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ABSTRACT

In March of 2020, banks faced the largest increase in liquidity demands ever observed. Firms drew funds on a massive scale from pre-existing credit lines and loan commitments in anticipation of cash flow disruptions from the economic shutdown designed to contain the COVID-19 crisis. The increase in liquidity demands was concentrated at the largest banks, who serve the largest firms. Pre-crisis financial condition did not limit banks' liquidity supply. Coincident inflows of funds to banks from both the Federal Reserve's liquidity injection programs and from depositors, along with strong pre-shock bank capital, explain why banks were able to accommodate these liquidity demands.

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I. INTRODUCTION

Firms go *first* to their bank(s) during a crisis. In the last three weeks of March 2020, anticipating disruptions to cash flow and external funding conditions, non-financial businesses drew funds from bank credit lines on an unprecedented scale. The shock occurred as asset prices had fallen across the capital markets. As a result, commercial and industrial (C&I) loans on bank balance sheets exploded, increasing by $482 billion between March 11 and April 1. For context, the weekly growth of bank C&I loans over the past 45 years has averaged 0.12% (with a standard deviation of 0.47%). Firms drew heavily on bank credit lines following the Lehman bankruptcy too, with lending increasing by about 6% during last three weeks of September 2008 and the first two weeks of October, or about 1.2% per week (about 10 times the average). In the last three weeks of March, however, lending grew more than 6% per week (or about 50 times the average). The growth in lending during these three weeks exceeded *every other* weekly growth rate going all the way back to 1973, when the Federal Reserve's H.8 releases (*Assets and Liabilities of Commercial Banks in the U.S.*) began (see Figure 1).[1]

The three weeks in March 2020 are an unprecedented stress test on the ability of banks to supply liquidity. This 'stress test' was induced by the COVID-19 pandemic, which was unexpected to most firms and banks, was non-financial in nature, and affected all industries in the economy. In this paper, we study how bank characteristics and the characteristics of the markets in which they operate explain the cross-section of this explosion in lending. Our evidence suggests that all of the increase in lending occurred through drawdowns on existing credit commitments. Large banks experienced much more drawdowns than smaller ones. Anecdotal evidence suggests that

[1] Calculations are the authors', based on the H.8 data for all U.S. Commercial Banks, not seasonally adjusted. See https://www.federalreserve.gov/releases/h8/current/h8.pdf

the drawdowns came mainly from large firms, who typically borrow from the largest banks.[2] As a result, C&I lending grew much faster for banks with assets over $50 billion than for other banks (Figure 2). We do not find evidence that banks' financial condition before the onset of the crisis constrained their lending in this COVID-19 stress test. In other words, our results suggest that banks passed this stress test.

In particular, we study two questions in this paper: First, how has firm demand for bank liquidity responded to the onset of the COVID-19 crisis? Viral outbreaks varied substantially across localities, with some cities such as New York, New Orleans and Detroit facing major outbreaks and others facing more limited exposure. State and local governments responded differently to the pandemic, both in the intensity and in the timing of lockdowns and other measures aimed to slow the disease. For example, states like California initiated lockdowns early, while other states such as Texas initiated these policies weeks later. We measure the size of local outbreaks using two strategies, one based on local employment declines in small firms, and the other by ex-post death rates from the COVID-19. We show much larger increases in lending at banks near large outbreaks.

Second, does bank financial condition constrain their ability to meet the unexpected increase in liquidity demands from their business clientele? To answer this question, we build off models developed by Cornett et al. (2011), who study a related phenomenon during the Financial Crisis of 2007–2009. Cornett et al. (2011) find that banks adjust to shocks to liquidity demands by reducing new credit origination, and that the changes in credit supply depend on bank financial

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[2] For press accounts, see "Banks tolerate credit-line draws in coronavirus crisis — for now," *American Banker*, March 26, 2020 and "Credit-line drawdowns have peaked. Will banks get repaid?" *American Banker*, April 15, 2020.

constraints. Specifically, in the 2007-2009 period banks more reliant on core deposits, banks holding more liquid assets, and banks with more capital cut new lending less (increased lending more) than other banks. Our research tests whether or not these bank financial conditions have affected liquidity supply in response to the ongoing COVID-19 crisis.[3] One key difference between 2007-2009 and now is that the Federal Reserve has intervened more quickly and more massively this time. Another difference is that banks have amassed more capital due to the regulatory changes since 2008. Thus, we can assess whether these interventions helped alleviate the effect of bank financial constraints on lending during the COVID-19 crisis.

We show that the advent of the COVID-19 crisis explains the increase in lending, as banks located near areas with larger outbreaks experienced faster loan growth. Large banks with high levels of unused loan commitments to business experienced by far the largest increases in lending. These banks, however, were able to fund the liquidity demands due to the massive increase in deposits, which grew by about $1 trillion in aggregate during the crisis weeks, twice as much as the aggregate increase in lending. Our cross-bank regressions find no evidence that bank lending grew more at those financed more with stable deposits before the crisis. Similarly, we do not find that pre-crisis measures of asset liquidity explain increases in lending. These two 'non-results' suggest that concern about liquidity posed no constraint on banks, in stark contrast to what happened during the 2008 crisis. Moreover, we find no evidence that bank capital constrained their lending either. Again, in striking contrast to 2008, bank lending did not vary with capital in response to the COVID-19 crisis.

[3] Our model differs slightly from theirs in defining liquid assets. Cornett et al. define mortgage-backed and asset-backed securities as illiquid because these asset classes were at the center of the 2008 crisis. In this paper, we treat them the same as other securities (that is, we treat them as liquid assets).

To develop our tests, we exploit two datasets: the quarterly *Call Reports* and weekly confidential FR 2644 data. The Q4, 2019 *Call Report* provides detailed measures of bank financial condition at the outset of the crisis, which we use to explain lending growth during Q1, 2020. Since lending exploded during the last three weeks of March (recall Figures 1 & 2), the bulk of the loan-growth variation during Q1, 2020 represents the effects of the liquidity shock during these three weeks. Hence, we exploit weekly growth in bank lending using the confidential FR 2644 data that underlie the Federal Reserve's H.8 releases. These are the only data that permit high-frequency analysis of the precise timing of the expansion of lending across banks. We construct all of our estimates within-bank (i.e., with bank fixed effects) to remove unobserved heterogeneity in bank lending patterns observed during normal (non-crisis) conditions.

Using the high frequency FR 2644 data, we control for lending patterns during normal periods based on the seven weeks between January 22 and March 11, after which lending took off.[4] In a parallel set of tests, we validate our results using the lower frequency *Call Report* data, where we control for lending during normal periods based on the eight quarters leading up to the first quarter of 2020. *Call Report* data allow us to include all banks (rather than just the weekly reporting banks in FR 2644), and also allow us to model both on-balance sheet lending increases as well as total credit production (the sum of loans on balance sheet plus undrawn commitments). However, it does not allow us to pinpoint the exact timing of the liquidity shock. Our results across the two approaches are consistent, both in terms of statistical significance and economic magnitude.

[4] January 22 was the date of the first reported case of COVID-19 in the U.S. March 11 is the beginning of the rapid onset of loan drawdowns and corresponds with the World Health Organzation's declaration of a global pandemic.

Our identification strategy assumes no correlation between pre-crisis bank characteristics and the liquidity demand shock that occurs in March 2020. While we see no reason to assume otherwise – the pandemic and ensuing market panic was certainly a surprise to everyone – we show that our results are similar when we vary the set of variables capturing liquidity demand. In fact, our results are also similar (quantitatively) in models using the *Call Report* data, which omit local demand covariates.

Our paper contributes to the literature on banks' role as liquidity suppliers to firms. Earlier research suggests that combining deposits and off-balance sheet credit commitments creates diversification synergies, which allow banks to hold less cash (Kashap, Rajan and Stein, 2002). Gatev and Strahan (2006) argue that the synergy is especially powerful during periods of market stress because deposits flow into banks at the same time that borrower liquidity demands peak. Ivashina and Scharstein (2010) find evidence consistent with this latter mechanism during the 2008 crisis, although Acharya and Mora (2015) find that banks paid higher rates to attract deposits. In this paper, we show that aggregate deposit inflows were more than enough to fund the increase in liquidity demands; these flows explain why pre-crisis deposits do not co-vary with lending across banks.

We also contribute to the emerging literature on the economic and financial consequences of the COVID-19 crisis. Many empirical papers study the stock market reaction to the pandemic, finding a strong response of equity prices to news about the virus and an increase in market volatility (Alfaro, Chari, Greenland, and Schott (2020); Baker, Bloom, Davis, Kost, Sammon, and Viratyosin (2020; Caballero and Simsek (2020)). Some studies compare how different types of stocks respond to the pandemic. Ding, Levine, Lin, and Xie (2020) find firms more exposed to the global supply chain fared worse, while Ramelli and Wagner (2020) find that exposure to international trade is also associated with poor stock price performance. Another set of studies focus on non-financial firms. Bartik, Bertrand, Cullen, Glaeser, Luca, and Stanton (2020), based on a survey small businesses, find a rapid onset of mass layoffs and concern by their surveyed firms about financial fragility. Several other authors study the early impact of the CARES Act and the Payroll Protection Program (Humphries, Neilson, and Ulyssea (2020); Granja, Makridis, Yannelis, and Zwick (2020); Cororaton and Rosen (2020)).

