risks

MDPI

Article

Analysis of the Mitigating Effect of Financial Regulatory Penalties on Bank Systemic Risk

Wenlong Miao, Siyu Zhang and Yuanyuan Huo *

International Business School, Shaanxi Normal University, Xi'an 710119, China; mwl@snnu.edu.cn (W.M.); zhangsy_snnu@snnu.edu.cn (S.Z.)
* Correspondence: yuanyuan.huo@snnu.edu.cn; Tel.: +86-13720659386

Abstract

Financial regulatory penalties are a critical tool for curbing bank violations and play an important role in safeguarding the banking system against systemic risk. This study examines the effects of regulatory penalties imposed by the People's Bank of China (PBOC) and the National Financial Regulatory Administration (NFRA) on bank systemic risk. We construct a unique dataset of 10,462 penalty decisions manually collected from 2014 to 2023, and employ a two-way fixed effects model to identify the impact of regulatory penalties. The results show that financial regulatory penalties exert a significant mitigating effect on bank systemic risk. This effect operates through two primary channels: first, by reducing the idiosyncratic risk of individual banks; and second, by weakening the intensity of risk transmission across institutions. The risk-controlling effect is further amplified under higher regulatory pressure and stronger creditor oversight. Heterogeneity analysis reveals that the penalty effect varies by penalty type, bank level, and regulatory authority, and is more pronounced for monetary fines, penalties imposed on provincial and municipal branches, and enforcement actions conducted by the NFRA. Notably, when banking institutions and the broader banking system are already in an extreme risk state, financial regulatory penalties may cease to serve as an effective tool for containing systemic risk and preserving financial stability. Our findings suggest that strengthening the enforcement and coordination of macroprudential and microprudential supervision, along with reinforcing market discipline, can enhance the effectiveness of financial penalties in safeguarding financial stability.

Keywords: financial regulatory penalties; bank systemic risk; bank individual risk

Check for updates

Academic Editors: Ramona Rupeika-Apoga and Alex Weissensteiner

Received: 16 June 2026
Revised: 2 August 2026
Accepted: 17 August 2026
Published: 20 August 2026

Copyright: © 2026 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license.

1. Introduction

Financial regulatory penalties, as the main tools for microprudential regulation and macroprudential supervision, play a significant role in the prevention of bank risks and the maintenance of financial stability. Following the 2008 financial crisis, countries generally strengthened financial supervision and increased regulatory penalties under the Basel III framework to contain systemic financial risks and reduce bank violations. Theoretically, strengthening financial supervision and regulatory penalties can mitigate bank systemic risk by curbing bank violations and preventing risk spillovers, thereby maintaining financial system stability. However, empirical evidence suggests that the actual effects of enhanced financial regulatory penalties may deviate from expectations. Major bank risk events have continued to occur, even against the backdrop of generally strengthened financial regulation after 2008. Consequently, it is of great significance to conduct a more accurate identification

 https://doi.org/10.3390/risks14080186

and comprehensive assessment of the actual impact and transmission channels through which financial regulatory penalties affect banking system risks. Such an assessment can help optimize prudential supervision, strengthen regulatory coordination, and enhance regulators' risk-control capabilities.

Financial regulation aims to supervise, inspect, and manage financial entities in accordance with laws and regulations. Its core objective is to control risks, prevent contagion, and avoid spillovers, thereby maintaining financial system stability. Regulatory penalties serve as a key enforcement tool. They reduce bank risk through post-event sanctions, generate deterrent effects via reputational damage (Braithwaite 2008), and mobilize social oversight (Gunningham et al. 1998). In doing so, they reinforce the effectiveness of other prudential mechanisms, including capital requirements, market discipline, and macroprudential supervision, in safeguarding financial stability. Empirical studies provide broad support for the effectiveness of regulatory penalties. Stronger enforcement helps banks control risk asset ratios (Delis et al. 2017), reduce balance sheet sizes (Delis et al. 2019), and lower non-performing loan rates and bankruptcy risks (Vyshnevskyi and Sohn 2023). In addition, penalties improve transparency, curb excessive risk-taking (Cohen et al. 2014), and restrain shadow banking expansion and systemic risks (Neill 2024). However, some research suggests that the effectiveness of penalties remains uncertain (Van Erp 2010), as they may not always deter violations or risk accumulation. Penalties may harm bank reputation (Doan et al. 2020), depress equity values (Slovin et al. 1999; Fuertes and Robles 2021), erode investor confidence, and trigger asset sales and risk contagion. In some cases, penalties imposed on low-risk banks may even encourage increased risk-taking (Köster and Pelster 2018). Furthermore, the Basel Accord offers limited constraints on penalties, potentially weakening banks' risk management incentives and exacerbating risk-taking (Da Veiga et al. 2012). Additionally, regulatory discretion may lead to inappropriate settlements, encouraging imitation among banks and heightening systemic risk.

Based on previous research, we recognize that there is controversy over the effectiveness of financial regulatory penalties in mitigating bank systemic risk. Banks inherently bear risk and may have risk-taking incentives to obtain high returns, irrespective of the intensity of financial regulation. This may be a pivotal factor influencing the effectiveness of financial regulatory penalties in mitigating bank systemic risk. Therefore, the actual mitigating effect of financial regulatory penalties on bank systemic risk deserves further exploration. Since the 2017 National Financial Work Conference emphasized that "preventing systemic financial risks is the eternal theme of financial work", the frequency of regulatory penalties has increased significantly, enhancing the collaborative role of macroprudential and microprudential supervision. However, whether China's enhanced financial regulatory penalties effectively control bank systemic risk—and the channels through which they do so—has yet to be systematically addressed in the literature. In light of the above, this study explores the relationship between financial regulatory penalties and bank systemic risk and raises the following questions. Can financial regulatory penalties control bank systemic risk? What are the key channels through which they exert their effects? And how do these effects differ across banks with disparate characteristics?

To answer these questions, we explore the control effects and mechanism of action of financial regulatory penalties on bank systemic risk, using penalty data from the People's Bank of China (PBOC) and the National Financial Regulatory Administration (NFRA). The study reveals that: (1) financial regulatory penalties have a restraining effect on bank systemic risk; (2) this effect operates through two primary channels—reducing individual bank-specific risks, and weakening risk transmission across institutions; (3) the effect is more pronounced for monetary fines, penalties imposed on provincial and municipal branches, and enforcement actions conducted by the NFRA; and (4) when banking

institutions and the broader banking system are already in an extreme risk state, financial regulatory penalties may cease to serve as an effective tool for containing systemic risk and preserving financial stability.

The contributions of this study are as follows. (1) We distinguish the differential effects of penalties imposed by the PBOC and the NFRA on systemic risk, offering a novel theoretical perspective on the complementarity between macroprudential and microprudential enforcement tools. The prior literature has largely treated regulatory penalties as a homogeneous disciplinary instrument (Jordan et al. 2000) or has focused exclusively on the enforcement actions of a single regulator (Wei et al. 2024). This approach overlooks the heterogeneity in the specificity of penalty types and the functional positioning of regulatory authorities, which may lead to differential effects on bank risk. In the context of China's dual-regulator institutional framework, penalties imposed by the PBOC typically target foundational violations in payment and settlement, credit reporting, and anti-money laundering. These areas usually carry the characteristics of macroprudential policy tools. In contrast, penalties imposed by the NFRA primarily address operational risks such as credit violations and false loan reporting, reflecting a microprudential supervisory orientation. We demonstrate the differential effectiveness of penalty measures implemented by the two regulatory authorities in curbing bank systemic risk, thereby extending the analytical perspective of prior studies regarding regulatory heterogeneity. This study offers new policy implications for enhancing enforcement effectiveness within the financial regulatory framework.

(2) We identify the underlying mechanisms and moderating factors through which regulatory penalties mitigate bank systemic risk, contributing to the growing literature on the conditions under which regulatory enforcement actions become effective. Building on prior evidence that penalties reduce bank risk (Berger et al. 2022), we further explicate, from both a temporal and a structural perspective, how penalties reduce systemic risk by curbing bank-specific risk and weakening risk transmission across institutions. We further reveal how regulatory pressure and creditor oversight significantly amplify these effects. These findings deepen the existing understanding of the effectiveness of regulatory penalties.

(3) We construct a multi-dimensional heterogeneity analysis framework that provides direct policy implications for designing differentiated and targeted regulatory regimes. We evaluate the risk-containment effects of different penalty types, bank levels, and regulatory authority identities. This framework can address the complex heterogeneity in penalty effectiveness across multiple institutional dimensions. Building on this foundation, we further examine whether the mitigating effect of regulatory penalties on systemic risk persists when banking institutions are exposed to extreme risk states. These findings provide new empirical evidence on whether financial regulatory penalties can serve as an effective instrument for safeguarding financial stability.

2. Theoretical Analysis and Hypotheses

2.1. The Controlling Effect of Financial Regulatory Penalties on Bank Systemic Risk

The intensification of systemic risk in the banking system is primarily manifested in two dimensions. First, individual bank risk tends to increase, potentially leading to widespread bank failures and triggering a banking crisis. Second, the interconnection of high-risk banking activities increases, amplifying banks' risk contagion and further exacerbating bank systemic risk (Zedda and Cannas 2020). While bank violations formally constitute breaches of regulatory rules, their substantive impact lies in exacerbating both bank individual risk and interbank risk transmission, thereby heightening systemic risk. Theoretically, financial regulatory penalties can mitigate systemic risk by curbing violations, reducing bank individual risk, and weakening interbank risk contagion.

2.1.1. Reduction in Individual Risk

Bank violations can significantly increase operational and asset-related risks, elevate the likelihood of insolvency, and undermine the stability of the broader banking system. For example, practices such as extending advances without genuine trade backgrounds, granting loans to a single borrower beyond statutory limits, financing non-compliant projects, and inadequately reviewing changes in fund usage (see Appendix A Table A1) can heighten the risk of internal and external fraud. These practices also amplify asset-liability risks, ultimately leading to a generalized increase in individual bank risk.

Financial regulatory penalties reduce individual bank risk by curbing violations, reducing operational risks, stabilizing operations, and increasing profits. (1) By restricting the employment of sanctioned personnel, limiting bank branch expansion, and increasing the legal costs of violations, regulatory penalties deter fraudulent lending, excessive credit concentration, and collusive misconduct. These measures standardize banking operations, strengthen their internal controls, and reduce their operational risks. Furthermore, the dissemination of penalty information may prompt bank employees, clients, and investors to take actions that constrain risk-taking behavior (Peek and Rosengren 1995; Delis et al. 2019; Roman 2020), further lowering bank individual risk. (2) By restricting banks' access to high-risk businesses (Koster and Pelster 2017), safeguarding the value of banking licenses, and ensuring their compliance with capital adequacy, liquidity, and other prudential standards, regulatory penalties reduce the likelihood of bank defaults (Gorton 1994), thereby enhancing the stability of each bank (Laeven and Levine 2009). (3) By increasing the frequency and severity of penalties, regulators incentivize banks to optimize loan portfolios, reduce non-compliant investments, and expand compliant revenue streams (Delis et al. 2017, 2019; Berger et al. 2022), further mitigating bank individual risk. Overall, financial regulatory penalties encourage banks to operate in a more standardized manner, avoid reputational and legal damage, and break the cycle of reputational erosion (Pfarrer et al. 2008). This, in turn, promotes banks' stronger asset-liability management, reduces their risk exposure, and enhances their long-term profitability.

