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Effect of COVID-19 on non-performing loans in China

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ABSTRACT
We examine the resilience of Chinese banks during the COVID-19 pandemic by investigating non-performing loan (NPL) ratios. We find that despite the reduction in the growth rate of total bank lending, bank NPL ratios significantly increase during the COVID-19 crisis. Banks with high-quality capital are more effective in controlling their NPL ratios during the Crisis. Big Five banks, state-owned banks and domestic banks have lower NPL ratios than their counterparts during the Crisis.

1. Introduction
China’s economy was severely hit by the COVID-19 pandemic despite a series of measures implemented by the Chinese authorities to support the economy and the financial system. Many businesses shut down and millions of people lost jobs, which resulted in an increase of soured bank loans. According to Reuters, (2020), the average non-performing loan (NPL) ratio of Chinese commercial banks by the end of the second quarter of 2020 was 1.94%, the highest since 2009. This motivates us to examine the impact of the pandemic on banks in the world’s second largest economy based on GDP. Specifically, we address the compound question: How does the COVID-19 crisis affect the NPL ratios of China’s banks, and which Chinese banks are more resilient in terms of controls of their NPL ratios to COVID-19?

China’s banking sector has expanded rapidly, both domestically and abroad, and has become the largest in the world since 2016 (Wildau, 2017). However, the high level of bank NPL ratios is a longstanding problem. According to the CEIC database, the average NPL ratio reached an all-time high of 12.4% in March 2005. Large and persistent quantities of NPLs suppress bank profitability, tie up

Abbreviations: NPL, non-performing loan.

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1 Based on the summary prepared by the World Bank, (2022), the key measures include liquidity injection into the banking system, reduction of the 7-day and 14-day reverse repo rates by 30 bps, targeted RRR cuts, reduction of the interest on excess reserves, expansion of policy banks’ credit line to private firms and MSEs (midsize enterprises), and introduction of new instruments to support lending to MSEs.

2 We use the terms “COVID-19 crisis”, “COVID-19 Pandemic” and “Crisis” interchangeably to refer to the economic/financial turmoil associated with COVID-19.

3 See https://www.ceicdata.com/en/indicator/china/non-performing-loans-ratio

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bank capital as provisions rise, weaken bank balance-sheets, and limit bank lending capacity (Park and Shin, 2021). In response to the 1997 Asian financial crisis, the Chinese government in 1999 began reducing the large amount of NPLs by initiating four major state-owned financial asset management companies to buy, manage, and dispose of bad loans (Hexun News, 2008; Fungacová et al., 2020). Through these efforts, NPL ratios in China achieved a record low of 0.9% in September 2011 (CEIC). Due to the adverse impact of the COVID-19 pandemic on the global economy, NPL problems re-emerged in several European countries (Ari et al., 2021). This motivates us to consider whether NPL problems also re-emerged in China with the COVID-19 pandemic.

Identification of what types of banks are more resilient to the COVID-19 crisis is an important question. Our first conjecture is that bank resilience to the Crisis might be affected by its capital holdings. The Basel Accords require that banks keep adequate capital, or so-called regulatory capital, relative to their risk exposure. Regulatory capital serves as a buffer for absorbing losses and can directly mitigate rising NPLs. Higher capital motivates shareholders to impose stricter screening and monitoring rules on borrowers, which can mitigate NPLs (e.g., World Bank, 2019; Zhang et al., 2016). In addition, regulatory capital can mitigate banks’ moral hazard behavior since banks with low capital have incentives to engage in risky lending behavior, which may result in higher NPLs (Keeton and Morris, 1987; Hellmann et al., 2000; Boudriga et al., 2009; Klein, 2013). Through these mechanisms, we expect that a high level of regulatory capital helps banks to mitigate NPLs during the COVID-19 pandemic.

Bank ownership is also an important determinant of bank resilience. We expect that foreign banks will bear higher NPL ratios than domestic banks during the COVID-19 crisis. First, foreign banks are required to keep higher provision coverage ratios, which limits their disposal of NPLs (Global, 2021). Second, foreign banks, compared to their domestic counterparts, are susceptible to higher risks because of language, culture, regulations, legal system, and asymmetric information problems (e.g., Amihud et al., 2002; Buch and DeLong, 2004; Iannotta et al., 2007).

China’s state-owned banks are mainly controlled by the central government. According to the soft budget constraint theory, state-owned banks have strong political connections with the central government and can easily obtain financing and non-performing loan resolution support from the central bank (Zhu and Yang, 2016). The state-owned banks can enjoy low interest rate spreads provided by the central bank to attract more deposits than their non-state-owned counterparts. Thus, we expect that the state-owned banks are more likely to better resolve their NPLs than their non-state-owned counterparts during COVID-19.

China’s Big Five Banks are the five largest state-owned banks, which account for about 40% of Chinese banking assets and provide nationwide wholesale and retail services. As large banks allow for more diversification opportunities (Salas and Saurina, 2002), have higher capabilities for loan evaluation and processing, and benefit from returns to scale (Hu et al., 2004), we expect that the Big Five banks are more capable to resolve NPLs than non-Big Five banks during the COVID-19 crisis.

Due to the intense interest of regulatory and academic communities in learning about the initial effects of the pandemic on various financial issues, previous studies are either qualitative or use a short window of pandemic data to test the impact empirically, although banks are more capable to resolve NPLs than non-Big Five banks during the COVID-19 crisis. First, foreign banks are required to keep higher provision coverage ratios, which limits their disposal of NPLs (Global, 2021). Second, foreign banks, compared to their domestic counterparts, are susceptible to higher risks because of language, culture, regulations, legal system, and asymmetric information problems (e.g., Amihud et al., 2002; Buch and DeLong, 2004; Iannotta et al., 2007).

Our paper reports at least three major findings. First, we create a measure of each bank’s exposure to the COVID-19 crisis using the bank’s branches in each province. This measure captures the different degrees of exposure of banks to the COVID crisis and provides enough variation to examine the impact of COVID exposure on bank loans. Our main measure of COVID-19 infections is newly confirmed COVID-19 cases each quarter. We find that despite the drop in bank loans, the average NPL ratio significantly increases when COVID-19 infections increase. The results are robust when using cumulative COVID-19 cases and COVID-19 deaths as alternative COVID-19 infection measures.

Second, we find that high-quality capital can mitigate rising NPL ratios during the Crisis. Our empirical analysis shows that the coefficients on the interaction terms between COVID-19 cases and the equity ratio or Tier 1 ratio is significantly negative while the coefficient estimate on the interaction term between COVID-19 cases and total regulatory capital (the sum of Tier 1 and Tier 2 capital) ratio is insignificant. Tier 1 capital is the primary capital of a bank and includes the highest quality of capital (common equity), while Tier 2 capital is supplementary capital (Saunders et al., 2022). Given that Tier 2 capital is harder to measure accurately and is more difficult to liquidate than Tier 1 capital, it is not surprising to find the significant coefficient on the interaction between COVID-19 and the total regulatory capital ratio.

Finally, we find that during the COVID-19 crisis domestic banks mitigate NPL ratios more effectively than foreign banks, and state-owned banks (Big Five banks) mitigate NPL ratios more than non-state-owned banks (Non-Big Five banks).

Our paper contributes to a growing body of literature on the COVID-19 crisis. This includes financial sector policies during the COVID-19 crisis (Demirgüç-Kunt et al., 2021), systemic risk (Duan et al., 2021), sovereign default risks for fiscally constrained governments (Augustin et al., 2021), and local bank deposits (Levine et al., 2021). The study most closely related to ours is by Beck and Keil (2022), who find that U.S. banks geographically more exposed to the COVID pandemic and lockdown measures experience a growth in NPLs. Our study differs from their study by focusing on the characteristics of banks that are more resilient to the COVID-19 crisis. Our study also complements the work of Cao and Chou (2022) by examining the impact of regulatory capital on NPL ratios during the COVID-19 crisis.

4 For example, Beck and Keil (2022) use four quarters of observations for the pandemic.
Our paper also contributes to the literature on NPLs. Previous studies find that NPL increases lead to economic crises and macroeconomy fragility (Kaminsky and Reinhart, 1999), and generally are associated with higher bank and corporate funding costs and corporate debt overhang (Aiyar et al., 2015). Other studies find that high NPLs decrease country output during a post-crisis period (Ari et al., 2021), and lead to more cross-border banking outflows from emerging markets (Park and Shin, 2021). We add to this literature by examining which banks are more resilient to the exogenous COVID-19 shock. Different from previous crises, the COVID-19 crisis is a health disruption crisis, not a crisis triggered by macroeconomic or financial sector imbalances. Therefore, findings from prior financial crises may not apply to this health-induced crisis.

The rest of the paper proceeds as follows. In Section 2, we describe the data, variables, and summary statistics. In Section 3, we conduct empirical tests. In Section 4, we conclude.

2. Data, variables, and descriptive statistics

We obtain the number of confirmed COVID-19 cases in China from the WIND Financial terminal. Fig. 1 provides a heat map of the cumulative confirmed cases per ten thousand population in each province of China from January 2020 to March 2022. The darker the red, the higher the number of cumulative confirmed cases per ten thousand population in a province. The data suggest that banks in different locations have different exposures to the COVID-19 crisis, which gave us the impetus to examine the impact of COVID-19 on Chinese banks. We create a measure of exposure to the COVID-19 crisis for each bank using the bank’s branches in each province. We use the number of new confirmed cases in a province divided by total population in the province as a proxy for the exposure of a bank only operating in that province to COVID-19. For banks operating in several provinces, we use the average of the number of new confirmed cases divided by total population in a province, weighted by the number of branches a bank has in the province.

Our dependent variables are the non-performing loan ratio, defined as non-performing loans divided by total loans, and loan growth. The data are obtained from WIND. Following the literature on bank NPLs (e.g., Salas and Saurina, 2002; Louzis et al., 2012; Quagliariello, 2007), we control for bank and macroeconomic characteristics variables. The bank-level control variables are total loans to total deposits (loan-to-deposit ratio), bank size (Size), and return on assets (ROA). The macroeconomic control variables are the GDP growth rate (GDP_GR), unemployment rate (Unemployment), and overnight rate (Interest). The overnight rate is used to capture the liquidity support the government provided to help the economy and the financial system during the pandemic. Table 1 provides the definitions of these variables. Size, GDP_GR, ROA and Interest are collected from WIND and Unemployment from CSMAR. Table 2 reports the summary statistics for the variables used in the analysis. Untabulated correlations suggest the absence of multicollinearity problems in our empirical tests.

3. Empirical analyses

3.1. Impact of the COVID-19 crisis on loan growth and NPL ratios

We first examine whether the total loans of a bank are lower during the COVID-19 crisis using the following specification:

\[ \text{Loan growth}_{i,t} = \alpha + \beta_1 \text{COVID}_{i,t} + \gamma \text{Control}_{i,t} + \mu_i + \theta_t + \epsilon_{i,t} \]  

where \( \text{Loan growth}_{i,t} \) is the total loan growth rate. \( \mu_i \) is the bank fixed effect, which controls for time-invariant bank characteristics, including omitted bank level factors that could affect the loan growth rate. \( \theta_t \) is the year-quarter fixed effect, which controls for the impact of time-variant macroeconomic factors that could potentially lead to changes in the loan growth rate, such as the liquidity support the government adopted during the pandemic that could affect all banks. The independent variable of primary interest is COVID, measured by COVID cases, COVID cumulative cases, or COVID deaths. Based on Table 3, we find that the loan growth rate significantly decreases when COVID-19 cases, cumulative cases, or deaths go up. This result is consistent with the evidence that during the COVID-19 disruption many corporate firms went bankrupt and did not have the ability to borrow from banks (Leng, 2020).

We then examine the quality of loans by regressing the NPL ratios on the three measures of COVID-19, respectively, using the following specification:

\[ \text{NPL ratio}_{i,t} = \alpha + \beta_1 \text{COVID}_{i,t} + \gamma \text{Control}_{i,t} + \mu_i + \theta_t + \epsilon_{i,t} \]  

where all the variables are as previously defined. The results reported in Table 4 show that the NPL ratios of the banks significantly increase with increases in COVID-19 cases. A one standard deviation increase in the new confirmed cases causes a significant increase of 0.02% in the NPL ratio. The regression results are robust using cumulative COVID-19 cases and COVID-19 deaths. For brevity, we only report the results using COVID-19 cases in the following tests.

3.2. Role of capital ratios

In the aftermath of the global financial crisis, the Basel Committee on Banking Supervision implemented a set of new regulations on banks’ capital and liquidity, known as Basel III, to strengthen bank stability. By December 2018 Chinese banks were compliant with the
regulations to increase minimum capital requirements. We examine whether capital ratios play a role in banks’ resilience during the COVID-19 crisis using the following formulation:

\[ NPL_{i,t} = \alpha_i + \beta_1 \text{COVID cases}_{i,t} \ast \text{Capital}_{i,t} + \beta_2 \text{COVID cases}_{i,t} + \beta_3 \text{Capital}_{i,t} + \gamma \text{Control}_{i,t} + \mu_i + \theta_t + \epsilon_{i,t} \]  

(3)

Where \( NPL_{i,t} \) is the non-performing loan ratio for bank \( i \) in quarter \( t \). \( \text{Capital}_{i,t} \) is measured by the equity ratio, Tier 1 capital ratio, or total regulatory capital ratio. All the other variables are as previously defined. The results reported in Table 5 show that, unlike the total regulatory capital ratio, high equity ratio and high Tier 1 capital ratio can help banks to significantly mitigate the negative impact of COVID-19 on their NPL ratios. The results imply that in addition to lending more to the economy during the COVID-19 crisis as Cao and Chou (2022) find, banks with more high-quality capital are also more effective in reducing their NPL ratios.

### 3.3. Bank ownership and relative importance

In this section, we explore whether domestic/foreign bank ownership, state/non-state ownership and Big Five/Non-Big Five size of banks have an impact on bank NPL ratios during the COVID-19 crisis. The state-owned commercial banks provide nationwide wholesale and retail services and mainly provide funds to state-owned firms. In contrast, foreign banks provide services to

![Fig. 1. Number of confirmed cases. This figure depicts the cumulative confirmed cases per ten thousand population in each province of China from January 2020 to March 2022. The darker the red, the higher the number of cumulative confirmed cases per ten thousand population in a province.](image)

![Table 1 Variable definitions.](image)
Table 2
Summary statistics. This table reports the summary statistics for the variables used throughout the paper. The COVID variables are for the period from 2020Q1 to 2022Q1, while the other variables are for the period from 2017Q1 to 2022Q1. Variable definitions are found in Table 1.

| Variable                      | Obs  | Mean   | Std  | PS   | Median | P95   |
|-------------------------------|------|--------|------|------|--------|-------|
| NPL ratio (%)                 | 2821 | 1.855  | 1.247| 0.800| 1.620  | 3.810 |
| Loan growth (decimal)         | 2821 | 0.022  | 0.045| 0.000| 0.002  | 0.081 |
| COVID cases (per ten thousand population) | 2821 | 0.022  | 0.376| 0.000| 0.000  | 0.039 |
| COVID cumulative cases (per ten thousand population) | 2821 | 0.142  | 0.921| 0.000| 0.000  | 0.388 |
| COVID deaths (per ten thousand population) | 2821 | 0.001  | 0.019| 0.000| 0.000  | 0.000 |
| Loan-to-deposit ratio (decimal) | 2821 | 0.737  | 0.138| 0.531| 0.725  | 0.967 |
| Size (ln)                     | 2821 | 25.616 | 1.979|23.110| 25.377 | 29.669 |
| ROA (%)                       | 2821 | 0.631  | 0.357| 0.164| 0.581  | 1.285 |
| GDP_Gr (decimal)              | 2821 | 0.076  | 0.054| 0.022| 0.067  | 0.204 |
| Unemployment (%)              | 2821 | 3.857  | 1.811| 3.610| 3.640  | 4.240 |
| Interest (%)                  | 2821 | 1.519  | 0.275| 0.945| 1.511  | 1.876 |
| Equity ratio (%)              | 2821 | 7.768  | 1.843| 5.439| 7.633  | 10.344|
| Tier 1 ratio (%)              | 2554 | 11.355 | 2.433| 8.790| 10.960 | 15.240|
| Regulatory capital ratio (%)  | 2554 | 13.838 | 2.314| 11.260| 13.600 | 17.330|

Table 3
Impact of COVID-19 on loan growth rates. This table reports the impact of the COVID-19 crisis on the loan growth rate (dependent variable). Models (1), (2) and (3) regress the loan growth rate on a bank’s exposure to new confirmed cases, cumulative COVID cases and new COVID-19 deaths, respectively, in a quarter. All the regressions control for the loan-to-deposit ratio, logarithm of bank total assets (Size), return on assets (ROA), GDP growth rate (GDP_Gr), overnight rate (Interest), unemployment rate (Unemployment), bank and year-quarter fixed effects. Variable definitions are reported in Table 1. Robust standard errors are reported in the parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

| (1)              | (2)              | (3)              |
|------------------|------------------|------------------|
| COVID cases      | −4.479***        | −4.539***        |
| (0.746)          | (0.960)          | (0.960)          |
| COVID cumulative cases | −0.636***        | −0.633***        |
| (0.106)          | (0.094)          | (0.094)          |
| COVID deaths     | −1.113***        | −1.113***        |
| (0.460)          | (0.460)          | (0.460)          |
| Loan-to-deposit ratio | 0.031*           | 0.031*           |
| (0.017)          | (0.017)          | (0.017)          |
| Size             | 0.010**          | 0.010**          |
| (0.004)          | (0.004)          | (0.004)          |
| ROA              | 2.024***         | 2.024***         |
| (0.430)          | (0.430)          | (0.430)          |
| GDP_Gr           | 1.436***         | 1.436***         |
| (0.263)          | (0.263)          | (0.263)          |
| Unemployment     | 0.427***         | 0.427***         |
| (0.10)           | (0.10)           | (0.10)           |
| Observations     | 2821             | 2821             |
| Adj. R-squared   | 0.438            | 0.438            |
| Bank FE          | Yes              | Yes              |
| Year-Quarter FE  | Yes              | Yes              |

Multinational firms and local clients. Foreign banks are limited in the loans they can make to clients and bond sales (Bradscher, 2021). We estimate the role that bank ownership and size plays in bank resilience during the pandemic by interacting our COVID measures with a bank ownership/importance dummy variable. Specifically:

\[
NPL_{ratio_i} = \alpha_i + \beta_1 COVID_{cases,i} + \beta_2 COVID_{cumulative,i} + \beta_3 COVID_{deaths,i} + \gamma Control_i + \mu_i + \theta_i + \epsilon_{i,t}
\]

where Dummy is a dummy variable for foreign banks, state-owned banks and Big Five banks, respectively. The Big Five banks include the Industrial and Commercial Bank of China, Bank of China, Agricultural Bank of China, China Construction Bank, and Bank of Communications. All other variables are as previously defined. The coefficient \( \beta_1 \) measures the effects of COVID-19 on the NPL ratios for foreign banks versus domestic banks, state-owned banks versus non-state-owned banks, and Big Five banks versus non-Big Five banks. We also control for bank and time fixed effects, \( \mu_i \) and \( \theta_t \). Table 6 reports the results examining the differential impact of COVID-19 on the NPL ratios for foreign against domestic banks, state-owned domestic banks against non-state-owned domestic banks, and Big Five banks against non-Big Five banks during the COVID-19 crisis in Columns (1), (2), and (3), respectively. The indicator variable Dummy is absorbed by the bank fixed effect \( \mu_i \), so it does not appear in Table 6. Domestic banks, state-owned banks and Big Five banks have a lower NPL ratio than their counterparts at a significance level of at least 10%.
Table 4
Impact of COVID-19 on the NPL ratios. This table reports the impact of the COVID-19 pandemic on the NPL ratios (dependent variable). In models (1), (2) and (3), the NPL ratios are regressed on a bank’s new confirmed cases, cumulative COVID cases and new COVID-19 deaths, respectively, in a quarter. Variable definitions are reported in Table 1. Robust standard errors are reported in the parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

|                | (1)     | (2)     | (3)     |
|----------------|---------|---------|---------|
| COVID cases    | 0.060** | 0.054***| 1.263** |
|                | (0.030) | (0.017) | (0.573) |
| COVID cumulative cases |         |         |         |
|                |         |         |         |
| COVID deaths   |         |         |         |
|                |         |         |         |
| Loan-to-deposit ratio | 1.222*** | 1.250***| 1.223***|
|                | (0.454) | (0.456) | (0.454) |
| Size           | −0.239  | −0.230  | −0.242  |
|                | (0.219) | (0.219) | (0.219) |
| ROA            | −1.257***| −1.253***| −1.258***|
|                | (0.186) | (0.186) | (0.186) |
| GDP_GR         | 5.229***| 4.877***| 5.275***|
|                | (1.731) | (1.752) | (1.731) |
| Unemployment   | 4.261***| 4.061***| 4.281***|
|                | (1.097) | (1.103) | (1.097) |
| Interest       | 0.598   | 0.595   | 0.609   |
|                | (0.527) | (0.529) | (0.527) |
| Observations   | 2821    | 2821    | 2821    |
| Adj. R-squared | 0.655   | 0.655   | 0.655   |
| Bank FE        | Yes     | Yes     | Yes     |
| Year-Quarter FE| Yes     | Yes     | Yes     |
| Observations   | 2821    | 2554    | 2554    |
| Adj. R-squared | 0.660   | 0.701   | 0.704   |
| Bank FE        | Yes     | Yes     | Yes     |
| Year-Quarter FE| Yes     | Yes     | Yes     |

Table 5
Effect of bank capital ratios. This table reports the effect of bank capital on the relationship between a bank’s NPL ratio (dependent variable) and its exposure to the COVID-19 pandemic. Columns (1), (2) and (3) present the regression results for the NPL ratio on equity ratio, tier 1 ratio, and total regulatory capital ratio, respectively. Variable definitions are reported in Table 1. Robust standard errors are reported in the parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

|                | (1)   | (2)   | (3)   |
|----------------|-------|-------|-------|
| Equity ratio   | −0.114**|       |       |
|                | (0.055)|       |       |
| COVID cases * Equity ratio | −0.059**|       |       |
|                | (0.024)|       |       |
| Tier 1 ratio   |       | −0.207**|       |
|                |       | (0.086)|       |
| COVID cases * Tier 1 ratio |       | −0.206***|       |
|                |       | (0.072)|       |
| Regulatory capital ratio |       | −0.202***|       |
|                |       | (0.074)|       |
| COVID cases * Regulatory capital ratio |       | 0.036  |
|                |       | (0.029)|       |
| COVID cases    | 0.387***| 2.175***|       |
|                | (0.127)| (0.738)|       |
| Loan-to-deposit ratio | 1.433***| 1.125**| 1.023**|
|                | (0.523)| (0.480)| (0.461)|
| Size           | −0.919***| −1.396***| −1.259***|
|                | (0.293)| (0.444)| (0.344)|
| ROA            | −1.188***| −1.083***| −1.079***|
|                | (0.165)| (0.144)| (0.144)|
| GDP_GR         | 7.664***| 9.292***| 9.975***|
|                | (1.804)| (2.249)| (2.233)|
| Unemployment   | 4.489***| 4.261***| 4.320***|
|                | (1.068)| (1.011)| (0.993)|
| Interest       | 0.630   | 0.685   | 0.953* |
|                | (0.532) | (0.520) | (0.542)|
| Observations   | 2821    | 2554    | 2554   |
| Adj. R-squared | 0.660   | 0.701   | 0.704   |
| Bank FE        | Yes     | Yes     | Yes     |
| Year-Quarter FE| Yes     | Yes     | Yes     |
4. Conclusion

Unlike previous macro-economic and financial crises, COVID-19 is a public health shock that has had a major impact on most national economies. Using Chinese data, we find that the NPL ratios of Chinese banks increase when COVID cases rise. Banks with high equity ratios and high Tier 1 capital ratios significantly lower NPL ratios during the COVID crisis. The NPL ratios are significantly lower for Big Five versus non-Big Five domestic banks, for domestic versus foreign banks, and for state-owned domestic versus non-state-owned domestic banks. Our findings have important implications for both banks and their regulatory authorities seeking guidance on the nature and diffusion of any negative impact on the NPL ratios of banks during an unprecedented health crisis. The results regarding equity ratio and Tier 1 capital ratio versus total regulatory capital ratio suggest the importance for policy makers and practitioners to distinguish between high-quality capital and low-quality capital. The results of ownership indicate the vulnerability of foreign banks and non-state-owned banks when facing a negative shock.

Our research makes a significant contribution to the growing literature on COVID-19. First, our COVID-19 period is much longer, ranging from Q1 2020 to Q1 2022, than previous studies, such as Beck and Keil (2022) and Cao and Chou (2022). A longer period of COVID-19 can provide us with more reliable regression results. Second, we examine the effect of COVID-19, proxied by COVID-19 cases, COVID-19 cumulative cases, and COVID-19 deaths, on the NPL for China’s banks from the perspective of the regulatory capital ratio and bank ownership, while Beck and Keil (2022) only examine COVID-19 deaths on the NPLs for US banks and do not investigate which banks are more resilient during the pandemic. Our paper is also totally different from Cao and Chou (2022). Although both papers examine the impact of COVID-19 on bank lending, Cao and Chou (2022) examine the impact of the regulatory capital ratio on the loan growth rate while our study focuses on NPLs.

Contributions

All authors have contributed equally to the paper and the ordering of names is alphabetical.

Author statement

All authors have contributed equally to this article. Listing of authorship is alphabetical.

Declaration of Competing Interest

None

Table 6

Effect of bank ownership and importance. This table reports the results of regressing bank NPL ratios (dependent variable) on the interaction between a bank’s exposure to COVID-19 case numbers and bank ownership and importance. Columns (1) – (3) present results for the dummy variable for foreign banks, state-owned commercial banks, and Big Five banks, respectively. Variable definitions are reported in Table 1. Robust standard errors are reported in the parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

|                | (1)            | (2)            | (3)            |
|----------------|----------------|----------------|----------------|
| COVID cases*D_foreign | 14.664**       |                |                |
|                | (8.329)        |                |                |
| COVID cases*D_state  |                | −0.215*        |                |
|                |                | (0.129)        |                |
| COVID cases*D_top5   |                | −0.320***      |                |
|                |                | (0.108)        |                |
| COVID cases        | 0.060**        | 0.061**        | 0.060**        |
|                | (0.030)        | (0.030)        | (0.030)        |
| Loan-to-deposit ratio | 1.224***       | 1.261***       | 1.220***       |
|                | (0.455)        | (0.482)        | (0.454)        |
| Size            | −0.238         | −0.222         | −0.243         |
|                | (0.219)        | (0.238)        | (0.220)        |
| ROA             | −1.258***      | −1.278***      | −1.258***      |
|                | (0.187)        | (0.191)        | (0.186)        |
| GDP_GR          | 5.224***       | 5.372***       | 5.263***       |
|                | (1.732)        | (1.796)        | (1.734)        |
| Unemployment    | 4.256***       | 4.454***       | 4.269***       |
|                | (1.098)        | (1.138)        | (1.098)        |
| Interest        | 0.599          | 0.652          | 0.603          |
|                | (0.527)        | (0.537)        | (0.527)        |
| Observations    | 2821           | 2756           | 2821           |
| Adj. R-squared  | 0.655          | 0.650          | 0.655          |
| Bank FE         | Yes            | Yes            | Yes            |
| Year-Quarter FE | Yes            | Yes            | Yes            |

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Data Availability

Data will be made available on request.

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