the four major state-owned banks can serve as the control group because they represent large state-owned commercial banks with relatively low risk levels under the deposit insurance system. These banks possess large-scale assets and deposits, high capital reserves, and strong risk management capabilities, resulting in relatively low non-performing loan ratios, indicating good asset quality and low risk levels. Moreover, the five major banks have strong market positions and operational capabilities, enabling them to cope with changes in the external economic and financial environment. Their competitive position in the market is strong, and they have abundant experience and resources to better adapt to various situations.

This conclusion also conforms to the economic principle of diminishing marginal returns. Diminishing marginal returns mean that as size increases, the additional benefit from extra input gradually decreases. In this case, large banks, due to their low risk levels, low premium rates, strong operational capabilities, and market positions, gain relatively lower marginal benefits from the implementation of the deposit insurance system. This indicates that the deposit insurance system has a relatively limited effect on enhancing their risk management and operational stability, as they already excel in risk management. On the contrary, small and medium-sized banks, especially rural commercial banks, which are smaller in scale, have relatively lower market positions and operational capabilities, and rely more on the deposit insurance system to reduce risks and enhance market credibility.

Table 9: Result of Heterogeneity Test Based on Bank Nature.

	(1)	(2)	(3)	(4)
Variables	Large State-Owned Commercial Banks	National Joint-Stock Commercial Banks	City Commercial Banks	Rural Commercial Banks
did	0.825	2.809*	5.420	9.840
	(3.40)	(0.38)	(0.43)	(0.62)
LDR	-0.00490	0.00448	0.0219	0.0219
	(-0.41)	(0.53)	(2.22)	(1.06)
CAR	-0.154*	-0.234*	-0.0759	-0.186
	(-3.35)	(-3.74)	(-1.59)	(-2.60)
Size	-0.468	-0.120	0.204	0.976*
	(-0.67)	(-0.28)	(0.44)	(1.98)
Lev	-0.0691	-0.127	-0.0116	-0.0575
	(-0.68)	(-1.27)	(-0.14)	(-0.45)
Growth	-0.00284	-0.0108*	-0.00812	-0.00481
	(-0.44)	(-1.76)	(-1.44)	(-0.45)
ROA	-1.512*	0.0914	-1.920*	-2.447*
	(-3.15)	(0.30)	(-4.82)	(-5.70)
BCI	0.125	0.112	0.189	0.317
	(0.80)	(0.71)	(0.73)	(0.97)
GDP	-0.102	-0.0112	0.0480	0.101
	(-0.73)	(-0.13)	(0.33)	(0.54)
M_2	-0.0617	0.148	0.405	0.783
	(-0.48)	(0.32)	(0.53)	(0.80)
RDRR	-0.329	0.171	0.442	0.743
	(-0.91)	(0.59)	(0.94)	(1.25)
cons	14.04	3.261	-26.40	-47.24
	(0.75)	(0.11)	(-0.60)	(-0.82)
N	92	128	277	140
R^2	0.857	0.664	0.368	0.453

t statistics in parentheses

* $p < 0.1$, $p < 0.05$, * $p < 0.01$

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4.3.2. Regional Heterogeneity Test of Banks

Similarly, the 42 banks were divided into national and local banks, and further categorized based on their primary operating regions into Eastern, Central, and Western regions for additional heterogeneity analysis. This was done to explore whether the impact of the deposit insurance system on the non-performing loan (NPL) ratio of commercial banks is related to the region.

The results in Table 10 showed that the overall correlation was not high, and there was even a slight negative correlation in the Central region. A possible reason for this phenomenon is the relatively small number of listed banks in the Central and Western regions, which directly leads to a smaller sample size, making it difficult to obtain sufficient data to determine a clear relationship between the deposit insurance system and the NPL ratio.

The results of this heterogeneity test indicate that the suppressive effect of the deposit insurance system on bank risk levels is relatively weakly related to the primary operating region of the banks. The reduction of the NPL ratio by the deposit insurance system is not significantly influenced by regional factors. This suggests that the policy's effectiveness is fairly uniform across the country, showing a balanced impact nationwide.

Table 10: Result of Heterogeneity Test Based on Bank Location.

	(1)	(2)	(3)	(4)
Variables	National Banks	Eastern Region	Central Region	Western Region
did	0.216	6.959	-1.853	2.075*
	(1.33)	(0.71)	(-0.08)	(0.06)
LDR	-0.00418	0.0142	0.0260	0.0528
	(-0.67)	(1.62)	(1.09)	(0.82)
CAR	-0.221*	-0.0630	-0.398*	-0.0813
	(-5.74)	(-1.61)	(-3.00)	(-0.44)
Size	0.397	0.230	2.231*	-1.224
	(1.45)	(0.73)	(2.78)	(-1.03)
Lev	-0.102	-0.0817	-0.00848	0.337
	(-1.57)	(-1.11)	(-0.03)	(0.93)
Growth	-0.00772*	-0.0182*	0.00397	0.00648
	(-1.78)	(-3.55)	(0.22)	(0.47)
ROA	0.0000836	-1.542*	-1.485*	-0.0513
	(0.00)	(-4.91)	(-1.81)	(-0.04)
BCI	0.103	0.192	0.168	0.0634
	(0.67)	(0.94)	(0.33)	(0.09)
GDP	-0.0542	0.0733	0.0137	-0.0296
	(-0.38)	(0.63)	(0.05)	(-0.08)
M_2	0.0126	0.479	0.195	0.0741
	(0.10)	(0.79)	(0.13)	(0.04)
RDRR	-0.0274	0.473	0.468	0.188
	(-0.07)	(1.28)	(0.52)	(0.15)
_cons	3.179	-22.95	-30.07	-31.05
	(0.33)	(-0.66)	(-0.34)	(-0.27)
N	220	290	79	48
R^2	0.661	0.219	0.710	0.815

t statistics in parentheses
$^{*}p < 0.1$, $p < 0.05$, $^{*}p < 0.01$

4.4. Robustness Test

4.4.1. Parallel Trend Test

From the parallel trend test graph demonstrated in Figure 2, it can be seen that in the two periods before the implementation of the system, the coefficients of the pre-implementation year dummy variables fall within the 95% confidence interval and include 0, indicating that they do not pass the significance test. This suggests that before the implementation of the system, there was no systematic difference between the treatment group and the control group, thereby satisfying the parallel trend assumption. After the implementation of the system, it is evident that the dynamic effect of the system

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shows a clear downward trend, and all pass the significance test.