2.1.2. Weakening of Risk Contagion

Bank violations can intensify interbank risk linkages and exacerbate bank systemic risk. For instance, engaging in non-compliant shadow banking activities, submitting inaccurate financial data, and exceeding leverage limits (Huang et al. 2023; Xiao et al. 2023; Huang and Jiang 2025) not only strengthen asset-liability interdependencies among financial institutions but also magnify risk contagion through shared asset holdings and information opacity (He et al. 2023; Cincinelli et al. 2024), further intensifying bank systemic risk. Additionally, deteriorations in credit data quality and payment settlement environments can elevate individual bank risk and amplify risk contagion effects (Adrian and Shin 2010; López-Espinosa et al. 2012).[1]

Financial regulatory penalties mitigate interbank risk contagion by curbing banks' high-risk activities and limiting interbank linkages. (1) By constraining banks' asset expansion, regulating their related-party transactions, and addressing shadow banking practices, penalties directly reduce interbank risk interconnections and help prevent the emergence of banks that are "too big to fail" (Stern and Feldman 2003). (2) By intensifying oversight of leveraged and risky assets, penalties reduce banks' sensitivity to market fluctuations, encouraging them to reduce interbank dependencies and avoid the "too interconnected to fail" phenomenon (Liu et al. 2015), thereby enhancing resilience and weakening interbank risk contagion. Moreover, penalties imposed by central banks for violations related to credit reporting, payment settlement, and anti-money laundering improve credit environments and reduce information asymmetry, contributing to a

reduction in overall banking system risk. Based on the above, we propose the following Hypothesis 1:

H1. *Financial regulatory penalties mitigate bank systemic risk by reducing individual bank risk and weakening interbank risk contagion.*

2.2. The Moderating Factors of Financial Regulatory Penalties on Bank Systemic Risk

The effectiveness of financial regulatory penalties in mitigating systemic risk is influenced by the broader regulatory environment and the supervision behavior of other market participants. In this paper, these two factors are identified as the regulatory environment pressure effect and the creditor monitoring effect.

2.2.1. Regulatory Environment Pressure

The increase in the proportion of similar banks that have been punished by regulators in the entire banking industry may send a signal of a stricter financial regulatory environment, shaping banks' expectations regarding the costs of violations and discouraging risk-taking behavior. On one hand, the public disclosure of penalties exerts a deterrent and warning effect, prompting banks that have not been punished to proactively cease violations and reduce the likelihood of risk transmission (Bandura and Walters 1977). On the other hand, regulatory penalties that hold senior executives personally accountable influence banks' market valuation and reputation, reinforcing banks' internal governance, narrowing the scope for bank misconduct, and enhancing regulatory effectiveness (Karpoff et al. 2008; D'Acunto et al. 2026). Therefore, we propose the following Hypothesis 2:

H2. *An increase in the intensity of penalties imposed on peer banks may amplify the effectiveness of financial regulatory penalties in mitigating systemic risk for the targeted banks.*

2.2.2. Creditor Monitoring Intensity

Non-deposit creditors—including interbank counterparties, the central bank, and bond investors—possess strong risk identification and monitoring capabilities. To some extent, these actors can compensate for regulatory resource constraints and mitigate information asymmetries, thereby enhancing the efficacy of regulatory penalties. First, interbank creditors, as banks' regular counterparties, have stronger information advantages and monitoring capabilities, which can impose hard financing constraints on penalized banks and prompt them to rectify their violations (Leland and Pyle 1977). Second, the central bank, as the lender of last resort and the macroprudential regulator, not only assesses the risks of penalized banks but also oversees their corrective measures. Moreover, the central bank may mitigate the systemic risk shocks imposed on other banks by penalized banks through its other regulatory functions—such as in payment and settlement, credit reporting, and anti-money laundering (Siebenbrunner et al. 2024). Thirdly, bond investors and securities regulators evaluate and scrutinize bank risks and penalty histories during the financing process (Delis et al. 2017), encouraging banks to operate in compliance with regulations and reduce risk exposure.[2] Consequently, stronger creditor supervision enhances the effectiveness of financial regulatory penalties in mitigating bank systemic risk. Based on the above analysis, we propose the following Hypothesis 3:

H3. *Strengthened supervision by non-deposit creditors over banks may enhance the effectiveness of financial regulatory penalties in mitigating bank systemic risk.*

Figure 1 illustrates the research framework.

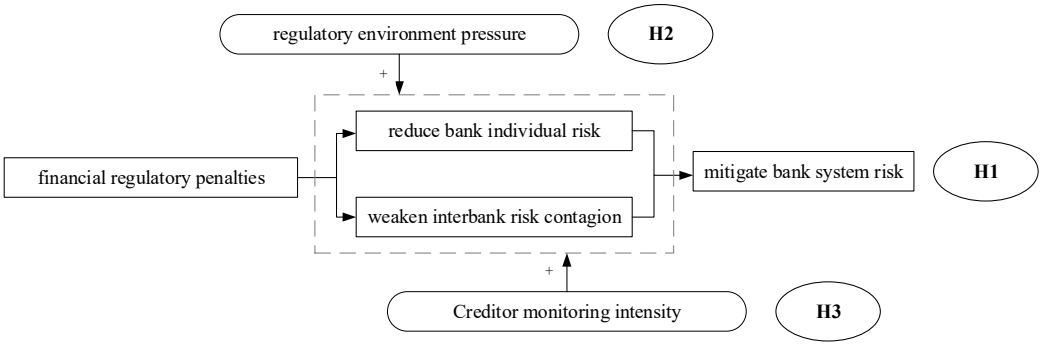


Figure 1. Research framework.

3. Research Design

3.1. Sample Selection and Data Sources

As PBOC and its branches began to publicly disclose administrative penalty data primarily in 2014, the data period of this study spans from the first quarter of 2014 to the fourth quarter of 2023. Given that the research focus is on bank systemic risk, constrained by both measurement methodologies and data availability, we select a sample of 37 listed banks, representative in terms of asset size and penalty frequency. The financial regulatory penalty variables are constructed based on 10,462 administrative penalty decisions and information tables disclosed on the websites of PBOC, its branches, and NFRA.[3] We exclude samples with less than three years of financial data or missing key variables. To align with the quarterly frequency of the analysis, a second-order interpolation method is applied to convert a small portion of annual financial data into quarterly observations. The final dataset comprises 1051 valid bank-quarter observations.

The financial regulatory penalties data are manually collected and organized, while all other data are obtained from the CSMAR database and publicly disclosed bank financial reports. To mitigate the influence of extreme values, continuous variables are winsorized at the 1% and 99% percentiles.

3.2. Model Construction

To examine the impact of financial regulatory penalties on the level of bank systemic risk, we employ a two-way fixed effects model specified as follows:

$$BSR_{i,t} = \alpha_0 + \alpha_1 Fsp_{i,t} + \beta \sum Controls_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (1)$$

where $BSR_{i,t}$ denotes the bank systemic risk; $Fsp_{i,t}$ represents the intensity of financial regulatory penalties imposed on the bank; $Controls_{i,t}$ is a vector of control variables; μ_i and λ_t denote bank-specific and time fixed effects, respectively; and $\varepsilon_{i,t}$ is the error term. The coefficient α_1 is the primary focus of this study, and it captures the effect of regulatory penalties on bank systemic risk, for which economic interpretation reflects the extent to which financial regulatory penalties influence the level of bank systemic risk.

3.3. Variable Definitions

(1) Explained variable: bank systemic risk (BSR)

The dependent variable is the systemic risk of bank i in period t, denoted as $BSR_{i,t}$. There are two primary approaches to measuring systemic risk in financial institutions. The first approach is based on asset returns and includes methods such as Marginal Expected Shortfall (MES) (Giglio et al. 2016; Acharya et al. 2017), Systemic

Risk Index ($SRISK$) (Brownlees and Engle 2017), and Conditional Value at Risk ($CoVaR$) (Adrian and Brunnermeier 2016). These methods are effective in capturing the temporal accumulation and evolution of systemic risk but are less suitable for analyzing structural risk contagion.[4] The second approach is based on balance sheet data and includes models such as those proposed by Birge and Judice (2013), Cincinelli et al. (2024), and Han and Wang (2023). These methods are particularly useful for capturing structural risk transmission but are less responsive to temporal risk dynamics.

Given the theoretical framework of this study, which emphasizes both individual risk and risk contagion, this paper employs $CoVaR$ as a proxy variable for bank systemic risk ($BSR_{i,t}$). This approach allows us to examine how bank systemic risk evolves over time. A higher $BSR_{i,t}$ value indicates a greater level of the indicator.

(2) Explanatory variables: financial regulatory penalty (Fsp)

The core explanatory variable in this study is the financial regulatory penalty variable ($Fsp_{i,t}$), which captures the intensity of penalties imposed by financial regulatory authorities on bank i in period t. It is measured as the total count of regulatory actions taken against a bank during a given quarter.

According to the Banking Supervision and Administration Law in China, the financial regulatory penalties discussed in this paper refer to enforcement actions taken by national financial regulatory authorities in accordance with laws, administrative regulations, rules, and normative documents against banking institutions operating within China. These include commercial banks, urban and rural credit cooperatives, other deposit-taking financial institutions, and policy banks. The measures encompass directives such as requiring timely rectification, suspending certain operations, restricting asset transfers, imposing fines, ordering suspension for rectification, revoking business licenses, and initiating takeover or restructuring procedures. Additionally, penalties may be imposed on responsible individuals, including disciplinary actions, warnings, fines, disqualification from managerial positions, and permanent or temporary bans from banking activities.

Therefore, regulatory penalties and related data collected in this study are categorized into three main types: (1) warnings or rectification notices; (2) fines; and (3) disqualification of senior management for a specified period, lifetime bans from the banking industry, and prohibitions on establishing new branches (hereafter referred to as disqualification). Penalties data are sourced from administrative penalty decisions and information tables published on the websites of PBOC and NFRA. For each bank-quarter, we aggregate the total number of penalty measures across all issued documents, add 1 to avoid taking the logarithm of zero, and then take the natural logarithm to form the primary regulatory penalty variable.

To investigate the heterogeneous effects of penalty types on bank systemic risk, we construct and introduce the following sub-variables into the regression model: g_Fsp captures the frequency of warnings and rectification orders received by the sample bank; c_Fsp reflects the frequency of disqualification orders imposed; and f_Fsp and a_Fsp represent the frequency and total amount of fines, respectively. Additionally, we examine the impact of penalties imposed at different organizational levels—such as headquarters, provincial branches, and sub-branches—to assess how the level of the punished entity affects the control of systemic risk.

(3) Channel identification variables

As indicated by the theoretical analysis, financial regulatory penalties primarily mitigate bank systemic risk through two mechanisms: (1) reducing individual bank risk and (2) weakening interbank risk contagion. The individual risk reduction channel is identified

using three key indicators, namely bank operational risk, operational stability, and profit cycle. Specifically, the ratio of operational risk-weighted assets to total assets (*o_Rwa*) is used to measure the level of operational risk, capturing losses arising from inadequate internal controls, system or employee errors, and external events. The three-period rolling variance of the return on assets (σ*_Roa*) is employed to reflect the robustness of bank operations (Peng et al. 2023). Additionally, the HP filter is applied to decompose the bank's profit growth rate into trend and cyclical components. The cyclical component (*c_Pgr*) is extracted to measure the profit cycle (Bunderson and Thakor 2022), which enables us to examine how financial regulatory penalties affect fluctuations in bank profitability, in addition to describing the trend of earnings growth.[5]

The weakening of interbank risk contagion is examined from two dimensions: high-risk business contagion and value risk contagion. With respect to high-risk business contagion, shadow banking activities are considered a major conduit for financial risk transmission. Therefore, this study constructs an indicator representing the proportion of interbank deposits, net funds lent, trading financial assets, and net resale financial assets to total assets (*Shadow*), which captures the scale of shadow banking activities and allows for assessing how regulatory penalties influence such high-risk exposures.[6] Regarding value risk contagion, to evaluate how penalties affect the correlation between a bank's value fluctuations and system-wide movements, we follow Brownlees and Engle (2017) in using a time-varying beta coefficient (*Beta*). This coefficient measures the dynamic relationship between a bank's returns and the market's returns, reflecting the degree to which the bank moves in tandem with systemic volatility. Its time-varying nature enables tracking changes in a bank's risk exposure and sensitivity to systemic risk over time.