Like us, a number of studies focus on the effect of debt and liquidity on non-financial firms. Albuquerque et al. (2020) find stock returns at firms with high leverage ratios fared much worse during the crisis than those with less leverage, while Fahlenbrach, Rageth, and Stulz (2020) find that firms with more financial flexibility did better. De Vito and Gómez (2020) find that most firms would exhaust their cash holdings within two years, consistent with many firms relying on banks for liquidity. Our paper is most closely related to Acharya and Steffen (2020a), who document that access to bank credit lines during the COVID-19 crisis helped non-financial firms, based on stock return patterns. Their paper studies the role of access to bank liquidity from the borrower perspective, whereas we study the problem from the bank (supply-side) perspective.

In another related note, Acharya and Steffen (2020b) apply models estimated from the pre-pandemic period to simulate the extent of credit line drawdowns at banks during the COVID-19 crisis. These models suggest that credit line usage increases when stock market returns are low (Berg et al. (2017)). Their analysis simulates aggregate loan drawdowns of $264 billion for the aggregate U.S. banking system, which is a little more than half of the increased lending seen in March 2020. They argue that banks overall are sufficiently well capitalized to accommodate this simulated demand for liquidity, but our data suggest the actual stress on banks has been substantially larger than the simulated one. Nevertheless, consistent with their conclusion, we find no evidence based on individual bank behavior that capital constrained their ability to meet this unprecedented demand for cash.

II. Empirical Methods, Data, and Results

Weekly Increases in Lending: Empirical Model & Data

The onset of the global COVID-19 virus pandemic initiated a market panic that led to a dramatic increase in firm drawdowns on existing credit lines. We exploit this increase in drawdowns in developing our empirical model, focusing on the three weeks from March 11 through April 1 as the period when liquidity demand spiked.[5] In our first empirical models, we use weekly data to construct the indicator variable *Crisis*, equal to one during these three weeks. To see how unusual this period is, Figure 3 illustrates the weekly growth in bank C&I loans from the beginning of 2020. The figure shows very clearly that these three weeks stand out from the early period. Moreover, the figure shows no unusual growth in other loans (e.g., real estate, consumer, etc.) during this time. Consistent with our interpretation, Acharya and Steffen (2020a) use data from S&P's *Loan Commentary and Data* to document that large public corporations drew about $225 billion on their bank lines during this period, which is only half of the increase in bank C&I lending in our data (about $480 billion). The difference probably reflects drawdowns by private firms.

[5] We end the analysis on April 1 for several reasons. First, the rush to draw funds from pre-existing credit lines had abated by then. Second, we want the weekly analysis to be comparable to the analysis from the Q1, 2020 *Call Report* data. Third, government programs such as the Payroll Protection Program began in early April, which changed the main source of variation in bank lending and would require a different modeling approach.

We use this unexpected shock to liquidity demand to study whether bank financial condition affected their willingness to supply liquidity. Having such a bright-line increase in liquidity demand is nearly unique; it allows us to trace out how (or whether) financial condition constrained banks' ability to supply liquidity. The weeks after Lehman's bankruptcy in 2008 offer the only other similar situation. Cornett et al. (2011) show that both liquidity and capital affected bank liquidity supply then. We report similar tests, though as discussed in the introduction the increase in drawdowns during the COVID-19 crisis dwarfs that observed during the most intense weeks of the 2008 crisis.

Using the shock to liquidity demand in March 2020, we estimate models of weekly bank lending of the following form:

$$\Delta C\&I\ Loans_{i,t}/A_{i,Q4,2019} = \alpha_i + \beta^0 Crisis_t + \Sigma\beta^j Crisis_t * Bank\ Financial\ Condition^j_{i,Q4,2019} + \Sigma\gamma^k Local\ Demand\ Conditions^k_{i,t} + \varepsilon_{i,t}\ . \quad (1)$$

The outcome in Equation (1) represents the weekly change in C&I lending from the Federal Reserve's FR 2644 dataset for bank *i* in week *t*, scaled by the bank's total assets from the end of the prior quarter.[6] We include the weeks from January 22 to April 1, 2020 for all of the domestic reporting banks, and set *Crisis* to one during the last three weeks of the sample. The FR 2644 data come from an authorized random stratified sample of weekly reporting banks.[7] We include a bank

[6] Results are similar using weekly loan growth as the outcome, although this variable contains large outliers. We prefer to normalize by beginning of period assets to eliminate the influence of outliers.

[7] The Federal Reserve reports the weekly aggregated balance sheet of U.S. banks at its website: https://www.federalreserve.gov/releases/h8/current/default.htm. We use the micro-data, which underlie these aggregates and were obtained through a confidential survey of depository institutions that requires confidential treatment of institution-level data and any information that identifies the individual institutions that reported the data.

fixed effect, α_i, in all of our models to remove bank-level heterogeneity, and cluster standard errors at the bank level throughout. Some of our tests also incorporate time effects.

We build *j* measures of bank financial condition based on the 2019 year-end bank *Call Reports*. As such, these measures are plausibly exogenous with respect to the COVID-19 pandemic (and any associated market panic), which was not declared by the World Health Organization until March 11, 2020 (which coincides with the beginning of our *Crisis* weeks). The bank financial measures vary only across banks (not over time), so the bank fixed effects fully absorb their direct effects in Equation (1). The β^j coefficients measure the impact of these conditions on lending during the three-week period in which firms were drawing down their credit lines, relative to their effects during the normal weeks that preceded it.

We include the following bank-level variables, from the Q4, 2019 bank *Call Reports*: 1) *Size*, equal to the log of total bank assets; 2) *Liquid assets*, equal to non-interest bearing balances + interest-bearing balances + Federal funds sold + Repurchase agreement + held-to-maturity securities (at amortized cost) + available for sale securities (at fair value); 3) *Core deposits* (a measure of funding liquidity), equal to deposits in domestic offices minus deposits over $250,000; 4) *Tier 1 capital*; and, 5) *Unused commitments*, equal to undrawn commitments to business.[8] We normalize each of the on-balance sheet measures (other than log of assets) by total assets; for *Unused commitments*, we normalize by the sum of assets plus unused commitments. If banks are constrained by their asset liquidity, by the availability of stable funds, or by scarce capital, we would expect those factors to affect lending growth positively. Lending growth could be

[8] Our measure of capital is close to the regulatory Tier 1 Leverage ratio, although we use the year-end total assets rather than average total assets as the denominator for consistency with the other variables in the model.

constrained either by reducing new loan originations or by restricting access to liquidity under existing lines (as occurred during the 2008 crisis). In contrast, if banks hold substantial liquidity buffers, if their funding is sufficiently abundant, and if they operate sufficiently far from regulatory minimum capital ratios, then the effects of the pre-crisis financial conditions may not affect lending growth.

To capture bank-specific variation in exposure to local demand conditions, we incorporate two strategies. First, we control for the weekly growth in employment, as measured by total hours worked, at small firms located in the state in which each bank is headquartered.[9] These data come from *Homebase*, a software provider for small businesses to track employee working hours for scheduling and payroll. As of January 2020, the *Homebase* data cover about 60,000 small businesses across all 50 states. About 90 percent of their clients have fewer than 100 employees. *Homebase* covers only a small fraction of total state-level employment, but has concentration in the leisure, hospitality and retail trade sectors, which are the sectors most hard-hit by the COVID-19 crisis. Because this measure comes from very small firms, it is unlikely to be directly affected by the drawdown behavior, which was dominated by large firms (i.e., it acts as an exogenous measure of local exposure to the virus; employment patterns at large firms might be affected by the availability of liquidity, which is our outcome). As a second strategy, we measure the state-level COVID-19 deaths per capita through the beginning of May 2020, which gives a comprehensive, cross-sectional measure of the extent of the viral outbreak.[10] The bank fixed effect

[9] Alternatively, we use the average weekly growth in employment across states in a bank's branch network, weighted by the bank's deposits in each state, and find similar results.

[10] We use death after the end of our sample for two reasons. First, unlike the number of cases, deaths do not depend on the level of testing, which varies substantially across regions. Hence, it suffers less from measurement error. Second, deaths are a severely lagging indicator of the extent of the outbreak, so the total number of deaths in May represents a better measure of the magnitude of the viral outbreak in late March than would contemporaneous measures.

captures the cross-sectional effect of this variable, so we focus on its interaction with the *Crisis* indicator.[11]

Panel A of Table 1 reports summary statistics for the full sample of domestic, weekly reporting banks in FR 2644. We report the distribution for both the change in lending and weekly growth in hours worked split based on *Crisis*. Panels B-D of Table 1 report the data sorted into three size bins: banks with assets below $10 billion; banks with assets between $10 and $50 billion; and banks with assets above $50 billion.

