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The Effects of the COVID-19 Pandemic on the Lending Operations of Chinese Commercial Banks

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Abstract: In 2020, COVID-19 significantly impacted China's economy, causing a contraction in import-export trade and slowing national trade growth. Commercial banks were also affected, with reduced economic activities and loan enterprises facing crisis. The pandemic challenged banks' income and asset quality, while policies encouraged loan support and interest rate reductions. Overdue loan repayments posed risks. This study explores COVID-19's impact on Chinese commercial banks' credit business, analyzing macroeconomic ties, credit behavior, and recent trends. Using 42 listed banks' data from 2008-2021, it finds that the pandemic promoted credit scale but altered credit structure, leading to adverse selection and increased risk for large banks. Finally, in response to the problems existing in Chinese commercial banks, this article proposes risk prevention measures and looks forward to their normal operational prospects.

1. Introduction

Most studies believe that the impact of the COVID-19 epidemic on the economy is stronger than that of Sara.Under the influence of the COVID-19 epidemic, in order to prevent the spread of the virus to the greatest extent, it is necessary to strictly control the flow and accumulation of people, which will lead to a reduction in consumption demand, a reduction in output, a weakening in investment, an increase in unemployment and a rise in prices in a short period of time.Due to the impact of COVID-19, the operation of commercial banks has been greatly impacted. For example, banks face a large operating burden in a short period of time, the non-performing rate of bank assets increases, the quality of bank assets is much worse than before, and the income and deposit of banks will decline(Liang and Xiao,2020)[1].Under the great impact of the new coronavirus, commercial banks that strongly support and invest a large amount of loans in the tertiary industry (such as wholesale and retail, tourism and culture, accommodation and catering, transportation, etc.) often face greater operational risks, and the asset quality continues to decline, which is extremely unfavorable to the healthy development of commercial banks(Weimin and Xiaowei,2020)[2].With the decline of residents' income and the increase of unemployment rate, bad debts of banks will increase, and operating loans and consumer loans will continue to decrease. Therefore, from the perspective of long-term development, the epidemic is closely related to income, employment rate and personal loans(Minfeng,2020)[3].The loans of rural banks, rural commercial banks, urban commercial banks and other banks are mainly for small and medium-sized enterprises. Therefore, the turnover of these

banks will drop significantly in a short period of time, and they will face a higher non-performing asset rate (Lu, 2020)[4].

In the future, the assets flowing into small and medium-sized enterprises will drop significantly, which is undoubtedly a huge impact on bank assets. In this case, residents will reduce their daily consumption, and small and medium-sized enterprises (especially retail, department stores, transportation, catering and other industries) will also cut down on expenditure and increase revenue, which will inevitably affect the debt capacity of enterprises in a short time (Jijun,2020)[5].As the credit pressure continues to increase, the market is becoming more volatile, the impact of the epidemic is more and more widespread, and the global economy is experiencing a significant setback. The global GDP in 2020 will only show an increase of 1-1.5 percentage points, and it is also facing a downward crisis(Standard and Poor's,2020)[6].Under the impact of the external environment and the leverage risk of the enterprise itself, individuals and enterprises often have greater capital demand, which greatly increases the performance risk(Deyshappriya,2020)[7].The performance risk would be affected by the macro-economy to a large extent. In the case of economic upturn, as long as the bank has a certain liquidity, it can lend large amounts of money to relevant enterprises. At this time, in order to reduce the non-performing loan rate, it is necessary to carry out macro-control(Jerić and Primorac ,2017)[8].Non-performing loans will be impacted by the macro-economy. The two are connected through the following ways: there is a positive correlation between economic growth and economic income. Therefore, when a series of economic growth indicators are reduced, problems such as default repayment will also appear, and credit risk will also appear in banks.

In summary, the global economy is decelerating amidst growing uncertainties, limiting corporate debt capacity and individuals' repayment abilities for mortgages and credit cards. This escalates non-performing loans, impacting financial institutions' asset quality. To foster a stable economic environment, mitigate financial risks like credit crises, and enhance societal harmony, studying the pandemic's effects on commercial banks is crucial. China's research lags due to its planned economy, limited data, and immature capital markets. Few empirical analyses exist on post-pandemic credit business factors. This paper aims to empirically assess the pandemic's influence on commercial banks' credit scale and structure, offering policy recommendations based on findings.