(4) Control variables

This study designs three dimensions of control variables which include prudential regulation, bank-specific characteristics, and macroeconomic conditions. First, the prudential regulatory control variables include the following: (1) Loan provision ratio (*Lpv*), expressed as the ratio of provisions to total loans, controls for the effect of bank risk resolution capacity on bank systemic risk. (2) Loan-to-deposit ratio (*Ldr*), expressed as the ratio of loans to total deposits, controls for the effect of the deposit-loan structure. (3) Core Tier 1 capital adequacy ratio (*Cap*), expressed as the ratio of core Tier 1 capital to risk-weighted assets, controls for the effect of bank capital. Second, the bank operational level control variables mainly include the following. (1) Bank asset size (*Size*), measured as the logarithm of year-end total assets, controls for the effect of bank size. (2) Return on capital (*Roe*), measured as the ratio of net profit to capital, controls for the impact of bank profitability. Finally, the macroeconomic control variables mainly include the following. (1) GDP growth rate (*Gdp*), which control for the effect of macroeconomic fluctuations. (2) M2 growth rate (*M*2), which controls for the impact of monetary policy on bank risk-taking.

Table 1 reports the variable definitions and summary statistics. Figure 2 presents scatter plots of regulatory penalty intensity against bank systemic risk, stratified by bank type, with fitted linear lines overlaid for each subgroup. The fitted lines for joint-stock, city commercial, and rural commercial banks all display a negative slope, whereas the corresponding line for large state-owned banks remains relatively flat. This divergence is consistent with the notion that implicit government guarantees attenuate the disciplinary effect of penalties on systemically important state-owned banks (Ming et al. 2023). Overall, this visual evidence suggests a negative association between financial regulatory penalties and bank systemic risk.

Table 1. Variables and descriptive statistics.

Symbol	Variable Name	N	Mean	SD	Min	Max
BSR	Bank systemic risk	1051	17.4776	5.7067	4.0072	35.0078
Fsp	Financial regulatory penalties	1051	1.5874	1.3623	0	4.4544
o_Rwa	Operational risk	1051	0.0496	0.0182	0.0080	0.2863
σ_Roa	Rolling variance of return on assets	1051	0.1104	0.0594	0.0096	0.3355
c_Pgr	Profit cycle	1051	0.0903	0.0713	−0.1586	0.2814
Shadow	Shadow banking size	1051	0.3005	1.1894	0.0008	8.7068
Beta	Beta coefficient	1051	0.7082	0.3430	−0.2885	2.5590
Lpv	Loan provision ratio	1051	3.2633	0.7364	2.1222	5.0103
Ldr	Loan-to-deposit ratio	1051	0.8329	0.1194	0.5751	1.1086
Cap	Core tier 1 capital adequacy ratio	1051	10.0817	1.5842	8.0409	14.0984
Size	The logarithm of the bank's asset size	1051	28.5140	1.5982	25.4489	31.2753
Roe	Return on capital	1051	7.6145	3.5962	2.0166	16.4913
Gdp	GDP growth rate	1051	10.2705	1.7053	8.0267	13.7900
M2	Money supply growth rate	1051	5.7268	3.6452	−6.9000	18.7000

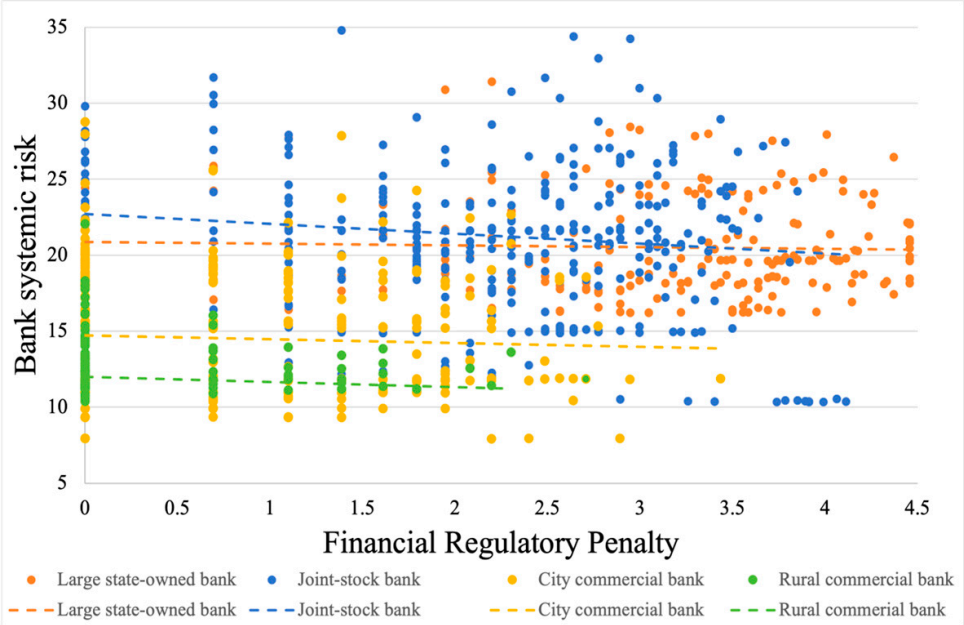


Figure 2. Scatter plot.

4. Result Analysis

4.1. Baseline Regression Analysis

Based on Model (1), Table 2 illustrates the correlation between the financial regulatory penalties and bank systemic risk (*CoVaR*). To avoid correlations between variables interfering with the estimation results, we clustered the standard errors at the individual bank level. Columns (2) and (3) display the estimation outcomes of Model (1) as fixed effects and control variables are sequentially introduced. The estimated coefficients of the core explanatory variable (*Fsp*) on bank systemic risk (*BSR*) are consistently negative and statistically significant across all specifications. Taking column (3) as an example, the estimated coefficient of *Fsp* is −0.1617, significant at the 10% level. This implies that, after controlling for a comprehensive set of bank-specific characteristics, macroeconomic factors, and regulatory covariates, a one-standard-deviation increase in penalty intensity is associated with a 1.2% reduction in the systemic risk of penalized banks. Thus, Hypothesis 1 is verified.

Table 2. Baseline regression analysis.

Variables	(1) *BSR*	(2) *BSR*	(3) *BSR*
Fsp	−0.2743 ***	−0.1540 *	−0.1617 *
	(−3.6412)	(−1.8038)	(−2.0199)
Lpv			−0.1061
			(−0.7325)
Ldr			−3.1259 ***
			(−2.6313)
Cap			0.1050
			(1.2019)
Size			−0.3558
			(−0.4999)
Roe			0.2357 **
			(3.3914)
Gdp			1.5733 ***
			(3.7587)
M2			−1.4500 **
			(−2.8023)
Constant term	16.1514 ***	17.7030 ***	18.4708
	(20.9564)	(41.4654)	(0.8346)
Sample size	1051	1051	1051
R^2	0.3467	0.3005	0.9140
Individual fixed	No	Yes	Yes
Time fixed	No	Yes	Yes

The values within parentheses represent the t—statistics adjusted by clustering at the individual bank level. The same convention applies to subsequent tables. ***, **, * indicate significant levels at 1%, 5%, and 10%, respectively.

4.2. Robustness and Endogeneity Tests

To enhance the reliability of our baseline results, we employ a comprehensive set of eight robustness and endogeneity tests. Specifically, we assess the robustness of our findings through variable substitution, sample exclusion, and the inclusion of additional controls for potentially omitted variables. We further adopt a range of identification strategies—including one-period lagged dynamic panel regression, System Generalized Method of Moments (SYS-GMM), instrumental variable estimation, reverse causality tests, and a Generalized Difference-in-Differences (G-DID) approach—to alleviate potential endogeneity concerns and strengthen the causal interpretation of our results.

(1) Variable substitution

In our baseline analysis, we employ the 95% confidence level *CoVaR* as the measure of bank systemic risk. To verify the robustness of our findings, we replace the dependent variable with the 99% confidence level *CoVaR* and re-estimate the effect of financial regulatory penalties on bank systemic risk. The estimation results are shown in column (1) of Table 3. The results show that the estimated coefficient of regulatory penalties remains consistent with the baseline findings, confirming the robustness of our baseline results.

In addition, to rule out the possibility that our findings are driven by the specific choice of a single systemic risk measure, we further introduce *MES*, a widely recognized alternative systemic risk indicator. It captures a bank's expected equity loss, conditional on the market being in distress, and is therefore more sensitive to changes in market expectations and bank operational adjustments. The regression results are presented in column (2) of Table 3. The estimated coefficient of *Fsp* remains negative and statistically significant. This further confirms that financial regulatory penalties continue to exert a significant controlling effect on bank systemic risk, and that our baseline results are robust.

Table 3. Robustness tests.

Variables	(1) *CoVaR*	(2) *MES*	(3) *BSR*	(4) *BSR*
Fsp	−0.4177 **	−0.0383 *	−0.1778 *	−0.1449 *
	(−1.9900)	(−1.9321)	(−1.9363)	(−1.7347)
Liq				−0.0267 ***
				(−4.0393)
Sample size	1051	1051	851	1051
R^2	0.9146	0.8817	0.9143	0.9154
Control variables	Yes	Yes	Yes	Yes
Individual fixed	Yes	Yes	Yes	Yes
Time fixed	Yes	Yes	Yes	Yes

***, **, * indicate significant levels at 1%, 5%, and 10%, respectively.

(2) Sample exclusion

Large state-owned commercial banks are typically under direct state guidance and operate with relatively low risk volatility under strict prudential regulation. At the same time, these banks have extensive branch networks, making them more likely to attract attention from local financial regulators. These factors may bias the results of the penalty effect test presented in the previous section. To avoid such potential distortion, this study excludes the five major state-owned commercial banks and focuses on estimating the changes in systemic risk among joint-stock banks, urban commercial banks, and rural commercial banks following regulatory penalties. The results are shown in column (3) of Table 3. The analysis demonstrates that financial regulatory penalties still exert a significant control effect on bank systemic risk, further supporting the robustness of the earlier findings.

(3) Omitted variables control

Given that liquidity risk is a key determinant of commercial banks' systemic risk, and the liquidity ratio serves as a critical regulatory indicator reflecting such risk (Buch et al. 2010), this study introduces the liquidity ratio (*Liq*) as an additional control variable into the benchmark model and re-estimates the regression. The results are displayed in column (4) of Table 3. The inclusion of this new control variable does not alter the statistical significance of the estimated coefficient on the financial regulatory penalty variable (*Fsp*), further confirming the robustness of the original results.

(4) One-period lagged dynamic panel regression

Given the potential inertia and dynamic nature of bank systemic risk, we design a one-period lagged dynamic panel model. Specifically, we incorporate the one-period lag of the systemic risk variable (*L.BSR*) as an additional explanatory variable into the baseline regression model. The results are reported in column (1) of Table 4. The estimated coefficient of *L.BSR* is positive and statistically significant at the 1% level, confirming the persistence of bank systemic risk over time. The estimated coefficient of *Fsp* remains significantly negative at −0.1411. This indicates that, even after controlling for the inertia of systemic risk changes, financial regulatory penalties continue to exert a significant risk-controlling effect. Our baseline conclusions remain robust.

(5) SYS-GMM

Since the one-period lagged dynamic panel regression may suffer from Nickell bias, we further employ the more rigorous SYS-GMM estimator to mitigate potential model specification errors. The estimation results are presented in column (2) of Table 4. The

analysis shows that the mitigating effect of financial regulatory penalties on bank systemic risk remains statistically significant at the 10% level. In addition, the model passes both the Hansen test and the second-order autocorrelation test, confirming the validity and robustness of our baseline results.

Table 4. Endogeneity tests.