Table 1 shows the dramatic shift that occurs during the crisis weeks. Pre-crisis, bank lending increases by only 0.01% of assets per week (with a standard deviation of 0.22% of assets); during the crisis weeks, bank lending increases by an order of magnitude more (to 0.1% of assets), while its standard deviation increases by about 70% (to 0.37%). These figures appear 'small' only because we normalize the change in C&I lending by the size of each bank's balance sheet from the end of the prior quarter. In fact, the changes in bank C&I lending during these three weeks are the largest since 1973 (when the FR 2644 data collection began).

Table 1 also shows that as lending explodes, small firm employment declines precipitously. During the pre-crisis period, weekly hours grew 1.07% per week but then falls by 17.23% during the crisis period (again, more than an order of magnitude more). The negative effect of the viral outbreak on local economic activity coincides with the explosion of bank lending because firms, anticipating future declines in cash flow, immediately draw funds from their bank credit lines when the effects of the pandemic become evident.

[11] Deaths come from Center for Systems Science and Engineering (CSSE), Johns Hopkins University. State population comes from World Population Review.

Panels B-D split the summary statistics based on bank size. This split shows that the largest banks faced, by far, the greatest increase in liquidity demand. Again, our measure normalizes the change in lending by the size of the lender's balance sheet, so the difference in lending in absolute terms across banks of different sizes is even more striking than at first glance (recall Figure 2). To be specific, the large banks experienced lending increases of 0.57% of assets per week (Panel B). In contrast, the small banks experienced lending increases of just 0.06% of assets (Panel D), and the medium-sized banks experience lending growth of 0.13% of assets (Panel C). Across all three bank-size bins, lending grew much faster during the crisis weeks, but this increase is most striking at the largest banks.

Weekly Loan Growth: Linking Lending to Bank Financial Conditions

Tables 2 and 3 report regressions from the weekly FR 2644 data, as in Equation (1). Table 2 reports pooled models, with all of the domestic reporting banks. Some specifications include only the loan-demand variables (*Crisis*, two lags of weekly growth in hours worked, their interactions with *Crisis*, and the state-level death rate from COVID-19 interacted with *Crisis*). We then report specifications that add the pre-crisis bank financial variables (*Size*, *Liquid assets*, *Core deposits*, *Tier 1 capital*, and *Unused commitments*) interacted with *Crisis*. We omit time effects from these models so the effects of *Crisis* and its interactions are well-identified (rather than being absorbed).

Table 3 then splits the analysis by bank size (<$10 billion in assets, $10-50 billion, and >$50 billion). In Table 3, we add the time effects to absorb fully the aggregate changes in lending patterns and thus allay concern about possible omitted variables related to liquidity demand. The models in Table 3 allow us to draw inferences about the impact of banks' ex ante financial condition on liquidity supply.

As shown in Table 2, all three types of demand control have strong explanatory power for loan growth. From column (1): lending increases much faster during the crisis period (consistent with summary statistics). From column (2): the increase during the crisis period is greater in states with larger (lagged) declines in weekly hours worked at small firms. The first lag interacts negatively and significantly with *Crisis*, and the two lags are jointly statistically significant (p-value < 0.02). Similarly, the increase in lending is greater during the crisis weeks in states with more overall death per capita from COVID-19 (columns 4-6).

Table 2, columns 3, 5 and 6 introduce the pre-crisis bank-level variables. Consistent with the simple summary statistics, *Size* enters positively and significantly. Large banks face greater liquidity demands during the crisis weeks. Raising *Size* by one standard deviation (=1.9) increases weekly lending by about 0.04% of assets. The *Unused commitments* variable is by far the strongest predictor of weekly lending increases. This result validates the premise of the paper, which is that the increase in lending comes primarily from liquidity demands in which businesses draw funds from their pre-existing credit lines once the effects of the pandemic become clear. The economic magnitude of this variable is large: a standard deviation increase in *Unused commitments* (=0.04) comes with an increase in lending of 0.14% of assets, or about one-third of a standard deviation of lending growth during the crisis weeks (=0.37%; see Table 1, Panel A). We also find that both *Asset liquidity* and *Tier 1 capital* correlate positively with lending. These results suggest that financial condition may have constrained bank lending (although both variables are strongly correlated with bank size).

Table 3 separates the analysis by bank size. Two things stand out from this sample split. First, the effect of *Unused commitments*, while positive across all three samples, is much larger and more statistically significant for the largest banks. For banks with assets over $50 billion, a standard deviation increase in *Unused commitments* (=0.07; see Table 1, Panel B) leads to an increase in lending of 0.48% of assets (=0.07 x 0.068). This increase equals about two-thirds of a standard deviation of the outcome during the crisis week (=0.72% of assets; see Table 1, Panel B). Second, once we separate the sample by size, the effects of the three financial condition measures – *Liquid assets, Core deposits, and Tier 1 capital* – lose statistical power. We find no effect for the largest banks for any of these measures. For the medium-sized banks, *Tier 1 capital* enters with a marginally significant positive coefficient; for the small banks, *Asset liquidity* enters with a marginally significant positive coefficient. Taken together, these results offer almost no support for the idea that bank financial conditions constrained their ability to supply liquidity during the crisis weeks.

Quarterly Increases in Lending: Empirical Model & Data

The results from the weekly FR 2644 reporting banks have two limitations. First, we cannot separate new loan originations from drawdowns on pre-existing loan commitments because the change in loans on bank balance sheet equals the sum of net drawdowns on existing credit lines plus new originations. We have argued that the variation we observe in these data reflect drawdowns (not originations), but we cannot demonstrate that claim directly because we do not observe the off-balance sheet changes in the weekly data. Second, the FR 2644 sample does not include all banks.

To remedy these two defects, we look next at quarterly *Call Report* data. We have seen that the vast bulk of C&I lending changes during the Q1, 2020 come during the three crisis weeks in March. Hence, the total quarterly changes in lending (both on and off the balance sheet) will provide a good measure of banks' response to the crisis. So, we estimate the following two equations:

$$\Delta C\&I\ Loans_{i,t}/Assets_{i,t-1} = \gamma_t + \alpha_i + \Sigma\mu^j Bank\ Financial\ Condition^j_{i,t-1}$$

$$+ \Sigma\beta^j Crisis_t * Bank\ Financial\ Condition^j_{i,t-1} + \varepsilon_{i,t}\ , \qquad (2a)$$

and:

$$\Delta(C\&I\ Loans+Undrawn\ Commit.)_{i,t}/(Assets+Undrawn\ Commit.)_{i,t-1} = \gamma_t + \alpha_i + \Sigma\mu^j Bank\ Financial\ Condition^j_{i,t-1} + \Sigma\beta^j Crisis_t * Bank\ Financial\ Condition^j_{i,t-1} + \varepsilon_{i,t}\ . \qquad (2b)$$

Equation (2a) is similar to Equation (1). We model the change in total C&I lending on the balance sheet of bank *i* in quarter *t*, normalized by lagged total assets. The sample includes all domestic banks and uses the eight quarters of 2018 and 2019 to pin down the 'normal' effect of bank condition on lending prior to the onset of the pandemic.[12] The time fixed effects, γ_t, capture the overall demand in each quarter and thus capture the overall shock observed in Q1, 2020. We leave out the location-specific measures of demand because these are not well-defined during the pre-crisis quarters. To construct standard errors, again we cluster by bank.

Unlike Equation (1), the bank fixed effects, α_i, do not fully absorb the 'normal' effects of the financial variables, as these exhibit within-bank variation over time. Hence, we include them in the regression, with their effect prior to the crisis captured by the μ^j coefficients. As in Equation

[12] In contrast, the weekly analysis uses the weeks of Q1, 2020 before the liquidity spike as the 'control' regime.

(1), the β^j coefficients capture the differential effect of bank financial condition during the crisis quarter relative to normal times. If bank financial conditions constrain their ability to accommodate the liquidity demand shock from the pandemic, the β^j coefficients will enter Equation (2a) with positive and significant effects. Equation (2b) allows us to estimate similar models using total credit production – the sum of on- and off-balance sheet lending commitments to businesses.

Table 4 reports summary statistics for the *Call Report* data, again looking at all banks first and then at banks in each of three size bins. We report these statistics separately for the crisis and pre-crisis quarters. Looking at the full sample (Panel A), on-balance sheet lending does not show any difference between Q1, 2020 and the earlier quarters. This masks very large differences, however, in the aggregates because the large banks were much more affected than the smaller ones. Consistent with the weekly data, large banks experienced much faster loan growth in Q1, 2020 than during the earlier quarters (Panel B). For them, loans grew by 0.2% of assets at the mean of the distribution prior to the crisis; in Q1, 2020, however, C&I loans grow 1.7% of assets at the mean. This difference, however, is *not* evident in total credit production (loans on balance sheets plus undrawn commitments), which is slightly lower during the crisis quarter for all banks and slightly higher for the largest banks. These patterns support our claim that credit-line drawdowns dominate changes in lending during the crisis.[13] Firms demand liquidity from pre-existing credit lines, as opposed to demanding new credit to facilitate growth or new investment. All else equal, each dollar drawdown leads to a dollar increase in loans on bank balance sheets but no change in total credit (=loans + undrawn commitments).