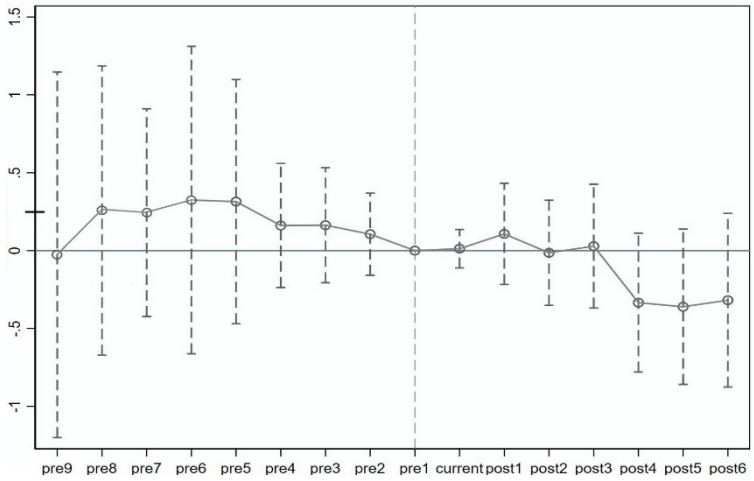

Figure 2: Result of Placebo Test Illustration.

4.4.2. Placebo Test

To enhance the identifiability of the placebo test, the treatment and control groups were randomly assigned 500 times. Figure below reports the distribution of the coefficients and p-values of the interaction term. It can be seen that the coefficient estimates of the interaction term, based on random samples, are concentrated around 0 and follow a normal distribution. Moreover, as shown by the benchmark regression results, the actual impact coefficient is -0.2019693, and most of the estimated p-values of the coefficients are greater than 0.1. This meets the expectations of the placebo test, indicating that the above results are not driven by other unobservable factors.

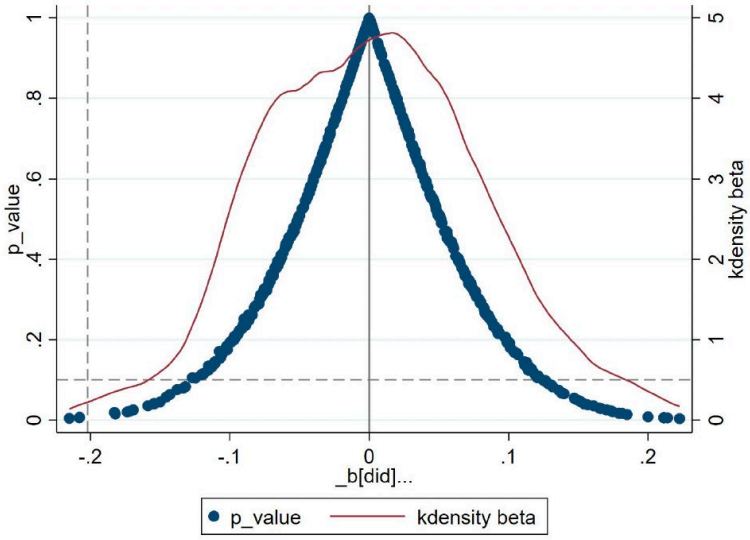

Figure 3: Result of Placebo Test.

5. Summary and Recommendations

Based on the empirical analysis conducted in this paper, several conclusions can be drawn regarding the impact of China's deposit insurance system on the risk levels of A-share listed commercial banks. Firstly, the deposit insurance system significantly suppresses the risk levels of these banks, as indicated by the reduction in the non-performing loan ratios. Secondly, there is a noticeable scale heterogeneity in this suppressive effect: as the size of the bank increases, the impact of the deposit insurance system on risk levels diminishes, demonstrating a significant diminishing marginal return effect. Finally, the reduction in NPL ratios due to the deposit insurance system is consistent across different regions, indicating that the policy's effectiveness is uniform nationwide.

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To address potential issues and enhance the effectiveness of the deposit insurance system, regulatory authorities should strengthen oversight of commercial banks to mitigate moral hazards[8]. This involves clearly defining business scopes, implementing tiered supervision, and setting stricter audit and payout conditions for troubled banks. Establishing comprehensive risk assessment systems and enhancing information disclosure are also crucial for improving transparency and reducing risks.

Insurance institutions need to create a dedicated management entity for deposit insurance funds to increase the system's stabilizing effect. This entity should independently audit the risks and payout conditions of commercial banks to minimize operational risks.

Commercial banks should proactively manage various risks by establishing robust risk management systems, conducting regular assessments, and adopting hedging strategies. Maintaining sufficient capital reserves, improving transparency, complying with regulations, and enhancing technological capabilities are essential steps[9]. Additionally, banks should fulfill their social responsibilities to support sustainable development and community growth[10]. These measures collectively ensure the stability and resilience of the financial system, safeguarding depositors' interests.

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