Variables	(1) *BSR*	(2) *BSR*	(3) *Fsp*	(4) *BSR*	(5) *Fsp*
Fsp	−0.1411 *	−0.7682 *		−1.0572 *	
	(−1.6870)	(−1.8192)		(−1.6867)	
L.BSR	0.5553 ***	0.6254 ***			−0.0236
	(8.5078)	(3.4863)			(−1.4602)
IV			0.0122 ***		
			(4.8982)		
Wald F			19.292		
Sample size	1014	1014	1051	1051	1014
R^2	0.9231				0.7867
AR (1)-P		0.001			
AR (2)-P		0.531			
Hansen-P		0.232			
Control variables	Yes	Yes	Yes	Yes	Yes
Individual fixed	Yes	Yes	Yes	Yes	Yes
Time fixed	Yes	No	Yes	Yes	Yes

*** and * indicate significant levels at 1% and 10%, respectively.

(6) Instrumental variable test

To address potential reverse causality or bidirectional causality between financial regulatory penalties and bank systemic risk, this study employs an instrumental variable (IV) approach. Specifically, sample banks are categorized into four types: large state-owned banks, joint-stock banks, city commercial banks, and rural commercial banks. For each bank, the instrument is constructed as the average number of penalties received by other banks within the same group, excluding the focal bank, during the observation period. Two-Stage Least Squares (2SLS) estimation is then implemented. The results are presented in columns (3) and (4) of Table 4.

In the first-stage regression, the instrumental variable exhibits a statistically significant positive effect on financial regulatory penalties (Fsp) at the 1% significance level. Moreover, the Kleibergen–Paap rk LM statistic from the under-identification test is significant, rejecting the null hypothesis of under-identification. The Kleibergen–Paap rk Wald F statistic exceeds the Stock–Yogo critical value (16.38) at the 10% significance level, which rules out the presence of weak instruments. These findings suggest that the selected instrumental variable is valid and appropriately identified. In the second-stage regression, the estimated coefficient of financial regulatory penalties on bank systemic risk remains significantly negative. This indicates that even after addressing potential endogeneity, financial regulatory penalties continue to have a statistically significant mitigating effect on systemic risk, reinforcing the robustness of the original estimation results.

(7) Reverse causality test

To more robustly examine the potential reverse causality between financial regulatory penalties and bank systemic risk, we replace the dependent variable in the baseline model with its one-period lag and use it as the core explanatory variable. Simultaneously, we treat the original explanatory variable as the new dependent variable. The results are reported in column (5) of Table 4. The estimated coefficient of $L.BSR$ on Fsp is statistically insignificant,

indicating that banks' prior systemic risk levels do not significantly affect the intensity of current regulatory penalties imposed on them. This finding effectively rules out the reverse causality concern that "riskier banks are more likely to receive penalties." Therefore, our baseline conclusions remain robust.

(8) G-DID analysis

To further validate the robustness of our baseline findings, we exploit the 2018 merger of the China Banking Regulatory Commission (CBRC) and the China Insurance Regulatory Commission (CIRC) as an exogenous shock to the financial regulatory framework, and construct a difference-in-differences (DID) design to conduct a quasi-natural experiment. In March 2018, the State Council approved the institutional reform plan to integrate the responsibilities of the CBRC and the CIRC into a newly established supervisory authority—the China Banking and Insurance Regulatory Commission (CBIRC). This merger represents a major institutional reform of China's financial regulatory architecture, effectively eliminating regulatory vacuums and arbitrage opportunities inherent in the previous separate regulatory system, while enhancing the professionalism and effectiveness of supervisory enforcement. In terms of enforcement practices, the intensity of banking regulatory penalties increased notably after the merger. Taking the sample banks as an example, they received a total of 237 penalties in the first quarter of 2018, representing a 20.92% increase compared to the same period in 2017. Thus, the CBRC-CIRC merger constitutes an exogenous and substantial regulatory reform shock, providing an ideal quasi-natural experimental setting for identifying the causal effect of penalties on bank systemic risk.

Danisewicz et al. (2018) found that after imposing penalties, regulators intensify their scrutiny of the penalized banks, making it more likely to uncover serious problems. This logic also applies to regulatory reforms that strengthen overall enforcement. Specifically, banks with a higher ex ante degree of violations are precisely those that attract more regulatory attention and thus experience a stronger policy impact. In contrast, banks with lower ex ante violation levels are less affected by the reform. Accordingly, we construct a G-DID model with two-way fixed effects, specified as follows:

$$BSR_{i,t} = \alpha_0 + \alpha_1 Treat_i \times Post_t + \beta \sum Controls_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (2)$$

We define the key variables in the G-DID model as follows. $Treat_i$ is the policy shock variable, measured as the average penalty intensity of each sample bank over the three-year period before the reform. A higher value of $Treat_i$ indicates that the bank faced stronger pre-reform penalties and, consequently, was more exposed to the regulatory reform shock. $Post_t$ is a time dummy variable, which takes the value of 0 before 2018 and 1 from 2018 onwards. The control variables are identical to those in Model (1). Columns (1) and (2) of Table 5 report the G-DID estimation results. The estimated coefficients of $Treat \times Post$ are significantly negative at the 1% level. This indicates that banks with higher pre-reform penalty intensity experienced a greater reduction in systemic risk following the CBIRC merger.

To further validate the parallel trends assumption, we construct the following model:

$$\begin{aligned} BSR_{i,t} \quad &= \alpha_0 + \alpha_1 Treat_i \times Before3 + \alpha_2 Treat_i \times Before2 + \alpha_3 Treat_i \times Before1 \\ &+ \alpha_4 Treat_i \times After1 + \alpha_5 Treat_i \times After2 + \alpha_6 Treat_i \times After3 \\ &+ \beta \sum Controls_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \end{aligned} \quad (3)$$

This model takes the period of the CBIRC merger (2018 Q1) as the baseline, and compares all other periods against this benchmark. Specifically, $Beforek$ equals 1 if the observation is k periods before 2018 Q1, and 0 otherwise; $Afterk$ equals 1 if the observation

is k periods after 2018 Q1, and 0 otherwise; and *Current* equals 1 if the observation is in the baseline period, and 0 otherwise. Columns (3) and (4) of Table 5 and Figure 3 present the results of the parallel trends test, with the current period omitted. Before the CBIRC merger, there is no significant differential trend in systemic risk across the sample banks, indicating that the parallel trends assumption is satisfied.

Table 5. G-DID estimation.

Variables	(1) *BSR*	(2) *BSR*	(3) *BSR*	(4) *BSR*
$Treat \times Post$	−0.2851 ***	−0.3457 ***		
	(−2.7577)	(−2.8646)		
$Treat \times Before3$			0.1426	0.1003
			(0.6699)	(0.3879)
$Treat \times Before2$			0.1465	0.1911
			(0.5451)	(0.6560)
$Treat \times Before1$			0.0969	0.1755
			(0.4364)	(0.7564)
$Treat \times After1$			0.0033	0.0937
			(0.0151)	(0.4399)
$Treat \times After2$			−0.6000 **	−0.4897 **
			(−2.7790)	(−2.1828)
$Treat \times After3$			−0.1609	−0.0485
			(−0.9246)	(−0.2615)
Sample size	845	845	845	45
R^2	0.8884	0.8909	0.8876	0.8898
Control variables	No	Yes	No	Yes
Individual fixed	Yes	Yes	Yes	Yes
Time fixed	Yes	Yes	Yes	Yes

*** and ** indicate significant levels at 1% and 5%, respectively.

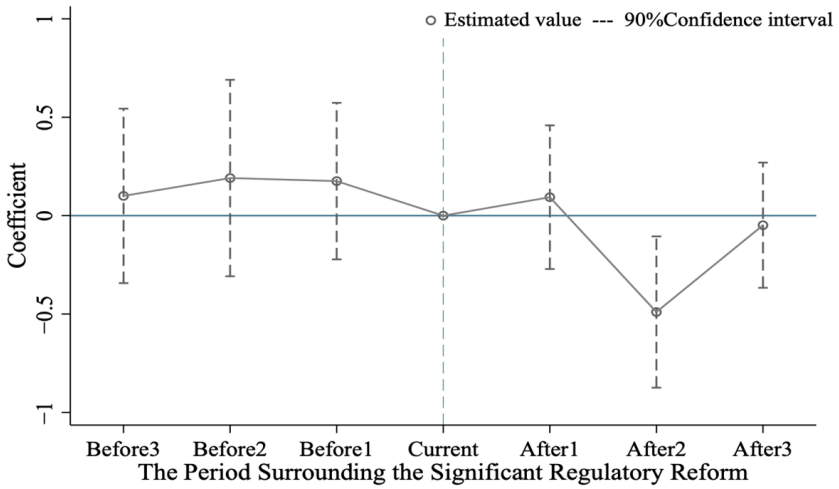


Figure 3. Parallel trends test.

4.3. Long-Term Effects of Regulatory Penalties

The baseline results show that financial regulatory penalties significantly reduce bank systemic risk. On this basis, we further discuss the long-term effects of regulatory penalties. Considering that penalties are corrective measures taken by regulators in a timely manner when financial institutions commit violations, we expect that regulatory penalties are unlikely to have long-lasting risk-control effects. To test this expectation, we follow Danisewicz et al. (2018) and introduce one- to three-period lags of the penalty variable into the baseline model. Table 6 reports the effects of regulatory penalties on bank systemic risk across different time horizons.

Table 6. Long-term effects test.

Variables	(1) *BSR*	(2) *BSR*	(3) *BSR*
L.Fsp	−0.1352 * (−1.7391)		
L2.Fsp		0.0288 (0.3261)	
L3.Fsp			−0.0893 (−1.0892)
Sample size	1014	977	940
R^2	0.9147	0.9138	0.9153
Control variables	Yes	Yes	Yes
Individual fixed	No	Yes	Yes
Time fixed	No	Yes	Yes

* indicates significant level at 10%.

The results show that *L2.Fsp* and *L3.Fsp* have no significant effect on bank systemic risk. In other words, the risk-control effect of regulatory penalties is limited to the current period and the subsequent period. This finding is broadly consistent with Ming et al.'s study (Ming et al. 2025), which suggests that the impact of regulatory penalties is short-lived. After a mandatory penalty is imposed, banks respond with immediate corrective actions. These actions reduce systemic risk in the short term, but do not generate long-term effects on financial stability.

4.4. Channels Test

Building upon the theoretical analysis presented in the previous section, this study confirms that financial regulatory penalties can effectively constrain individual banks' risk-taking behaviors and reduce the transmission of risks among financial institutions. As a result, such penalties contribute to the mitigation of systemic risks within the banking system. This research examines the key mechanisms through which financial regulatory penalties affect systemic risk by analyzing two dimensions: the evolution of systemic risk over time and the cross-sectional spread of risks among financial institutions, with particular emphasis on individual bank risk and interbank risk spillovers.

4.4.1. Channel of Bank Individual Risk Suppression

To examine the inhibitory effect of financial regulatory penalties on bank individual risk, this study further analyzes the effects of *Fsp* on *o_Rwa*, *σ_Roa*, and *c_Pgr*. The results are shown in columns (1), (2), and (3) of Table 7. The empirical results show that the estimated coefficient of *Fsp* on *o_Rwa* is significantly negative, at −0.0016. A one-standard-deviation increase in penalty intensity reduces the ratio of operational risk assets by 4.64%. This suggests that stronger regulatory penalties impose tighter constraints on bank violations. The estimated coefficient of *Fsp* on *σ_Roa* is also significantly negative, at −0.0021. A one-standard-deviation increase in penalty intensity reduces earnings volatility by 2.59%. This implies that enhanced regulatory enforcement encourages banks to strengthen asset-liability management and risk-control measures. As a result, operational volatility declines and compliance stability improves. Furthermore, the estimated coefficient of *Fsp* on *c_Pgr* is 0.0057, significant at the 1% level. A one-standard-deviation increase in penalty intensity extends the profit cycle by 8.60%. This indicates that regulatory penalties, to some extent, prolong the upward phase of the profit cycle, promote earnings growth, and enhance the operational stability and resilience of commercial banks.