[13] The increase in lending was also much too massive and abrupt to have been driven by new loan originations, which require substantial time for negotiation of pricing and contract terms.

Quarterly Increases in Lending: Results

Tables 5 & 6 report the estimates of Equations (2a) and (2b) using the nine quarters from the beginning of 2018 through the first quarter of 2020.

The results in Table 5 are fully consistent with those from Table 3, despite the fact that Table 5 uses all banks (rather than a subset), uses a different pre-crisis benchmark (all of 2018 and 2019, rather than the first weeks of Q1, 2020), and has no cross-state control for the level of the viral outbreak.

In particular, as in Table 3, the growth in lending in Q1, 2020 is best explained by the level of pre-existing business loan commitments. The effect of pre-existing commitments is much larger for the largest banks, and the magnitudes line up very closely with those from the weekly analysis. For example, the coefficient on *Unused commitments* for the largest banks equals 0.068 at weekly frequency (Table 3, column 2). This coefficient is 'turned on' for three weeks during Q1, 2020, so the total effect on lending over the quarter equals 3x0.068 = 0.204. This effect is very close to the coefficient estimated on the interaction of the *Crisis* x *Unused Commitments* from Table 5 of 0.195 (column 2). Moreover, as with the weekly data, there is very little evidence that bank financial conditions affect changes in lending. We estimate a positive effect of *Crisis x Tier 1 capital* for the small banks (column 4), but this effect is only marginally significant.

Table 6 reports estimates of Equation (2b), where the outcome captures total credit production to businesses. This variable is not affected by credit line drawdowns, only by overall changes in credit originations. We find no correlation between *Crisis x Unused Commitments* and credit production, either for the full sample or for any size-based subsample. Consistent with Table 5, there is little evidence that this broader measure of credit production is constrained by bank financial condition. Again, we see a marginally significant positive coefficient on *Crisis x Tier 1 capital* for the small banks, as well as marginally significant positive coefficient on *Crisis x Core deposits.* Neither of these, nor asset liquidity, has a significant effect on total credit production for the medium-sized or large banks.

Discussion

We have analyzed how banks have accommodated the unprecedented increase in liquidity demands in response to the ongoing COVID-19 pandemic. Pre-existing unused loan commitments explain the majority of the variation in lending, especially for large banks. Yet we see almost no correlation between bank financial strength and their willingness to bear this liquidity shock. The shock is the largest ever observed, going all the way back to 1973. It is larger than anything observed during the 2008 crisis, when financial condition of banks *did* constrain lending. How is this possible? We suspect that changes in the regulatory regime after the 2008 crisis, inflows of deposits, and the Federal Reserve's aggressive actions in response to the pandemic, explain our results.

Increases in bank liquidity has been a mechanical side effect of the massive expansion of the Federal Reserve's balance sheet from Quantitative Easing (QE), as it effectively expands the supply of excess reserves. The Fed began expanding the supply of reserves in September of 2019, and then announced a massive expansion of QE in response to the pandemic on March 15, 2020. At the same time, the Fed also expanded and reinstated lending programs to banks and other large financial institutions constructed during the 2008 crisis. The policy moves were timely – expanding liquidity supply from the central bank just as non-financial firms were drawing liquidity from their banks.

At the same time that liquidity supplied by the Fed expanded, it also expanded from private sources. Deposits flowed rapidly into banks, again at just the same time that liquidity demands spiked. Figure 4 graphs the aggregate flow of deposits into U.S. banks from the beginning of March 2020, compared to the increase in total C&I lending. As the figure shows, for every $1 of new lending, there is about $2 of additional deposits. Deposits increased by almost $1 trillion during the three weeks from March 11 to April 1. Hence, liquidity poured into banks at exactly the right time, both from the public sector and the private sector. This coincident increase in liquidity supply to banks, when most needed by their borrowers, is consistent with earlier episodes (e.g., Kashyap, Rajan and Stein, 2002; Gatev and Strahan, 2006).

Our results also suggest that capital did not constrain banks during this COVID-19 crisis. As we show, the largest banks faced by far the greatest increases in liquidity demands. But these banks also experienced the greatest increase in regulatory capital from the post-2008 changes in regulation. Innovations such as stress testing and additional capital buffers required for the systemically important financial institutions (SIFIs) moved the largest banks well above minimum capital requirements (Schneider, Yang, and Strahan, 2020). These regulatory innovations, while controversial, seem to have succeeded in building a sufficiently thick capital cushion to allow banks to bear this liquidity shock. That said, the longer-term effect of the increased credit exposure on bank solvency is impossible to assess until more time has passed.

III. CONCLUSION

We have shown that liquidity demands on the large U.S. banks reached unprecedented levels during late March 2020. Firms went to their banks for cash, drawing funds from pre-existing credit lines and loan commitments, in anticipation of massive declines in future cash flow from the oncoming economic shutdown. Large banks experienced the lion's share of these liquidity demands. Banks met the demand without running into binding financial constraints. We suggest two reasons for this. First, bank liquidity and bank solvency buffers were both substantially more robust before the COVID-19 crisis than they were before the 2008 crisis. Second, aggregate liquidity supply, from both the Federal Reserve and from depositors, flowed in at exactly the right time.

References

Acharya, V.V. and Steffen, S., 2020a. 'Stress tests' for banks as liquidity insurers in a time of COVID. CEPR COVID Economics.

Acharya, V.V. and Steffen, S., 2020b. The risk of being a fallen angel and the corporate dash for cash in the midst of COVID. VOX, CEPR Policy Portal.

Acharya, V.V. and Mora, N., 2015. A crisis of banks as liquidity providers. The journal of Finance, 70(1), pp.1-43.

Albuquerque, R.A., Koskinen, Y., Yang, S. and Zhang, C., 2020. Love in the Time of COVID-19: The Resiliency of Environmental and Social Stocks.

Alfaro, L., Chari, A., Greenland, A.N. and Schott, P.K., 2020. Aggregate and firm-level stock returns during pandemics, in real time (No. w26950). National Bureau of Economic Research.

Baker, S.R., Bloom, N., Davis, S.J., Kost, K.J., Sammon, M.C. and Viratyosin, T., 2020. The unprecedented stock market impact of COVID-19 (No. w26945). National Bureau of Economic Research.

Bartik, A.W., Bertrand, M., Cullen, Z.B., Glaeser, E.L., Luca, M. and Stanton, C.T., 2020. How are small businesses adjusting to COVID-19? Early evidence from a survey (No. w26989). National Bureau of Economic Research.

Berg, T., Saunders, A., Steffen, S. and Streitz, D., 2017. Mind the gap: The difference between US and European loan rates. The Review of Financial Studies, 30(3), pp.948-987.

Cornett, M.M., McNutt, J.J., Strahan, P.E. and Tehranian, H., 2011. Liquidity risk management and credit supply in the financial crisis. Journal of financial economics, 101(2), pp.297-312.

Cororaton, A. and Rosen, S., 2020. Public Firm Borrowers of the US Paycheck Protection Program. Available at SSRN 3590913.

De Vito, A. and Gómez, J.P., 2020. Estimating the COVID-19 cash crunch: Global evidence and policy. Journal of Accounting and Public Policy, p.106741.

Ding, W., Levine, R., Lin, C. and Xie, W., 2020. Corporate Immunity to the COVID-19 Pandemic (No. w27055). National Bureau of Economic Research.

Fahlenbrach, R., Rageth, K. and Stulz, R.M., 2020. How valuable is financial flexibility when revenue stops? Evidence from the COVID-19 crisis. Fisher College of Business Working Paper, (2020-03), p.007.

Gatev, E. and Strahan, P.E., 2006. Banks' advantage in hedging liquidity risk: Theory and evidence from the commercial paper market. The Journal of Finance, 61(2), pp.867-892.

Granja, J., Makridis, C., Yannelis, C. and Zwick, E., 2020. Did the Paycheck Protection Program Hit the Target? (No. w27095). National Bureau of Economic Research.

Humphries, J.E., Neilson, C. and Ulyssea, G., 2020. The evolving impacts of COVID-19 on small businesses since the CARES Act.

Ivashina, V. and Scharfstein, D., 2010. Bank lending during the financial crisis of 2008. Journal of Financial economics, 97(3), pp.319-338.

Kashyap, A.K., Rajan, R. and Stein, J.C., 2002. Banks as liquidity providers: An explanation for the coexistence of lending and deposit‐taking. The Journal of finance, 57(1), pp.33-73.

