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Bank Capital and Lending During a Downturn

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The banking sector has observed a considerable increase in capital ratios since the financial crisis. Regulatory changes and stress testing contributed to this increase. However, the recent downturn might result in sizable losses and a decline in bank equity. The Federal Reserve and other government agencies have encouraged banks to use their capital buffers and made temporary adjustments to capital regulation as a way to reduce the impact of the reduction in bank capital on lending and the real economy.

Capturing how important is the capital channel requires isolating the effect of the capital reduction from demand and other supply factors. This is difficult because many of the same factors influencing the loan supply also affect the demand for credit. Disentangling these effects requires either a structural model or a clean (and generally hard to obtain) empirical identification strategy. In this article, I present estimates from the Corbae and D'Erasmo structural model of banking. The model features big banks with market power and small banks that compete in credit markets and face capital requirements (risk-weighted and leverage ratio).

The model is simulated to generate dynamics that resemble a deep recession similar to those used in the recent stress test sensitivity analysis that the Federal Reserve conducted in light of the coronavirus event.[1] Estimates of the capital channel are obtained by comparing the dynamics under the baseline scenario and those that arise from two exercises: one that studies a capital injection for all banks during the COVID-19 scenario and another that analyzes the relaxation of capital regulation also during the scenario.[2] The average loan growth response is estimated to be 0.5 (2.0) and 3.3 (5.4) percent in 2021.Q1 (2022.Q1) per 1 percentage point increase in capital ratios or decline in the capital ratio requirement.

I thank Edison Yu for his help with an early draft of this article.

1 See https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200625c.htm.

2 This experiment that injects capital into the banking sector resembles the Capital Purchase Program (CPP) under the Troubled Asset Relief Program (TARP) that was implemented during the previous crisis. The capital injection provides an upper bound to what policies targeting an increase in bank lending by relaxing capital constraints can achieve.

Estimates From Existing Empirical Literature

Examining the effects of bank capital on bank lending, the so-called bank lending channel, has been a central question in the banking literature. A related research question in the literature is whether and how much capital requirements affect bank lending.[3] One challenge in the empirical work is to control the demand factors in the analysis. In a recession or a financial crisis, economic activities tend to decline, which leads to lower demand for bank borrowing. Thus the simple correlation between bank capital and bank lending can be spurious if we do not take into account this firm-borrowing channel. A review of the empirical literature shows that, in line with the findings from the structural model, the estimates range between a 0.7 percent and a 10 percent drop in lending growth for a 1 percentage point decrease in the capital ratio or increase in the capital requirement, with most of the estimates on the lower end of the range.

Early estimates (e.g., Bernanke and Lown, Peek and Rosengren, Berrospide and Edge) show that a 1 percentage point decline in capital ratio causes a reduction between 1 and 6 percent.[4] The literature has grown significantly since these earlier empirical papers. Empirical work has tried to isolate the supply channel by using loan-level data and semi-natural experiments such as the Great Financial Crisis (GFC) in 2008. A more recent literature focuses on studying the effects of the stress tests (e.g., Acharya, Berger, and Roman, Cortes, Demyanyk, Li, Loutskina, and Strahan, and Berrospide and Edge) or the effects of countercyclical capital requirements (e.g., Jiménez, Ongena, Peydro, and Saurina).[5,6] Estimates from this literature suggest that a 1 percentage point higher stress test capital requirement leads to an around 2 percentage point lower growth rate of loans.[7]

As pointed out by Chodorow-Reich and Jimenez, Ongena, Peydro, and Saurina, it is difficult for firms to make new borrowing relationships during a financial crisis. The estimates using the experience from the GFC may be an upper bound for the effects of bank capital on lending supply. Estimates using non-GFC-period data generally have a smaller magnitude (for example, Berrospide and Edge). Jiménez, Ongena, Peydro, and Saurina show no lending decline during normal times at the firm level. The economy is currently in a non-financial crisis induced recession, and firms are faced with less difficulty in switching lenders than in a financial crisis. However, loosening capital requirements might be still more effective than during the calm economic times during an economic expansion.

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3 See Corbae and D'Erasmo for a review of the effects of bank capital regulation and Yu for a review of the literature looking at the link between stress tests and credit.

4 See Peek and Rosengren for another study on the 1990 credit crunch.

5 See also Agarwal, An, Cordell, and Roman, Bassett and Berrospide, Calem, Correa, and Lee, and Cornett, McNutt, Strahan, and Tehranian for related empirical work on the stress tests. Glancy and Kurtzman study the effect of the capital requirement on loan pricing.

6 Aiyar et al. study time-varying capital requirements using UK data. See Mésonnier and Monks, and Gropp et al. for related studies.

7 See Yu for a review of the literature looking at the link between stress tests and credit.

Model Overview and Calibration

In order to estimate the capital lending response, I use the model in Corbae and D'Erasmo. The model is designed to capture two salient features of the U.S. banking sector: an industry dominated by large institutions, and capital ratios that vary considerably by bank size and are well above the minimum required.

The data show that the banking sector is highly concentrated. The number of commercial banks in the U.S. has fallen from over 11,000 in 1984 to under 5,000 in 2016 while the asset market share of the top 10 banks has grown from 25.8 percent in 1984 to 51.8 percent in 2019. Rising market shares of big banks motivate us to consider a model of the banking industry that allows for imperfect competition.[8] In particular, the model considers a market structure where big banks with market power interact with small competitive (fringe) banks. Furthermore, it allows us to understand how regulatory policy may affect market structure as well as consider how market structure influences risk taking.

The other important feature of the U.S. commercial banking sector that the model captures is that risk-weighted capital ratios are lower for large banking institutions than for small banks, and capital ratios are well above what regulation defines as well capitalized.[9] Moreover, while capital ratios are not a perfect predictor of bank failure, our analysis shows that the average fraction of banks that exit conditional on being within 1 percent of the minimum required is well above 70 percent. In the model, banks face minimum capital requirements and are subject to aggregate uncertainty and bank-specific fluctuations in the access to short-term funding and deposits (fluctuations that are more volatile for small banks that are less diversified than big banks). Aggregate uncertainty can derive from business cycle fluctuations in business confidence that affect the demand for loans or from events outside the model that affect borrowers' default probability. Bank-specific fluctuations can derive for example from inflows or outflows of deposits. These forces, together with the possibility of bank failure, shape the distribution of bank capital in the model, which resembles that of the data. That is, aggregate and bank-specific fluctuations will lead banks to hold excess capital above the minimum required.

In the model, banks of different sizes intermediate between households (which determine the supply of deposits and equity) and entrepreneurs (which shape the demand for loans from banks and non-banks and the level of risk in the real sector of the economy). Entrepreneurs demand funds to fund a project/buy a house. If they choose to operate the project, they choose the level of risk and face a relatively standard risk-return trade-off (i.e., a higher return comes with a lower success probability). The level of risk that borrowers take is not directly observable to banks. This, together with limited liability, leads to a positive relationship between the loan interest rate and

8 Corbae and D'Erasmo provide further evidence in favor of imperfect competition. The paper also shows that market power has important implications for bank dynamics and the effect of changes in capital regulation.

9 Capital ratios based on total assets (as opposed to risk-weighted assets) present a similar pattern.

the level of risk that entrepreneurs take. That is, as the interest rate increases, entrepreneurs that choose to borrow invest in projects with a higher expected return in order to break even, and these carry a lower success probability. This induces a positive link between interest rates and borrower default. This is generally known as the risk-shifting effect.

Banks can invest in risky assets (loans) and safe assets (cash/securities). Along with possible equity injections, an incumbent bank allocates its net worth and deposits to its asset portfolio and pays dividends. Equity funding is more costly than deposit funding as all deposits are insured. Equity issuance costs are a function of the amount raised, bank size, and the business cycle. We estimate that equity financing costs are significantly larger for small banks than for big banks and that it is more costly to issue equity in bad times than in good times.[10]

Banks face capital requirements that can vary over time and across banks. There is a risk-weighted capital requirement (i.e., banks need their equity capital to be at least a fraction of risk-weighted assets). Banks also face a leverage ratio requirement (i.e., banks need equity to be at least a given fraction of total assets). A bank that does not satisfy either the risk-weighted or the leverage requirement needs to issue equity in order to continue operating or else it fails. That is, banks may fail in the event of cash shortfalls if the value of keeping the bank open (net of re-capitalization costs) is not sufficiently valuable.

Model Calibration and COVID Stress Scenario

The model is calibrated to capture the current regulatory environment and state of the commercial banking sector. I set the parameters of the model using data from commercial banks in the U.S. (aggregated to the Bank Holding Company level) as in Corbae and D'Erasmo and initial conditions for the simulation to match balance sheet ratios and loan market shares by bank size to values observed in 2020.Q1.[11,12] In order to do so, we identify big banks with the Top 10 banks in the asset distribution and small banks with the rest. We use data on banks' portfolio composition, capital levels, dividend payments, equity issuance, cost of extending loans, and interest margins (among other statistics) by bank size. By using bank-size-specific moments, we are able to capture, for example, that big banks are more efficient at extending loans than small banks and that their capital ratios are smaller than those of small banks. To capture the post-Dodd-Frank Act capital requirements, all banks are required to hold a minimum risk-weighted Tier 1 capital of 6 percent plus a 2.5 percent capital conservation buffer. Big banks are also

10 These costs derive from commitment problems and capture informational frictions and agency costs in raising equity, which we take to be more pronounced at small banks.

11 See Corbae and D'Erasmo for the full list of parameters as well as a description of the calibration strategy.

12 The bank-level data correspond to the U.S. Consolidated Report of Condition and Income for Commercial Banks (regularly called "call reports"). The data contain quarterly data on the income statements and balance sheets of all U.S. commercial banks. The public version of the data can be accessed at https://cdr.ffiec.gov/public/PWS/DownloadBulkData.aspx.

subject to a Global Systemically Important Bank (GSIB) capital surcharge of 1 percent.[13] In addition, banks are also subject to leverage constraints. Minimum Tier 1 leverage ratios are set to 4 percent and 5 percent for small and large banks, respectively.[14]

Once the model is calibrated, the next step is to determine the downturn episode that underlies the lending-response estimates. Following the onset of the coronavirus event, the Federal Reserve undertook a sensitivity analysis to explore the vulnerabilities of banks to the downside risks to the economy posed by the COVID-19 pandemic.[15,16] Using this sensitivity analysis as a guide, I simulate the model to capture one of their proposed scenarios (U-shaped). This scenario (which I will refer to as the COVID-19 scenario) presents a slow recovery with a small gain toward the end of 2020. More specifically, in this scenario, in 2021.Q1, real GDP is 6.7 percent below the value observed in 2020.Q1, and, in 2022.Q2, real GDP is still 2.4 percent below the value in 2020.Q1.[17]

The key variables that link the model and the COVID-19 scenario are real GDP and the loan-default frequency (which determines charge-offs and loan loss provision). Both output and default are a function of banks' and borrowers' choices (through the equilibrium in the loan market, which determines aggregate lending, the loan interest rate, and the riskiness of borrowers' projects) as well as aggregate productivity, which moves independently. In order to connect the scenario with the model, I set the path for aggregate productivity so the resulting model GDP and loan-default frequency approximate those in the scenario.[18] Figure 1 presents the evolution of real GDP, loan default, failure rate, lending, and capital ratios during the COVID-19 scenario.[19]

13 Eight U.S. banks are GSIBs: Bank of America, Bank of New York Mellon, Citigroup, Goldman Sachs, JP Morgan Chase, Morgan Stanley, State Street, and Wells Fargo. The GSIB surcharge varies by bank depending on a measure of systemic importance. The surcharge for U.S. GSIBs ranged between 1.0 percent and 2.5 percent of risk-weighted assets as of November 2019. See https://www.fsb.org/wp-content/uploads/P221119-1.pdf.

14 The leverage ratio for big banks captures the on-balance-sheet incidence of the enhanced supplementary leverage ratio.

15 See https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200625c.htm and https://www.federalreserve.gov/publications/files/2020-sensitivity-analysis-20200625.pdf for a description of the sensitivity analysis as well as the underlying data for the scenario.

16 Stress test scenarios are not forecasts. They describe a hypothetical set of events designed to assess the strength of the banking organizations and are based on various sources of economic forecasts from April 2020.

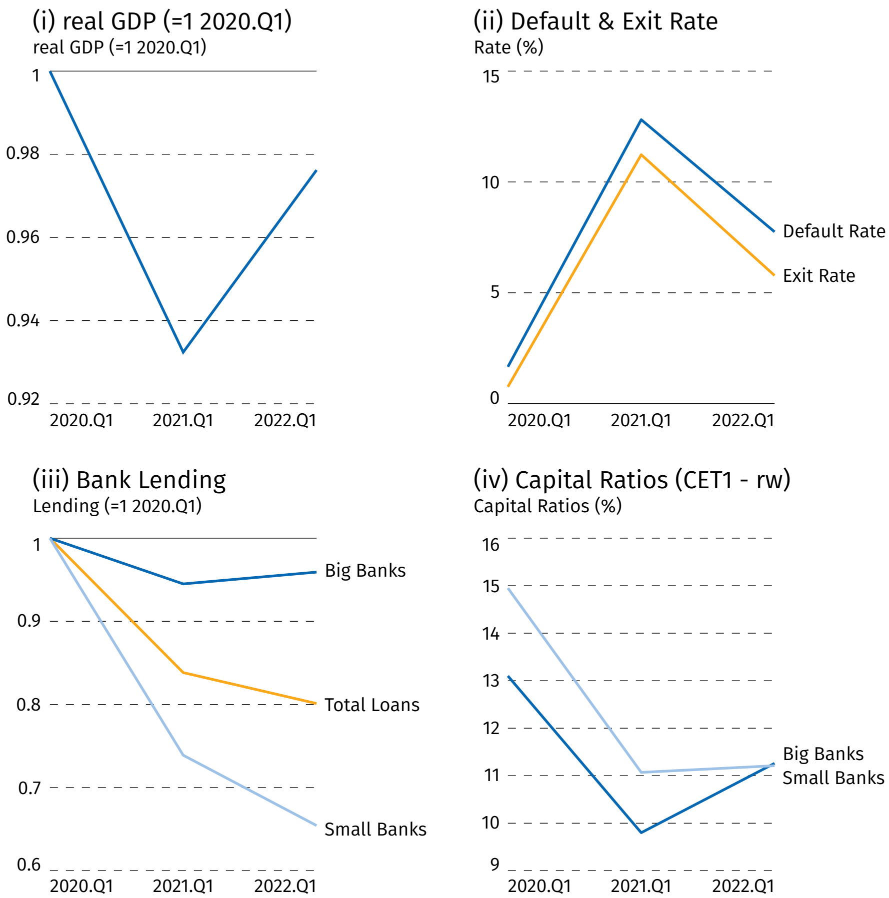
17 The scenarios were constructed with data up to April 2020 and predicted a drop in GDP in 2020.Q2 equal to 35.7 percent (quarterly growth rate annualized). The realized real GDP drop in 2020.Q2 was 31.4 percent according to the available data at the time this article is being written (U.S. Bureau of Economic Analysis, third estimate Real Gross Domestic Product).

18 In order to obtain the path of aggregate productivity, it is necessary to obtain the equilibrium of the model and simulate the model along a given productivity path. If the model generates the output path consistent with the scenario proposed, we stop. If not, we adjust the path of productivity or the process of productivity itself (in which case we need to re-solve the equilibrium of the model) and redo the experiment.

19 It is important to note that the scenario does not incorporate the additional unemployment insurance benefits, business loan programs, or protections for homeowners such as delayed foreclosures or the right to request a forbearance established by the CARES Act (which was signed into law in March 2020).

FIGURE 1

COVID-19 Scenario



Note: The panels in this figure show the evolution of model variables along the COVID-19 scenario. Real GDP (Panel (i)) and Lending (Panel (iii)) are normalized to 1 in 2020.Q1. Default rate refers to the loan default rate. Exit rate refers to the bank exit rate by small banks. CET1 - rw refers to Common Equity Tier 1 capital ratio risk-weighted.

In the baseline scenario, total lending declines by 16.2 percent and 19.9 percent in 2021.Q1 and 2022.Q1, respectively, relative to 2020.Q1 (see Panel (iii)). The lending response differs considerably by bank size, as total lending by big banks declines by approximately 5 percent and by small banks by up to 35 percent by the end of the scenario. The decline in lending by small banks is the result of a reduction in lending by banks that continue operating during the scenario but also by a decline in lending derived from bank failure (shown in Panel (ii)). The default rate and the bank exit/failure rate spike in 2021.Q1 at 12.8 percent and 11.2 percent, respectively (see Panel (ii)). As there is no big bank failure during the COVID-19 scenario, the exit rate refers to the failure rate of small banks. Figure 1 also shows that, along the COVID-19 scenario, the model generates a decline in CET1 ratios that is in line with the predictions of the stress test sensitivity analysis conducted by the Board (see Panel (iv)). In particular, results from the sensitivity analysis conducted by the Board predict that, at the minimum, the aggregate CET1 capital ratio (for banks included in the stress test) declines to 8.2 percent, and the model generates a decline to 9.8 percent for big banks.[20] The average CET1 ratio for small banks in the model (which cannot be compared with results from the stress scenario) declines, at its minimum, to 11.07 percent. This corresponds to banks that survive after the first year of the scenario.

Lending Response Estimates

The estimation of the lending response is constructed with a focus on separating demand and supply factors from the capital channel during the COVID stress scenario described in the previous section. The exercises I study in this section change capital policies along the scenario, so the comparison against the baseline provides a framework to isolate the effects of bank capital on credit, bank failure, and concentration.

Along the simulated path, two exercises are performed. First, one that is based on a Bank Capital Injection. This exercise analyzes how an unexpected injection of capital that leads to a 2.5 percentage point increase in bank capital ratios for all banks affects lending (e.g., an unexpected injection of bank capital that partially reverses the initial decline in capital observed during the COVID scenario).[21] The capital injection (while unexpected) resembles the Capital Purchase Program under the Troubled Asset Relief Program (TARP) in that it provides capital during a crisis period to a wide range of commercial banks. The exercise can be thought of as providing an upper bound to what policies that are designed to increase lending via relaxing capital requirements can attain. Second, an exercise that is based on Reducing Required Capital. This exercise captures how a reduction in risk-weighted capital requirements affects the evolution of lending along the scenario. We focus on an exercise that diminishes risk-weighted capital requirements by 2.5 percent. We study a reduction in the capital conservation buffer that does not impose restrictions on dividends. This experiment captures guidelines put in place to induce banks to use their capital buffers to sustain lending.[22] Changes in capital regulation are announced and implemented at the start of the COVID-19 scenario.

Bank Capital Injection

This section describes the results from the exercise that considers a capital injection to commercial banks along the COVID-19 scenario—an injection that increases capital ratios by 2.5 percent. Figure 2 presents the estimated average lending response (Panel (i)) scaled to represent the lending response

20 The sample of the sensitivity analysis consists of the 33 firms participating in DFAST 2020.

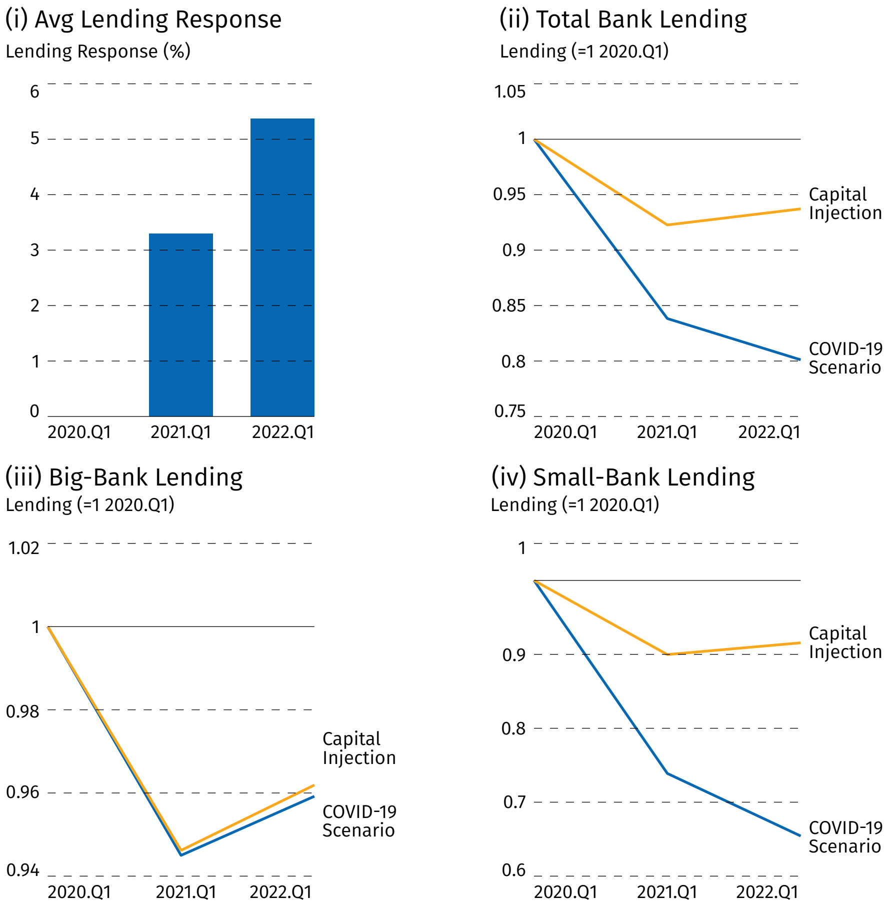
21 The capital injection is bank specific as there is a distribution of heterogeneous banks with different initial levels of capital and capital ratios. Capital injections or the reduction in regulatory capital requirements happen prior to the exit decision of the banks.

22 On March 17, 2020, the federal banking agencies adopted an interim final rule that revises the definition of eligible retained income. Under the U.S. capital rule, if a banking organization's capital ratios fall within its buffer requirements, the maximum amount of capital distributions and discretionary bonus payments it can make is a function of its eligible retained income. The revised definition of eligible retained income will make any automatic limitations on capital distributions that could apply under the agencies' capital rules more gradual.

per 1 percentage point increase in capital ratios, as well as the evolution of Total Lending (Panel (ii)), Big-Bank Lending (Panel (iii)), and Small-Bank Lending (Panel (iv)).

FIGURE 2

Capital Injection: Lending Response



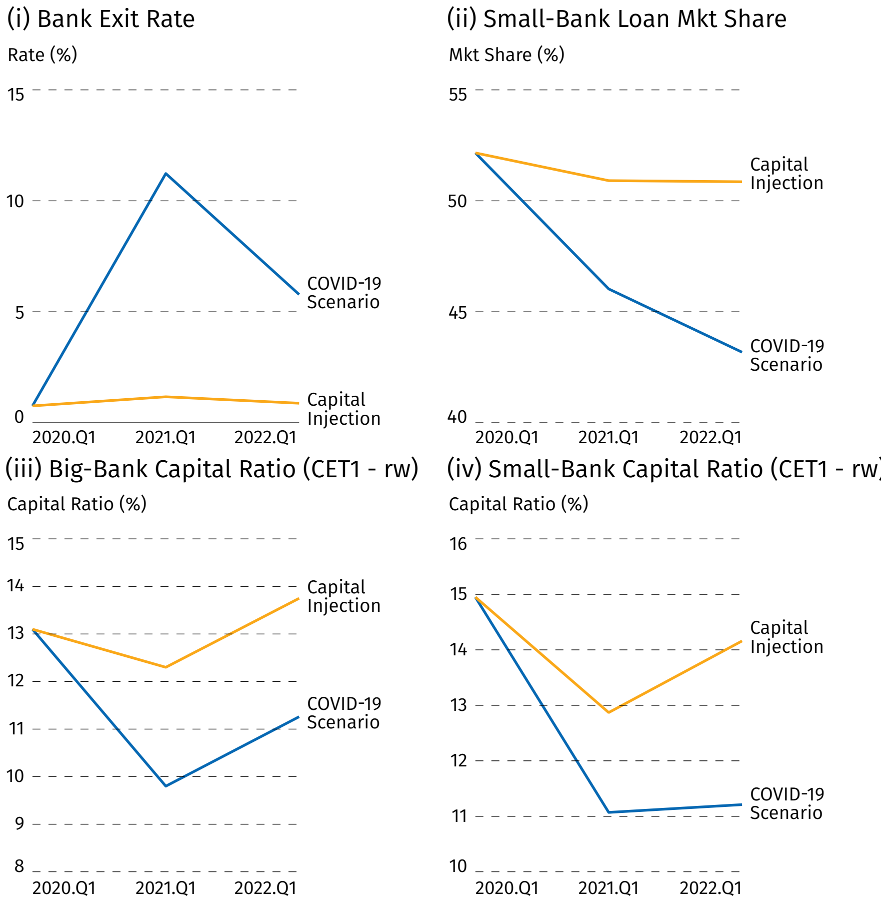
Note: Panel (i) shows the average lending response per 1 percentage point increase in capital ratios. Panels (ii)-(iv) present the evolution of the variables along the COVID-19 scenario ("COVID-19 scenario") and the evolution of the same variables during the Capital Injection exercise ("Capital Injection"). Lending (Total, Big Bank, and Small Bank) is normalized to 1 in 2020.Q1.

The estimated average lending response of a 1 percentage point increase in capital ratios is 3.3 (5.4) percent in 2021.Q1 (2022.Q1). That is, an injection of capital that increases capital ratios by 1 percentage point induces a change in loan growth of 3.3 (5.4) percent in 2021.Q1 (2022.Q1). The average response corresponds to the (asset-weighted) average of the bank-level response. The estimated lending response for big banks is 0.05 (0.11) percent in 2021.Q1 (2022.Q1) and for small banks is 6.4 (10.5) percent also in 2021.Q1 (2022.Q2). That is, an increase of 1 percentage point in capital ratios induces a null response in loan growth for big banks and an increase in loan growth equal to 6.4 (10.4) percent in 2021.Q1 (2022.Q1) for small banks.

This differential response across banks can be explained as follows. The initial impact of the scenario is smaller in big banks than in small banks. Figure 2 Panels (iii) and (iv) present the evolution of bank lending by bank size. The capital injection leads to a significant reduction in small-bank failure, which ameliorates the impact of the scenario on small-bank and total bank lending (see Panel (i) in Figure 3).

FIGURE 3

Capital Injection: Bank Failure, Concentration, and Capital Ratios



Note: Panel (i) presents the bank exit rate and corresponds to the exit rate by small banks (there is no big-bank exit). Panel (ii) presents the Small-Bank Loan Market Share and Panels (iii) and (iv) show the Common Equity Tier 1 capital ratio risk-weighted ("CET1 - rw"). All panels present the evolution of the variables along the COVID-19 scenario ("COVID-19 scenario") and the evolution of the same variables during the Capital Injection exercise ("Capital Injection").

A portion of the under-capitalized small banks that chose to exit under the COVID-19 scenario do not fail after the capital injection. This selection effect is also reflected in the average increase in capital ratios for small banks, which differs from the targeted increase at the individual-bank level. In addition, incumbent small banks, who operate as price takers, increase their loan supply with an additional positive impact on lending. Even though the capital injection for the big bank targets the same increase in its capital ratio as that of small banks, its loan supply, which takes into account its effect on the loan interest rate and with it bank profitability and the level of risk in the loan portfolio of the industry, is significantly smaller than that of small banks. The big bank uses the capital injection as well as some of its safe assets to cover for its relatively large loan losses while keeping its balance sheet composition almost unchanged. This smaller response from big banks is consistent with estimates from the literature (e.g., Bernanke and Lown and Berrospide and Edge).

This experiment shows that capital injections also have implications for bank concentration (see Panel (ii) in Figure 3). While the industry remains more concentrated than before the start of the scenario, small-bank market share increases by 4.8 percent relative to the scenario by 2021.Q1 and close to 7.7 percent by 2022.Q1. This change in bank concentration has implications for loan interest rates that remain higher than in 2020.Q1 but decline by 10 basis points relative to the COVID-19 scenario. The increase in bank capital is also reflected in the decline in the fraction of banks that operate below the "well-capitalized" threshold. Small banks' exposure to risky assets declines after the capital injection.

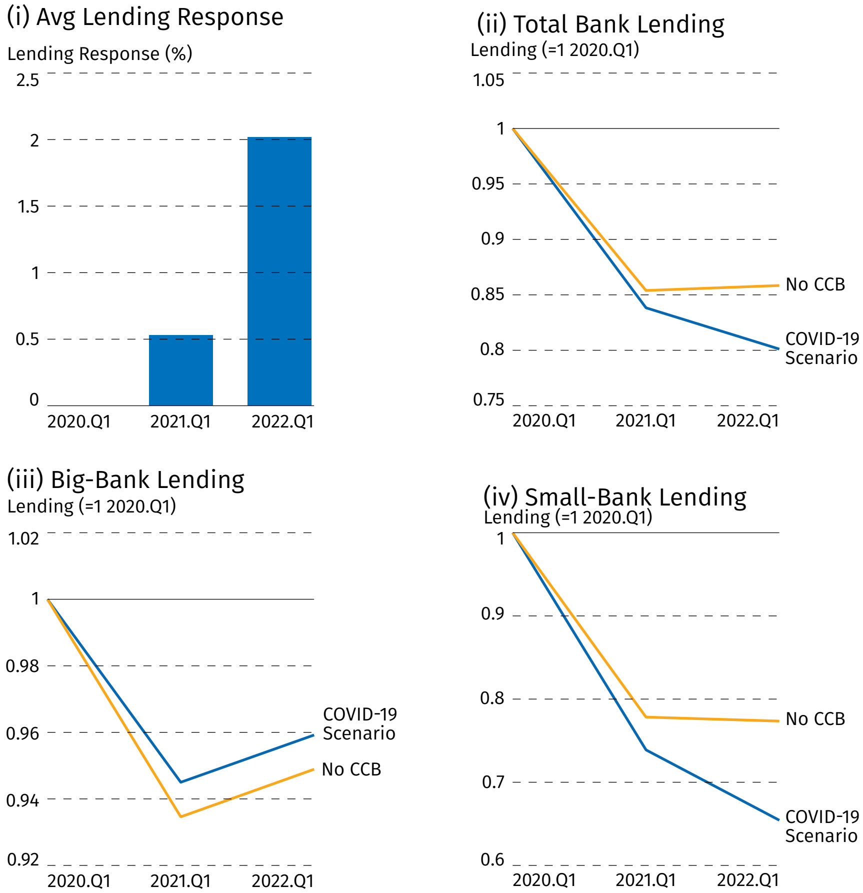
Temporary Reduction in Required Capital

This section describes the results from the exercise that eliminates the Capital Conservation Buffer (a 2.5 percent reduction in risk-weighted capital requirements). Figure 4 presents the estimated average lending response (Panel (i)) per 1 percentage point decline in the Capital Conservation Buffer, as well as the evolution of Total Lending (Panel (ii)), Big-Bank Lending (Panel (iii)), and Small-Bank Lending (Panel (iv)). The estimated average lending response scaled to represent the response to a 1 percentage point decline in risk-weighted capital ratios is 0.5 (2.0) percent in 2021.Q1 (2022.Q1). That is, a 1 percentage point reduction in risk-weighted capital ratios for all banks results in an increase in loan growth of 0.5 (2.0) percent in 2021.Q1 (2022.Q1).

Figure 4 shows that the response of small banks drives the estimated average lending response (see Panels (ii) and (iv)) as the change in lending by big banks is in fact negative (see Panel (iii)). The lending response of small banks per percentage point reduction in capital requirements is 1.6 (4.8) percent in 2021.Q1 (2022.Q1), and that of the big banks is −0.42 (−0.41) in 2021.Q1 (2022.Q1). In line with the previous experiment, a portion of the positive effect on bank lending derives from a reduction in bank failure (see Panel (i) in Figure 5). However, the reduction in exit is much smaller than in the first experiment, which among other factors also explains why the average response in this exercise is smaller than in the exercise presented before. The reduction in minimum capital requirements is not enough to change the prospects of many of the heavily under-capitalized banks that would need to issue fresh equity in order to continue operating. The positive lending response is also explained by an increase in lending by surviving small banks. As the big bank reduces its lending, a minor increase in the loan interest rate induces small banks to loan more.

FIGURE 4

Reduction in Required Capital: Lending Response



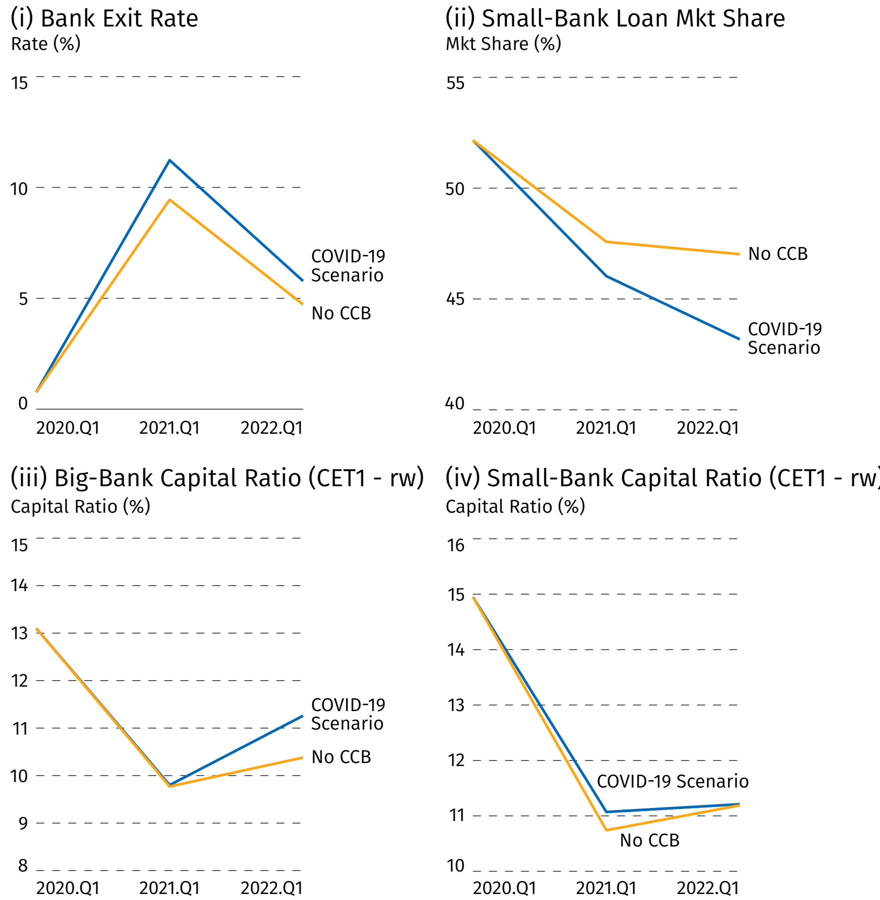
Note: Panel (i) shows the average lending response scaled to represent the response per 1 percentage point decline in the Capital Conservation Buffer (CCB). Panels (ii)-(iv) present the evolution of the variables along the COVID-19 scenario ("COVID-19 scenario") and the evolution of the same variables during the Reduction in the Capital Conservation Buffer exercise ("No CCB"). Lending (Total, Big-Bank, and Small-Bank) is normalized to 1 in 2020.Q1.

The reduction in minimum capital requirements allows the big bank to continue operating without recapitalizing even though it suffers relatively larger losses than small banks (see the slightly smaller capital ratio in Panel (iii) of Figure 5). This reduction in big-bank equity results in the small reduction in lending that we discussed before. In addition, the big bank finds it optimal to continue paying dividends toward the end of the scenario.

In line with the previous exercise, Figure 5 shows that changes in capital regulation have implications for bank concentration (see Panel (ii) in Figure 5). Small-bank market share increases by 1.6 (3.9) percent relative to the scenario by 2021.Q1 (2022.Q1). The estimated aggregate bank loan response (i.e., the response of total bank loans) is 0.6 (2.3) percent in 2021.Q1 (2022.Q1).

FIGURE 5

Reduction in Required Capital: Bank Failure, Concentration, and Capital Ratios



Note: Panel (i) presents the bank exit rate and corresponds to the exit rate by small banks (there is no big bank exit). Panel (ii) presents the Small Bank Loan Market Share and Panels (iii) and (iv) show the Common Equity Tier 1 capital ratio risk-weighted ("CET1 - rw"). All panels present the evolution of the variables along the COVID-19 scenario ("COVID-19 scenario") and the evolution of the same variables during the Reduction in the Capital Conservation Buffer exercise ("No CCB").

Final Remarks

Capturing how important is the capital lending channel in a downturn requires isolating the effect of the capital reduction from demand and other supply factors. This is difficult because many of the same factors influencing the loan supply also affect the demand for credit. Empirical estimates that rely on a variety of shocks such as the financial crisis and banks' variation in exposures to those shocks for identification range from a 0.6 percent to 10 percent drop in lending growth for a 1 percentage point decrease in the capital ratio, with most in the lower end of that range. Estimates are bigger for smaller banks and when using data from the financial crisis. In this article, using the Corbae and D'Erasmo model, I estimate the lending response to be between 0.5 and 5.8 percent. As in the data, I find that the lending response to capital shocks is smaller for big banks than for small banks. The intensive margin of lending plays a smaller role than the extensive margin (small-bank failure), and industry structure and bank market power are important for the observed difference between small and big banks.

As the uncertainty over the future remained elevated during the second quarter of 2020, the Federal Reserve took several actions directed toward financial stability and bank resiliency. One of those actions required large banks (banks with more than $100 billion in assets) to preserve capital by suspending share repurchases and capping dividends.[23,24] An extension of the model that considers dividend restrictions for big banks shows that the estimated lending response is larger than that of the baseline model. For example, the average lending response of eliminating the Capital Conservation Buffer requirement when dividend restrictions are in place equals 1.9 (2.2) percent in 2021.Q1 (2022.Q1) versus the estimated value of 0.5 (2.0) percent in the baseline.

To conclude, it is important to mention a few caveats to the analysis. While in line with the data in many dimensions, the structural model has a simplified balance sheet structure.[25] Importantly, the dynamics of loan default are estimated from historical data and do not capture completely measures implemented by the federal government and the Federal Reserve to ameliorate the impact of the crisis, such as the provisions in the CARES Act (which was signed into law in March 2020).[26] RB

23 See the original press release at https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200625c.htm.

24 These measures were originally put in place for one quarter and extended for another quarter on September 30, 2020. See the press release at https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200930b.htm.

25 For example, some off-balance-sheet exposures are not fully captured. Greenwald, Krainer, and Paul show that over the weeks following the March 2020 U.S. COVID-19 outbreak, commercial and industrial (C&I) lending by U.S. banks grew rapidly as firms used previously committed but undrawn balances on credit lines.

26 The CARES Act, among other measures, provided additional unemployment insurance benefits, established business loan programs, and put in place protections for homeowners as foreclosures are delayed, or they have the right to request a forbearance for up to 180 days.

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