Table 7. Channel tests.

Variables	(1) *o_Rwa*	(2) *σ_Roa*	(3) *c_Pgr*	(4) *Shadow*	(5) *Beta*
Fsp	−0.0016 *	−0.0021 **	0.0057 ***	−0.0065 **	−0.0224 **
	(−1.9574)	(−2.1946)	(3.3624)	(−2.0309)	(−2.0976)
Sample size	1051	1051	1051	1051	1051
R^2	0.6391	0.8814	0.8207	0.9826	0.5307
Control variables	Yes	Yes	Yes	Yes	Yes
Individual fixed	Yes	Yes	Yes	Yes	Yes
Time fixed	Yes	Yes	Yes	Yes	Yes

***, **, * indicate significant levels at 1%, 5%, and 10%, respectively.

The underlying economic rationales may be as follows. After the imposition of legal penalties on non-compliant banks, financial regulators typically conduct unscheduled inspections within a specified timeframe to ensure ongoing compliance. Alternatively, comprehensive "look-back" on-site examinations may be carried out to evaluate the effectiveness of corrective actions taken by the penalized institutions. Should the rectification efforts prove inadequate or incomplete, these banks may face even stricter enforcement measures. Under such heightened regulatory scrutiny, non-compliant banks are incentivized to minimize legal exposure and pursue long-term stability by proactively adjusting internal structures and strategic models, thereby enhancing operational stability (Delis et al. 2017). These adjustments contribute to improved profitability and operational efficiency, suggesting that financial regulatory penalties can exert a mitigating influence on systemic risk at the individual bank level over a defined time horizon.

4.4.2. Channel of Bank Risk Contagion Weakening

To evaluate the mitigating effect of financial regulatory penalties on bank risk contagion, this study examines the causal effects of *Fsp* on *Shadow* and *Beta*. The results are shown in columns (4) and (5) of Table 7. The results show that the estimated coefficient of *Fsp* on *Shadow* is −0.0065, which is statistically significant at the 5% level. A one-standard-deviation increase in penalty intensity reduces shadow banking activities by 2.95% for penalized banks. This suggests that regulatory penalties effectively constrain high-risk shadow banking activities. These include non-compliant asset management, wealth management, and channel businesses. By curbing these practices, penalties reduce the intensity of financial risk contagion and weaken risk transmission across banks and other financial institutions. The estimated coefficient of *Fsp* on *Beta* is −0.0224, which is also significant at the 5% level. A one-standard-deviation increase in penalty intensity reduces the degree of risk interconnectedness between penalized banks and the financial system by 4.31%. This implies that regulatory penalties reduce the correlation between bank-specific value fluctuations and broader market movements, thereby curbing the spillover effects of bank-level risks to the financial system.

The underlying economic rationales may be as follows: (1) Financial regulatory penalties can curb high-risk shadow banking activities by prompting banks to improve information disclosure, enhance risk transparency and strengthen corporate governance. These measures, by simplifying the inter-bank financing structure and controlling banks' high-leverage operations, force banks to refocus on their core business. As a result, the transmission pathways of risks throughout the banking system are disrupted, and the spillover effects of bank-specific risks on the broader financial system are mitigated.

(2) Financial regulators may control bank systemic risk by imposing targeted penalties on systemically important violators and reducing the correlation of the bank's risk network. Evidence indicates that banks with large-scale noncompliant interbank assets

exhibit lower funding stability and face a higher likelihood of insolvency during financial crises due to liquidity runs (Diallo and Al-Mansour 2017; Wu and Shen 2019; Han and Wang 2023). Furthermore, these institutions maintain more extensive direct interbank exposures and indirect linkages through common asset holdings, significantly amplifying their impact on systemic risk (Adrian and Shin 2010; López-Espinosa et al. 2012). Therefore, entities engaged in high-risk interbank asset activities represent critical nodes in the systemic risk network. To enhance regulatory effectiveness, authorities can align penalty intensity with the systemic importance of these institutions by increasing the frequency and severity of inspections and penalties. This approach helps control high-risk violations, mitigate interbank risk transmission, and reduce overall systemic risk exposure.

(3) Regulatory penalties also serve to curb homogeneous investment strategies among banks, thereby weakening risk transmission mechanisms. By discouraging high-risk, synchronized investment behaviors, penalties encourage banks to adopt diversified asset allocation strategies and implement prudent risk management practices. This reduces the likelihood of uniform market reactions, lowers individual banks' sensitivity to systemic fluctuations, and weakens the co-movement between bank-specific risks and broader financial market risks, ultimately contributing to the containment of systemic risk at the banking system level.

(4) A tiered and collaborative supervisory framework enhances the enforcement efficiency of regulatory penalties and helps suppress regional risk resonance. In practice, high-risk interbank asset operations and large-scale shadow banking activities are prioritized for on-site inspections and enforcement actions. To improve regulatory coordination, financial authorities increasingly adopt multi-agency joint supervision mechanisms. Provincial regulators coordinate regional oversight resources and intensify supervision over branches of non-compliant banks located in prefectural and county-level jurisdictions. These targeted measures help prevent risk transmission and resonance among banks, thereby supporting the effective containment of systemic risks at the operational level.

4.5. Impact Effect Analysis

According to theoretical analysis, the control effect of financial regulatory penalties on bank systemic risk may be influenced by external regulatory environment pressure and the supervisory behavior of bank creditors. Therefore, this paper analyzes the factors influencing the effectiveness of financial regulatory penalties in mitigating systemic risk from the following two aspects.

4.5.1. Regulatory Environment Pressure Effect

The regulatory environment pressure faced by banks usually stems from the penalty intensity imposed on peer institutions. Specifically, when other banks receive regulatory penalties more frequently and in larger amounts, the overall regulatory environment tends to tighten, and the external deterrent effect of regulatory signals strengthens. Against this background, banks that have not been penalized will perceive higher compliance pressure and thus be more proactive in complying with regulatory requirements and strengthening risk controls, thereby enhancing the inhibitory effect of financial regulatory penalties on systemic risk. This mechanism reflects the reinforcing effect of regulatory environment pressure on regulatory effectiveness.

To examine the regulatory environment pressure effect of financial regulatory penalties on bank systemic risk, this study introduces a proxy variable representing the proportion of fines imposed on other banks of the same type relative to the total fines across all sample banks (Fsp_m). This variable captures the regulatory pressure exerted on a given bank i

when its peer institutions are subject to penalties.[7] The estimation results are shown in columns (1) and (2) of Table 8. The analysis reveals that the coefficient of the interaction term between the peer penalty intensity and the bank-specific penalty intensity is negative and statistically significant at the 10% level. This indicates that as the regulatory pressure from peer institutions increases, the effectiveness of financial regulatory penalties in curbing systemic risk is further strengthened. Hypothesis 2 is verified.

Table 8. Analysis of moderating effects.

Variables	(1) *BSR*	(2) *BSR*	(3) *BSR*	(4) *BSR*	(5) *BSR*	(6) *BSR*
$Fsp \times adx$	−0.4780 *	−0.4179 *	−0.0249 ***	−0.0211 **	−1.5430 ***	−1.3427 **
	(−1.9404)	(−1.7429)	(−2.6506)	(−2.3124)	(−2.8452)	(−2.5531)
Fsp	−0.0424	−0.0620	0.1926	0.1363	0.1622	0.1177
	(−0.4243)	(−0.6214)	(1.5442)	(0.9779)	(1.4177)	(0.9009)
adx	0.7023	0.8443	−0.0198	−0.0189	−0.6801	−0.4414
	(0.9179)	(1.1284)	(−0.9280)	(−0.5117)	(−0.4839)	(−0.2061)
Sample size	1051	1051	1051	1051	1051	1051
R^2	0.9134	0.9149	0.9132	0.9149	0.9121	0.9141
Control variables	No	Yes	No	Yes	No	Yes
Individual fixed	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed	Yes	Yes	Yes	Yes	Yes	Yes

In columns (1) and (2), *adx* is *Fsp_m*; in columns (3) and (4), it is *Il*; and in columns (5) and (6), it is *Ndl*. ***, **, * indicate significant levels at 1%, 5%, and 10%, respectively.

The underlying economic rationales may be as follows: (1) A stricter regulatory environment reduces the opportunistic risk-taking mentality and short-term compliance behaviors. It enhances the ability of financial regulatory penalties to control operational risks, asset-liability risks, and interbank risk contagion at the individual bank level, thereby reinforcing the systemic risk mitigation effect of financial regulatory penalties. Furthermore, when regulators intensify their oversight based on an assessment of the overall risk landscape, such actions help uncover previously hidden bank information and send credible signals to the market. This encourages market participants to reassess and scrutinize bank activities, thereby amplifying the financial governance effect of regulation and making the systemic risk-control function of penalties more pronounced. (2) Regulatory penalties imposed on peer banks generate a deterrent effect, raising the expected costs of non-compliant operations (Wang et al. 2023) and reducing the risk-taking incentives of banks with similar characteristics (Caiazza et al. 2018). As the overall enforcement intensity in the financial industry increases, non-violating banks may proactively implement risk-reduction measures to avoid regulatory scrutiny. This demonstrates both the punitive effect on violators and the preventive signaling effect on non-violators. Consequently, heightened peer regulatory pressure enhances the capacity of existing financial regulatory penalties to manage systemic risk in the banking system.

4.5.2. Creditor Monitoring Effect

The creditors of banks' non-deposit liabilities are primarily professional financial institutions equipped with risk assessment and management capabilities. To examine how creditor monitoring moderates the impact of financial regulatory penalties on bank systemic risk control, this study introduces two key indicators. First, the proportion of interbank liabilities (*Il*) is used to measure the intensity of supervision exerted by interbank creditors.[8] A higher *Il* suggests that interbank creditors are likely to impose stricter monitoring on the bank in question. Second, we introduce the proportion of non-deposit liabilities (*Ndl*).[9] This

variable further categorizes non-deposit liabilities into interbank liabilities, bond financing liabilities, and central bank borrowings. It captures the supervisory intensity of various non-deposit creditors, including interbank institutions, bond market investors, and the central bank.

As evidenced in columns (3)–(6) of Table 8, the significantly negative coefficients of $Il \times Fsp$ and $Ndl \times Fsp$ interaction terms demonstrate that elevated creditor monitoring intensity strengthens the systemic risk containment function of regulatory penalties. Specifically, banks with higher Il and Ndl exhibit greater reductions in both idiosyncratic risks and interbank contagion risks under equivalent penalty intensity. This synergistic effect derives from creditors' dual role as risk mitigators and market disciplinarians. Hypothesis 3 is verified.

The underlying economic rationales may be as follows: (1) Institutional creditors demonstrate superior information-processing capabilities compared to retail depositors, leading to intensified monitoring following regulatory penalties. During financial distress, their rapid withdrawal of funds generates early liquidity pressures that compel banks to address risks more swiftly (Chouchène et al. 2017; Janbaz et al. 2024). (2) Increased reliance on bond financing necessitates the disclosure of penalties as material events, which directly links regulatory compliance to market-based financing costs through yield spread adjustments. This mechanism encourages banks to implement timely corrective measures. (3) A high dependence on central bank borrowing activates a coordinated supervisory response, involving punitive interest rates and macroprudential tools. These measures deter banks from exploiting emergency liquidity facilities for non-compliant activities and help contain systemic risk transmission.

5. Heterogeneity Analysis

Building on the preceding analysis, this study further investigates the heterogeneous effects of penalty characteristics—including penalty type, the tier of penalized banks, and the regulatory authority involved—on the risk containment efficacy of financial regulatory penalties.