Ramelli, S. and Wagner, A.F., 2020. Feverish stock price reactions to covid-19.

Schneider, T.I., Strahan, P.E. and Yang, J., 2020. Bank Stress Testing: Public Interest or Regulatory Capture? (No. w26887). National Bureau of Economic Research.

Figure 1: Weekly Growth in C&I Loans on Bank Balance Sheets: 1973-April, 2020

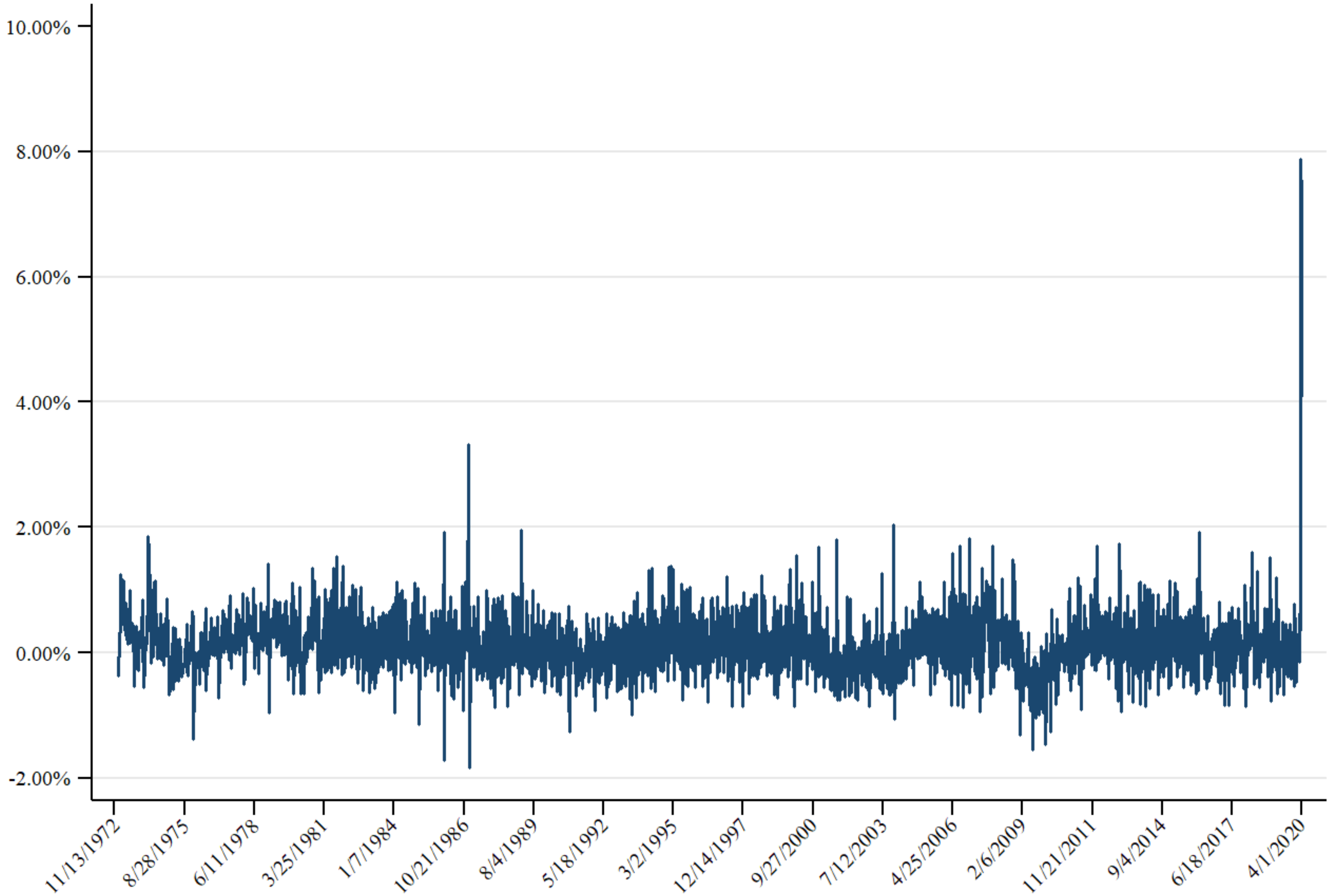

Figure 2: Cumulative C&I Loans Growth by Bank Size

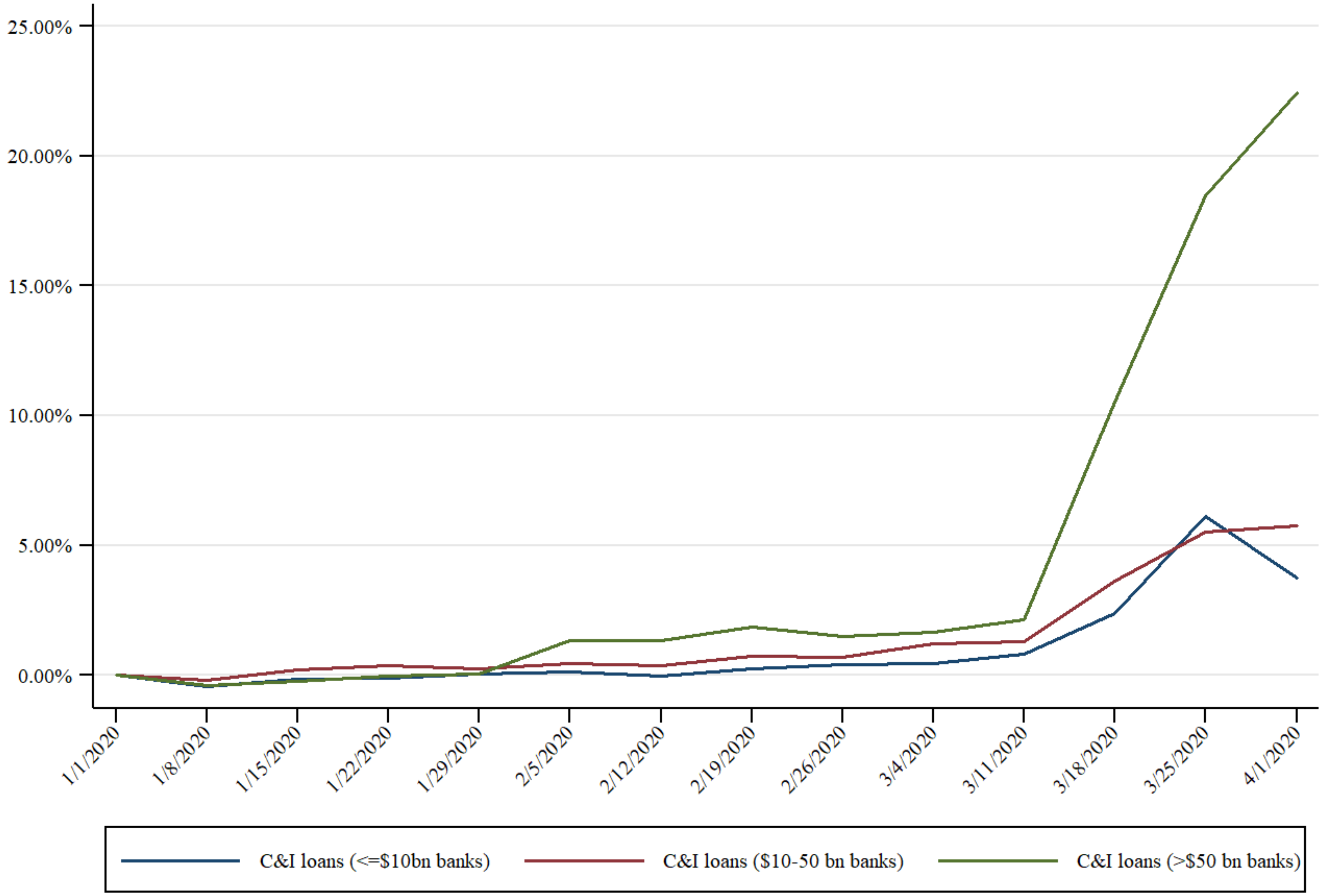

Figure 3: Weekly Loan Growth, all Domestic U.S. Banks

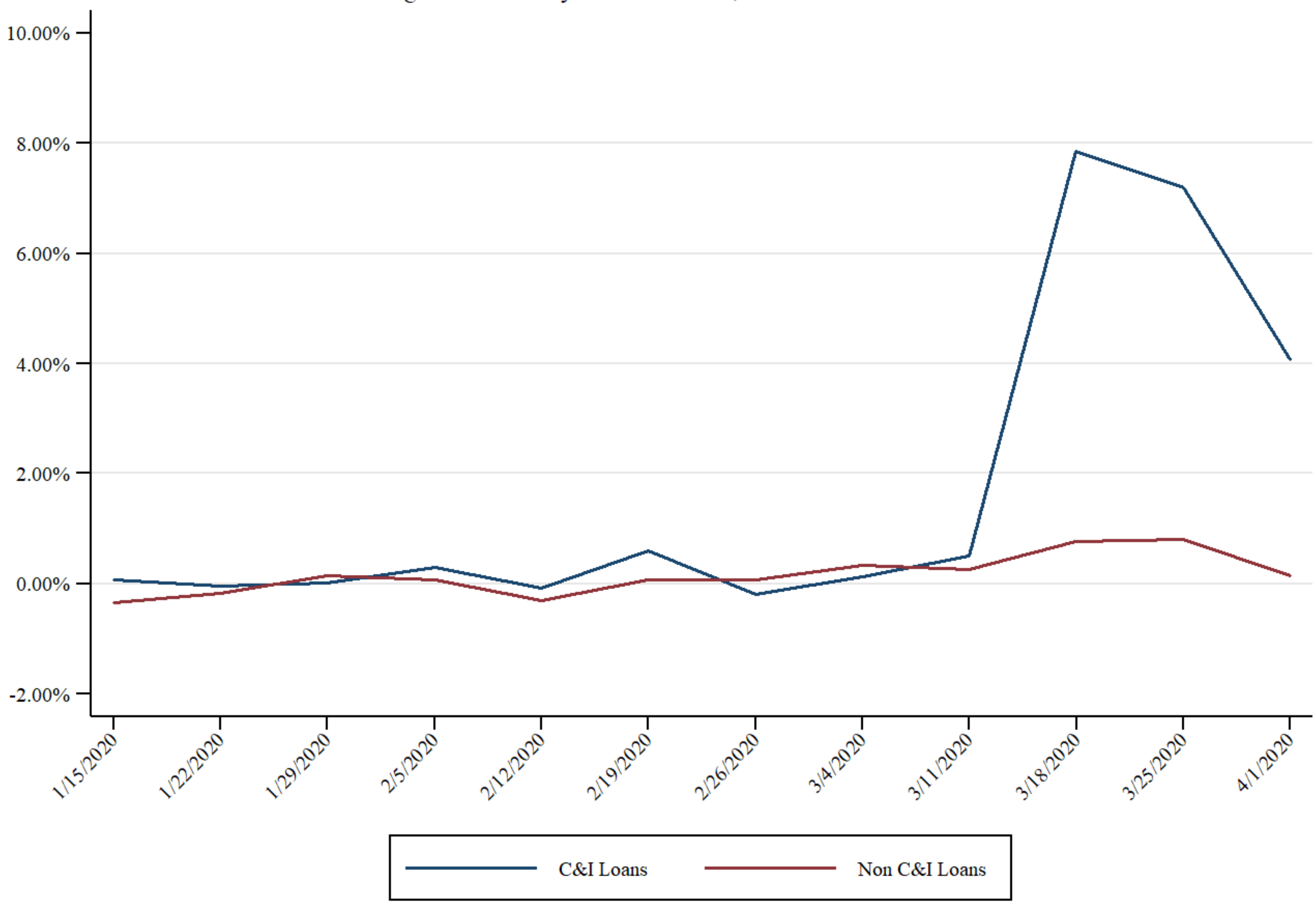

Figure 4: Increases in C&I Loans and Deposits (Billions of $)

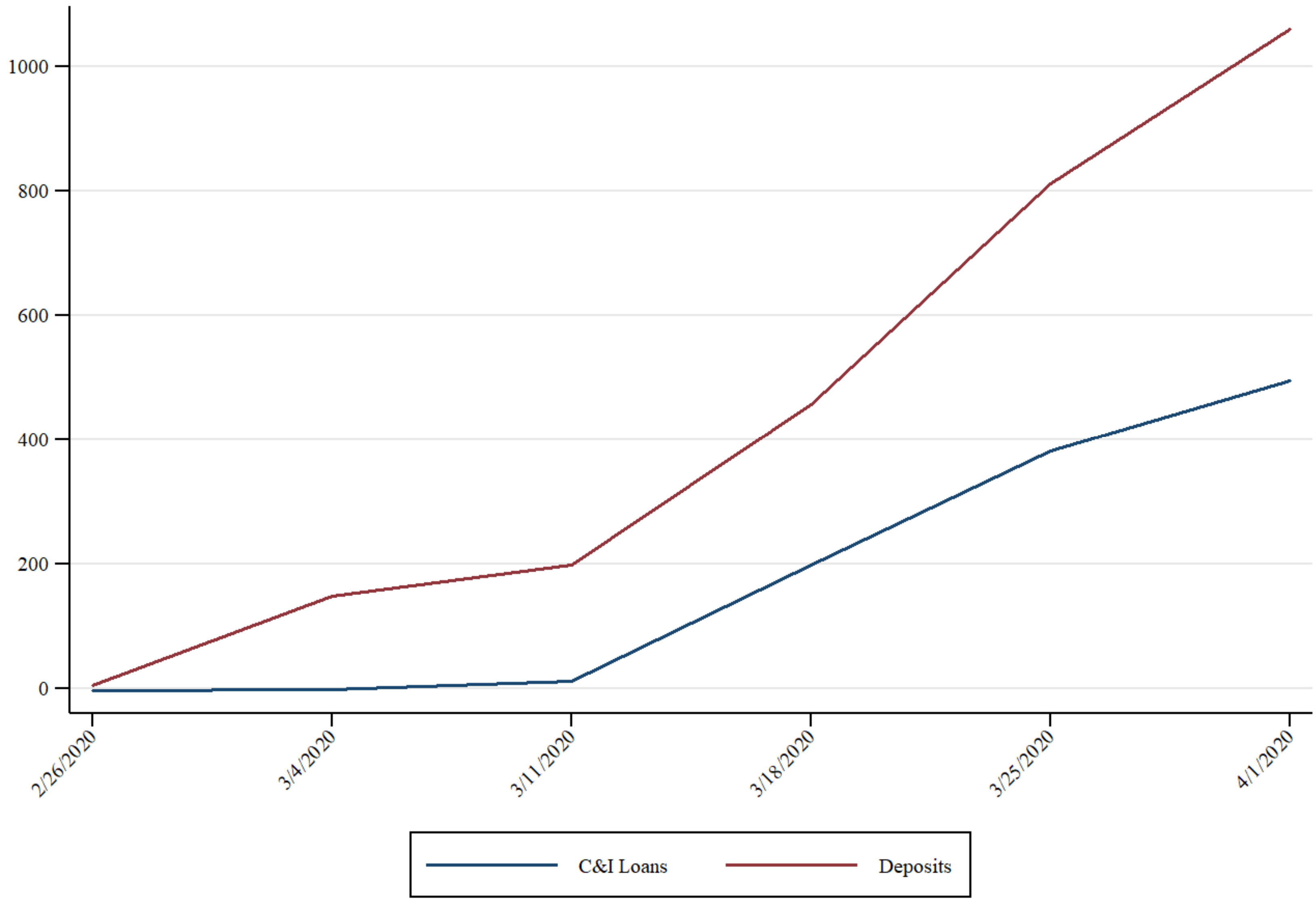

Table 1: Summary Statistics for Weekly Lending

This table reports summary statistics for the weekly change in commercial and industrial (C&I) lending by banks and hours worked by small firms from January 22 through April 1, 2020. Lending data are from the Federal Reserve FR 2644 data and hours are from Homebase. In