2. Model proposal

This paper will study the credit business of commercial banks from two aspects of credit business scale and credit structure. Therefore, the following five explanatory variables are selected: loan scale, proportion of personal loans, proportion of enterprise loans, proportion of medium and long-term loans, and proportion of credit loans. Among them, the loan scale is used to reflect the bank's credit business scale, the proportion of medium and long-term loans, the proportion of personal loans, the proportion of enterprise loans and the proportion of credit loans are used to reflect the bank's credit structure, and the credit structure can usually reflect the risk level of loans.

This paper mainly studies the impact of COVID-19 on credit business, so the core explanatory variable is the dummy variable dum, which indicates whether the epidemic has occurred or not. Since the full outbreak of covid-19 is at the end of 2019, the dummy variable dum is taken as 0 in the years before 2020 and 1 in the years after 2020. In addition, from the perspective of loan supply and demand, this paper selects other internal financial indicators and macroeconomic indicators of banks that will have an impact on credit business as control variables. The specific indicators are as follows:

1) Scale of bank assets. The asset scale of a bank can reflect the overall strength of a bank and is the basis for carrying out various businesses. To a certain extent, it determines the profitability and risk bearing capacity of a bank. The operation of loan business will naturally be affected by the asset scale of a bank.

2) Liquidity ratio. On the one hand, the liquidity ratio determines the bank's risk bearing capacity and affects the bank's choice of loan types with different risk levels. On the other hand, it will act on the bank's deposit interest rate and then on the deposit scale, thus affecting the bank's loan supply capacity.

3) Return on total assets. The rate of return on total assets is the ratio of net profit to total assets of a commercial bank, which can reflect the profitability of a bank and have an impact on the loan efficiency and loan operation efficiency of a bank.

4) Deposit scale and deposit growth rate. Both the deposit scale and the deposit growth rate are indicators reflecting the bank's deposit business. According to the bank's business principle of "fixed loan by deposit", the bank's ability to absorb deposits is, to a large extent, what determines the supply capacity of loans and thus the development level of the bank's credit business.

5) Market share. The market share refers to the proportion of bank loans in the current period to the total loans of financial institutions. It can measure the operating ability of commercial banks' credit business and also reflect the status and competitiveness of banks in the credit market.

6) Capital adequacy ratio. The capital adequacy ratio is defined as the ratio of the bank's first-class net capital to risk weighted assets. It is an important regulatory indicator in the bank's capital regulatory framework. Under the constraint of the capital adequacy ratio regulation, the bank will control its own risk by adjusting the credit scale and adjusting the credit asset structure. Therefore, the level of the bank's capital adequacy ratio will affect the development of its credit business.

7) GDP growth rate. GDP growth rate is an important indicator reflecting the macroeconomic environment. Changes in the economic environment will directly affect the loan demand of the society. Therefore, the macroeconomic situation is an important factor affecting bank credit business.

In order to study the impact of the COVID-19 epidemic on the credit scale and credit structure of commercial banks, a panel data model is established for analysis. The dummy variable dum representing the epidemic is taken as the core explanatory variable. The specific form of the model is as follows:

$$Y_{it}=\alpha_i+\beta_1 dum_{it} + \beta_2 CAR_{it} + \beta_3 lnAS_{it} + \beta_4 CR_{it} + \beta_5 ROA_{it} + \beta_6 lnSS_{it} + \beta_7 SGR_{it} + \beta_8 MS_{it} + \beta_9 RGDP_{it} + \lambda_t + \varepsilon_{it} \quad (1)$$

In the above model, i=1,2,3,……N, t=1,2,3……T, Y_{it} respectively represent the explained variables lnLR, PLP, ELP,CLP and LLP, ε_{it} is the random error term, α_i is the individual effect that does not change with time, and λ_t is the time effect that does not change with time.Table 1 is the main variable definition table for this article.

Due to the incomplete data disclosure of some commercial banks before 2008, the sample data selected in the empirical research part is from 2008 to 2021. In order to make the sample data as complete as possible, this paper finally selects the data of 42 listed banks from 2008 to 2021 for empirical analysis, including 6 state-owned banks, 9 national joint-stock banks, 17 urban commercial banks and 10 rural commercial banks. The main sources of bank sample data are the wind database and the annual financial reports of various commercial banks. Individual indicators that cannot be directly obtained from existing databases or annual reports are calculated according to relevant formulas. The article uses Stata as the analysis software.

Table 1: Variable definition table.

	Variable name	Variable symbols	Variable definition
Explained variable	volume of credit	lnLS	Total loans of the current period
	Proportion of personal loans	PLP	Proportion of current personal loans in total loans
	Proportion of enterprise loans	ELP	Proportion of current enterprise loans in total loans
	Proportion of medium and long-term loans	LLP	Proportion of current medium and long-term loans in total loans
	Proportion of credit loans	CLP	Proportion of credit loans in total loans in the current period
Explanatory variable	Dumb variable epidemic situation	dum	The virtual variable representing the new crown is 0 before 2020 and 1 after 2020
	Leverage ratio	LER	Tier 1 net capital / total assets
	Bank asset scale	lnAS	Logarithm of ending asset balance
	Liquidity ratio	CR	Current assets at the end of the period / current liabilities at the end of the period
	Return on total assets	ROA	Current net profit / total assets
	Deposit scale	lnSS	Logarithm of total deposit at the end of the period
	Deposit growth rate	SGR	(total deposits of the current period - total deposits of the previous period) / total deposits of the previous period
	market share	MS	Ending loans of commercial banks / total ending loans of financial institutions
	capital adequacy ratio	CAR	Tier 1 net capital / risk weighted assets
	GDP growth rate	RGDP	Annual growth rate of GDP

3. Empirical process and result analysis

3.1 Empirical analysis of the impact of COVID-19 on credit business scale

The empirical study in this section selects the loan scale as the explained variable to reflect the credit business scale of commercial banks. The regression analysis results of the loan scale are shown in Table 2.

From the empirical results of the model, it can be seen that the virtual variable dum representing the epidemic has a significant impact on the loan scale, and the coefficient is positive, which indicates that the epidemic has promoted the overall loan scale of commercial banks, and the assumptions made in the theoretical model have been verified.

Comparing the empirical data of the epidemic on the loan scale in each sub sample, we can see that the dummy variable dum coefficient is positive. The absolute value of the dum coefficient in the state-owned bank sample reaches 09962, which is about twice that of the joint-stock bank, rural commercial bank and urban commercial bank samples. This shows that the epidemic has brought

more promotion to the expansion of the credit business scale of the state-owned commercial banks; In addition to the core explanatory variables, the total asset scale, deposit scale, real GDP growth rate, deposit growth rate, liquidity ratio and total asset return rate of commercial banks in other control variables also have a significant impact on the overall loan scale of commercial banks, and the impact results are consistent with the actual situation. Among them, the ending asset balance is positively related to the loan scale, and the size of the asset balance will affect the bank's credit decision for the current period. The scale of deposits is also positively correlated with the scale of loans, which fully reflects the logic of the idea of "loan by deposit". In addition, the return on total assets is positively correlated with the loan scale, and the GDP growth rate is positively correlated with the loan scale, which indicates that the overall credit business scale of commercial banks will be affected by the bank's own operating conditions and the macroeconomic environment.

Table 2: Regression results of loan scale.

	Full sample	Subsample			
lnLS	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
	all banks	state owned banks	joint stock bank	City Commercial Bank	rural commercial bank
dum	0.2356*** (5.73)	0.9962*** (10.42)	0.2525*** (6.02)	0.1412*** (4.37)	0.2485*** (6.35)
CAR	0.0035 (1.21)	-0.0070 (-1.53)	0.0067* (1.92)	0.0036 (1.11)	-0.0046 (-1.22)
lnAS	0.1626*** (4.09)	0.1238 (0.68)	0.0448 (1.17)	0.0528 (1.13)	0.0535 (0.76)
RGDP	0.0068* (1.76)	-0.0441*** (-6.89)	0.0106*** (3.11)	0.0068 (1.14)	0.0087* (1.78)
lnSS	0.8530*** (21.48)	0.5859*** (3.86)	0.9575*** (28.73)	1.0059*** (20.72)	0.8843*** (12.14)
SGR	-0.0037*** (-4.63)	0.0074** (2.11)	-0.0026*** (-3.38)	-0.0056*** (-6.17)	-0.0015 (-1.58)
MS	-0.0020 (-0.86)	-0.0023 (-0.47)	0.0009 (0.52)	-0.0015 (-0.60)	0.0003 (0.12)
CR	3.3479*** (4.15)	16.9111*** (9.60)	4.6278*** (6.05)	0.5146*** (5.26)	2.7366*** (3.59)
ROA	0.2021*** (5.91)	1.4892*** (15.18)	-0.0154 (-0.39)	0.0975** (2.11)	-0.0101 (-0.32)
_cons	-2.8494*** (-5.62)	-8.7919*** (-9.49)	-3.2048*** (-7.59)	-1.3114*** (-9.45)	-1.6141*** (-3.40)

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

To sum up, the following conclusions can be drawn: first, for the commercial banks in China as a whole, the outbreak of COVID-19 has a positive impact on the loan scale of banks. Second, the impact of the epidemic on the credit business scale of different types of commercial banks is different. The epidemic has a stronger effect on the credit business scale of larger banks (such as state-owned banks) and a smaller effect on the credit business scale of smaller banks (such as urban commercial banks and rural commercial banks). Therefore, small-scale banks should pay attention to actively carry out business transformation under the background of the epidemic, and improve business efficiency by developing diversified businesses.

3.2 Empirical analysis of the impact of COVID-19 on credit structure

The empirical study in this section selects the proportion of personal loans, the proportion of enterprise loans and the proportion of credit loans as the explanatory variables to study the credit asset structure of commercial banks. The results of full sample regression analysis on credit structure are shown in Table 3.

Table 3: Full sample regression results of credit structure

	Model (6)	Model (7)	Model (8)	Model (9)
	Proportion of personal loans	Proportion of enterprise loans	Proportion of medium and long-term loans	Proportion of credit loans
dum	18.7595***	-6.1296***	9.5324***	1.5545
	(9.90)	(-2.89)	(3.39)	(1.11)
CAR	0.0403	-0.1439	0.2422	-0.1199
	(0.30)	(-0.96)	(1.25)	(-1.22)
lnAS	2.4902	3.1471	-5.9842**	5.8260***
	(1.35)	(1.55)	(-2.15)	(4.26)
RGDP	-0.2834	0.4852**	0.2753	0.2545*
	(-1.59)	(2.44)	(1.04)	(1.94)
lnSS	0.0783	-4.0920**	7.4864***	-1.2458
	(0.04)	(-2.01)	(2.69)	(-0.91)
SGR	0.0688*	0.1353***	0.0425	0.0795***
	(1.88)	(3.30)	(0.78)	(2.93)
MS	-0.0298	-0.0273	0.1309	0.0854
	(-0.28)	(-0.23)	(0.84)	(1.10)
CR	345.4780***	-96.5333**	-289.4502***	-87.4558***
	(9.30)	(-2.32)	(-3.80)	(-3.18)
ROA	-0.0781	3.8620**	2.8104	1.9554*
	(-0.05)	(2.20)	(1.18)	(1.67)
_cons	-2.102***	162.5197***	131.8056***	29.6143*
	(-9.07)	(4.65)	(3.78)	(1.71)

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

It can be seen from the empirical results on the proportion of personal loans in model (6) above that the coefficient of dummy variable dum indicating the epidemic situation is significantly positive, which indicates that the epidemic situation will promote the growth of personal loan business of commercial banks. The empirical results of model (7) on the proportion of enterprise loans can be seen that the coefficient of dummy variable dum indicating the epidemic situation is significantly negative, which indicates that the epidemic situation will inhibit the growth of enterprise loans of commercial banks. This corresponds to our previous theoretical analysis. Under the impact of the epidemic, the probability of enterprise bankruptcy increases and the non-performing loan rate increases. Therefore, the bank will take the initiative to reduce the amount of enterprise loans for the purpose of avoiding risks. The regression results of model (8) on medium and long-term loans show that the regression coefficient of dummy variable dum, which represents the epidemic situation, is significantly positive. As the medium and long-term loans have a large time span, they will be affected by many uncertain factors during the period. Compared with the short-term loans, they will face various risks. From the perspective of risk aversion of commercial banks, it is contrary to our expectation. This may be due to the large proportion of individual housing loans in medium and long-

term loans. According to the empirical results of model (9) on the proportion of credit loans, the regression coefficient of dummy variable dum is positive but not significant. Under the epidemic situation, in theory, commercial banks will control the proportion of high-risk credit loans and reduce the risk of credit asset structure, so as to reduce the possibility of losses suffered by commercial banks in the process of credit business operation. But the relationship between the two is not significant.

According to the empirical results of the above three models, the assumptions made in the theoretical model have been verified. In addition, among other control variables, liquidity ratio has a significant impact on the four indicators of credit asset structure. Specifically, the liquidity ratio is negatively and positively correlated with the proportion of medium and long-term loans, credit loans and enterprise loans, and positively correlated with the proportion of personal loans. This indicates that the improvement of the liquidity ratio will increase the bank's holdings of low-risk loans. The liquidity ratio can indicate the liquidity risk level of commercial banks. The higher the liquidity ratio, the higher the solvency and liquidity management level of banks, and the ability to resist risks will also be improved. Therefore, under normal circumstances, when the bank's liquidity ratio rises, its risk bearing capacity will be enhanced and it can properly operate higher risk businesses. At this time, the bank can adjust the credit asset structure and increase the supply of medium and long-term loans, credit loans and other high-risk loans to obtain higher loan income; When the bank's liquidity ratio decreases, the improvement of the bank's liquidity risk level will lead to the increase of the instability of its business operation. At this time, the bank needs to pay special attention to the control of credit asset risk, reduce the proportion of high-risk credit assets, and increase the holding of low-risk credit assets such as personal loans. However, our empirical results show that the behavior of commercial banks becomes more conservative and cautious after adding the dummy variable indicating the epidemic.

3.3 Robustness test

In this paper, the data of commercial banks from 2012 to 2021 in the full sample are selected as the substitute samples to test the robustness of the full sample regression results of model 1, to ensure the stability of the conclusions, and to verify whether the external event of China's introduction of the leverage ratio regulatory policy in 2011 will affect the accuracy of the empirical conclusions. The output results of the inspection are shown in table 4.

For the five explained variables representing the scale and structure of credit business, the coefficients of the core explanatory variable dum are all significant, and the symbols are consistent with the empirical results of the original sample, which once again proves that the scale of credit business of commercial banks shows growth and development under the epidemic, and has an impact on the structure of credit business, and may lead to adverse incentives for risk. It is worth noting that, compared with the regression results of the original sample, the regression coefficient of dum is not significant in the regression in which the explained variable is the proportion of medium and long-term loans during the test. This may be due to the enhanced operational stability of commercial banks after the introduction of leverage ratio regulation, and the tendency of commercial banks to conduct high-risk loan business is significantly reduced under the leverage ratio regulation. Therefore, the conclusion of the empirical analysis in the previous section is relatively stable, and the impact of strengthening policy supervision on bank credit business in 2011 will not interfere with the accuracy of this empirical conclusion.

The final regression results show that the credit scale of commercial banks is significantly related to the epidemic. In terms of credit structure, Other explained variables (credit scale, proportion of personal loans, proportion of credit loans, proportion of medium and long-term loans) are all positively correlated, which is consistent with the previous research. The above empirical regression

results confirm that the epidemic has a significant impact on the credit business of commercial banks. Therefore, we should be more cautious and innovative in preventing the credit business of commercial banks after the epidemic.

Table 4: Full sample robustness test results.

	volume of credit	Proportion of personal loans	Proportion of enterprise loans	Proportion of medium and long-term loans	Proportion of credit loans
dum	0.1270*** (4.09)	6.1577*** (3.47)	-5.8584*** (-3.28)	2.2805 (1.35)	2.8677*** (3.52)
CAR	0.0020 (0.74)	-0.0066 (-0.04)	-0.0671 (-0.43)	0.2825 (1.41)	-0.1564 (-1.61)
lnAS	0.5263*** (9.45)	-0.3174 (-0.10)	8.3897*** (2.62)	-21.4843*** (-5.09)	11.0752*** (5.42)
RGDP	0.0049 (1.27)	-0.2360 (-1.07)	0.1689 (0.76)	-0.0021 (-0.01)	0.1477 (1.02)
lnSS	0.4850*** (8.63)	3.1646 (0.99)	-10.1741*** (-3.15)	22.6768*** (5.31)	-6.2131*** (-3.01)
SGR	-0.0080*** (-7.23)	0.0726 (1.15)	0.0199 (0.31)	-0.0278 (-0.34)	0.0352 (0.90)
MS	-0.0011 (-0.54)	-0.0409 (-0.35)	-0.0367 (-0.32)	0.0739 (0.61)	0.0799 (1.37)
CR	1.2854*** (4.76)	91.1361*** (5.91)	-87.0822*** (-5.61)	-1.7069 (-0.14)	18.9880*** (3.29)
ROA	0.2610*** (6.09)	0.7498 (0.31)	3.9181 (1.59)	5.3829* (1.84)	1.9591 (1.38)
_cons	-1.5934*** (-8.30)	-48.8377*** (-4.46)	123.3352*** (11.19)	4.8658 (0.51)	-42.7274*** (-9.26)

Note: t statistics in parentheses,* p < 0.1, ** p < 0.05, *** p < 0.01.

4. Relevant suggestions

Through the above analysis and empirical analysis, we can see that the impact of the epidemic on the credit scale and credit structure of commercial banks can not be underestimated. Therefore, in view of the current situation of the credit business development of commercial banks, this paper puts forward corresponding suggestions from the macro and internal perspectives, with a view to helping Chinese commercial banks optimize the credit structure, realizing the healthy development of commercial banks and the stable operation of the financial industry.

4.1 Countermeasures from a Macro Perspective

GDP growth significantly impacts commercial bank loan scales. Local governments should enhance epidemic early warning systems and increase fiscal spending on social security to support residents and businesses, ensuring economic stability and reducing bank risks (Changyong, 2016)[9]. An expansionary fiscal policy should also be adopted to stimulate growth while reforming the capital market to diversify financing channels for enterprises (Ye, Yuxuan and Lingling, 2022)[10].The pandemic has endangered small and medium-sized enterprises, prompting banks to be cautious in

lending (Shiying, 2022)[11]. A proactive monetary policy should be implemented, allowing for flexible measures like postponing repayments or reducing interest rates to support affected businesses (Yuxi, 2022)[12].To address rising unemployment, the government should provide support and training for affected businesses and workers, reducing unemployment rates and personal loan defaults (Lin and Yanfeng, 2009)[13]. A robust legal framework is essential for managing credit in banks. Standardizing borrowing procedures and enhancing credit reporting systems can help monitor borrower performance and reduce non-performing loans (Yaxue, 2020)[14].

4.2 Countermeasures from the perspective of banks

To control risks effectively, banks must enhance their risk management systems. This includes: (1)Employee Training: Strengthening risk awareness and loan management procedures among staff to prevent the exploitation of process loopholes (Yebin and Si, 2017) [15]. (2) Early Warning Mechanisms: Developing a proactive early warning system to assess industry trends and national policies, allowing banks to respond to potential crises and minimize impacts. (3) Strict Loan Control: Implementing rigorous oversight of loan processes, assessing enterprise credit situations, and adjusting loan types based on business conditions to reduce risks.

Banks should innovate their profit models and expand into intermediary services, which remain underdeveloped in China (Yinggui and Zijie, 2019)[16]. Small banks should leverage their strengths to develop non-credit businesses, while larger banks can grow investment banking to boost income and balance credit structures. Additionally, focusing on high-quality assets and employing technology for asset management will help reduce risk and support stable credit business operations (Tingting and Ming, 2022)[17].

5. Conclusion

This paper studies the factors affecting the credit business of Chinese commercial banks, incorporating a virtual variable for the epidemic to confirm its impact on loan scale and structure.

The findings reveal that the epidemic has promoted the overall scale of credit business, as increased bank loans can enhance profitability. However, it has also altered the credit structure, leading to adverse selection and raising risk levels, as commercial banks increasingly favor credit loans, medium and long-term loans, and personal loans over enterprise loans. This shift has heightened the risk assets within banks, particularly affecting larger institutions like state-owned and national joint-stock banks, which face greater exposure to risks due to adverse incentives created by the epidemic.

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