5.1. Heterogeneous Analysis of Penalty Type

Different regulatory instruments—such as rectification orders, fines, and disqualification from office—impose distinct legal and financial burdens on offending banks and their executives, potentially leading to varied deterrent effects on non-compliant and risk-taking behaviors. To explore these differences, this study separately examines the heterogeneous impacts of four penalty indicators: the frequency of rectification orders (g_Fsp), disqualification orders (c_Fsp), fine imposition (f_Fsp), and the total amount of fines (a_Fsp). The results, presented in Panel A of Table 9, show that both the frequency and magnitude of fines are significantly and negatively associated with systemic risk levels in banks. This suggests that, compared to non-economic penalties such as rectification and disqualification, financial penalties exert a more direct and potent influence on bank behavior, effectively curbing risk-taking and enhancing operational discipline, thereby contributing more substantially to systemic risk control.

The underlying economic rationales may be as follows: (1) Rectification orders entail relatively low legal costs, and due to market positioning and structural constraints, penalized banks often fail to make meaningful behavioral adjustments. (2) High-cost penalties like disqualification are reserved for severe violations and are rarely applied, limiting their general deterrent and signaling effects. (3) Fines increase the cost of misconduct, significantly reducing or even eliminating the net benefit of violations, thereby diminishing banks' incentives to engage in such behavior. Furthermore, when expected

risk-taking returns fall short of potential franchise value losses, banks are incentivized to strengthen risk management and adopt more conservative strategies (Cicchiello et al. 2022; Neill 2024; Li et al. 2025).

Table 9. Heterogeneity analysis of penalty type, penalized bank level and regulatory authority.

Variables	(1) *BSR*	(2) *BSR*	(3) *BSR*	(4) *BSR*
Panel A: By Penalty Type				
	Rectification orders	Disqualification orders	Fine imposition	Total amount of fines
g_Fsp	0.0620			
	(0.6968)			
c_Fsp		0.0455		
		(0.2502)		
f_Fsp			−0.2141 **	
			(−2.4655)	
a_Fsp				−0.0488 *
				(−1.7382)
Sample size	1051	1051	1051	1051
R^2	0.9138	0.9137	0.9142	0.9139
Control variables	Yes	Yes	Yes	Yes
Individual fixed	Yes	Yes	Yes	Yes
Time fixed	Yes	Yes	Yes	Yes
Panel B: By Penalized Bank Level				
	Head offices	Provincial branches		Municipal branches
Fsp	0.2163	−0.2908 ***		0.2163
	(1.3538)	(−3.0666)		(1.3538)
Sample size	1051	1051		1051
R^2	0.9139	0.9145		0.9139
Control variables	Yes	Yes		Yes
Individual fixed	Yes	Yes		Yes
Time fixed	Yes	Yes		Yes
Panel C: By Regulatory Authority				
	PBOC		NFRA	
Fsp	−0.0636		−0.2679 ***	
	(−0.5220)		(−2.7666)	
Sample size	426		1051	
R^2	0.8551		0.9144	
Control variables	Yes		Yes	
Individual fixed	Yes		Yes	
Time fixed	Yes		Yes	

***, **, * indicate significant levels at 1%, 5%, and 10%, respectively.

5.2. Heterogeneity Analysis of Penalized Bank Level

To further examine the impact of financial regulatory penalties on bank systemic risk across different bank levels, the study categorizes penalized banks into a head office group, a provincial branch group, and a municipal branch group. Estimation results are shown in Panel B of Table 9. The findings show that penalties imposed on banks' provincial branches significantly reduce bank systemic risk at the 1% significance level, indicating a stronger risk containment effect.

The underlying economic rationales may be as follows: (1) Central regulatory authorities primarily focus on policy formulation and macro-level risk assessment, with limited on-site inspection capacity, resulting in fewer penalties on head offices and

weaker risk-control outcomes. (2) Provincial and municipal regulators operate closer to the operational frontlines, enabling more effective implementation of risk-based supervision and thus significantly lowering systemic risks. (3) Provincial-level regulation demonstrates superior effectiveness due to: (a) deeper policy understanding and more accurate risk identification; (b) broader enforcement authority that allows stronger legal penalties; and (c) the ability to coordinate regulatory resources across the province, leading to more targeted and deterrent penalties. In contrast, municipal-level enforcement is constrained by limited authority and potential interference from interpersonal relationships, resulting in weaker risk-control effects.

5.3. Heterogeneity Analysis of Regulatory Authority

Given differing mandates among regulatory bodies, this study investigates how penalties issued by PBOC and NFRA affect systemic risk. Panel C of Table 9 reports the results. It reveals that penalties from NFRA have a significantly negative coefficient at the 1% level, indicating a stronger systemic risk containment effect.

The underlying economic rationales may be as follows: (1) PBOC penalties primarily target areas such as credit reporting, payment systems, and anti-money laundering, which contribute to long-term infrastructure development but have limited short-term impact on systemic risk. Meanwhile, as the macroprudential regulatory authority of a developing country, PBOC has explored and adopted less structural and more aggregate macroprudential regulatory tools. The latter was significantly less effective in controlling bank systemic risk than the former (IMF 2018). (2) Penalties from NFRA focus more directly on high-risk banking activities and illegal transactions, thereby more effectively curbing individual risk and contagion effects in the short term.

Figure 4 presents the heterogeneous effects of financial regulatory penalties on bank systemic risk across different penalty types, penalized bank levels, and regulatory authorities. As shown in Figure 4, regulatory penalties significantly control systemic risk under the following conditions: (1) when they impose direct economic costs (monetary fines), (2) when they target operational-level entities (provincial branches), and (3) when they are enforced by the microprudential supervisor (NFRA).

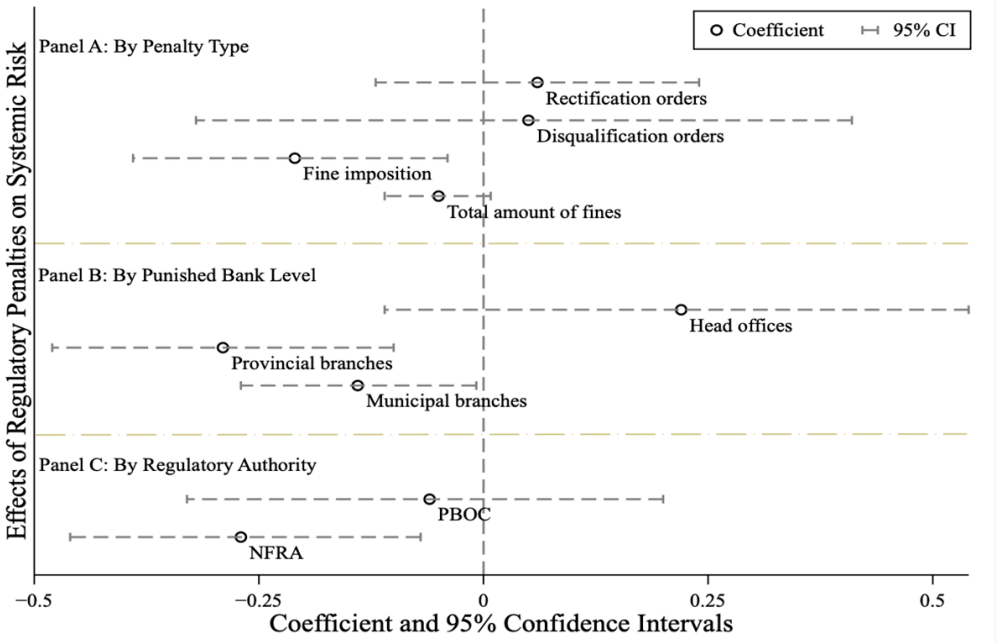


Figure 4. Forest plot of penalty type, penalized bank level and regulatory authority.

6. Further Analysis

We further observe the control effect of financial regulatory penalties on bank systemic risk under extreme risks. Referring to the studies of Yang et al. (2024) and Huang and Jiang (2025), the explanatory variable is replaced with the bank systemic risk estimated by the extreme value theory (EVT) under the thick-tail condition, while the other control variables and treatment methods remain the same. The estimated results are shown in Table 10. Analysis shows that the explanatory effect of financial regulatory penalties on bank systemic risk is not significant.

Table 10. Analysis of regulatory penalty effects on extreme systemic risk.

Variables	(1) *BSR*	(2) *BSR*	(3) *BSR*
Fsp	−0.0427 ***	−0.0080	−0.0011
	(−4.3231)	(−0.7387)	(−0.1025)
Sample size	1051	1051	1051
R^2	0.0958	0.4299	0.6538
Control variables	No	No	Yes
Individual fixed	No	Yes	Yes
Time fixed	No	Yes	Yes

*** indicates significant level at 1%.

On this basis, this chapter further examines the control effect of financial regulatory penalty measures—including rectification orders, revocation of professional qualifications, fine frequency, and fine amount—on extreme systemic risk. The results are shown in Panel A of Table 11. The results show that the coefficients of these penalty variables remain statistically insignificant on extreme systemic risk. Furthermore, following Huang and Jiang (2025), we decompose bank systemic risk into two components: individual risk and associated risk. The corresponding results are presented in Panel B and C of Table 11. The results show that virtually none of the penalty measures exert a significant controlling effect on either individual risk or associated risk.

Figure 5 displays a forest plot of the coefficient estimates by subgroup, showing the heterogeneous effects of various financial regulatory penalty measures on extreme systemic risk and its two dimensions—individual risk and associated risk. The economic implications of the above test results lie in that when banking institutions and the banking system are in an extreme risk situation, financial regulatory penalties may not be an effective way to control bank systemic risk and maintain financial stability.

Table 11. Heterogeneous analysis of penalty types on extreme systemic risk.

Variables	(1) *BSR*	(2) *BSR*	(3) *BSR*	(4) *BSR*
Panel A: Different Penalty Types—Extreme Systemic Risk				
	Rectification orders	Disqualification orders	Fine imposition	Total amount of fines
g_Fsp	0.0243 **			
	(2.0970)			
c_Fsp		−0.0300		
		(−1.2271)		
f_Fsp			−0.0062	
			(−0.5241)	
a_Fsp				0.0007
				(0.2054)
Sample size	1051	1051	1051	1051
R^2	0.6550	0.6542	0.6539	0.6538

Table 11. *Cont.*

Variables	(1) *BSR*	(2) *BSR*	(3) *BSR*	(4) *BSR*
Panel B: Different Penalty Types—Individual Risk				
	Rectification orders	Disqualification orders	Fine imposition	Total amount of fines
g_Fsp	0.0361 *			
	(1.8648)			
c_Fsp		−0.0433		
		(−1.0513)		
f_Fsp			−0.0139	
			(−0.7816)	
a_Fsp				−0.0017
				(−0.3000)
Sample size	1051	1051	1051	1051
R^2	0.6516	0.6509	0.6508	0.6507
Panel C: Different Penalty Types—Associated Risk				
	Rectification orders	Disqualification orders	Fine imposition	Total amount of fines
g_Fsp	−0.0019			
	(−0.6875)			
c_Fsp		−0.0140		
		(−1.5735)		
f_Fsp			0.0009	
			(0.3127)	
a_Fsp				0.0008
				(0.7071)
Sample size	1051	1051	1051	1051
R^2	0.7401	0.7415	0.7401	0.7403
Control variables	Yes	Yes	Yes	Yes
Individual fixed	Yes	Yes	Yes	Yes
Time fixed	Yes	Yes	Yes	Yes

** and * indicate significant level at 5% and 10%, respectively.

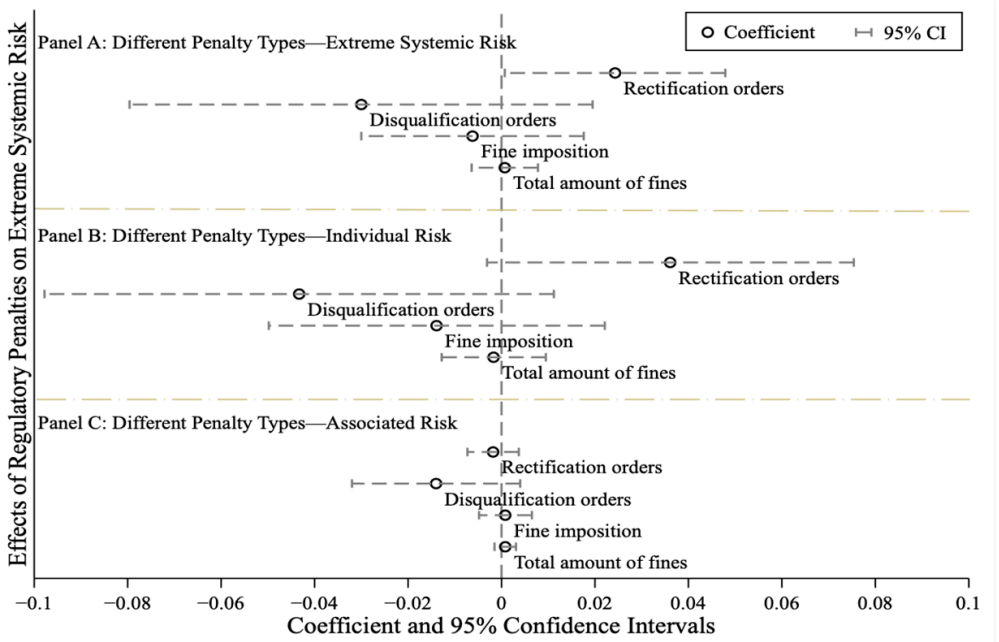


Figure 5. Forest plot of estimated effects of different penalty types on extreme systemic risk.

7. Conclusions

This study examines Chinese listed banks from 2014 to 2023 and empirically investigates how financial regulatory penalties influence bank systemic risk. The conclusions are as follows. First, financial regulatory penalties play a mitigating role in bank systemic risk. This effect can be achieved either by mitigating bank operational risk, enhancing operational stability, promoting bank profitability, and curbing individual bank risk, or by reducing high-risk interbank activities and weakening risk transmission among banks. Second, a stricter regulatory environment and stronger creditor oversight both reinforce the effectiveness of regulatory penalties in curbing bank systemic risk. Penalties in the form of fines, penalties on provincial and lower-level bank branches, and penalties imposed by financial regulatory authorities are more effective in mitigating bank systemic risk. It is worth noting that when banking institutions and the banking system are in an extreme risk situation, financial regulatory penalties may not be an effective way to control bank systemic risk and maintain financial stability.

These findings suggest several measures to further enhance the effect of financial regulatory penalties on systemic risk control. These include strengthening coordination between macroprudential management and microprudential supervision, improving the consistency and enforcement of penalties by different regulatory authorities, and enhancing regulatory collaboration in responding to major risks. At the same time, moderately increasing fine severity can enhance economic deterrence against violations, while unified inspections and standardized penalties for common violations can improve industry compliance. Regulators should also strengthen oversight of bank headquarters and reinforce the supervisory role of creditors and market participants through risk information disclosure and peer assessment.

This study has several limitations that point to future research directions. (1) Our analysis focuses on the direct disciplinary effects of penalties through observable channels, but does not capture the indirect reputational effects. Penalties signal misconduct to the market, potentially triggering adverse reactions from depositors, investors, and counterparties, which may amplify the disciplinary effect. Future research could disentangle the reputational channel. (2) Our reduced-form estimation may not fully account for unintended risk-taking responses. Penalized banks may shift risky activities to off-balance-sheet vehicles or engage in regulatory arbitrage, offsetting part of the intended risk reduction. Future studies could trace these behavioral adjustments using granular operational data. (3) While our dataset includes 10,462 penalty decisions, it is limited to publicly disclosed enforcement actions and may not cover informal supervisory interventions. Moreover, the lack of standardized severity metrics prevents a more nuanced severity-based classification of penalties. Future research could complement our analysis with proprietary supervisory data or richer textual information. (4) This paper is confined to the domestic Chinese banking context and does not address cross-border spillovers. Stricter domestic enforcement may induce regulatory arbitrage, with banks shifting risky activities to jurisdictions with weaker oversight. Conversely, penalties on globally active banks could enhance home-country regulatory credibility. Future research could incorporate bilateral cross-border exposure data to trace these international spillovers.

Author Contributions: Conceptualization, W.M. and Y.H.; methodology, W.M.; software, W.M.; validation, S.Z. and Y.H.; formal analysis, W.M. and S.Z.; investigation, W.M.; resources, Y.H.; data curation, S.Z.; writing—original draft preparation, W.M. and S.Z.; writing—review and editing, S.Z. and Y.H.; visualization, S.Z.; supervision, Y.H.; project administration, Y.H.; funding acquisition, W.M. and Y.H. All authors have read and agreed to the published version of the manuscript.

Funding: We acknowledge the support of the National Social Science Foundation of China in the Later Period, "Research on the Cross border Infectious Effects and Monitoring and Prevention of Systemic Financial Risks" (Grant No. 23FJYA004), and the Planning Project of Humanities and Social Sciences Research Project of the Ministry of Education, "Analysis of Sustainable Development Mechanism and Construction of Optimization Path for Digital Inclusive Finance" (Grant No. 23YJA790032).

Data Availability Statement: The data presented in this study are available upon request from the corresponding author. The data are not publicly available due to privacy restrictions. Public deposit is not permitted, though de-identified subsets can be shared upon reasonable request.

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

PBOC	The People's Bank of China
NFRA	The National Financial Regulatory Administration
SYS-GMM	System Generalized Method of Moments
G-DID	Generalized Difference-in-Differences
CBRC	The China Banking Regulatory Commission
CIRC	The China Insurance Regulatory Commission
CBIRC	The China Banking and Insurance Regulatory Commission (CBIRC)
EVT	The Extreme Value Theory

Appendix A

Table A1. Summary of bank violations disclosed by National Financial Regulatory Headquarters, 2010–2023.

No.	Typical Violations	Violation Category
1	Violation of granting credit loans to related persons	No real transaction background
2	Consecutive banker's acceptance business without real trade background for the same customer and formation of advances	
3	Issuing banker's acceptances for enterprises without real and effective trading backgrounds	
4	Issuing housing mortgage loans without real loan demand	
5	Failure to effectively verify the authenticity of the background of accounts' receivable assignment	
6	Acceptance of instruments that do not have a real transaction and debt relationship	
7	Provision of credit and issuance of factoring financing without a real trade background	
8	Handling of factoring financing business receivable return notes that are not real	
9	Lax examination of authenticity of trade background in handling letters of credit and forfaiting resale business	
10	Issuance of false capitalization summons for borrowers and irregular loan disbursement	
11	Illegal issuance of loans in violation of the loan-to-value ratio requirement for the same borrower	
12	Issuance of loans without fulfillment of credit conditions, and issuance of loans beyond the credit limit	
13	Failure to strictly review and monitor the use of funds from letters of credit and formation of advances on expiration of letters of credit	
14	Granting loans to projects that do not comply with regulations	
15	Inadequate basis for loan disbursement and repeated offenses	
16	Disorganized management of connected transactions	
17	Other pre-lending due diligence inadequacies	
18	Issuance of factually incorrect creditworthiness certificates and other business violations	Joint counterfeiting
19	Violation of the real-name system of personal deposit accounts for personal savings deposits	
20	Private use of seals to issue fund entry vouchers for external use	
21	Participating in illegal transfer of credit assets and misrepresentation of statements to hide non-performing loans	
22	Providing false certificates to regulatory authorities that do not meet regulatory requirements	
23	Serious violation of prudent business principles in the purchase and sale business, formation of advances by commercial paper bonding and concealment of non-performing assets	

Table A1. *Cont.*

No.	Typical Violations	Violation Category
24	Lack of timely approval of fund utilization and change in use of loan funds	Loopholes in the supervision of loan approvals
25	Failure to effectively monitor the use of loan funds after loan approval, and reflecting inaccurate use of loan funds	
26	Ineffective post-loan management, loans become non-performing and cause losses	
27	Engaging in bond investment activities in violation of the law and creating significant risks	
28	Deposit and loan linkage in related businesses	Violations of business scope and procedures
29	Misappropriation of loan funds and conversion of loans to deposits	
30	Non-compliance of interbank bill assets	
31	Management of trust property not prudent	
32	Operational deviation from the main business and over-representation of interbank financing	
33	Issuance of mortgage loans to uncompleted buildings	
34	Issuance of working capital loans for project construction for real estate project development	
35	Failure to accurately measure risk and make appropriate capital and provisions as required	
36	Failure to obtain regulatory authorization for the appointment of senior executives	
37	Adopting improper means to absorb deposits	
38	Unauthorized promises of financial product returns	
39	Illegal derecognition of financial assets	Risk treatment violations
40	Failure to recognize and pursue responsibility for written-off non-performing loans	
41	Investment in bonds and asset management plans by unqualified institutions	

Notes

[1] Banks' violations, such as incorrect credit information formats and unauthorized access to credit reports, degrade data quality, undermine the effectiveness of the credit system, and reduce the accuracy of risk assessments. These deficiencies, at the financial infrastructure level, amplify individual bank risk. Breaches of payment and settlement regulations—such as improper account opening and inadequate account management—deteriorate the payment environment and heighten individual risk exposure. When false accounts are used across multiple banks, such violations may trigger risk contagion. Similarly, violations of anti-money laundering (AML) regulations—such as failure to perform customer due diligence or inaccurately reporting large and suspicious transactions—increase credit and operational risks, as well as the likelihood of severe regulatory penalties.

[2] For instance, Article 29 of the "Administrative Measures for the Issuance and Trading of Corporate Bonds" (2021 Edition) stipulates that if an issuer is under investigation by an administrative authority or is being criminally investigated by a judicial authority due to suspected violations of laws and regulations, and the relevant cases remain unresolved, and such circumstances have a material impact on the administrative approval for the public issuance of its corporate bonds, the issuer, the lead underwriter, and the securities service providers shall promptly submit a written report to the stock exchange or the China Securities Regulatory Commission. In such cases, the stock exchange or the China Securities Regulatory Commission shall suspend the corresponding procedures for issuance, listing review, or issuance registration in accordance with the law.

[3] The asset size of the sample banks constitutes over 55% of the total asset size of the banking industry, and the 10,462 penalty decisions included in the dataset represent more than 50% of all penalty opinions disclosed by the two major regulatory authorities. This indicates that the bank sample selected in this study holds a pivotal role in maintaining the stability of the banking system and safeguarding financial security.

[4] The financial market network structure method, developed in later stages, is also based on the returns of financial institutions or financial market indices. It analyzes systemic risk by calculating tail risk contagion effects and shares characteristics with the structural dimension approach to systemic risk measurement.

[5] Considering that bank operating earnings may be influenced by a combination of long-term structural factors (e.g., digital technology development, management restructuring) and short-term volatility factors (e.g., policy shocks, financial regulation), directly using the profit growth rate to measure changes in bank earnings may introduce trend-related disturbances. These disturbances can obscure the cyclical characteristics of earnings. To address this issue, this paper employs the HP filtering method to detrend the profit growth rate, thereby more accurately capturing the dynamic impact of financial regulatory sanctions on bank profitability.

[6] The accounting entries related to shadow banking activities in bank balance sheets include interbank deposits, out-sourced funds, financial assets held for trading, receivable-type investments, available-for-sale financial assets, and trading financial assets. Considering data availability and completeness, this paper selects the amount of interbank deposits, the net amount of out-sourced funds, the net amount of trading financial assets, and the net amount of bought-and-sold financial assets as proxies to measure shadow banking activities.

[7] The asset structure of banks of the same type is more similar, and the convergence of business types and asset portfolios is an important factor that triggers the enhancement of interbank risk correlation.

[8] The ratio of interbank liabilities is the proportion of a bank's interbank liabilities to its total liabilities, which include interbank deposits, funds on demand, and sale and repurchase financial assets.

[9] The ratio of non-depository liabilities of banks is calculated as (deposits with interbank and other financial institutions + on-demand funds + sale-repurchase financial assets)/deposits.

References

Acharya, Viral V., Lasse H. Pedersen, Thomas Philippon, and Matthew Richardson. 2017. Measuring systemic risk. *The Review of Financial Studies* 30: 2–47. [CrossRef]

Adrian, Tobias, and Hyun Song Shin. 2010. Liquidity and leverage. *Journal of Financial Intermediation* 19: 418–37. [CrossRef]

Adrian, Tobias, and Markus K. Brunnermeier. 2016. CoVaR. *American Economic Review* 106: 1705–41. [CrossRef]

Bandura, Albert, and Richard H. Walters. 1977. *Social Learning Theory*. Englewood Cliffs: Prentice-Hall, Vol. 1.

Berger, Allen N., Jin Cai, Raluca A. Roman, and John Sedunov. 2022. Supervisory enforcement actions against banks and systemic risk. *Journal of Banking & Finance* 140: 106222. [CrossRef]

Birge, John R., and Pedro Judice. 2013. Long-term bank balance sheet management: Estimation and simulation of risk-factors. *Journal of Banking & Finance* 37: 4711–20. [CrossRef]

Braithwaite, John. 2008. Regulatory capitalism: How it works, ideas for making it work better. In *Regulatory Capitalism*. Cheltenham: Edward Elgar Publishing.

Brownlees, Christian, and Robert F. Engle. 2017. SRISK: A Conditional Capital Shortfall Measure of Systemic Risk. *Review of Financial Studies* 30: 48–79. [CrossRef]

Buch, Claudia M., Sandra Eickmeier, and Esteban Prieto. 2010. *Macroeconomic Factors and Micro-Level Bank Risk*. CESifo Working Paper Series. Munich: CESifo.

Bunderson, Stuart, and Anjan V. Thakor. 2022. Higher purpose, banking and stability. *Journal of Banking & Finance* 140: 106138. [CrossRef]

Caiazza, Stefano, Matteo Cotugno, Franco Fiordelisi, and Valeria Stefanelli. 2018. The spillover effect of enforcement actions on bank risk-taking. *Journal of Banking & Finance* 91: 146–59. [CrossRef]

Chouchène, Mabrouk, Zied Ftiti, and Wided Khiari. 2017. Bank-to-bank lending channel and the transmission of bank liquidity shocks: Evidence from France. *Research in International Business and Finance* 39: 940–50. [CrossRef]

Cicchiello, Antonella Francesca, Matteo Cotugno, Salvatore Perdichizzi, and Giuseppe Torluccio. 2022. Do capital buffers matter? Evidence from the stocks and flows of nonperforming loans. *International Review of Financial Analysis* 84: 102369. [CrossRef]

Cincinelli, Peter, Elisabetta Pellini, and Giovanni Urga. 2024. Is there an optimal level of leverage? The case of banks and non-bank institutions in Europe. *International Review of Financial Analysis* 94: 103323. [CrossRef]

Cohen, Lee J., Marcia Millon Cornett, Alan J. Marcus, and Hassan Tehranian. 2014. Bank earnings management and tail risk during the financial crisis. *Social Science Electronic Publishing* 46: 171–97. [CrossRef]

D'Acunto, Francesco, Michael Weber, and Jin Xie. 2026. Punish one, teach a hundred: The sobering effect of punishment on the unpunished. *Management Science* 72: 6721–42.

Da Veiga, Bernardo, Michael Mcaleer, and Felix Chan. 2012. It pays to violate: How effective are the Basel accord penalties in encouraging risk management? *Accounting & Finance* 52: 95–116. [CrossRef]

Danisewicz, Piotr, Danny McGowan, Enrico Onali, and Klaus Schaeck. 2018. The real effects of banking supervision: Evidence from enforcement actions. *Journal of Financial Intermediation* 35: 86–101. [CrossRef]

Delis, Manthos D., Panagiotis K. Staikouras, and Chris Tsoumas. 2017. Formal enforcement actions and bank behavior. *Management Science* 63: 959–87. [CrossRef]

Delis, Manthos D., Panagiotis K. Staikouras, and Chris Tsoumas. 2019. Supervisory enforcement actions and bank deposits. *Journal of Banking & Finance* 106: 110–23. [CrossRef]

Diallo, Boubacar, and Abdullah Al-Mansour. 2017. Shadow banking, insurance and financial sector stability. *Research in International Business and Finance* 42: 224–32. [CrossRef]

Doan, Ngoc Thang, Dung Phuong Hoang, and Anh Hoang Thi Pham. 2020. Media reputation: A source of banks' financial performance. *International Journal of Bank Marketing* 38: 1399–419. [CrossRef]

Fuertes, Ana-Maria, and Maria-Dolores Robles. 2021. Bank credit risk events and peers' equity value. *International Review of Financial Analysis* 75: 101668. [CrossRef]

Giglio, Stefano, Bryan Kelly, and Seth Pruitt. 2016. Systemic risk and the macroeconomy: An empirical evaluation. *Journal of Financial Economics* 119: 457–71. [CrossRef]

Gorton, Gary. 1994. Bank regulation when 'banks' and 'banking' are not the same. *Oxford Review of Economic Policy* 10: 106–19. [CrossRef]

Gunningham, Neil, Peter Grabosky, and Darren Sinclair. 1998. Smart regulation: Designing environmental policy. In *Oxford Socio-Legal Studies*. Oxford: Oxford University Press.
Han, Haozhe, and Xingjian Wang. 2023. Monetary policy uncertainty and corporate cash holdings: Evidence from China. *Journal of Financial Stability* 67: 101138. [CrossRef]
He, Wenjia, Wenjing He, Dandan Xu, and Pengpeng Yue. 2023. Economic volatility, banks' risk accumulation and systemic risk. *Finance Research Letters* 57: 104115. [CrossRef]
Huang, Ji, Zongbo Huang, and Xiang Shao. 2023. The risk of implicit guarantees: Evidence from shadow banks in China. *Review of Finance* 27: 1521–44. [CrossRef]
Huang, Min, and Hai Jiang. 2025. Shadow banking, macroprudential policy and banks' systemic risk. *Research in International Business and Finance* 77: 102950. [CrossRef]
IMF. 2018. *The IMF's Annual Macroprudential Policy Survey—Objectives, Design, and Country Responses*. IMF Working Paper. Washington: International Monetary Fund.
Janbaz, Mehdi, M. Kabir Hassan, Josanco Floreani, and Alberto Dreassi. 2024. Liquidity pressure and the sovereign-bank diabolic loop. *International Review of Economics and Finance* 93: 1039–57. [CrossRef]
Jordan, John S., Joe Peek, and Eric S. Rosengren. 2000. The market reaction to the disclosure of supervisory actions: Implications for bank transparency. *Journal of Financial Intermediation* 9: 298–319. [CrossRef]
Karpoff, Jonathan M., D. Scott Lee, and Gerald S. Martin. 2008. The consequences to managers for financial misrepresentation. *Journal of Financial Economics* 88: 193–215. [CrossRef]
Koster, Hannes, and Matthias Pelster. 2017. Financial penalties and bank performance. *Journal of Banking & Finance* 79: 57–73. [CrossRef]
Köster, Hannes, and Matthias Pelster. 2018. Financial penalties and banks' systemic risk. *The Journal of Risk Finance* 19: 154–73. [CrossRef]
Laeven, Luc, and Ross Levine. 2009. Bank governance, regulation and risk taking. *Journal of Financial Economics* 93: 259–75. [CrossRef]
Leland, Hayne E., and David H. Pyle. 1977. Informational asymmetries, financial structure, and financial intermediation. *Journal of Finance* 32: 371–87. [CrossRef]
Li, Shouxing, Lili Ding, and Xin Zhao. 2025. Does government dual-target management affect local bank credit structure? Evidence from China. *International Review of Economics & Finance* 97: 103760. [CrossRef]
Liu, Zijun, Stephanie Quiet, and Benedict Roth. 2015. Banking sector interconnectedness: What is it, how can we measure it and why does it matter? *Bank of England Quarterly Bulletin* 55: 130–38.
López-Espinosa, Germán, Antonio Moreno, Antonio Rubia, and Laura Valderrama. 2012. Short-term wholesale funding and systemic risk: A global CoVaR approach. *Journal of Banking & Finance* 36: 3150–62. [CrossRef]
Ming, Lei, Yuanbiao Huang, and Shenggang Yang. 2023. Research on the Regulatory Penalty Effect in the Banking Industry. *Economic Research Journal* 58: 114–32.
Ming, Lei, Yuanbiao Huang, and Yifan Wu. 2025. Regulatory penalties and the high-quality development of banks: A perspective based on bank efficiency. *World Economy* 48: 146–79.
Neill, Ashleigh. 2024. Banking on resilience: EU macroprudential policy and systemic risk. *International Review of Economics and Finance* 93: 678–99. [CrossRef]
Peek, Joe, and Eric Rosengren. 1995. Bank regulation and the credit crunch. *Journal of Banking & Finance* 19: 679–92. [CrossRef]
Peng, Yuhao, Sichao Ma, Nanxuan Wang, and Hangxing Zheng. 2023. Shadow banking regulation and bank risk prevention. *Economic Research Journal* 58: 83–99.
Pfarrer, Michael D., Katherine A. Decelles, Ken G. Smith, and M. Susan Taylor. 2008. After the fall: Reintegrating the corrupt organization. *Academy of Management Review* 33: 730–49. [CrossRef]
Roman, Raluca A. 2020. Winners and losers from supervisory enforcement actions against banks. *Journal of Corporate Finance* 60: 101516. [CrossRef]
Siebenbrunner, Christoph, Martin Hafner-Guth, Ralph Spitzer, and Stefan Trappl. 2024. Assessing the systemic risk impact of bank bail-ins. *Journal of Financial Stability* 71: 101229. [CrossRef]
Slovin, Myron B., Marie E. Sushka, and John A. Polonchek. 1999. An analysis of contagion and competitive effects at commercial banks. *Journal of Financial Economics* 54: 197–225. [CrossRef]
Stern, Gary H., and Ron J. Feldman. 2003. *Too Big to Fail: The Hazards of Bank Bailouts*. Washington, DC: Brookings Institution Press.
Van Erp, Judith. 2010. Regulatory disclosure of offending companies in the dutch financial market: Consumer protection or enforcement publicity? *Law & Policy* 32: 407–33. [CrossRef]
Vyshnevskyi, Iegor, and Wook Sohn. 2023. Nonperforming loans and related lending: Evidence from Ukraine. *Emerging Markets Review* 57: 101069. [CrossRef]
Wang, Li, Zeyu Huang, and Yanan Wang. 2023. Bank shareholder network and board governance: Evidence from Chinese commercial banks. *Journal of Innovation & Knowledge* 8: 100412. [CrossRef]

Wei, Jian, Qihang Xue, and Huimin Wang. 2024. How does bank supervision penalties affect enterprise innovation? *China Industrial Economy* 7: 105–23.

Wu, Meng-Wen, and Chung Hua Shen. 2019. Effects of shadow banking on bank risks from the view of capital adequacy. *International Review of Economics & Finance* 63: 176–97. [CrossRef]

Xiao, Shuhua, Shushang Zhu, and Ying Wu. 2023. Asset securitization, cross holdings, and systemic risk in banking. *Journal of Financial Stability* 67: 101140. [CrossRef]

Yang, Zihui, Shudai Wang, and Lin Sun. 2024. Industry layout and systemic risk of Chinese financial institutions. *The Journal of World Economy* 47: 95–123.

Zedda, Stefano, and Giuseppina Cannas. 2020. Analysis of banks' systemic risk contribution and contagion determinants through the leave-one-out approach. *Journal of Banking & Finance* 112: 105160. [CrossRef]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.