addition, we report bank characteristics for banks in the sample as of Q4, 2019 from the bank Call Reports. All variables, except Assets and Log(Assets), are winsorized at 1%.

Panel A: All Banks	N	Mean	Std Dev
	(1)	(2)	(3)
Full Sample (January 22 - April 1, 2020)			
Bank Assets (in $thousands)	8,234	21,029,000	141,830,000
Unused C&I comm./(Unused C&I comm.+Assets)	8,234	0.05	0.04
Weekly Change in C&I Loans/Assets	8,234	0.0004	0.0029
Liquid assets/Assets	8,234	0.27	0.14
Core deposits/Assets	8,234	0.77	0.08
Tier 1 capital/Assets	8,234	0.11	0.03
%Change in weekly hours	8,234	-5.60	12.64
State COVID death per capita as of May 4 (in p.p.)	8,234	0.02	0.03
Log(Assets)	8,234	14.15	1.90
Pre-Crisis (January 22 - March 10, 2020)			
Weekly ΔC&I/Assets	5,235	0.0001	0.0022
%Change in weekly hours	5,235	1.07	2.23
Crisis (March 11 - April 1, 2020)			
Weekly ΔC&I/Assets	2,999	0.0010	0.0037
%Change in weekly hours	2,999	-17.23	14.72

Table 1: Summary Statistics for Weekly Lending (Cont'd)

Panel B: Large Banks (>$50 billion)	**Pre-Crisis (January 22 - March 10, 2020)**			**Crisis (March 11 - April 1, 2020)**		
	N	Mean	Std Dev	N	Mean	Std Dev
	(1)	(2)	(3)	(4)	(5)	(6)
Unused C&I comm./(Unused C&I comm.+Assets)	270	0.11	0.07	156	0.11	0.07
Weekly Change in C&I Loans/Assets	270	0.0001	0.0014	156	0.0057	0.0072
Liquid assets/Assets	270	0.31	0.16	156	0.31	0.16
Core deposits/Assets	270	0.75	0.09	156	0.75	0.09
Tier 1 capital/Assets	270	0.09	0.02	156	0.09	0.02
%Change in weekly hours	270	0.84	1.94	156	-16.96	14.97
State COVID death per capita as of May 4 (in p.p.)	270	0.03	0.04	156	0.03	0.04
Log(Assets)	270	19.00	0.97	156	19.00	0.97
Panel C: Medium-Sized Banks ($10-50 billion)	**Pre-Crisis (January 22 - March 10, 2020)**			**Crisis (March 11 - April 1, 2020)**		
	N	Mean	Std Dev	N	Mean	Std Dev
	(1)	(2)	(3)	(4)	(5)	(6)
Unused C&I comm./(Unused C&I comm.+Assets)	511	0.06	0.04	292	0.06	0.04
Weekly Change in C&I Loans/Assets	511	0.0002	0.0015	292	0.0013	0.0027
Liquid assets/Assets	511	0.22	0.10	292	0.22	0.10
Core deposits/Assets	511	0.74	0.09	292	0.74	0.09
Tier 1 capital/Assets	511	0.10	0.02	292	0.10	0.02
%Change in weekly hours	511	0.93	2.14	292	-17.80	14.96
State COVID death per capita as of May 4 (in p.p.)	511	0.02	0.03	292	0.02	0.03
Log(Assets)	511	16.85	0.43	292	16.85	0.43

Table 1: Summary Statistics for Weekly Lending (Cont'd)

Panel D: Small Banks (<=$10 billion)	**Pre-Crisis (January 22 - March 10, 2020)**			**Crisis (March 11 - April 1, 2020)**		
	N	Mean	Std Dev	N	Mean	Std Dev
	(1)	(2)	(3)	(4)	(5)	(6)
Unused C&I comm./(Unused C&I comm.+Assets)	4,454	0.04	0.04	2,551	0.04	0.04
Weekly Change in C&I Loans/Assets	4,454	0.0001	0.0023	2,551	0.0006	0.0033
Liquid assets/Assets	4,454	0.28	0.14	2,551	0.28	0.14
Core deposits/Assets	4,454	0.78	0.07	2,551	0.78	0.07
Tier 1 capital/Assets	4,454	0.11	0.03	2,551	0.11	0.03
%Change in weekly hours	4,454	1.10	2.25	2,551	-17.19	14.68
State COVID death per capita as of May 4 (in p.p.)	4,454	0.02	0.03	2,551	0.02	0.03
Log(Assets)	4,454	13.54	1.24	2,551	13.55	1.24

Table 2: Explaining Weekly Lending Growth

This table reports panel regressions of the weekly change in bank C&I loans from January 22 to April 1, 2020 (from the Federal Reserve's FR 2644 data) on bank financial condition measures from Q4, 2019 *Call Reports*. *Crisis*is an indicator variable equal one for the weeks between March 11 and April 1. We capture local credit demand with *Crisis* and its interactions with state-level growth in hours worked by small firms (from *Homebase*), along with the extent of death from COVID-19. F-stat and p-value at the bottom of the table report tests on whether coefficients on *Crisis * %Change in weekly hours (t-2 to t-1)* and *Crisis * %Change in weekly hours (t-3 to t-2)* sum up to zero. Standard errors are clustered at bank level. T-statistics are reported in parentheses. '*' denotes significance at the 10% level, '**' the 5% level, and '***' the 1% level.

	Weekly Change in C&I Loans/Assets					
	(1)	(2)	(3)	(4)	(5)	(6)
Crisis	0.000858***	0.000136	-0.00517***	0.000631***	-0.00422***	-0.00505***
	(9.210)	(1.403)	(3.442)	(5.533)	(2.908)	(3.393)
%Change in hours $_{(t-2 \text{ to } t-1)}$		0.00217	0.00138			0.000928
		(1.274)	(0.830)			(0.557)
Crisis * %Change in hours $_{(t-2 \text{ to } t-1)}$		-0.00634***	-0.00548***			-0.00493***
		(3.422)	(3.074)			(2.784)
%Change in hours $_{(t-3 \text{ to } t-2)}$		0.00224	0.00166			0.00123
		(1.301)	(0.980)			(0.738)
Crisis * %Change in hours $_{(t-3 \text{ to } t-2)}$		-0.00254	-0.00187			-0.00137
		(1.406)	(1.064)			(0.800)
Crisis * Log(Assets)			0.000197***		0.000181***	0.000182***
			(3.348)		(3.025)	(3.044)
Crisis * Liquid assets/Assets			0.00240***		0.00235***	0.00236***
			(3.862)		(3.853)	(3.850)
Crisis * Core deposits/Assets			-0.000633		-0.000770	-0.000609
			(0.547)		(0.677)	(0.535)
Crisis * Tier 1 capital/Assets			0.00747*		0.00674*	0.00718*
			(1.785)		(1.729)	(1.826)
Crisis * Unused C&I comm./(Unused C&I comm.+Assets)			0.0323***		0.0325***	0.0324***
			(6.042)		(6.284)	(6.236)
Crisis * State COVID death per capita				0.0128**	0.00970**	0.00686*
				(2.015)	(2.465)	(1.788)
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No	No
F-stat		7.33	5.46			4.18
p-value		0.01	0.02			0.04
Observations	8,234	8,234	8,234	8,234	8,234	8,234
R-squared	0.140	0.157	0.222	0.144	0.208	0.223

Table 3: Explaining Weekly Lending Growth, by Bank Size

This table reports panel regressions of the weekly change in bank C&I loans from January 22 to April 1, 2020 (from the Federal Reserve's FR 2644 data) on bank financial condition measures from Q4, 2019 Call Reports. We capture local credit demand with Crisis, which equals one for the weeks between March 11 and April 1, and its interactions with state-level growth in hours worked by small firms (from Homebase), along with the extent of death from COVID-19. F-stat and p-value at the bottom of the table report tests on whether coefficients on Crisis * %Change in weekly hours (t-2 to t-1) and Crisis * %Change in weekly hours (t-3 to t-2) sum up to zero. Standard errors are clustered at bank level. T-statistics are reported in parentheses. '*' denotes significance at the 10% level, '**' the 5% level, and '***' the 1% level.

	Weekly Change in C&I Loans/Assets					
	Large Banks (>$50 billion)		Medium-Sized Banks ($10-50 billion)		Small Banks (<$10 billion)	
	(1)	(2)	(3)	(4)	(5)	(6)
%Change in hours $_{(t-2 \text{ to } t-1)}$	-0.00130	-0.00217	0.000575	0.000146	0.00260	0.00227
	(0.205)	(0.334)	(0.130)	(0.0325)	(1.330)	(1.166)
Crisis * %Change in hours $_{(t-2 \text{ to } t-1)}$	-0.0124	-0.00854	-0.00121	8.72e-05	-0.00707***	-0.00612**
	(1.471)	(0.962)	(0.262)	(0.0180)	(2.745)	(2.397)
%Change in hours $_{(t-3 \text{ to } t-2)}$	0.00213	0.000977	0.000389	-0.000165	0.000848	0.000525
	(0.286)	(0.132)	(0.0722)	(0.0306)	(0.448)	(0.280)
Crisis * %Change in hours $_{(t-3 \text{ to } t-2)}$	-0.00119	0.00295	-0.00266	-0.000839	-0.00147	-0.000397
	(0.104)	(0.261)	(0.449)	(0.141)	(0.593)	(0.166)
Crisis * Log(Assets)	-5.45e-05	-9.83e-06	0.000369	0.000353	2.69e-05	1.47e-05
	(0.150)	(0.0288)	(0.921)	(0.901)	(0.352)	(0.189)
Crisis * Liquid assets/Assets	0.00205	0.00141	0.00141	0.00114	0.00115*	0.00112*
	(1.087)	(0.635)	(0.559)	(0.473)	(1.819)	(1.829)
Crisis * Core deposits/Assets	0.00400	0.00259	0.000865	0.000715	-0.00150	-0.00149
	(0.940)	(0.528)	(0.472)	(0.394)	(1.098)	(1.106)
Crisis * Tier 1 capital/Assets	0.0216	0.0114	0.0182*	0.0159	0.00302	0.00288
	(0.540)	(0.292)	(1.685)	(1.579)	(0.622)	(0.618)
Crisis * Unused C&I comm./(Unused C&I comm.+Assets)	0.0659***	0.0680***	0.0177***	0.0180***	0.0222***	0.0223***
	(14.96)	(14.32)	(2.723)	(2.820)	(3.115)	(3.203)
Crisis * State COVID death per capita		0.0181*		0.00883		0.00608
		(1.759)		(1.539)		(1.326)
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
F-stat	0.65	0.10	0.18	0.01	4.21	2.59
p-value	0.43	0.75	0.67	0.94	0.04	0.11
Observations	426	426	803	803	7,005	7,005
R-squared	0.756	0.760	0.325	0.328	0.135	0.136

Table 4: Summary Statistics for Quarterly Lending

This table reports summary statistics for the quarterly change in commercial and industrial (C&I) lending by banks from Q1, 2018 to Q1 2020. Data are from the bank Call Reports. All variables, except Assets and Log(Assets), are winsorized at 1%.

Panel A: All Banks	**Pre-Crisis (2018-2019)**			**Crisis (Q1, 2020)**		
	N	Mean	Std Dev	N	Mean	Std Dev
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Assets)	43,443	12.47	1.48	4,483	12.55	1.51
Core deposits/Assets	43,443	0.77	0.13	4,483	0.77	0.13
Tier 1 capital/Assets	43,443	0.13	0.09	4,483	0.13	0.09
C&I comm./(C&I comm.+ Assets)	43,443	0.03	0.03	4,483	0.03	0.03
Liquid assets/Assets	43,443	0.30	0.17	4,483	0.30	0.17
ΔC&I loans/Lagged Assets	43,443	0.002	0.009	4,483	0.002	0.009
Δ(C&I Loans+Unused Commit.)/(Lagged C&I comm.+ Assets)	43,443	0.002	0.011	4,483	0.002	0.010

Panel B: Large Banks (>$50 billion)	**Pre-Crisis (2018-2019)**			**Crisis (Q1, 2020)**		
	N	Mean	Std Dev	N	Mean	Std Dev
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Assets)	336	18.93	0.93	39	19.00	0.98
Core deposits/Assets	336	0.72	0.15	39	0.73	0.12
Tier 1 capital/Assets	336	0.10	0.02	39	0.09	0.02
C&I comm./(C&I comm.+ Assets)	336	0.09	0.06	39	0.09	0.06
Liquid assets/Assets	336	0.33	0.18	39	0.30	0.18
ΔC&I loans/Lagged Assets	336	0.002	0.006	39	0.017	0.015
Δ(C&I Loans+Unused Commit.)/(Lagged C&I comm.+ Assets)	336	0.003	0.009	39	0.004	0.011

Table 4: Summary Statistics for Quarterly Lending (Cont'd)

Panel C: Medium-Sized Banks ($10-50 billion)	**Pre-Crisis (2018-2019)**			**Crisis (Q1, 2020)**		
	N	Mean	Std Dev	N	Mean	Std Dev
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Assets)	743	16.79	0.45	88	16.83	0.45
Core deposits/Assets	743	0.73	0.09	88	0.74	0.09
Tier 1 capital/Assets	743	0.10	0.02	88	0.10	0.03
C&I comm./(C&I comm.+ Assets)	743	0.06	0.04	88	0.06	0.04
Liquid assets/Assets	743	0.24	0.14	88	0.24	0.14
ΔC&I loans/Lagged Assets	743	0.003	0.008	88	0.007	0.008
Δ(C&I Loans+Unused Commit.)/(Lagged C&I comm.+ Assets)	743	0.005	0.010	88	0.002	0.008

Panel D: Small Banks (<=$10 billion)	**Pre-Crisis (2018-2019)**			**Crisis (Q1, 2020)**		
	N	Mean	Std Dev	N	Mean	Std Dev
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Assets)	42,364	12.34	1.25	4,356	12.41	1.25
Core deposits/Assets	42,364	0.77	0.13	4,356	0.77	0.13
Tier 1 capital/Assets	42,364	0.13	0.09	4,356	0.13	0.09
C&I comm./(C&I comm.+ Assets)	42,364	0.03	0.03	4,356	0.03	0.03
Liquid assets/Assets	42,364	0.30	0.17	4,356	0.30	0.17
ΔC&I loans/Lagged Assets	42,364	0.002	0.009	4,356	0.002	0.009
Δ(C&I Loans+Unused Commit.)/(Lagged C&I comm.+ Assets)	42,364	0.002	0.011	4,356	0.002	0.010

Table 5: Explaining Quarterly Lending Growth

This table reports panel regressions of the quarterly change in bank C&I loans from Q1, 2018 to Q1, 2020 (nine quarters). All data are from Call Reports. Crisis is an indicator variable equal to one for Q1, 2020. All explanatory variables are from the end of the prior quarter. Standard errors are clustered at bank level. T-statistics are reported in parentheses. '*' denotes significance at the 10% level, '**' the 5% level, and '***' the 1% level.

	ΔC&I Loans/Lagged Assets			
	All banks	Large Banks (> $50 billion)	Medium-Sized Banks ($10-50 billion)	Small Banks (< $10 billion)
	(1)	(2)	(3)	(4)
Liquid assets/Assets	0.0254***	0.0216	0.0456***	0.0253***
	(13.49)	(0.894)	(4.103)	(13.49)
Crisis * Liquid assets/Assets	0.000825	0.0107	-0.00386	-0.000291
	(1.077)	(1.565)	(0.758)	(0.385)
Core deposits/Assets	0.00714***	-0.00445	-0.0114	0.00703***
	(2.769)	(0.243)	(0.986)	(2.717)
Crisis * Core deposits/Assets	0.00267	0.00282	0.00101	0.00244
	(1.632)	(0.417)	(0.121)	(1.453)
Tier 1 capital/Assets	0.0124*	0.124	-0.104*	0.0147**
	(1.690)	(1.298)	(1.755)	(2.028)
Crisis * Tier 1 capital/Assets	0.00550**	0.107	0.0398	0.00438*
	(2.236)	(0.913)	(1.404)	(1.746)
C&I comm./(C&I comm.+ Assets)	0.122***	0.0964*	0.246***	0.123***
	(11.63)	(1.682)	(3.858)	(11.57)
Crisis * C&I comm./(C&I comm.+ Assets)	0.0247***	0.195***	0.0856***	0.0151**
	(3.633)	(10.28)	(4.104)	(2.144)
Log(Assets)	-0.00547***	-0.0179***	-0.0278***	-0.00490***
	(4.096)	(3.524)	(4.541)	(3.870)
Crisis * Log(Assets)	0.000615***	0.00202*	0.00517**	0.000230*
	(5.254)	(1.707)	(2.566)	(1.815)
Observations	47,926	374	830	46,712
R-squared	0.221	0.630	0.330	0.218
Bank FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes

Table 6: Explaining Quarterly Growth in Total Credit Production

This table reports panel regressions of the quarterly change in bank C&I loans plus unused loan commitments to businesses, from Q1, 2018 to Q1, 2020 (nine quarters). All data are from *Call Reports*. *Crisis* is an indicator variable equal to one for Q1, 2020. All explanatory variables are from the end of the prior quarter. Standard errors are clustered at bank level. T-statistics are reported in parentheses. '*' denotes significance at the 10% level, '**' the 5% level, and '***' the 1% level.

	Δ(C&I Loans+Unused Commit.)/(Lagged C&I comm.+ Assets)			
	All banks	Large Banks (> $50 billion)	Medium-Sized Banks ($10-50 billion)	Small Banks (< $10 billion)
	(1)	(2)	(3)	(4)
Liquid assets/Assets	0.0137***	-0.0209	0.0363**	0.0135***
	(5.495)	(0.526)	(2.095)	(5.400)
Crisis * Liquid assets/Assets	-0.000780	-0.00259	-0.000623	-0.000932
	(0.835)	(0.217)	(0.100)	(0.979)
Core deposits/Assets	0.00553*	0.00133	-0.0110	0.00521
	(1.673)	(0.0482)	(0.665)	(1.569)
Crisis * Core deposits/Assets	0.00353*	0.00886	-0.00125	0.00340*
	(1.794)	(0.875)	(0.140)	(1.660)
Tier 1 capital/Assets	0.0195	0.0425	-0.0865	0.0217*
	(1.569)	(0.377)	(1.151)	(1.747)
Crisis * Tier 1 capital/Assets	0.00576*	-0.0145	0.0253	0.00573*
	(1.891)	(0.0773)	(0.818)	(1.821)
C&I comm./(C&I comm.+ Assets)	-0.317***	-0.237**	-0.0406	-0.321***
	(19.16)	(2.578)	(0.409)	(19.17)
Crisis * C&I comm./(C&I comm.+ Assets)	-0.00860	0.00722	-0.0111	-0.00855
	(1.070)	(0.248)	(0.430)	(1.001)
Log(Assets)	-0.00463**	-0.0232***	-0.0320***	-0.00400*
	(2.231)	(2.818)	(3.516)	(1.920)
Crisis * Log(Assets)	3.34e-05	0.00205	0.00348	3.84e-05
	(0.254)	(1.411)	(1.140)	(0.242)
Observations	47,926	374	830	46,712
R-squared	0.247	0.257	0.264	0.248
Bank FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes