Have Banks Caught Corona?

Effects of COVID on Lending in the U.S.

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Exploiting spatial and time variation, we find that banks geographically more exposed to lockdown measures experience an increase in loss provisions and non-performing loans. Exposures to the pandemic itself have a similar, but slightly weaker effect. We observe an increase in small business lending driven by government-guaranteed loans which seem to replace regular loans. Interestingly, lenders more exposed to lockdown measures rely more on government-guaranteed loans – even when controlling for borrower exposure. Finally, we observe a reduction in the number and average amount of syndicated loans for banks more affected by the pandemic, as well as an increase in interest spreads. These findings point to a negative impact of the pandemic on the supply side of finance, to previously unknown side effects of government support, and to the critical role of banks in channeling government support measures to small firms.

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I. Introduction

The COVID-19 pandemic has hit the U.S. economy fast and hard. Unemployment claims spiked up in the first half of 2020 at an unprecedented speed. While such a shock is unlikely to leave banks unaffected, equity buffers have improved significantly since the 2007 financial crisis and fiscal, monetary and regulatory policy responses were swift and radical. In this paper we examine if and how banks' health has been affected by lockdown measures or COVID-19 outbreaks, and if there have been effects on lending growth, including in reaction to government support programs, and on loan conditionality. Constructing a novel measure of geographic exposure of banks to pandemic and lockdown measures, we find that banks geographically more exposed to the pandemic and especially to lockdown measures experience an increase in loss provisions and/or non-performing loans. Higher bank exposure to lockdown measures is associated with an increase in small business lending driven by government-guaranteed loans, while we observe a reduction in unsubsidized small business lending. Finally, we find a reduction in the number and average amount of syndicated loans for banks more affected by the pandemic, and an increase in interest spreads.

The economic shock stemming from the COVID-19 pandemic and lockdown measures is different from previous recessions and crises. First, unlike most previous crises, this crisis is not the result of macroeconomic and financial sector imbalances, but rather an exogenous public health shock, so that it is not clear how quickly this shock is reflected in the quality of banks' loan portfolios. Second, while economic recessions and crises often result in a drop in demand for and supply of loans, the COVID-19 crisis shows unique characteristics in its effect on both real economy and financial system. Drops in aggregate demand have been swift but temporary, resulting in an increase rather than decrease in corporate loan demand, as companies in affected sectors require liquidity for survival. Third, while higher uncertainty and lower risk

appetite tend to reduce loan supply during economic recessions and crises, aggressive monetary and regulatory policy measures, combined with loan guarantees by government have tried to counter some of these effects. It is thus an open empirical question how exposure to pandemic and lockdown measures has affected bank health and through this also bank lending, and to which extent government support has mitigated such effects and had any unintended side effects.

This paper combines bank-, bank-county, and loan-level data from several sources and uses a novel bank-level gauge of exposure to pandemic and lockdown policies to provide an assessment of the effect of COVID-19 and lockdown policies on the health of the banking system, exploiting variation in pandemic outbreaks and lockdown policies across U.S. counties and throughout 2020. Focusing on the US offers several advantages: first, we avoid unobservable or hard-to-capture country traits that might drive both pandemic contagion/lockdown measures and banks' behavior and reactions by focusing on one specific country. Second, COVID-19 outbreaks were initially concentrated in urban centers on both coasts before the pandemic moved Mid-West and ultimately into the South and Southwest, providing us with geographic variation in pandemic exposure. Similarly, unlike in most other countries, state and county governments across the U.S. have shown quite some variation in lockdown policies. Third, given the variation in regional exposure of banks, different banks were affected to a different degree by the pandemic at different points in time. This allows us to use variation in geographic exposure of banks to pandemic and lockdown measures to construct a bank-specific gauge of exposure to pandemic and lockdowns and relate it to bank- and loan-level outcomes.

As in many other advanced countries, fiscal, monetary and regulatory authorities have reacted swiftly and resolutely to the crisis, including one-time tax rebates, extended unemployment benefits, loan (guarantees), lowering the federal funds rate to 0-0.25%, a variety of funding facilities targeted at commercial paper and corporate

credit issuers and dealers and issuers of small business loans, among others, lowering of regulatory capital and liquidity buffers, and easing of loan classification requirements. In addition, under the April 2020 CARES Act's Paycheck Protection Program (PPP) loans were made available by the Small Business Administration through banks to small businesses to encourage them to retain or rehire employees that have been furloughed. The loans will be forgiven if certain requirements are met.[1] Massive PPP lending and significant variation in lockdown measures thus yield an ideal laboratory to understand how government policy impacts financial intermediation in a crisis.

Theory and evidence from previous crises provide contradictory evidence on whether negative macroeconomic shocks result in lending retrenchment or not. On the one hand, theory and evidence suggests lending retrenchment, due to dropping collateral values and thus increasing agency conflicts (Gertler and Bernanke, 1989) or due to losses reducing bank capital and banks' limited ability to raise additional capital (see Ivashina and Scharfstein, 2010; Cornett et al., 2011). However, Kahle and Stulz (2013) find no evidence for a credit supply shock during the Global Financial Crisis, but rather evidence for a demand reduction. And while Ivashina and Scharfstein (2010) show a sharp downturn in syndicated lending from mid-2007 onwards, they also show an increase in C&I loans on the aggregate balance sheet of the U.S. banking sector between September and October 2008, due to drawdowns of credit lines. Critically, while the current shock has been characterised by a sudden and dramatic increase in uncertainty, the shock has not been caused by macroeconomic or financial sector imbalances. Initial evidence from the current shock suggests that loan demand has increased substantially, with many firms drawing down credit lines or tapping capital markets (Acharya and Steffen, 2020). At the same time and as described above, there have been aggressive measures by central banks to encourage banks to keep lend-

[1] For more detail, see this cross-country compilation by the IMF on Policy Responses to COVID-19. The PPP lending program was generally targeted at small businesses with at most 500 employees, with an interest rate of one percent and maturities of two years.

ing to the real economy, while they also mitigated to an extent an immediate deterioration of loan performance. It is thus a-priori not clear whether the reaction of banks will be the same during the current as during previous crises. While the previous evidence on lending growth is thus ambiguous, it points more clearly to an increase in interest spreads, related to reduced net worth of borrowers (and thus collateral value), higher funding costs for banks, and increased uncertainty (see Santos (2010) for evidence from the Global Financial Crisis). A similar effect can be expected in the context of the current crisis, related to lower asset prices and lower revenue streams reducing net worth of borrowers, while increasing demand for liquidity by firms.

Our first set of results shows an increase in loan loss provisions and in non-performing loans (NPLs) over 2020, related to banks' exposure to lockdown policies. While the results are somewhat less robust for the effects of COVID-19 outbreaks, there are also significant effects on loan loss provisions. The effect of lockdown policies on non-performing loans can be observed both for C&I and household loans.

Our second set of results shows that banks have been reducing lending, partly off-set by the government-sponsored PPP for banks more exposed to lockdown measures. The discrepancy between total lending in- and excluding PPP loans is especially marked for small business loans: while we observe a general increase in small business lending, this is driven by banks that are geographically more exposed to lockdown measures; further there is a general decline in small business lending without PPP loans, stronger for banks more exposed to the pandemic and lockdown measures. We also find an increase in overall C&I lending and a general decline in household lending, which do not vary across banks' exposure to pandemic or lock-down measures. We further focus on bank-county data to differentiate between demand and supply effects in the bank-level reaction of small business lending to the pandemic. Specifically, we compare changes from small business lending in 2017 to 2019 to PPP loans in 2020 across banks with differential geographic exposure to the pandemic and lock-

down measures within the same county and find that the increase in small business lending is driven by supply (i.e., bank-level exposure to the pandemic) at least as much as by demand (i.e., county-level exposure to the pandemic) factors. Results also suggest that lending growth, especially to small businesses, was driven by firm demand for liquidity and was facilitated by government-backed loan programs. Interestingly, government-backed loans seem to also partially function as a subsidy for business relations of highly exposed banks and not only as assistance for exposed borrowers. We believe this is a previously unrecognized side effect.

This second set of finding confirms the theoretical prediction and previous empirical finding that small business lending is geographically closely linked to the performance and health of banks, in this case their exposure to pandemic and lock-down measures, unlike large enterprise and household lending, which does not rely as much on geographic proximity (Agarwal and Hauswald (2010), Granja et al. (2018)).

Our third set of results shows that banks more affected by COVID issued fewer syndicated loans while banks more exposed to lockdown policies issued syndicated loans with lower average loan amounts and increased interest spreads. These findings are consistent with theories and previous empirical work that have shown an increase in risk premiums and tighter risk appetite by banks in markets not targeted by government lending programs during periods of increased uncertainty (Pástor and Veronesi (2013)).

Our paper is related to a small but rapidly expanding literature on the effect of COVID-19 on the banking system. Specifically, using bank regulatory filings Li et al. (2020) document the largest ever liquidity demand by firms drawing down preexisting credit lines; banks were able to accommodate the liquidity demand due to cash inflows from the Fed and from depositors. Using loan-level data, Greenwald et al. (2020) show that bank lending increased following the March 2020 U.S. COVID-19 outbreak, concentrated on C&I lending, and in the form of credit line draw-downs. Focusing on

the firm-side, Halling et al. (2020) show that particularly highly rated firms issued public debt after the onset of the pandemic, but substantially less equity. Acharya and Steffen (2020) show that while AAA-A-rated firms raised cash through bond and equity issuances (in addition to credit line drawdowns), BBB-rated firms mainly increased cash holdings through credit line drawdowns and term loan issuances; non-investment grade and unrated firms had to rely fully on credit-line drawdowns and term loans from banks. Chodorow-Reich et al. (2020) show that the increase in bank credit in the first two quarters of 2020 are almost completely due to drawdowns by large firms of lines of credit. Several papers have focused on the effectiveness of the PPP: Li and Strahan (2021) show that firms with closer relationships to their banks received PPP loans earlier; while Granja et al. (2020) find that localities less affected by the pandemic received more PPP funding during the first round.[2] On the cross-country level, Colak and Öztekin (2021) show that lending contracted in countries hit more severe by the pandemic, while Hasan et al. (2020) find an increase in interest spreads for higher firm and lender exposure to the pandemic. Our paper differs from these papers and adds to this literature along several dimensions: first, while focusing on the US, to our best knowledge we are the first to show that loan portfolio performance and lending growth vary with banks' geographic exposure to the pandemic and lockdown measures. Second, while Hasan et al. (2020) infer banks' exposure from investor calls and Colak and Öztekin (2021) use country-level gauges of the pandemic, we use bank-specific gauges of pandemic and lockdown exposure using granular geographic data on branch and deposit distribution.

Our paper is also related to a more established literature on the transmission of macroeconomic shocks through credit markets. Gertler and Gilchrist (1993) show a

[2] Duchin and Hackney (2020) show that firms with prior lending relationships or personal connections to bank executives are more likely to obtain Paycheck Protection Program loans. Darmouni and Siani (2020) show that corporate bond issuance is used to increase holdings of liquid assets rather than for real investment and that most issuers, including many riskier "high-yield" firms, prefer issuing bonds to borrowing from their bank.

rise in credit following contractionary monetary shocks, and also argue that this increase is biased toward larger firms. Using loan-level data and a structural model, Greenwald et al. (2020) do not only look at the COVID-19 shock but also identify monetary policy shock based on the approach of Romer and Romer (2004) and show an increase in overall lending after shocks, due to credit line draw-downs, while term lending to smaller firms drops. We add to this literature by focusing specifically on the COVID shock but looking both at bank-level lending and loan-level conditionality and exploiting cross-bank variation in geographic exposure to the pandemic.

Our paper provides several contributions. First, we construct a novel measure of *geographic* exposure to the pandemic, which allows us to *differentiate* between the effect of geographic variation in A) the pandemic itself (COVID related deaths), B) lockdown policies, and C) national trends / general time effects. Second, while other papers tend to either focus on bank liquidity effects of the pandemic or on an overall exposure to the pandemic in general, we take an entirely different view, collecting evidence related to a channel based on *bank health* / loan portfolio quality. Finally, we explore the effect of government assistance in the form of the PPP on bank lending growth, isolate demand and supply effects by measuring borrower and bank exposures to the pandemic, while controlling for other factors, and document that the effect of lockdowns on banks seems to be at least as important as the effect on borrowers. We believe our finding and interpretation that PPP government support acted partially as a subsidy to the business of troubled banks is novel.

While our results are for the U.S., they offer important lessons for other advanced countries in terms of the impact of the pandemic and lockdown policies on banking systems. Before proceeding, we would like to stress the tentative nature of our exercise, as the pandemic and its economic fall-out are still evolving. And while we relate our analysis to theories on bank behaviour over the business cycle, we cannot rigorously test specific hypotheses and thus refrain from making any causal statements. Finally,

while we can differentiate across banks according to their exposure to the pandemic and – separately – to lockdown policies and use county-bank level data to differentiate between supply and demand-side effects in small business lending, we are careful to state that we cannot exclude alternative explanations.

The remainder of the paper is organised as follows. The next section introduces the different data sources and variables we use in our analysis. Section III provides evidence on loan performance across banks. Section IV presents bank-level evidence on the effect of COVID-19 on lending and loan conditionality. Section V concludes.

II. Data and Variables

We combine data from a number of data sources to assess the impact of COVID-19 and lockdown policies on the banking system in the U.S. Descriptive statistics for all the variables used in county, bank, bank-county, and loan level analyses are in Tables A1, A2, A3, and Table A4 in the appendix, respectively, while we present the most important variables in Table 1.

A. COVID-19 and lockdown policies

We capture county exposure to the pandemic by COVID-19 related deaths per 100,000, based on data from the New York Times, except for the 5 counties that are part of New York City, which the New York Times sums up into one metropolitan aggregate. For consistency we use CDC data for these counties. Population data come from the U.S. Census. Observations are per county and the number of new deaths in a quarter (we use cumulative deaths in the Online Appendix as robustness). In county regressions in the appendix we use the logarithm of 1 + the number of deaths per 100,000 inhabitants. The descriptive statistics in Table A1 show an increase in the average COVID-19 deaths from 0.44 per 100,000 in the first quarter to 17.7 in the second quarter, 24.3 in

the third, and 68.2 in the fourth quarter, but with significant variation across counties.

To capture lockdown policies on the county level, we use the non-pharmaceutical intervention (NPI) index from Olivier Lejeune. The NPI index is defined on the state level (there is little to no variation within states), ranging from 0 (no or few containment measures in place) to 6 (harsh lockdown where residents are not allowed to come out of their home) and is computed as the arithmetic average of all days in a quarter. The descriptive statistics in Table A1 shows an increase in the average NPI from 0.42 in the first quarter to 3.27 in the second quarter and a decline to 1.76 and 0.59 in the third and fourth quarters, but again with significant variation across states and thus counties.

We use unemployment data from BLS Local Area Unemployment Statistics. While the average unemployment rate over the period of analysis is 5.4%, it ranges from a 10th percentile of 2.7% to a 90th percentile of 9.6%.

As a graphic illustration of the regional variation, Figure 1 charts quarterly county level exposures to new COVID-19 related deaths (per 100,000 inhabitants), state level NPIs, and county level unemployment rates in the first three quarters of 2020 across contiguous U.S. counties. Panels A, D, G, and J in the left column illustrate the spread of COVID-19 and show that COVID deaths were initially concentrated around population centers, especially along coastal areas and the Great Lakes in Q2, before moving increasingly South and Southwest in Q3, and Midwest in Q4. The Panels in the middle column show that NPIs have been tougher in the North and in coastal areas and were dramatically higher in Q2 than before or after. Panels in the right column show that unemployment rates were the highest in Q2 and elevated especially along costal areas and the Northeast.

Panel A (B) in Figure A1 in the appendix confirms the positive correlation between unemployment and both COVID-19 deaths (NPIs) suggested by the geospatial plots, charting the median monthly unemployment rates over the period March 2019 to De-

cember 2020 for U.S. counties with zero deaths and for counties with cumulative Q4 2020 COVID-19 related deaths per 100,000 inhabitants above the median of all counties with more than zero deaths (counties below and above the median 2020 NPIs). While there is no sizeable difference in unemployment rates between these two groups until March 2020, counties hit hard by COVID death rates and NPIs experience much steeper and more persistent increases in unemployment rates than counties without COVID-19 deaths.

Other county level controls are from Jie Ying Wu's COVID-19 database and for 2019. We include the number of ICU beds, the shares of persons older than 65, of African-American and Hispanics (all weighted by total county population), median income, population density, 2-digit NAICS and government employment shares.

In all analyses in this paper we winsorize all variables at the 1st and 99th percentiles, unless they are dummies, indexes, or in logarithmic terms.

B. Bank-level data

In our first set of regressions, we focus on a sample of 4,787 banks and their loan losses and lending growth. We construct a measure of bank exposure to COVID-19 related death rates and NPIs from bank branch deposit distributions, and thus only use banks with a "significant branch network". This excludes, for example, de-facto investment banks like Goldman Sachs, or any bank with $10 billion or more in assets but less than 10 branches, banks with $5 billion or more and less than 5 branches, $3 billion or more and less than 3 branches, or $1 billion or more and only 1 branch. We also restrict the sample to deposit taking banks, with deposits accounting for at least 10% of total assets. Observations are excluded if zero or missing values are reported for total bank assets, equity capital, deposits, or total loans and leases.

For bank level exposure to COVID-19 deaths, we compute the "average exposure" to areas in which the bank is physically present, using 2019 bank branch deposit shares

in total bank deposits as weights for each county (based on Federal Deposit Insurance Corporation's Summary of Deposits data). We illustrate this idea visually with the examples of Citibank and Zions Bancorp in Q2 2020 in Figure 2. Citi branches (solid red dots) are concentrated in city centers, with a particularly heavy exposure to the New York City metropolitan area – the early epicenter of the U.S. pandemic. Zions (hollow blue circles) is a counter example, operating a relatively dispersed network of locations across the western U.S. with presence in rural areas and cities less affected by COVID in the first half of 2020.[3] Computed on the bases of new Q2 deaths, this exposure amounts to 67 for Citibank and 13 for Zions. Table A5 in the appendix lists the 35 largest U.S. banks in the sample with their respective COVID exposures. Appendix Figure A2 shows the total branch and deposit intensity across the U.S.

To show that exposure to the pandemic and lockdown measures can have an effect on the real economy and thus on bank's loan portfolio quality and lending growth, we run regressions explaining unemployment across counties and over the period Q1 2019 to Q4 2020. Table A6 in the Appendix suggests that it is both COVID-19 outbreaks *and* NPIs that can explain time and regional variation in unemployment rates. The results show a significant increase in unemployment in 2020 compared to the last quarter of 2019. Beyond the general trend, however, there is geographic co-variation in unemployment with COVID outbreaks and lockdown measures. This result is in line with other research documenting adverse impacts of lockdown measures on local economies (Gungoraydinoglu et al., 2021).

Other bank level variables are from the Federal Financial Institutions Examination Council's Call Reports. We use a number of dependent variables. First, we use growth in loan loss provisions and NPLs, both measured for each quarter to gauge the effect of the crisis and policy responses on banks' loan losses. Growth in loan loss provisions relative to the corresponding pre-year quarter varies between -200% (10th percentile)

[3]Notable overlaps are only in California and Las Vegas.

and 200% (90th percentile), with a mean of 16.9%, while growth in NPLs varies between -111% and 119%, with a mean of 0.65%.[4] Second, we use the growth in loans and leases to test the effect of the pandemic and policy responses on banks' lending activities. Over our sample period, loan growth including (excluding) PPP lending varied between -2.85% (-3.83%) at the 10th percentile and 19.62% (17.22%) at the 90th percentile, with a mean of 7.72% (6.3%). We also analyse small business loans, defined as in Call Reports filings and including small C&I and small agricultural loans (with an original amount of 1 million or less) either excluding or including PPP lending.[5] Finally, we consider growth in two additional categories of lending: commercial and industrial loans including loans secured by commercial real estate (all C&I loans are included irrespectively of their size) and household loans including loans secured by real estate and not assigned to C&I or agricultural loans.

Bank controls in Tables 2 to 8 are the logarithm of total assets, income, equity, deposits, liquidity, unused commitments, and loans and leases in percent of total assets; C&I, household, agricultural, and real estate loans in percent of total loans and leases (loan portfolio shares). All bank controls are from the respective pre-year quarter. We augment these covariates in tables 4 to 8 with the percentage change of unused credit commitments and deposits.

It is important to note that the sample used in regressions based only on Call Reports data includes all reporting banks with usable information (a total of 4,787). This means that a lot of small and mid-sized institutions are included – which is reflected by average total bank assets of $2.9 billion and a small bank share (up to one billion in total assets) of 88%. In regressions explaining PPP lending in a bank-county panel, the sample is smaller with 486 banks, with a considerably larger average total assets

[4] All growth variables used in regressions are computed symmetrically, as "$growth\ in\ x_t = \frac{x_t - x_{t-1}}{0.5*x_t + 0.5*x_{t-1}}$".

[5] Note that the classifications of "small business loans" differ between PPP and Call Reports. While the former uses a borrower size threshold of 500 employees, the latter uses a loan volume threshold of 1 million USD. However, 88% of all PPP loans in our sample are fall into that loan volume classification.

of $19 billion and a smaller fraction of small banks (8.5%). In these regressions we use only those banks that participated both in pre-COVID small business lending from our Community Reinvestment Act database and in PPP lending from the Small Business Administration dataset. In the syndicated loan market there are only 162 institutions in the estimation sample, dominated also by very large ones – average total assets are $62 billion and only 28% of banks are small. In the Online Appendix we also run auxiliary regressions for our estimations from Call Reports data where we split the sample into large and small banks (using 1$ billion in total assets as the boundary). While differential effects (on loss provisions, loan performance, and small business lending) based on bank exposure are stronger for small banks, we see robust and significant general effects on large banks as well.

C. *Bank-county-level data*

To explore how bank exposure affects granting of Paycheck Protection Program (PPP) loans, we access Small Business Administration PPP loan data and match over 85% of all PPP loans to banks in Call Reports or in Summary of Deposits.[6] Most PPP loans are extended in Q2 2020 and in Q1 2021 following the release of government funds (see Figure 5). In the analysis of PPP lending we do not work with a panel, but rather form bank-county level aggregates of PPP loan volumes and construct a cross-section of all PPP lending in the analysis.[7] We combine this with Community Reinvestment Act (CRA) small business and small farm loan origination data from 2017-2019, which are also available on the bank-county level and where we also form bank-county level loan volume aggregates.[8]

In this setting we analyse bank-county cells in which a bank extended at least both

[6] Almost all others are extended by lenders not regulated by the FDIC or the Federal Reserve and are thus not included in Call Reports.

[7] Note that we analyse Q2 2020 and Q1 2021 separately in the Online Appendix.

[8] Under the CRA, banks have to report small business loans (loans at less than 1 million) at a granular, community (county) level.

one CRA and one PPP loan. The dependent variable we use is the percentage change in the total loan volume extended under the Community Reinvestment Act between 2017 and 2019 and under the PPP (we divide the 3-year aggregate by 3 to obtain the average for a pre-COVID year).[9] On average, the county-bank-level volume of PPP loans between Q2 2020 and Q1 2021 represents 35% of the pre-COVID average annual volume of CRA small business loans. Since only 708 lenders appear in the CRA dataset and not all extend both CRA and PPP loans in at least one county, the sample size is smaller than in studies that only focus on PPP lending.

In addition to the bank- and county-level controls described above we further add bank-county variables indicating branch presence (1/0), the deposit based market share of the bank in the county, and the percentage the county amounts to in the bank's total branch deposits.

D. Loan-level data

In our final set, we use syndicated loan data to gauge the effect of the pandemic and policy reactions on loan conditionality. Loan level data come from the Thompson Reuters LPC's DealScan database and company level data are from DealScan and Standard & Poor's Compustat. We use the DealScan-Compustat linking table used in Chava and Roberts (2008) and made available on Michael Robert's homepage to match borrowers in both databases. We also use an updated version of the link extension for their table from Keil (2018) to match DealScan borrowers to Compustat firms for years after 2016. To match banks from DealScan to their financial information from Call Reports and Summary of Deposits we created a linking table where we fuzzy-matched via different name similarity scores and filtered using location variables, year, and other information contained in both files (table, algorithm, and additional technical details

[9] In the Online Appendix we use an alternative definition that resembles an "extensive margin" and covers bank-counties with at least one CRA *or* at least one PPP loan.

are available upon request). Following Bharath et al. (2011), Schwert (2018, 2020), and others a "loan" refers to a "facility" in DealScan. Our broadest estimation sample contains 10,941 loans over the period 2017 Q1 to 2020 Q2, the last quarter for which DealScan was updated in the WRDS format.[10]

We focus on the number of syndicated loans per quarter and banks, the average loan amount, and the interest rate spread over LIBOR in basis points, defined as the all-in-spread, which is the amount paid by borrowers in basis points for each dollar that is actually drawn-down (and in the appendix on the logarithm of 1 plus maturity in months). On average, a bank in our sample participates in 26 syndicated loans per quarter. The average loan volume in our sample is 494 million and the average borrower has total assets of 66 billion, reflecting that the syndicated loan market is primarily for large corporates. The interest rate spread varies from 113 (10th percentile) to 400 (90th percentile), with a mean of 235 basis points.

Basic bank controls are defined as above. Loan type fixed effects are for term loans, revolving credit lines, and other (or loans classified as both). Detailed loan controls comprise of the respectively left out loan term, the logarithm of loan volume, fixed effects for loan purpose, collateral, and refinanced loans.

III. The Economic and Financial Cost of COVID-19

In our first empirical analysis, we assess the impact of pandemic and lockdown policies on banks' loan portfolio performance, captured by loan loss provisions and non-performing loans. The tremendous economic shock documented in the previous section suggests that banks may generally start to experience problems in their loan portfolio. We first provide a graphic illustration of the impact of COVID-19 on loan losses, plotting loss provisions and non-performing loans (NPLs) indexed to 100 in Q4 2019

[10]The SDC subscription we have access to does not contain several variables that we require for our analysis.

in panels A and B in Figure 3. There is a steep increase in loss provisions by around 70% in Q2 that falls but stays elevated thereafter. Similarly, NPLs increase considerably by around 8% with a conversion back to pre-COVID levels in Q4.

To test the effect of COVID-19 exposure on banks' growth in loan loss provisions and NPLs more formally, we run the following bank-quarter panel regression:

$$\begin{aligned} Y_{b,t} =& \beta_1 Q1\ 2020_t + \beta_2 Q2\ 2020_t + \beta_3 Q3\ 2020_t + \beta_4 Q4\ 2020_t \\ &+ \beta_5 COVID\ Deaths_{b,t} + \beta_6 NPIs_{b,t} + \gamma \boldsymbol{X_{b,t}} + \eta_t + \delta_b + \epsilon_{b,t}. \end{aligned} \tag{1}$$

where subscripts b and t indicate banks and quarters, respectively. We allow for clustering of error terms $\epsilon_{b,t}$ on the bank level. All regressions absorb time-invariant bank and general year-quarter-specific effects, η_t and δ_b, respectively. Fixed effects for the four quarters of 2020 measure the general effect of the pandemic and lockdown measures on all banks (the omitted fixed effect is for Q4 2019). Time-variant bank controls $\boldsymbol{X_{b,t}}$ include current percentage changes in deposits and unused credit line commitments and lagged values of the logarithm of total assets, loan portfolio shares, and income, equity, deposits, liquidity, unused commitments, and loans and leases in percent of total assets.

The results in columns (2)-(4) of Table 2 show that exposure to COVID-19 and to NPIs can explain bank variation in loan loss provisions. Fixed effects for the four quarters of 2020 are highly significant with growth in loan loss provisions as the dependent variable in column (1), while the Q2 and Q3 dummies become insignificant once we control for banks' exposure to NPIs in columns (3) and (4) and the Q4 dummy becomes insignificant in column (4) where we control for both bank exposure to COVID-19 and lockdown policies. Bank exposure to both COVID outbreaks and NPIs enter positively and significantly, though the coefficient size drops slightly once we include both exposure variables simultaneously.

The results are not only statistically but also economically significant. The Q2 2020 fixed effect in column (1) suggests a 66% increase in the growth of loan loss provisions compared to Q4 of 2019. Bank exposure to COVID deaths has a considerable additional differential effect on loss provisions (columns 2 and 4). The coefficient in column (4) suggests the growth rate of loan loss provisions increases by 2.6 percentage points when bank exposure to COVID deaths doubles. This is sizeable given the 17% sample average. Increasing the NPI index by one notch implies a 19.5 percentage point increase in the growth rate of loan loss provisions.

It makes sense to assess the "full exposure" to the pandemic, since NPIs and COVID deaths are both statistically significant in column (4). While the fixed effects for 2020 capture both effects, they also capture the opposite effect of government responses aimed at supporting businesses and financial intermediaries. Thus, we combine the product of the regression coefficient of Covid Deaths in column 4 and the average Covid Deaths exposure value throughout the pandemic year 2020 with the product of the NPI coefficient and the average 2020 NPI exposure value. This implies an increase of 105.3 percentage points for banks with an average exposure to both factors of the pandemic (relative to banks without any exposure).

The results in column (5) of Table 2 show that there is a significant general increase in NPLs during the first two quarters of 2020. However, significance is lower than in the loss provisions regressions and the Q3 and Q4 2020 quarterly dummies have a negative and significant coefficient. Bank exposure to COVID-19 deaths is insignificant, while exposure to NPIs enters positively and significantly in columns (7) and (8), (while all 2020 quarter fixed effects turn negative). Using the coefficient in column (8) as a reference, the percentage change in NPLs is 13 percentage points higher when the NPI index increases by one notch.

In Table 3 we show that positive effects of NPIs on NPLs are driven similarly by

household loans and by C&I loans.[11] While bank exposure to COVID-19 enters insignificantly, most of the quarter dummies enter either insignificantly or negatively and significantly. Together, the results in Tables 2 and 3 show that growth in loan loss provisions is positively associated with bank exposure to the pandemic and lockdown policies, while growth in non-performing loans is positively associated only with bank exposure to lockdown policies.

One concern may be that our measure of bank exposure is based on branch networks. While this is common, lending might have become more detached from a bank's physical presence.[12] Due to changes in lending technology (Berger and DeYoung, 2006; Buchak et al., 2018; Fuster et al., 2019) and the general loss of branches (Keil and Ongena, 2020), more small business and mortgage lending is made in locations where the lending bank does not have any branches. In the appendix we analyze correlations between different measures of local branch presence on one hand, and the local small business lending and mortgage lending data we have access to (PPP, CRA, and HMDA lending) on the other hand. Correlations between dummies (an extensive margin) and continuous variables that include totals (variables with many zero values) as well as intensive margins (excluding all zeros) have high values up to 0.853 (Table A7). Computing an exposure dummy based on pre-COVID CRA or HMDA lending in Tables A8 and A9 yields equivalent results to those in our baseline. We take this as evidence that proximity is still sufficiently relevant at least in small business lending, in line with Agarwal and Hauswald (2010) and Granja et al. (2018). Since CRA data is only available for a much smaller subset of banks, we rely on the branch based exposure measure in the remainder of the paper.

In auxiliary regressions in the Online Appendix, we find that our baseline results in Table 2 hold when we use bank exposure to cumulative instead of new quarterly

[11] We do not observe a breakdown for small business NPLs separately.
[12] We thank an anonymous referee for this point.

COVID deaths and NPIs, compute growth rates from pre-quarter instead of pre-year quarter values, or exclude controls and use lower fixed effects dimensionality. In Figure A3 in the appendix we show that the differential geographical exposure to COVID has primarily effects on the health of bank loan portfolios, while there are only moderate or positive effects on bank liquidity, unused credit commitments outstanding, and deposits. In the Online Appendix we show with regression analysis that there are no significant negative effects of exposures to COVID deaths and NPIs on deposits and bank liquidity – increasing our confidence that the the effect of the pandemic on banks works through loan portfolio quality. Since these sets of regressions here include much more smaller banks than those analysing either PPP lending on the bank-county level or syndicated lending we also estimate our baseline regressions for either only small or only large banks (using 1 Billion in assets as the delimiter). Due to power loss caused by smaller estimation samples there is a slight loss of significance. Results in Table 2 are similar for both separately analysed groups of banks; the differential exposures to NPIs, however, are more robust for small banks, while the general effect is economically more considerable for large banks. This is in line with smaller banks' loan portfolios being more concentrated in the area around their branch network, while larger banks' loan portfolios is geographically diversified and not necessarily concentrated around their branch network.

IV. COVID-19, Lending, and the Role of Government Support

While so far we have focused on the economic and financial costs of COVID-19 and lockdown measures, we now turn to the banking system's role in supporting corporations and households during the pandemic. We will first focus on banks' lending growth, in- and exclusive of the Paycheck Protection Program (PPP) and across different categories, before focusing on a country-bank panel to disentangle supply and

demand-side effects. Finally, we focus on changes in loan conditionality for syndicated loans.

A. COVID-19 and Lending Growth

In this subsection we explore if exposure to the pandemic and lockdown measures are associated with any effects on lending volumes on the bank level. In addition to total loans and leases, we also gauge the impact of the pandemic on small business loans and differentiate each of these aggregates into one with and one without loans under the PPP. As in previous analyses, we first undertake graphic illustration before proceeding to regression analysis (Figure 4, volumes are indexed to 100 in Q4, 2019). While there are steep increases for total loans and leases (Panel A) including PPP lending in Q2 and Q3 2020, excluding PPP lending causes the spike to flatten, suggesting that the increase is entirely driven by PPP lending. The increase in small business loans (Panel B) including PPP is on average considerably larger than the increase in total loans and leases. However, excluding PPP lending reveals that non-PPP small business lending dropped by over 20% in Q2 of 2020 and has remained at depressed levels. Using the same regression set-up as for loan loss provisions and NPLs, we next explore the relationship between the pandemic and lending volumes more formally.

In Table 4 we run similar regressions as in Table 2, but using percentage changes in total loan volumes (Panel A) and small business loan volume (Panel B), either including (Columns 1-4) or excluding (Columns 5-8) PPP lending. There is a moderately sized (0.27 percentage points) and slightly significant general increase in the growth rate of total lending in Q2 2020 (Column 1, Panel A) and decreases in other quarters, all compared to Q4 of 2019. The last three 2020 quarter fixed effects become highly significant and negative with a larger magnitude of 6.29-8.81 percentage points once PPP lending is excluded (Column 5, Panel A). This is sizeable, given the 6.3% sample mean. Regressions explaining total loans and leases show that bank exposure to

COVID-19 deaths is insignificant. Exposure to lockdown policies has significant positive effects on growth in total loans and leases when PPP lending is included, while there is no significant effects once PPP lending is excluded. In summary, in addition to a general decrease in lending over the course of 2020, there was a positive relationship between bank exposure to NPIs and bank lending, though driven by PPP loans, suggesting that this might be driven by demand rather than supply.

Regressions in Columns (1) and (5) in Panel B of Table 4 show that total small business lending volume growth increased significantly in Q2, Q3, and Q4 by 11.6, 14.2, and 1.5 percentage points, respectively, when PPP lending is included, while they decreased significantly by 20 to 29 percentage points when we exclude PPP loans, all relative to Q4 of 2019. Given the sample mean of -0.2% excluding (8.35% including) PPP lending, these are dramatic economic magnitudes. In Columns (2) - (4) and (6) - (8) we see considerable differential effects associated with NPIs that amplify the general effect. Banks more exposed to NPIs increase small business lending including PPP loans more than other lenders, while they decrease lending excluding PPP more. Exposure to COVID-19 deaths per 100,000 has similar effects on small business lending excluding PPP loans. In terms of economic significance, we find that an increase of the NPI index by one notch implies an increase of almost 7 percentage points in the growth of total small business lending including PPP loans and a 5 to 5.4 percentage point decrease when PPP loans are excluded. Since NPIs and COVID Deaths are both statistically significant in column (8), we again compute the combined effect of the average exposure to the pandemic (the product of the regression coefficient of Covid Deaths and the average 2020 Covid Deaths exposure plus the product of the NPI coefficient and the average 2020 NPI exposure). This implies a growth decrease in small business loans (excluding PPP) of 30.4 percentage points for banks with an average exposure to both pandemic factors. With PPP, the equivalent number is a 10.3

percentage points increase.[13] In sum, we observe a general increase in small business lending, driven by banks that are geographically more exposed to lockdown measures and by PPP lending, while there is a general decline in small business lending without PPP loans, stronger for banks more exposed to the pandemic and lockdown measures.

Findings for lending growth including PPP are consistent with an increase in loan demand during the COVID-19 pandemic, which outweighed any possibly negative effects of the crisis on loan supply, and are consistent with Acharya and Steffen (2020), Chodorow-Reich et al. (2020) and Li et al. (2020). The substantially larger effects for small business than overall loans (including PPP) is an indication that loan supply to this specific group was supported by policy measures (in line with findings by Chodorow-Reich et al. (2020), while smaller firms also rely more on banks than larger firms that have access to public capital markets.

Findings on lending growth excluding PPP loans are also consistent with results from Colak and Öztekin (2021), a negative supply impact, and banks cutting back regular lending. Taking both results on lending volumes, including and excluding PPP lending, together further supports hypotheses of either a crowding-out effect of regular small business by PPP lending or a successful attempt to step in and make up for the shortfall in supply. A supply-side interpretation is possible, where banks harder hit in their loan portfolio may tend to switch towards PPP lending. In this line of thought PPP became essentially a de-facto subsidy for banks with deteriorating health. In the next subsection we will attempt to disentangle demand and supply side interpretations.

In Table 5 we show that the higher growth in total loans and leases including PPP loans is driven more by C&I than by household loans. However, differential bank exposures to NPIs and COVID-19 deaths are insignificant. The results in column (1) show that there was a positive and significant increase in C&I loan growth in the sec-

[13] The computation does not include the insignificant COVID deaths coefficient.

ond, third, and fourth quarters of 2020 (compared to the last quarter of 2019). The results in columns (5) to (8) show a decline in lending growth to households, but no significant variation in this decline with banks' exposure to COVID-19 deaths or NPIs.

In our usual set of robustness regressions in the Online Appendix, we confirm that the baseline results of this subsection in Table 4 hold when we use cumulative bank exposures, quarter-over-quarter growth rates, or exclude controls and use lower fixed effects dimensionality. Significance levels for coefficients of interest are higher in the the regression based on quarter-over-quarter growth rates. For the aggregate of total loans and leases and unused commitments, the pattern of general and differential increases is similar to small business lending when we exclude PPP loans. Differential effects are absent when we explain unused commitments alone.

As in the previous subsection we estimate all baseline regressions from Table 4 separately for large and small banks. Results for total loans and leases are very similar in both bank groups. For small business lending, economic magnitudes of general effects (increases including and decreases excluding PPP loans) are larger for large banks, while differential effects are statistically more significant for small banks, in line with geographically more concentrated lending by smaller banks.

B. COVID-19 and Small Business Lending - Supply vs. Demand

Our results from section IV.A are consistent with both demand and supply side stories explaining bank lending throughout the pandemic. The advantage of our approach so far is being able to differentiate not only between lending volumes with and without PPP lending, but also between total, small business, C&I, and household lending. The downside is that bank-quarter aggregates do not allow us to separate demand from supply side effects. In this section we therefore focus only on PPP lending and try to disentangle demand and supply by analysing PPP lending in the cross-section of primarily Q2 2020 and Q1 2021, when most PPP lending in our data took place (see

Figure 5). Forming a cross-section of bank-county PPP loan volume aggregates and defining these as "borrowers" equivalently to Berg et al. (2019) and others we can apply county fixed effects that absorb all demand side effects similarly to Khwaja and Mian (2008). This allows us to understand if supply side factors can explain our previous findings. In particular, we estimate the following regression

$$y_{b,c} = \beta_1 COVID\ Deaths\ Bank_b + \beta_2 NPIs\ Bank_b + \gamma \boldsymbol{X_b} + \theta \boldsymbol{Y_c} + \eta \boldsymbol{Z_{b,c}} + \delta_c + \epsilon_{b,c}, \tag{2}$$

where subscripts b and c indicate banks and counties, respectively. We allow for bank level clustering of errors $\epsilon_{b,c}$ and use county fixed effects δ_c in our most stringent regressions, absorbing county characteristics $\boldsymbol{Y_c}$ which also include county exposure to COVID-19 deaths and NPIs. The dependent variable is the percentage change in the total volume of loans extended and included in the CRA database between 2017 and 2019 to the PPP in 2020. In addition to bank controls used above, we also add bank-county controls (in $\boldsymbol{Z_{b,c}}$): branch presence (1/0), market share based on deposits, and the share the county amounts to in the bank's total branch deposits. Note that county COVID deaths and NPIs are absorbed in regressions where we include county fixed effects: we explain bank participation in PPP lending from differential *bank exposure* to COVID outbreaks and NPIs within the same county, assuming similar demand for bank loans in a given county and thus isolating supply-side effects. In some regressions we exclude county fixed effects (and use county controls described above), allowing us to estimate coefficients for county COVID deaths and NPIs.

The results in Table 6 suggest that it is bank exposure as much as real economy exposure to lockdown measures that explains variation in take-up of PPP loans. Both county and bank exposures to NPIs are positive and highly significant in all regressions. A one standard deviation increase in bank exposure to NPIs is associated with a 22-25% increase in lending volumes. County and bank exposures to COVID deaths

are insignificant. We find thus evidence for both demand- and supply-side constraints driving lending growth: banks more exposed to lockdown measures across their network face higher losses and loss provisions and might therefore be more willing to substitute PPP loans for regular loans.

While we consciously focus on a definition of lending that resembles an intensive margin and that is more likely to be affected by a bank balance sheet strength or risk management and less by bank operational strategy or financial technology,[14] we do run auxiliary regressions in table A10 the appendix with an alternative definition that resembles an "extensive margin".[15] Interestingly, results are equivalent for bank exposure to NPIs, but considerably weaker for county exposure to NPIs, supporting our finding that supply side and bank level exposures to NPIs seem to be at least as important in explaining PPP lending as borrower exposures.

In the Online Appendix we show that results are similar when we either focus on Q1 2021 or Q2 2020, although bank some exposures to COVID-19 deaths become significant or almost significant in the latter analysis and always have positive coefficient signs. These results suggest that banks more geographically exposed to lockdown measures expanded lending to small businesses supported by the PPP. This finding is consistent with but also expands on Li and Strahan (2021) who find that PPP lending is provided by banks primarily in their core markets, while we also find a geographic expansion of lending by these banks, with extensive and intensive margins of similar economic magnitude.

While we confirm results by Granja et al. (2020) that county exposure to the pandemic as measured by COVID deaths did not drive PPP lending, we show a positive

[14] We thank an anonymous referee for this point.

[15] The variable is the difference of two dummies, where the first (second) is 1 if a bank extended small business and farm loans under the PPP (reported under the CRA between 2017 and 2019), implying that a 1 means "entry", a −1 "exit", and a 0 "no change". That sample includes all bank-counties in which a bank had either a branch presence, a CRA small business loan between 2017 and 2019, or a PPP loan. The interpretation is the change in the likelihood that any loan is issued by a bank in a county before and during the COVID crisis (see Berg et al., 2019, for an equivalent application).

effect of lockdowns on PPP lending. The significant coefficients of county exposure to NPIs is consistent with small businesses requesting substitution of regular loans with PPP loans or increasing PPP loan demand. To our knowledge, the strong association of bank exposure to NPIs with PPP lending is novel. This finding is in line with the previous bank level results that banks with direct exposure to NPIs are relying more heavily on PPP loans and increase their PPP lending. While we do not observe non-PPP loans on the bank-county level, findings from this and the preceding section taken together are consistent with the explanation of a crowding out and de-facto subsidy effect for banks with deteriorating loan portfolios caused by high geographical exposure to NPIs.

C. COVID-19 and Loan Conditionality

We have shown that banks are adversely affected through their geographical exposure to the pandemic. While providing increasing total loan volumes, especially to small businesses with loan volumes up to 1 million, this effect was entirely driven by government sponsored PPP lending. We now explore if there are effects on the number of loans, average loan amount, and interest spreads in the market for medium and large syndicated loans in the U.S. Two downsides of analysing the syndicated loan market are that we have a small number of banks and that these are very large and geographically more diversified, working against the likelihood of finding significant results. The advantage, however, is that this market itself is less aggressively targeted by government interventions to counter adverse economic effects of COVID and NPIs. Locations of borrowers in this market are also less likely to correlate with the geographical footprint of lending activities of banks.

We first plot the total number of syndicated loans extended by U.S. banks by quarter in Figure 6, hinting at a small but noticeable decline in the first quarter of 2020. To understand how exactly COVID impacted banks in their activity on the syndicated

loan market, we form bank-quarter aggregates of the total number of syndicated loans led by a bank in a quarter, compute the average volume of loans in which a bank led or participated, and explain these as dependent variables in regression

$$\begin{aligned} Y_{b,t} =& \beta_1 Q1\ 2020_t + \beta_2 Q2\ 2020_t + \beta_3 COVID\ Deaths_{b,t} \\ &+ \beta_4 NPIs_{b,t} + \gamma \boldsymbol{X_{b,t}} + \eta_t + \delta_b + \epsilon_{b,t}, \end{aligned} \tag{3}$$

where the subscripts b and t refer to banks and quarters, respectively. Bank controls $\boldsymbol{X_{b,t}}$ are defined as above and standard errors $\epsilon_{b,t}$ are clustered by bank.

Results in Table 7 show that the syndicated loan market was indeed adversely affected in the second quarter (first quarter coefficients are also negative, but insignificant). The coefficient in column (1) implies a general 22% reduction of loans issued, while the one in column (5) suggests a 29% decrease in average volumes. In 3 out of 4 regressions, bank exposure to COVID deaths and to NPIs enter significantly and negatively. Column (4) implies that a doubling in the death rate exposure decreases bank loan extensions by 17.6%, while column (8) suggests that an increased exposure to NPIs by one notch in the index reduces average volumes by 18.5%. In the Online Appendix, we find that results are similar when we use cumulative exposure to COVID measures, reduce fixed effects dimensionality, and exclude controls. When running regression on the bank-borrower-quarter level with borrower × year-quarter fixed effects, in an analysis in the spirit of Khwaja and Mian (2008), we find that the general negative effects are also present or even slightly stronger, while the significance of differential exposure coefficients drops.

We next turn to the effects on interest rate spreads and in the appendix on maturities. Figure 7 provides a graphical illustration. Floating interest quoted as spreads over LIBOR increase, on average, while maturities on newly granted loans drop, on average. To explore the effect of the pandemic on loan conditionality (interest spreads in

percentage points and of maturities in months), we adjust the regression model used in the previous section as follows:

$$\begin{aligned} Y_l =& \beta_1 Q1\ 2020_t + \beta_2 Q2\ 2020_t + \beta_3 COVID\ Deaths_{b,t} \\ &+ \beta_4 NPIs_{b,t} + \gamma \boldsymbol{X_{b,t}} + \tau \boldsymbol{Z_l} + \eta_{f,t} + \delta_b + \epsilon_l, \end{aligned} \tag{4}$$

where the subscripts l, b, f and t refer to loan facilities, banks, borrowers and quarters, respectively. Compared to the previous bank level analysis, this estimation includes not only bank controls, but also loan controls $\boldsymbol{Z_l}$ and higher dimensionality fixed effects, including bank-fixed effects, loan type fixed effects, and either industry × state and industry × year-quarter fixed effects (similar to Berg et al., 2019) or borrower × year-quarter fixed effects. Standard errors ϵ_l are clustered at the bank level to control for any unobservable bank-specific pricing differences.

The results in columns (1) and (2) of Table 8 show that, in line with the graphical evidence, interest spreads experienced a significant uptick in the second quarter of 2020. Using the coefficient in column (2) as reference they increased by about 65 basis points in Q2 2020 relative to Q4 2019, corresponding to 27% of the sample mean (235 basis points). Columns (3) and (7), however, suggest that this increase is driven by bank exposure to COVID-19 deaths, which enters positively and significantly. However, while being always positive, the coefficient is not significant in all specifications. The magnitude of the coefficient in column (7) implies that the interest spread on a new loan increases by 30 basis points for a doubled exposure to COVID-19 deaths. While this result is similar to findings by Hasan et al. (2020), the economic effect seems significantly larger, though we work with very different samples (U.S. vs. cross-country). The results in columns (5) to (8), on the other hand, show that bank-level exposure to NPIs has no significant measurable effect on interest spreads in all but one specification. The coefficient sign is not always positive either.

The results in appendix Table A11 show similar though weaker results for maturities. The coefficient of the Q2 2020 fixed effect enters negatively and highly significant in columns (1) and (2), with the coefficient sizes suggesting a 57% and 52.7 % decrease in maturities in Q2, respectively (implying 27.4-29.5 months shorter using the sample mean). Bank exposures to COVID outbreaks and NPIs are insignificant with the exception of a significant negative coefficient of NPIs in Column (8).

In summary, the loan-level results suggest that there was a tightening of loan supply and conditionality due to COVID-exposures of banks. Variation across banks in this tightening is weakly related to their exposure to the pandemic. Unlike in the Tables 5 and 6 regressions, there is no direct government support in the syndicated lending markets, so that the lower supply and tighter conditionality is in line with traditional theories of lending retrenchment during economic crises.

For loan level regressions, our usual robustness checks using cumulative bank exposures, excluding controls and using a lower fixed effects dimensionality confirm our findings and are available in the Online Appendix.

V. Conclusion

This paper has documented the impact of the COVID-19 pandemic and lockdown measures on the performance and behavior of the U.S. banking system. Using a novel measure of geographic bank exposure, we find that both the pandemic and especially the public-health response explain variation in loan performance across banks. While overall lending growth increases in 2020 and with bank exposure to lockdowns, we find especially strong growth in small business lending, which varies with banks' exposure to lockdown policies. However, we also find that this increase in small business lending is primarily driven by government support through the PPP program, which replaced "regular" lending. The latter falls off a cliff for small businesses and reduces

even more for banks highly exposed to lockdowns. While there is evidence of demand impulses for government-backed loans in our bank-county level analysis of small business lending, the effect of bank exposure to NPIs is surprisingly even more robust. We observe a trend in syndicated lending that is similar to non-PPP small business loans, with fewer and smaller loans being granted by banks more exposed to the pandemic. Finally, we find that banks more exposed to the pandemic increase interest spreads for syndicated loans.

Our findings are consistent with previous papers showing an increase in corporate and small business lending and with work that shows an increase in interest spreads. More generally, our findings are consistent with Gertler and Gilchrist (1993) and Greenwald et al. (2020) of a positive effect of macroeconomic shocks on lending, but also consistent with evidence of an increased risk premium following such a shock.

Compared to previous work, however, we show an important role of bank exposure to COVID-19 deaths and especially to lockdown measures in driving the increase in small business loans, especially with government support, rather than a demand-driven take-up in such loans. Our evidence is consistent with the idea that government responses to contain the pandemic via lockdowns adversely affected credit markets in the short run. While government interventions to stabilize credit markets via sponsored loans prevented a credit freeze, these benefits did not affect all markets. They also had the unanticipated or at least undiscussed effect of subsidizing the business of *banks* that were more exposed to the pandemic or lockdowns.

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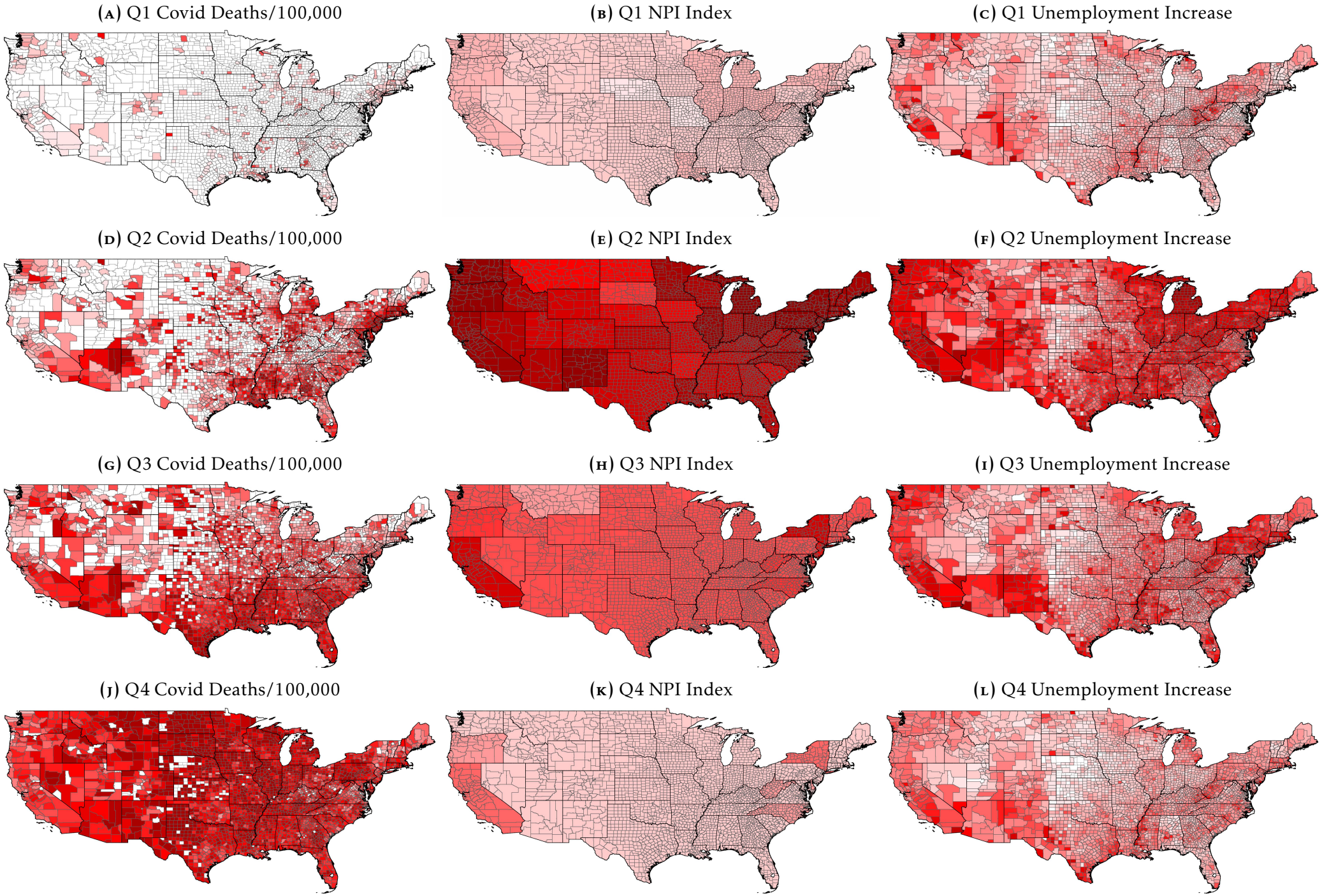
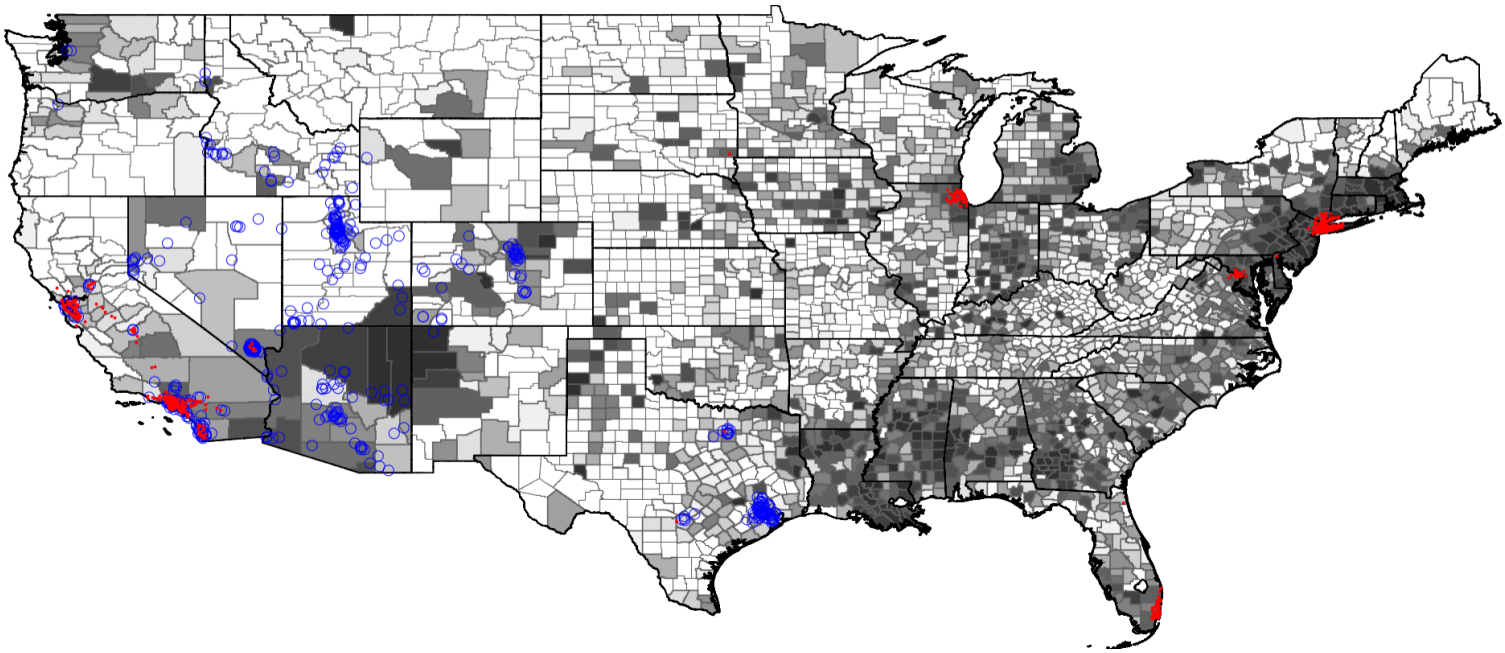
Figure 1: Geographic Variation in Exposure to COVID-19, NPIs and Unemployment



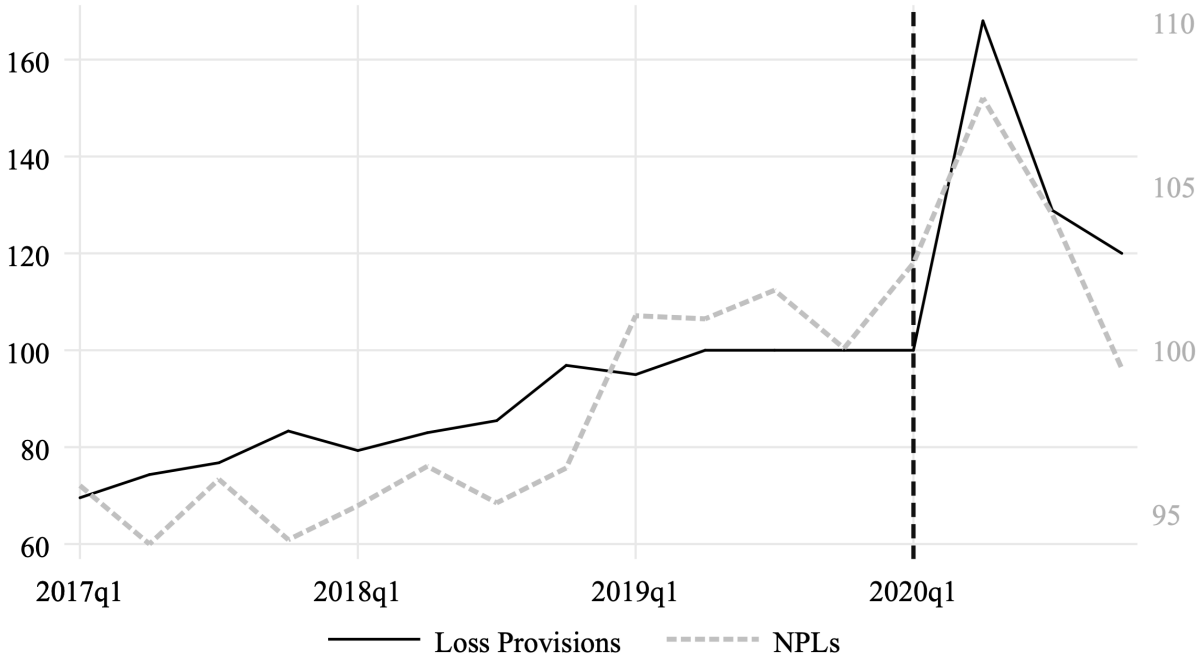
Coloring of contiguous U.S. counties follows a heat map scheme with identical thresholds across all panels. The darker the red in panels A, D, G, J, the higher the number of new quarterly COVID-19 related deaths per 100,000 inhabitants in a county. The darker the red in panels B, E, H, K, the more restrictive the average quarterly NPIs as measured by a state level index from Olivier Lejeune. The darker the red in panels C, F, I, L, the larger the increase in county unemployment rates.

Figure 2: Examples for Differential Exposures – Citibank and Zions Bankcorp



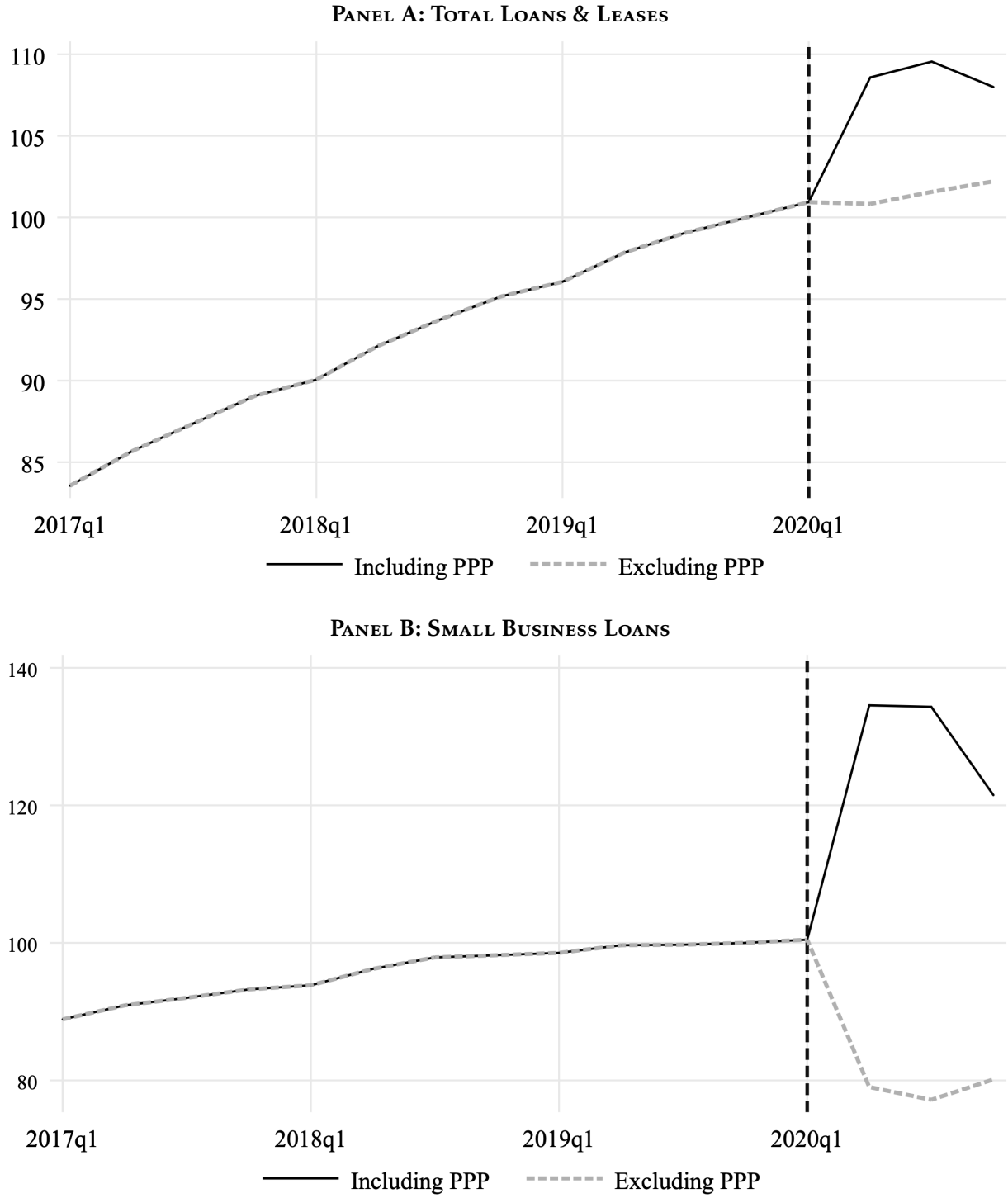
Red dots (blue circles) represent June 2019 Citibank (Zions Bancorp) branches. Citibank (Zions) is an example for a commercial bank with a relatively high (low) geographical exposure to COVID deaths, especially in the first half of 2020. Coloring of contiguous U.S. counties follows a heat map scheme, corresponding to the number of new Q2 2020 COVID-19 related deaths per 100,000 inhabitants. The darker the gray, the higher the death rate.

Figure 3: Bank Health And COVID



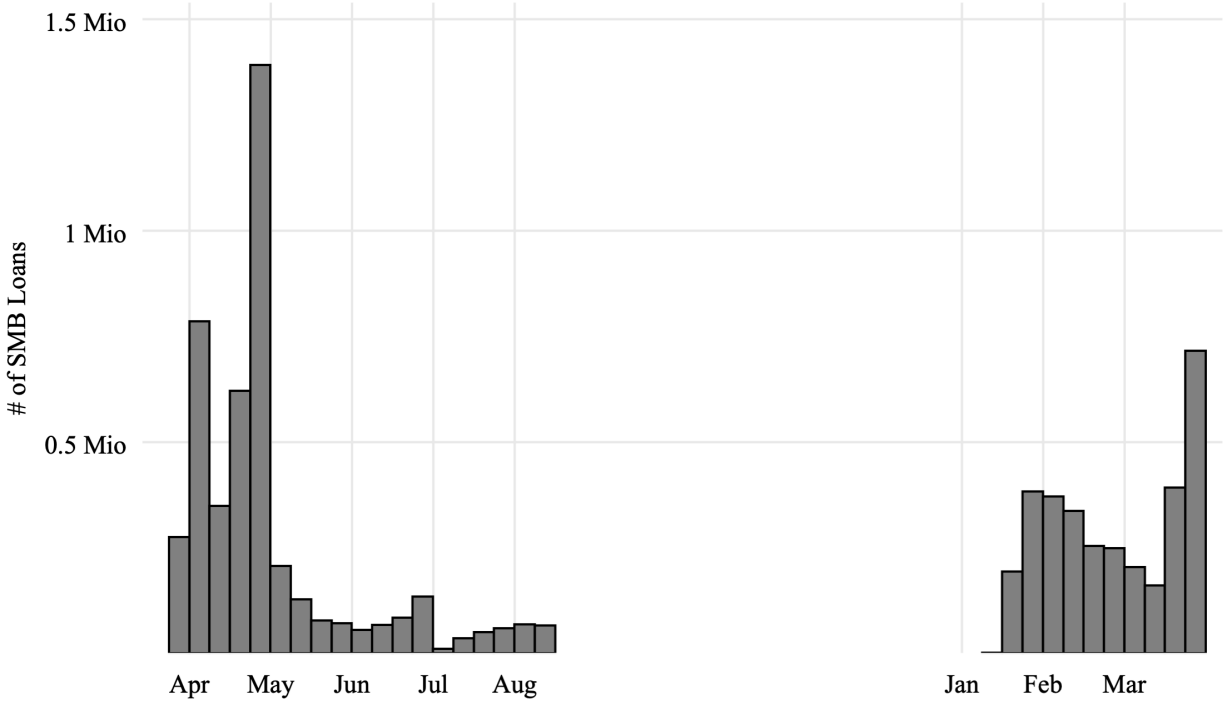
This figure shows U.S. banks' median quarterly loan loss provisions (solid thin black line) and non-performing loans (dashed line gray), indexed to 100 in Q4 2019. The vertical black dashed line indicates the first COVID quarter Q1 2020.

Figure 4: Lending Volumes and COVID in 2020 and 2021



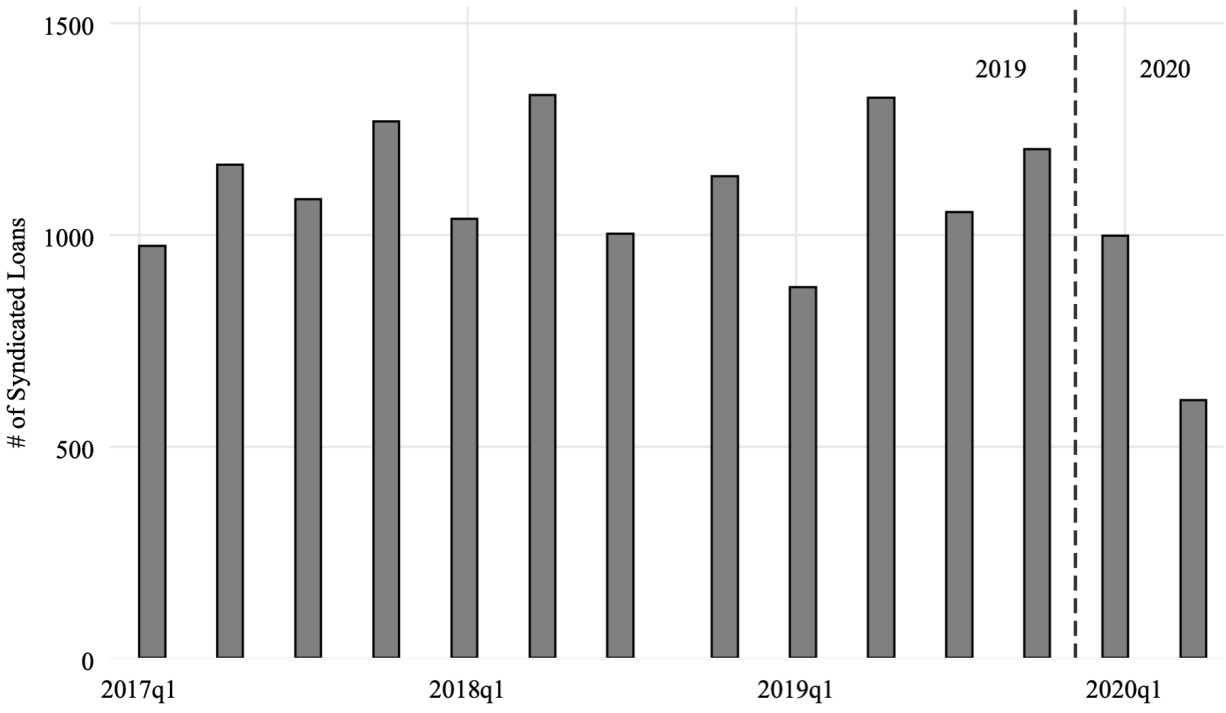
This figure shows U.S. banks' median total (panel A) and small business (B) lending volumes (all indexed to 100 in Q4 2019). Solid thin black lines include PPP loans, while dashed thick gray lines exclude them. The vertical black dashed line indicates the first COVID quarter Q1 2020.

Figure 5: Paycheck Protection Program Lending



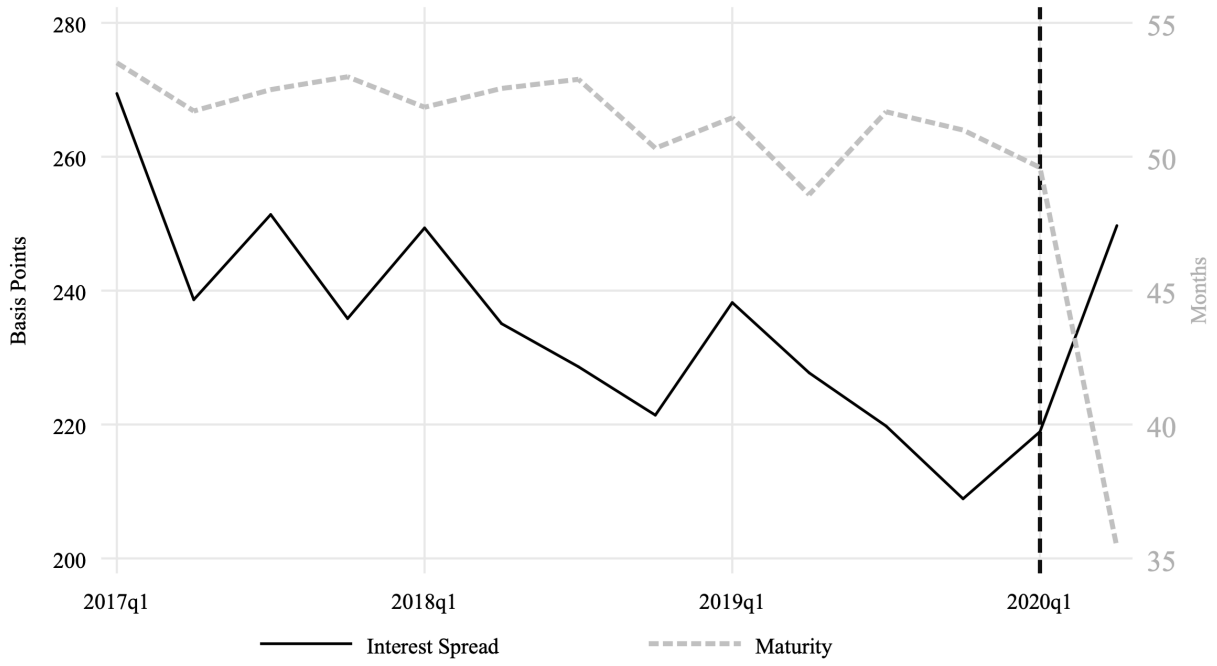
Bars represent the weekly number of loans extended under the paycheck protection program (PPP).

Figure 6: Syndicated Loan Issuances



Bars represent the quarterly number of loans extended by U.S. banks in the syndicated loan market.

Figure 7: Syndicated Loans and Exposure to COVID



This figure shows mean quarterly basis point spreads over LIBOR for syndicated loans (solid thin black line) and maturities in months (dashed thick gray line). The vertical black dashed line indicates the first COVID quarter Q1 2020.

Table 1: Descriptive Statistics

Variable	N	10th Perc.	Median	90th Perc.	Mean	SD
Panel A: Bank-Level						
Covid Deaths	61,606	0	0	22.99	7.82	26.03
Q1 2020 Covid Deaths	3,905	0	.01	1.36	.62	1.81
Q2 2020 Covid Deaths	4,065	0	9.67	71.52	25	39.44
Q3 2020 Covid Deaths	4,007	2.77	15.31	53.78	23.94	27.75
Q4 2020 Covid Deaths	4,077	21.2	55.02	135.84	69.13	53.71
NPIs	61,606	0	0	1.67	.4	.91
Q1 2020 NPIs	3,905	.26	.41	.6	.42	.14
Q2 2020 NPIs	4,065	2.6	3.08	4.01	3.28	.57
Q3 2020 NPIs	4,007	1.67	1.67	1.9	1.76	.31
Q4 2020 NPIs	4,077	.5	.5	.55	.57	.23
Growth in Loss Provisions	61,606	-200	8.7	200	16.89	147.3
Growth in NPLs	59,107	-110.9	-2.54	118.73	.65	88.33
Growth in NPLs (C&I)	51,032	-188.5	-6.7	191.9	-.7	116.9
Growth in NPLs (Households)	56,824	-130.13	-4.8	128.94	-2.55	94.78
Growth in L&L (in. PPP)	61,606	-2.85	6.03	19.62	7.72	10.88
Growth in L&L (ex. PPP)	61,606	-3.83	5.03	17.22	6.3	10.12
Growth in Sm Bus Loans (in. PPP)	40,253	-9.38	4.39	33.05	8.35	20.35
Growth in Sm Bus Loans (ex. PPP)	40,253	-19.99	1.33	19.62	-.21	24.55
Growth in C&I Loans	61,390	-7.4	8.26	30.55	10.4	17.29
Growth in Household Loans	61,590	-8.29	4.16	21.23	5.7	13.9
Panel B: Bank-County-Level (PPP Lending)						
Bank Covid Deaths	105,051	7.52	25.47	87.45	41.75	38.35
Bank NPIs	105,051	2.86	3.65	4.01	3.52	.52
County Covid Deaths	105,051	0	8.94	69.05	24.77	39.2
County NPIs	105,051	2.79	3.3	4.11	3.36	.58
Extensive Margin	105,051	-1	0	1	-.15	.72
Intensive Margin	27,640	.07	1.56	1.89	1.24	.83
Panel C: Bank-Level (Syndicated Lending)						
Covid Deaths	713	0	0	1.01	3.08	12.84
Q1 2020 Covid Deaths	51	.21	.91	2.77	1.36	1.61
Q2 2020 Covid Deaths	50	12.16	35.94	82.8	42.47	26.22
NPIs	713	0	0	.89	.31	.92
Q1 2020 NPIs	51	.53	.85	1.04	.82	.18
Q2 2020 NPIs	50	2.94	3.63	3.96	3.53	.45
Number of Loans	713	0	1	57	25.79	65.46
Average Loan Volume (M)	594	82.23	352.69	915.16	435.89	349.87
Panel D: Loan-Level						
Covid Deaths	10,941	0	0	.78	2.87	12.96
Q1 2020 Covid Deaths	716	.62	1.36	4.16	1.87	1.36
Q2 2020 Covid Deaths	536	31.2	49.2	83.1	56.1	20.9
NPIs	10,941	0	0	.77	.234	.802
Q1 2020 NPIs	716	.77	.869	.923	.861	.087
Q2 2020 NPIs	536	3.126	3.639	3.915	3.621	.342
Spread over LIBOR (BPS)	10,941	113	200	400	235	135
Maturity (Months)	10,911	19	60	70	52	19

This table contains summary statistics for main variables of interest from bank-, bank-county- (PPP), bank- (syndicated lending), and loan-level analyses (panels A, B, C, D). Observations are those used in regressions 1 in tables A6, 2, 6, 7, and 8. "COVID Deaths" variables and "NPI Index" refer to the bank level exposures to COVID, computed as the deposit weighted number of new COVID-19 related deaths/100,000 inhabitants (or the NPI index value) during a quarter in a U.S. county.

Table 2: Bank Health and the COVID Shock

	Loss Provisions				Non-Performing Loans			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Covid Deaths		3.572***		2.558**		0.469		-0.200
		(0.002)		(0.034)		(0.524)		(0.789)
NPIs			20.654***	19.512***			13.011***	13.105***
			(0.000)	(0.000)			(0.000)	(0.000)
Q1 2020 FE	39.957***	38.927***	31.383***	31.119***	3.246**	3.115**	-2.178	-2.161
	(0.000)	(0.000)	(0.000)	(0.000)	(0.017)	(0.025)	(0.213)	(0.217)
Q2 2020 FE	66.470***	58.036***	-1.266	-3.561	3.341*	2.259	-39.200***	-39.045***
	(0.000)	(0.000)	(0.922)	(0.783)	(0.052)	(0.366)	(0.000)	(0.000)
Q3 2020 FE	39.380***	29.685***	3.008	-1.925	-4.055**	-5.308*	-26.836***	-26.465***
	(0.000)	(0.000)	(0.687)	(0.802)	(0.041)	(0.063)	(0.000)	(0.000)
Q4 2020 FE	25.954***	11.747*	14.202***	4.677	-7.589***	-9.464**	-14.897***	-14.148***
	(0.000)	(0.060)	(0.002)	(0.458)	(0.001)	(0.011)	(0.000)	(0.000)
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.03	0.03	0.03	0.03	0.05	0.05	0.05	0.05
Observations	61,606	61,606	61,606	61,606	73,103	73,103	73,103	73,103
Banks	4,613	4,613	4,613	4,613	4,787	4,787	4,787	4,787

This table contains bank panel regressions from Q1 2017 to Q4 2020. Dependent variables are symmetric pp-changes in loan loss provisions and total non-performing loans and leases relative to the pre-year quarter. Independent variables of interest are fixed effects for 2020 quarters, the logarithm of 1 + the bank level exposure to COVID related deaths, and an NPI index. Exposure to COVID deaths is the deposit weighted number of new COVID-19 related deaths / 100,000 inhabitants during a quarter in a U.S. county. The state level NPI index is linked to banks equivalently. Controls include lagged values of the logarithm of total assets, loan portfolio shares, and income, equity, deposits, liquidity, unused commitments, and loans and leases in percent of total assets. Standard errors are clustered by bank. ***, **, and * indicate statistical significance at 1%, 5%, and 10%. P-values are in parenthesis.

Table 3: Bank Health and the COVID Shock – Decomposition of NPLs

	C&I Loans				Household Loans			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Covid Deaths		1.188		0.393		0.514		-0.219
		(0.269)		(0.719)		(0.529)		(0.791)
NPIs			15.932***	15.757***			14.185***	14.288***
			(0.000)	(0.000)			(0.000)	(0.000)
Q1 2020 FE	3.587*	3.249*	-3.055	-3.094	2.018	1.872	-3.909**	-3.890**
	(0.063)	(0.096)	(0.213)	(0.207)	(0.178)	(0.217)	(0.040)	(0.041)
Q2 2020 FE	3.077	0.306	-49.063***	-49.407***	0.995	-0.203	-45.533***	-45.359***
	(0.191)	(0.930)	(0.000)	(0.000)	(0.599)	(0.942)	(0.000)	(0.000)
Q3 2020 FE	-2.428	-5.651	-30.371***	-31.130***	-7.627***	-9.009***	-32.445***	-32.037***
	(0.377)	(0.157)	(0.000)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)
Q4 2020 FE	-4.469	-9.203*	-13.451***	-14.918***	-11.271***	-13.322***	-19.226***	-18.411***
	(0.159)	(0.078)	(0.000)	(0.005)	(0.000)	(0.001)	(0.000)	(0.000)
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04
Observations	61,055	61,055	61,055	61,055	69,775	69,775	69,775	69,775
Banks	4,452	4,452	4,452	4,452	4,695	4,695	4,695	4,695

This table contains bank panel regressions from Q1 2017 to Q4 2020. Dependent variables are symmetric pp-changes in C&I and household loan non-performing loans relative to the pre-year quarter. Independent variables of interest are fixed effects for 2020 quarters, the logarithm of 1 + the bank level exposure to COVID related deaths, and an NPI index. Exposure to COVID deaths is the deposit weighted number of new COVID-19 related deaths / 100,000 inhabitants during a quarter in a U.S. county. The state level NPI index is linked to banks equivalently. Standard errors are clustered by bank. ***, **, and * indicate statistical significance at 1%, 5%, and 10%. P-values are in parenthesis.

Table 4: Lending Volumes and the COVID Shock

	Including PPP Loans				Excluding PPP Loans			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel A: Total Loans and Leases								
Covid Deaths		0.094		0.028		-0.052		-0.058
		(0.128)		(0.662)		(0.347)		(0.310)
NPIs			1.302***	1.289***			0.085	0.113
			(0.000)	(0.000)			(0.677)	(0.592)
Q1 2020 FE	-0.403***	-0.429***	-0.944***	-0.946***	-0.295***	-0.280***	-0.330***	-0.325***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.003)
Q2 2020 FE	0.271*	0.056	-3.975***	-3.997***	-6.294***	-6.174***	-6.572***	-6.528***
	(0.096)	(0.796)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Q3 2020 FE	-0.433**	-0.683***	-2.714***	-2.766***	-6.910***	-6.771***	-7.060***	-6.953***
	(0.020)	(0.005)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Q4 2020 FE	-4.828***	-5.202***	-5.561***	-5.665***	-8.808***	-8.601***	-8.856***	-8.642***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Adj. R^2	0.65	0.65	0.66	0.66	0.64	0.64	0.64	0.64
Observations	77,009	77,009	77,009	77,009	77,009	77,009	77,009	77,009
Banks	4,824	4,824	4,824	4,824	4,824	4,824	4,824	4,824
Panel B: Small Business Loans								
Covid Deaths		0.728***		0.245		-1.126***		-0.771***
		(0.000)		(0.186)		(0.000)		(0.002)
NPIs			6.950***	6.820***			-5.418***	-5.011***
			(0.000)	(0.000)			(0.000)	(0.000)
Q1 2020 FE	-1.898***	-2.155***	-4.767***	-4.800***	3.093***	3.491***	5.329***	5.434***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Q2 2020 FE	11.573***	9.890***	-11.120***	-11.264***	-20.007***	-17.405***	-2.315	-1.863
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.487)	(0.573)
Q3 2020 FE	14.208***	12.231***	1.757	1.324	-29.057***	-26.001***	-19.350***	-17.987***
	(0.000)	(0.000)	(0.160)	(0.286)	(0.000)	(0.000)	(0.000)	(0.000)
Q4 2020 FE	1.543***	-1.358	-2.372***	-3.277***	-20.116***	-15.633***	-17.064***	-14.222***
	(0.003)	(0.114)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Adj. R^2	0.35	0.35	0.35	0.35	0.30	0.30	0.30	0.30
Observations	48,858	48,858	48,858	48,858	48,859	48,859	48,859	48,859
Banks	4,684	4,684	4,684	4,684	4,684	4,684	4,684	4,684

This table contains bank panel regressions from Q1 2017 to Q4 2020. Dependent variables are symmetric pp-changes in loans & lease (small business) volumes in panel A (B) with and without PPP loans relative to the pre-year quarter. Independent variables of interest are fixed effects for 2020 quarters, the logarithm of 1 + the bank level exposure to COVID related deaths, and a state level NPI index. Exposure to COVID deaths is the deposit weighted number of new COVID-19 related deaths / 100,000 inhabitants during a quarter in a U.S. county. NPIs are linked to banks equivalently. Controls include lagged values of the logarithm of total assets, loan portfolio shares, and income, equity, deposits, liquidity, unused commitments, and loans and leases in % of total assets, current year-over-year percentage changes in deposits and in undrawn commitments. Standard errors are clustered by bank. ***, **, and * indicate statistical significance at 1%, 5%, and 10%. P-values are in parenthesis.

Table 5: Lending Volumes and the COVID Shock – Decomposition of Loans

	C&I Loans				Household Loans			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Covid Deaths		0.010		0.020		-0.031		-0.024
		(0.945)		(0.892)		(0.754)		(0.812)
NPIs			-0.186	-0.196			-0.151	-0.140
			(0.723)	(0.716)			(0.692)	(0.719)
Q1 2020 FE	-0.032	-0.035	0.045	0.044	0.011	0.020	0.074	0.076
	(0.838)	(0.830)	(0.866)	(0.870)	(0.931)	(0.879)	(0.716)	(0.708)
Q2 2020 FE	15.548***	15.525***	16.156***	16.140***	-0.679***	-0.606**	-0.185	-0.166
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.041)	(0.884)	(0.895)
Q3 2020 FE	15.474***	15.448***	15.801***	15.764***	-0.807***	-0.724**	-0.542	-0.498
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.044)	(0.443)	(0.487)
Q4 2020 FE	9.642***	9.603***	9.747***	9.673***	-1.022***	-0.897*	-0.937***	-0.847*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.064)	(0.009)	(0.091)
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.40	0.40	0.40	0.40	0.37	0.37	0.37	0.37
Observations	77,279	77,279	77,279	77,279	77,565	77,565	77,565	77,565
Banks	4,835	4,835	4,835	4,835	4,848	4,848	4,848	4,848

This table contains bank panel regressions from Q1 2017 to Q4 2020. Dependent variables are symmetric pp-changes in C&I (household) loan volumes relative to the pre-year quarter in columns 1-4 (5-8). Independent variables of interest are fixed effects for 2020 quarters, the logarithm of 1 + the bank level exposure to COVID related deaths, and an NPI index. Exposure to COVID deaths is the deposit weighted number of new COVID-19 related deaths / 100,000 inhabitants during a quarter in a U.S. county. The state level NPI index is linked to banks equivalently. Controls include lagged values of the logarithm of total assets, loan portfolio shares, and income, equity, deposits, liquidity, unused commitments, and loans and leases in percent of total assets. We also include current year-over-year percentage changes in deposits and in undrawn commitments. Standard errors are clustered by bank. ***, **, and * indicate statistical significance at 1%, 5%, and 10%. P-values are in parenthesis.

Table 6: PPP Loans Extended by Banks

	(1)	(2)	(3)	(4)	(5)	(6)
County Covid Deaths	-0.024		-0.021		-0.019	
	(0.221)		(0.244)		(0.328)	
Bank Covid Deaths	-0.003	0.039			-0.014	0.025
	(0.975)	(0.661)			(0.865)	(0.773)
County NPIs	0.340***		0.201***		0.200***	
	(0.000)		(0.000)		(0.000)	
Bank NPIs			0.432**	0.392**	0.433**	0.390**
			(0.011)	(0.029)	(0.011)	(0.029)
County FE		Yes		Yes		Yes
County Controls	Yes	–	Yes	–	Yes	–
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank-County Controls	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.16	0.22	0.17	0.22	0.17	0.22
Observations	30,387	33,997	30,387	33,997	30,387	33,997
Banks	483	483	483	483	483	483

This table contains bank-county panel regressions for Paycheck Protection Program loans extended from Q2 2020 to Q1 2021. Dependent variable is the percentage change in the total volume of loans extended under the Community Reinvestment Act between 2017 and 2019 and under the Paycheck Protection Program. The sample contains all bank-counties in which both at least one CRA and at least one PPP loan was extended by a bank. The independent variables of interest are the logarithm of 1 + the bank level exposure to COVID related deaths, and an NPI index. Bank exposure to COVID deaths is the cumulative Q4 2020 deposit weighted number of new COVID-19 related deaths / 100,000 inhabitants during a quarter in a U.S. county. The state level NPI index is linked to banks equivalently. Bank controls include lagged values of the logarithm of total assets, loan portfolio shares, and income, equity, deposits, liquidity, unused commitments, and loans and leases in percent of total assets. We also include current year-over-year percentage changes in deposits and in undrawn commitments, and bank-county variables for the presence of any bank branch (a 1/0 dummy), the branch deposit market share, and the share of bank-county deposits inside the bank. County controls are from 2019 and include the number of ICU beds, persons older than 65, blacks and hispanics weighted by total county population, median income, population density, 2-digit NAICS and government employment shares. Standard errors are clustered by bank. ***, **, and * indicate statistical significance at 1%, 5%, and 10%. P-values are in parenthesis.

Table 7: Syndicated Loan Issuances and Volumes

	Number of Loans				Average Loan Volume			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Covid Deaths		-0.060***		-0.176*		-0.050*		0.117
		(0.009)		(0.093)		(0.076)		(0.132)
NPIs			-0.050*	0.124			-0.074**	-0.185**
			(0.062)	(0.281)			(0.019)	(0.032)
Q1 2020 FE	-0.105				-0.042			
	(0.285)				(0.699)			
Q2 2020 FE	-0.216**				-0.291**			
	(0.016)				(0.017)			
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.94	0.94	0.94	0.94	0.68	0.68	0.68	0.68
Observations	713	713	713	713	1,284	1,284	1,284	1,284
Banks	51	51	51	51	162	162	162	162

This table contains bank-quarter-level regressions from Q1 2017 to Q2 2020. The dependent variable is the logarithm of 1 + the number of syndicated loans where a bank acted as a leader in Columns 1-4 and the logarithm of 1 + the average volume of syndicated loans where a bank lead or participated in Columns 5-8. Independent variables of interest are fixed effects for the first two quarters of 2020, the logarithm of 1 + the bank level exposure to COVID related deaths, and an NPI index. Exposure to COVID deaths is the deposit weighted number of new COVID-19 related deaths / 100,000 inhabitants during a quarter in a U.S. county. The state level NPI index is linked to banks equivalently. Bank controls include current %-changes in deposits and unused credit line commitments and lagged values of the logarithm of total assets, loan portfolio shares, and income, equity, deposits, liquidity, unused commitments, and loans and leases in percent of total assets. Standard errors are clustered by bank. ***, **, and * indicate statistical significance at 1%, 5%, and 10%. P-values are in parenthesis.

Table 8: Interest Spreads of Syndicated Loans and the COVID Shock

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Covid Deaths			29.451**	176.334			30.443**	199.874
			(0.037)	(0.296)			(0.031)	(0.194)
NPIs					-0.471	166.812	-9.325	224.939**
					(0.979)	(0.120)	(0.571)	(0.020)
Q1 2020 FE	-1.344	3.004						
	(0.864)	(0.688)						
Q2 2020 FE	43.685***	65.066***						
	(0.000)	(0.000)						
Year-Quarter FE	Yes	Yes	–	–	–	–	–	–
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry * State FE	Yes	–	Yes	–	Yes	–	Yes	–
Industry * Quarter FE			Yes	–	Yes	–	Yes	–
Borrower FE		Yes		–		–		–
Borrower * Quarter FE				Yes		Yes		Yes
Loan Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.45	0.74	0.47	0.77	0.47	0.77	0.47	0.77
Observations	10,941	9,452	10,819	6,544	10,819	6,544	10,819	6,544
Borrowers	4,711	2,953	4,663	2,164	4,663	2,164	4,663	2,164
Banks	32	30	32	29	32	29	32	29

This table contains syndicated loan-level regressions from Q1 2017 to Q2 2020. The dependent variable is the interest spread over LIBOR (BPS). Independent variables of interest are fixed effects for the first two quarters of 2020, the logarithm of 1 + the bank level exposure to COVID related deaths, and an NPI index. Exposure to COVID deaths is the deposit weighted number of new COVID-19 related deaths / 100,000 inhabitants during a quarter in a U.S. county. The state level NPI index is linked to banks equivalently. Loan type fixed effects are for term loans, revolving credit lines, and other or both. Loan controls comprise of maturity, loan volume, fixed effects for loan purpose, collateral, and refinanced loans. Bank controls include current %-changes in deposits and unused credit line commitments and lagged values of the logarithm of total assets, loan portfolio shares, and income, equity, deposits, liquidity, unused commitments, and loans and leases in percent of total assets. Standard errors are clustered by the bank's headquarter state. ***, **, and * indicate statistical significance at 1%, 5%, and 10%. P-values are in parenthesis.

Appendix

Table A1: County-Level Descriptive Statistics

Variable	N	10th Perc.	Median	90th Perc.	Mean	SD
Unemployment Rate	17,816	2.7	4.5	9.6	5.4	3.1
Covid Deaths	17,816	0	0	14.2	5.3	18.2
Q1 2020 Covid Deaths	17,816	0	0	1.17	.439	1.664
Q2 2020 Covid Deaths	17,816	0	5.7	49.2	17.7	32.1
Q3 2020 Covid Deaths	17,816	0	14	58.2	24.3	30.7
Q4 2020 Covid Deaths	17,816	14.4	51.5	136.5	68.2	61.3
NPIs	17,816	0	0	2.857	.682	1.158
Q1 2020 NPIs	17,816	.262	.418	.582	.416	.126
Q2 2020 NPIs	17,816	2.604	3.077	4.011	3.273	.581
Q3 2020 NPIs	17,816	1.674	1.674	2	1.762	.318
Q4 2020 NPIs	17,816	.5	.5	1	.586	.248
ICU Beds	17,816	0	12.2	37.1	16.9	60.3
Share of Elderly (above 65)	17,816	.134	.185	.243	.187	.043
Median Income	17,816	10.6	10.9	11.2	10.9	.2
Population Density	17,816	11.6	64.5	480.4	313.6	2,000.6
Share of Black and Hispanic	17,816	.014	.047	.29	.103	.129
Emp Share Primary Sector	17,816	.003	.02	.109	.044	.065
Emp Share Construction	17,816	.03	.056	.104	.063	.033
Emp Share Manufacturing	17,816	.036	.136	.324	.161	.114
Emp Share Trade, Transp, Util	17,816	.18	.234	.313	.241	.056
Emp Share Information	17,816	.004	.01	.022	.012	.009
Emp Share FIRE	17,816	.026	.042	.072	.046	.02
Emp Share Professional Services	17,816	.037	.08	.161	.091	.051
Emp Share Education + Health	17,816	.093	.167	.257	.172	.066
Emp Share Leisure Hospitality	17,816	.078	.123	.197	.134	.059
Emp Share Other Services	17,816	.018	.032	.048	.033	.012
Emp Share Government	17,816	.115	.188	.311	.202	.08

This table contains summary statistics for variables used in county-level regressions, in figures, or for bank exposure calculations. Observations are those used in regression 1, table A6.

Table A2: Bank-Level Descriptive Statistics

Variable	N	10th Perc.	Median	90th Perc.	Mean	SD
Covid Deaths	61,606	0	0	22.99	7.82	26.03
Q1 2020 Covid Deaths	3,905	0	.01	1.36	.62	1.81
Q2 2020 Covid Deaths	4,065	0	9.67	71.52	25	39.44
Q3 2020 Covid Deaths	4,007	2.77	15.31	53.78	23.94	27.75
Q4 2020 Covid Deaths	4,077	21.2	55.02	135.84	69.13	53.71
NPIs	61,606	0	0	1.67	.4	.91
Q1 2020 NPIs	3,905	.26	.41	.6	.42	.14
Q2 2020 NPIs	4,065	2.6	3.08	4.01	3.28	.57
Q3 2020 NPIs	4,007	1.67	1.67	1.9	1.76	.31
Q4 2020 NPIs	4,077	.5	.5	.55	.57	.23
Growth in Loss Provisions	61,606	-200	8.7	200	16.89	147.3
Growth in NPLs	59,107	-110.9	-2.54	118.73	.65	88.33
Growth in NPLs (C&I)	51,032	-188.5	-6.7	191.9	-.7	116.9
Growth in NPLs (Households)	56,824	-130.13	-4.8	128.94	-2.55	94.78
Growth in L&L (in. PPP)	61,606	-2.85	6.03	19.62	7.72	10.88
Growth in L&L (ex. PPP)	61,606	-3.83	5.03	17.22	6.3	10.12
Growth in Sm Bus Loans (in. PPP)	40,253	-9.38	4.39	33.05	8.35	20.35
Growth in Sm Bus Loans (ex. PPP)	40,253	-19.99	1.33	19.62	-.21	24.55
Growth in C&I Loans	61,390	-7.4	8.26	30.55	10.4	17.29
Growth in Household Loans	61,590	-8.29	4.16	21.23	5.7	13.9
Income/Assets	42,801	.08	.26	.45	.26	.17
Equity/Assets	42,801	8.66	10.87	14.92	11.52	3.04
Liquidity/Assets	42,801	10.74	22.63	44.81	25.52	13.81
Deposits/Assets	42,801	75.78	84.86	89.72	83.58	5.86
Loans and Leases/Assets	42,801	48.5	71.2	84	68.4	14.2
Undrawn Commitments/Assets	42,801	3.55	10.56	20.79	11.65	7.16
Assets (Bn)	42,801	.07	.27	1.69	4.01	62.27
Growth in Deposits	61,606	-2.48	5.67	20.53	7.83	10.63
Growth in Undrawn Commitm	61,333	-19.67	7.69	38.72	8.83	27.25
C&I/Tot Loans & Leases	42,801	3.36	11	24.61	12.87	9.06
Agricul/Tot Loans & Leases	42,801	0	1.06	23.2	6.75	11.27
Househ/Tot Loans & Leases	42,801	.29	2.94	12.59	5.14	6.44
Real Est/Tot Loans & Leases	42,801	48.77	76.02	92.59	73	17.18

This table contains summary statistics for variables used in bank-level regressions or figures. Observations are those used in regression 1, table 2. "COVID Deaths" and "NPIs" refer to the bank level exposures to COVID, computed as the deposit weighted number of new COVID-19 related deaths / 100,000 inhabitants and the average NPI index value during a quarter in a U.S. county.

Table A3: Bank-County-Level Descriptive Statistics (PPP Regressions)

Variable	N	10th Perc.	Median	90th Perc.	Mean	SD
Bank Covid Deaths	109,398	69.36	107.97	155.88	109.93	36.29
Bank NPIs	109,398	1.45	1.78	2.02	1.74	.26
County Covid Deaths	109,398	34.2	92.73	189.48	104.44	64.8
County NPIs	109,398	1.38	1.64	2.17	1.69	.32
Extensive Margin	109,398	-1	0	1	-.09	.73
Intensive Margin	30,387	-1.56	.64	1.76	.35	1.2
Deposit Market Share	109,398	0	0	0	.01	.04
County Share in Bank	109,398	0	0	0	0	.01
Branch Presence	109,398	0	0	0	.1	.3
Assets (Bn)	109,398	1.35	6.42	393.27	182.15	492.95
Growth in Deposits	109,398	11.2	20.6	35.8	23.4	13.5
Growth in Undrawn Commitm	109,398	-3.05	10.26	30.85	12.83	18.3
Income/Assets	109,398	.18	.34	.44	.33	.1
Equity/Assets	109,398	9.57	11.17	14.77	11.82	2.14
Liquidity/Assets	109,398	9.57	16.98	28.35	18.65	8.12
Deposits/Assets	109,398	51.52	72.37	81.91	69.41	12.57
Loans and Leases/Assets	109,398	72.21	79.63	86.79	78.73	8.92
Undrawn Commitments/Assets	109,398	12.64	19.84	52.86	27.85	22.9
C&I/Tot Loans & Leases	109,398	10.01	23.99	44.72	26.86	14.92
Agricul/Tot Loans & Leases	109,398	0	.06	3	.99	2.42
Househ/Tot Loans & Leases	109,398	.47	8.21	25.2	10.96	10.96
Real Est/Tot Loans & Leases	109,398	29.88	52.26	80.72	54.59	19.27
ICU Beds	109,398	0	0	0	0	0
Share of Elderly (above 65)	109,398	.13	.17	.23	.18	.04
Median Income	109,398	42,186	55,965	82,814	59,488.03	16,454.59
Population Density	109,398	21.3	132.1	1,387.1	587.55	1,488.11
Share of Black and Hispanic	109,398	.02	.07	.3	.12	.13
Emp Share Primary Sector	109,398	0	.01	.08	.03	.05
Emp Share Construction	109,398	.03	.06	.1	.06	.03
Emp Share Manufacturing	109,398	.03	.11	.29	.14	.1
Emp Share Trade, Transp, Util	109,398	.18	.23	.3	.23	.05
Emp Share Information	109,398	0	.01	.03	.01	.01
Emp Share FIRE	109,398	.03	.04	.08	.05	.02
Emp Share Professional Services	109,398	.05	.1	.2	.11	.06
Emp Share Education + Health	109,398	.1	.17	.26	.18	.06
Emp Share Leisure Hospitality	109,398	.09	.13	.19	.14	.05
Emp Share Other Services	109,398	.02	.03	.05	.03	.01
Emp Share Government	109,398	.1	.16	.29	.18	.07

This table contains summary statistics for variables used in bank-county-level regressions or figures. Observations are those used in regression 1, table 6. "COVID Deaths" and "NPIs" refer either to the county or to the bank level exposures to COVID, where the latter are computed as the deposit weighted number of new COVID-19 related deaths / 100,000 inhabitants and the average NPI index value during a quarter in a U.S. county.

Table A4: Loan-Level Descriptive Statistics

Variable	N	10th Perc.	Median	90th Perc.	Mean	SD
Covid Deaths	10,941	0	0	.78	2.87	12.96
Q1 2020 Covid Deaths	716	.62	1.36	4.16	1.87	1.36
Q2 2020 Covid Deaths	536	31.2	49.2	83.1	56.1	20.9
NPIs	10,941	0	0	.77	.234	.802
Q1 2020 NPIs	716	.77	.869	.923	.861	.087
Q2 2020 NPIs	536	3.126	3.639	3.915	3.621	.342
Spread over LIBOR (BPS)	10,941	113	200	400	235	135
Maturity (Months)	10,911	19	60	70	52	19
Facility Amount (M)	10,941	22	200	1,200	494	973
Term Loan (1/0)	10,941	0	0	1	.4	.5
Revolving Loan (1/0)	10,941	0	1	1	.554	.497
Purpose CAPX (1/0)	10,941	0	0	0	.05	.218
Purpose Working Cap (1/0)	10,941	0	0	0	.01	.097
Purpose Corporate (1/0)	10,941	0	0	1	.155	.362
Purpose M&A (1/0)	10,941	0	1	1	.7	.5
Purpose Debt Repaym (1/0)	10,941	0	0	0	.026	.158
Purpose Other (1/0)	10,941	0	0	0	.052	.221
Secured Loan (1/0)	10,941	0	0	1	.353	.478
Refinancing Loan (1/0)	10,941	0	1	1	.652	.476
Assets (Bn)	10,941	122	1,706	2,153	1,358	785
Deposit Growth	10,941	.51	3.86	14.8	6.13	7.05
Unused Commitm Growth	10,941	-1.6	3.71	20.21	8.69	17.34
Deposits/Assets	10,941	56	72	78	68	11
Liquity/Assets	10,941	17	27	32	26	6
Equity/Assets	10,941	9.5	10.5	12.7	10.9	1.3
Income/Assets	10,941	.217	.293	.409	.294	.082
Loans & Leases/Assets	10,941	34	48	67	49	13
Unused Commitm/Assets	10,941	29	44	57	44	14
C&I/Tot Loans & Leases	10,941	21	29	38	28	7
Agricult/Tot Loans & Leases	10,941	.038	.078	.549	.191	.242
Househ/Tot Loans & Leases	10,941	8.4	13.4	21.9	16.1	7.6
Real Est/Tot Loans & Leases	10,941	35.9	42.6	53	45	8.5

This table contains summary statistics for variables used in loan-level regressions or figures. Observations are those used in regression 1, table 8. "COVID Deaths" and "NPIs" refer to the bank level exposures to COVID, computed as the deposit weighted number of new COVID-19 related deaths / 100,000 inhabitants and the average NPI index value during a quarter in a U.S. county.

Table A5: Exposure of the Largest U.S. Banks to COVID in the First Half of 2020

Bank	Headquarters	Assets	Branches	Deaths	NPIs
Signature Bank	New York, NY	51	31	211	2.56
New York Community Bancorp	Westbury, NY	54	241	202	2.32
Banco Santander	Wilmington, DE	85	613	191	1.96
Hsbc Holdings Plc	Tysons, VA	173	225	189	2.49
People'S United Financial	Bridgeport, CT	58	414	156	1.85
Jpmorgan Chase & Co.	Columbus, OH	2,338	5,024	147	2.15
Citigroup	Sioux Falls, SD	1,454	709	146	1.68
Northern Trust Corporation	Chicago, IL	136	56	142	1.8
Citizens Financial Group	Providence, RI	166	1,105	137	1.84
Toronto-Dominion Bank	Wilmington, DE	320	1,244	135	2.03
Bank Of Montreal	Chicago, IL	138	590	131	1.76
M&T Bank Corporation	Buffalo, NY	119	788	127	2.23
Comerica Incorporated	Dallas, TX	73	436	121	2
Tcf Financial Corporation	Sioux Falls, SD	47	330	121	1.78
Royal Bank Of Canada	Los Angeles, CA	61	71	117	2.46
Capital One Financial Corporation	McLean, VA	329	488	112	2.02
Pnc Financial Services Group	Wilmington, DE	398	2,398	110	1.82
Regions Financial Corporation	Birmingham, AL	126	1,460	107	1.5
Wells Fargo & Company	Sioux Falls, SD	1,713	5,570	102	1.71
Synovus Financial Corp.	Columbus, GA	48	296	101	1.5
Bank Of America Corporation	Charlotte, NC	1,853	4,335	99	1.95
Cit Group	Pasadena, CA	45	66	99	2.47
East West Bancorp	Pasadena, CA	44	111	93	2.37
Banco Bilbao Vizcaya Argentaria	Birmingham, AL	93	642	93	1.55
Fifth Third Bancorp	Cincinnati, OH	168	1,224	89	1.78
Huntington Bancshares Incorporated	Columbus, OH	109	909	88	1.83
First Horizon National Corporation	Memphis, TN	43	291	87	1.51
U.S. Bancorp	Cincinnati, OH	486	2,979	84	1.8
First Republic Bank	San Francisco, CA	116	81	83	2.39
Bb&T Corporation	Charlotte, NC	461	1,791	82	1.71
Keycorp	Cleveland, OH	143	1,125	81	2
Tiaa Board Of Overseers	Jacksonville, FL	42	13	79	1.52
Mitsubishi Ufj Financial Group	San Francisco, CA	133	350	78	2.38
Zions Bancorporation	Salt Lake City, UT	69	435	70	1.7
Bnp Paribas	San Francisco, CA	93	554	61	2.24

This table contains information on the 35 largest U.S. banks. Total assets (in billion USD) and numbers of branches are from 2019. The exposure to COVID is based on the county-level death rates or a state-level NPI index. The bank level exposure variables in this table bank's weighted averages using the county-level branch deposit share in the bank's total deposits as weights. The list (and all tables and plits) exclude institutes that are formally commercial banks but do not operate a significant branch network (excluding those banks with $ 10 Bn or more in assets but less than 10 branches, those with at least 5 Bn and less than 5 branches, 3 Bn and less than 3 branches, or 1 Bn and only 1 branch).

Table A6: County Unemployment Rates and Exposure to COVID

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Covid Deaths			0.415***	0.381***			0.301***	0.289***
			(0.000)	(0.000)			(0.000)	(0.000)
NPIs					3.072***	2.488***	2.968***	2.348***
					(0.000)	(0.000)	(0.000)	(0.000)
Q1 2020 FE	0.919***	0.891***	0.842***	0.830***	-0.361	-0.113	-0.373	-0.103
	(0.000)	(0.000)	(0.000)	(0.000)	(0.120)	(0.593)	(0.104)	(0.623)
Q2 2020 FE	7.345***	6.681***	6.567***	6.042***	-2.711*	-1.274	-2.934**	-1.311
	(0.000)	(0.000)	(0.000)	(0.000)	(0.073)	(0.369)	(0.046)	(0.341)
Q3 2020 FE	3.370***	3.076***	2.316***	2.150***	-2.045**	-1.248	-2.625***	-1.707**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.021)	(0.146)	(0.003)	(0.045)
Q4 2020 FE	1.767***	1.627***	1.767***	1.627***	1.767***	1.627***	1.767***	1.627***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County FE		Yes		Yes		Yes		Yes
County Controls	Yes	–	Yes	–	Yes	–	Yes	–
Adj. R^2	0.61	0.76	0.62	0.77	0.67	0.79	0.67	0.79
Observations	17,816	25,128	17,816	25,128	17,816	25,128	17,816	25,128

This table contains county panel regressions from Q1 2019 to Q4 2020. The dependent variable is the average quarterly unemployment rate. Independent variables of interest are the logarithm of 1 + the number of new quarterly COVID-19 related deaths / 100,000 inhabitants and a state level NPIs index. Controls are from 2019 and include the number of ICU beds, persons older than 65, blacks and hispanics weighted by total county population, median income, population density, 2-digit NAICS and government employment shares. Standard errors are clustered by state. ***, **, and * indicate statistical significance at 1%, 5%, and 10%. P-values are in parenthesis.

Table A7: Pairwise Correlations of Local Bank Presence and Lending Variables

	Lending Volumes								
	Dummies			Shares 1			Shares 2		
Local Presence	CRA	PPP	HMDA	CRA	PPP	HMDA	CRA	PPP	HMDA
Dummy	0.11	0.13	0.20						
Share 1				0.85	0.85	0.81			
Share 2							0.21	0.64	0.46

This table contains pairwise correlations of variables that capture physical local presence and CRA small business, PPP small business, and HMDA mortgage lending activity. In the first row and the first set of columns we use dummies indicating *any* local physical presence or local lending. In the other rows columns we use the share of branch deposits or lending volume in a bank-county in percent of the corresponding total bank aggregate. "1" indicates an intensive margin where all zero presence or lending shares are set to missing, while "2" indicates a total effect where such zeros are included. Branch presence and deposits are from 2019 and CRA lending is from the three pre-crisis years, and HMDA lending is from the pre-crisis year 2019.

Table A8: NPLs and the COVID Shock – Using a CRA Lending based Exposure

	(1)	(2)	(3)	(4)
Covid Deaths		2.978		0.280
		(0.267)		(0.925)
NPIs			21.890***	21.761***
			(0.000)	(0.000)
Q1 2020 FE	12.179***	10.764***	2.509	2.433
	(0.000)	(0.001)	(0.459)	(0.475)
Q2 2020 FE	20.849***	11.945	-54.177***	-54.575***
	(0.000)	(0.208)	(0.005)	(0.003)
Q3 2020 FE	18.283***	9.742	-21.354**	-21.925**
	(0.000)	(0.292)	(0.041)	(0.033)
Q4 2020 FE	17.769***	6.288	4.276	3.275
	(0.002)	(0.607)	(0.485)	(0.780)
Year-Quarter FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes
Adj. R^2	0.07	0.07	0.07	0.07
Observations	3,887	3,887	3,887	3,887
Banks	243	243	243	243

This table contains bank panel regressions from Q1 2017 to Q4 2020. The dependent variable is the symmetric %-change in total non-performing loans and leases relative to the pre-year quarter. Independent variables of interest are fixed effects for 2020 quarters, the logarithm of 1 + the bank level exposure to COVID related deaths, and an NPI index. Exposure to COVID deaths is the CRA lending weighted number of new COVID-19 related deaths / 100,000 inhabitants during a quarter in a U.S. county. The state level NPI index is linked to banks equivalently. Controls include lagged values of the logarithm of total assets, loan portfolio shares, and income, equity, deposits, liquidity, unused commitments, and loans and leases in percent of total assets. Standard errors are clustered by bank. ***, **, and * indicate statistical significance at 1%, 5%, and 10%. P-values are in parenthesis.

Table A9: NPLs and the COVID Shock – Using a HMDA Lending based Exposure

	(1)	(2)	(3)	(4)
Covid Deaths		-1.139		-2.096*
		(0.320)		(0.080)
NPIs			10.618***	11.550***
			(0.002)	(0.001)
Q1 2020 FE	3.857**	4.343**	-0.728	-0.237
	(0.020)	(0.013)	(0.748)	(0.917)
Q2 2020 FE	8.814***	12.119***	-27.009**	-24.076**
	(0.000)	(0.003)	(0.022)	(0.039)
Q3 2020 FE	2.250	5.480	-16.669**	-12.389*
	(0.373)	(0.187)	(0.012)	(0.067)
Q4 2020 FE	-0.393	3.983	-6.570*	0.937
	(0.894)	(0.451)	(0.067)	(0.861)
Year-Quarter FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes
Adj. R^2	0.06	0.06	0.06	0.06
Observations	35,995	35,995	35,995	35,995
Banks	2,306	2,306	2,306	2,306

This table contains bank panel regressions from Q1 2017 to Q4 2020. The dependent variable is the symmetric %-change in total non-performing loans and leases relative to the pre-year quarter. Independent variables of interest are fixed effects for 2020 quarters, the logarithm of 1 + the bank level exposure to COVID related deaths, and an NPI index. Exposure to COVID deaths is the HMDA mortgage lending weighted number of new COVID-19 related deaths / 100,000 inhabitants during a quarter in a U.S. county. The state level NPI index is linked to banks equivalently. Controls include lagged values of the logarithm of total assets, loan portfolio shares, and income, equity, deposits, liquidity, unused commitments, and loans and leases in percent of total assets. Standard errors are clustered by bank. ***, **, and * indicate statistical significance at 1%, 5%, and 10%. P-values are in parenthesis.

Table A10: PPP Loans Extended by Banks – Extensive Margin

	(1)	(2)	(3)	(4)	(5)	(6)
County Covid Deaths	0.002		0.003		0.004	
	(0.746)		(0.545)		(0.539)	
Bank Covid Deaths	0.006	0.019			-0.018	-0.010
	(0.944)	(0.833)			(0.818)	(0.899)
County NPIs	0.061***		-0.005		-0.006	
	(0.003)		(0.853)		(0.830)	
Bank NPIs			0.450***	0.472***	0.453***	0.474***
			(0.000)	(0.000)	(0.000)	(0.000)
County FE		Yes		Yes		Yes
County Controls	Yes	–	Yes	–	Yes	–
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank-County Controls	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.19	0.22	0.21	0.24	0.21	0.24
Observations	109,398	129,125	109,398	129,125	109,398	129,125
Banks	486	486	486	486	486	486

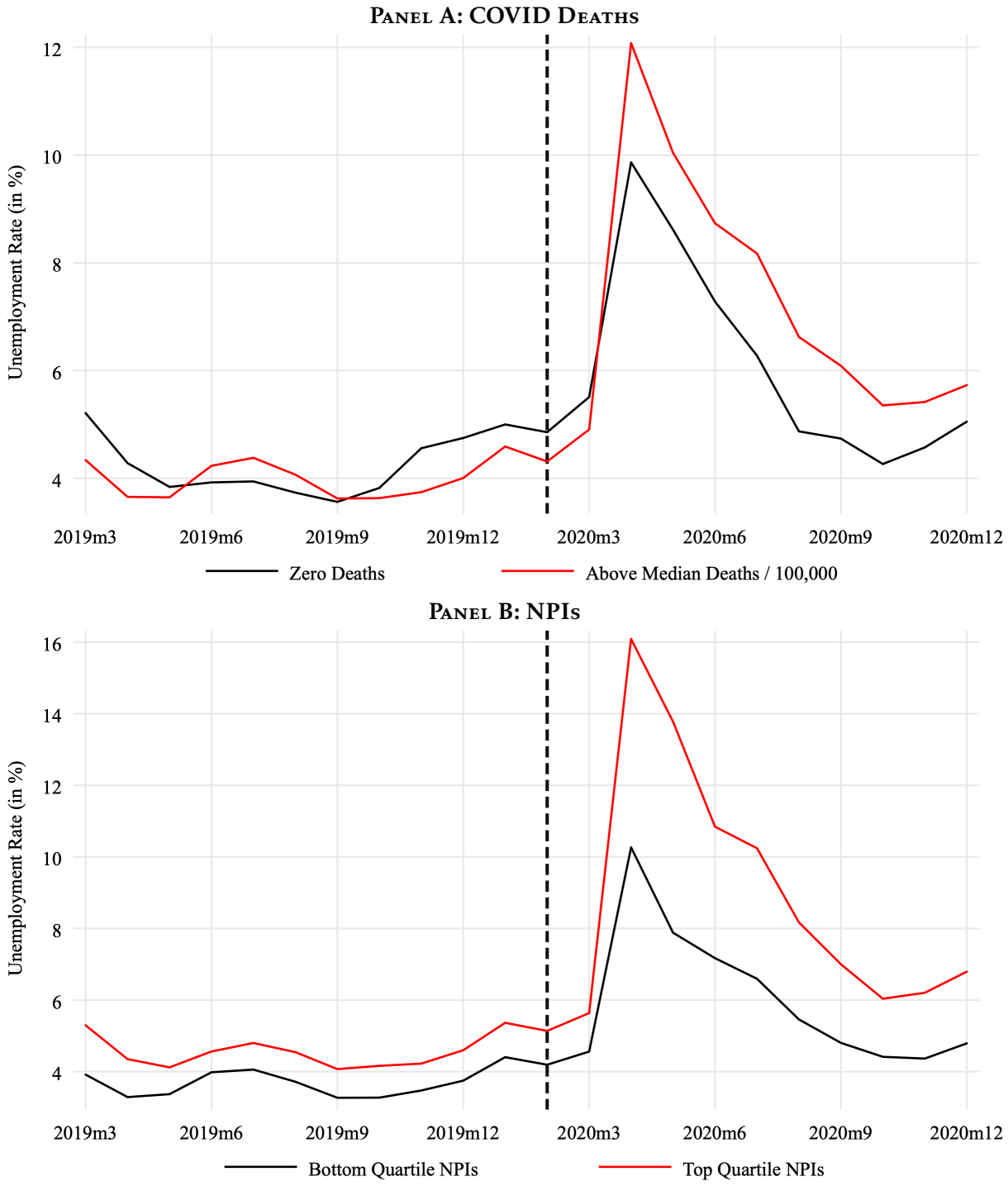
This table contains bank-county panel regressions for Paycheck Protection Program loans extended from Q2 2020 to Q1 2021. Dependent variable is the difference of two dummy variables where the first (second) is 1 if a bank extended small business loans under the Community Reinvestment Act between 2017 and 2019 (under the Paycheck Protection Program). The sample contains all bank-counties in which either at least one CRA or at least one PPP loan was extended by a bank. The independent variables of interest are the logarithm of 1 + the bank level exposure to COVID related deaths, and an NPI index. Bank exposure to COVID deaths is the cumulative Q4 2020 deposit weighted number of new COVID-19 related deaths / 100,000 inhabitants during a quarter in a U.S. county. The state level NPI index is linked to banks equivalently. Bank controls include lagged values of the logarithm of total assets, loan portfolio shares, and income, equity, deposits, liquidity, unused commitments, and loans and leases in percent of total assets. We also include current year-over-year percentage changes in deposits and in undrawn commitments, and bank-county variables for the presence of any bank branch (a 1/0 dummy), the branch deposit market share, and the share of bank-county deposits inside the bank. County controls are from 2019 and include the number of ICU beds, persons older than 65, blacks and hispanics weighted by total county population, median income, population density, 2-digit NAICS and government employment shares. Standard errors are clustered by bank. ***, **, and * indicate statistical significance at 1%, 5%, and 10%. P-values are in parenthesis.

Table A11: Maturities of Syndicated Loans and the COVID Shock

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Covid Deaths			0.096	0.354			0.080	0.265
			(0.248)	(0.513)			(0.378)	(0.583)
NPIs					0.170	-1.292	0.146	-1.203*
					(0.222)	(0.116)	(0.284)	(0.085)
Q1 2020 FE	-0.101**	-0.130						
	(0.020)	(0.108)						
Q2 2020 FE	-0.570***	-0.527***						
	(0.000)	(0.000)						
Year-Quarter FE	Yes	Yes	–	–	–	–	–	–
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry * State FE	Yes	–	Yes	–	Yes	–	Yes	–
Industry * Quarter FE			Yes	–	Yes	–	Yes	–
Borrower FE		Yes		–		–		–
Borrower * Quarter FE				Yes		Yes		Yes
Loan Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.28	0.58	0.30	0.66	0.30	0.66	0.30	0.66
Observations	10,800	9,273	10,678	6,387	10,678	6,387	10,678	6,387
Borrowers	4,674	2,910	4,625	2,121	4,625	2,121	4,625	2,121
Banks	31	29	31	28	31	28	31	28

This table contains syndicated loan-level regressions from Q1 2017 to Q2 2020. The dependent variable is the logarithm of 1 + maturity in months. Independent variables of interest are fixed effects for the first two quarters of 2020, the logarithm of 1 + the bank level exposure to COVID related deaths, and an NPI index. Exposure to COVID deaths is the deposit weighted number of new COVID-19 related deaths / 100,000 inhabitants during a quarter in a U.S. county. The state level NPI index is linked to banks equivalently. Loan type fixed effects are for term loans, revolving credit lines, and other or both. Loan controls comprise of interest spread, loan volume, fixed effects for loan purpose, collateral, and refinanced loans. Bank controls include current %-changes in deposits and unused credit line commitments and lagged values of the logarithm of total assets, loan portfolio shares, and income, equity, deposits, liquidity, unused commitments, and loans and leases in percent of total assets. Standard errors are clustered by the bank's headquarter state. ***, **, and * indicate statistical significance at 1%, 5%, and 10%. P-values are in parenthesis.

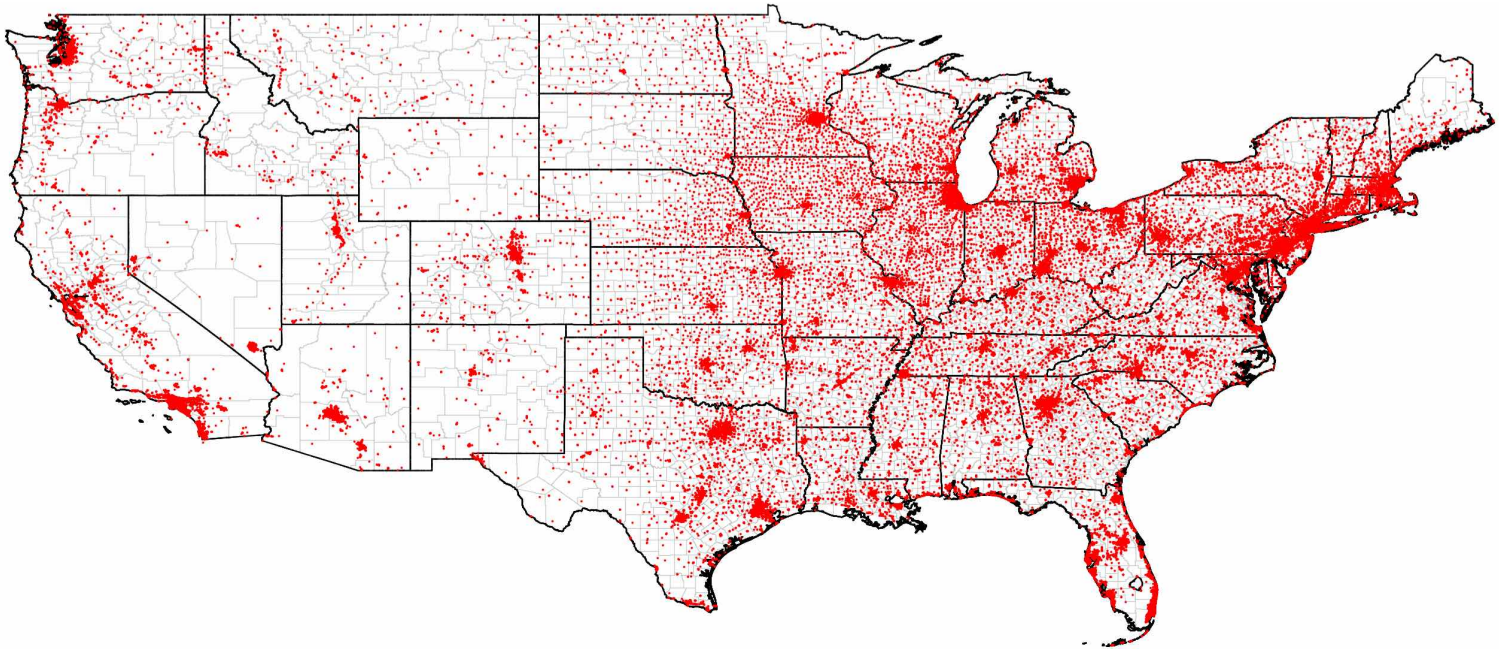
Figure A1: Unemployment in Counties with Different Exposures to COVID



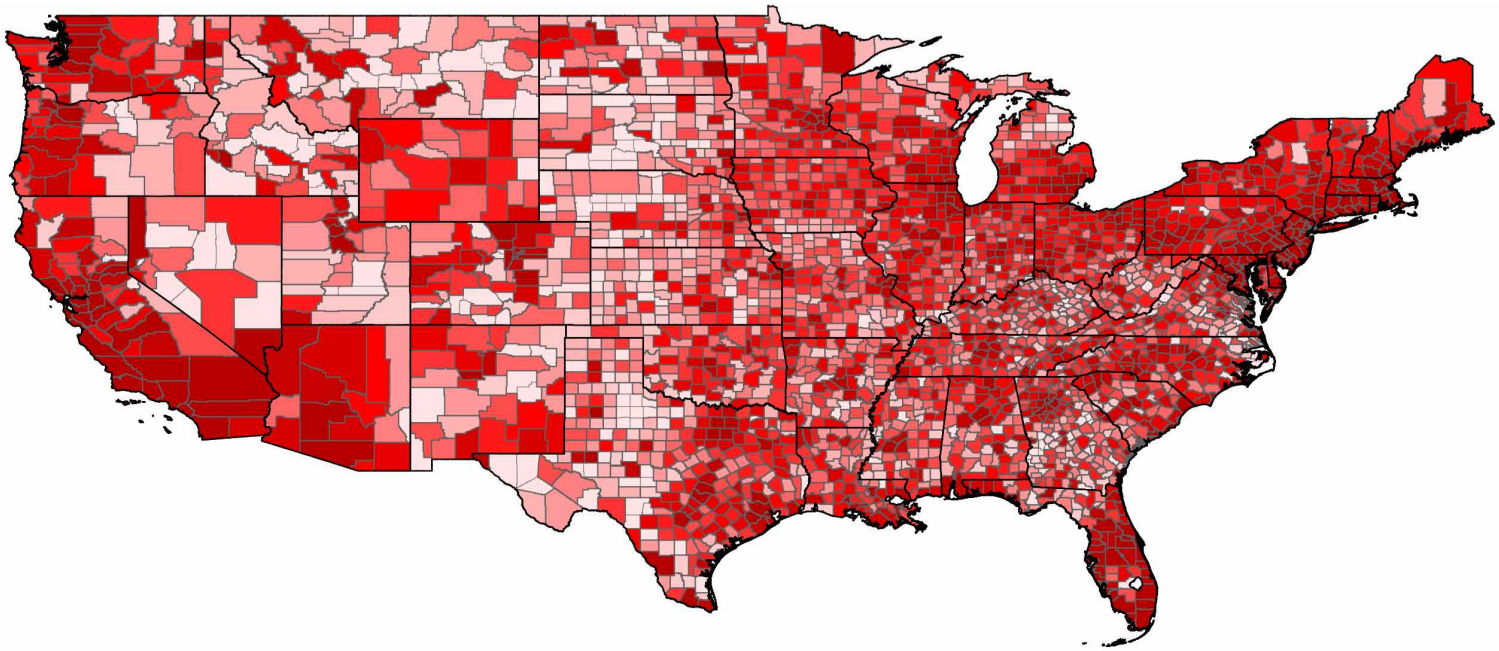
This figure displays median monthly unemployment rates for U.S. counties. Panel A divides them into groups with zero deaths and cumulative Q4 2020 COVID-19 related deaths / 100,000 inhabitants above the median of counties with more than 0 deaths. Panel B plots the top and bottom quartiles of the sample along an NPI index. The vertical black dashed line indicates the month with the first COVID-related deaths in the US, February 2020.

Figure A2: Geographical Footprint of Banks

Panel A: Branch Office Locations

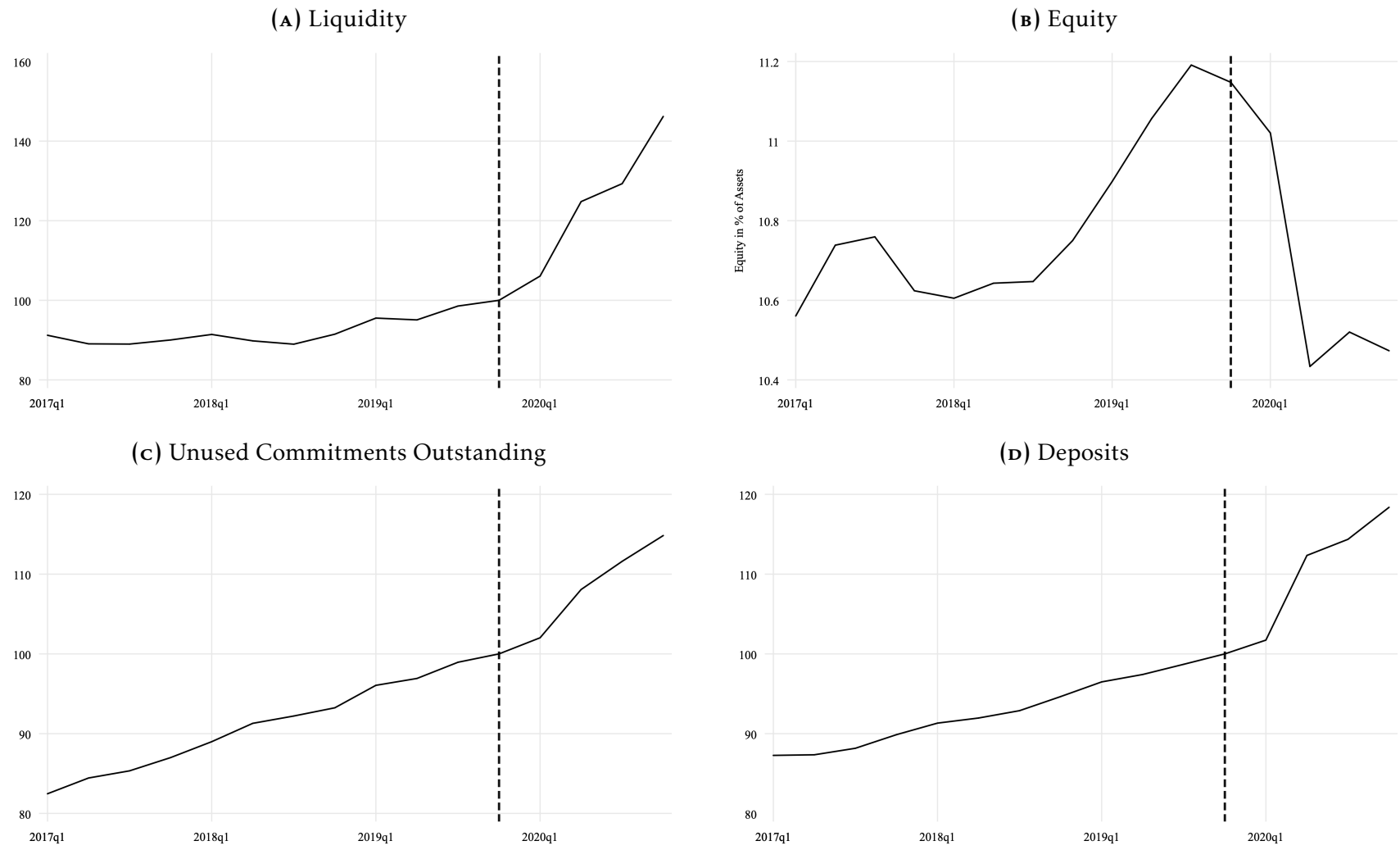


Panel B: Branch Deposit Distribution



Every dot in panel A represents a bank branch in June 2019 in the contiguous states of the U.S. Coloring of counties in panel B follows a heat map scheme, corresponding to 2019 deposits at bank branches in a county. A darker red means more deposits.

Figure A3: Other Variables of Banks and COVID



Panels A, C, and D shows U.S. banks' mean quarterly liquidity, unused commitments outstanding, and deposits indexed to 100 in Q4 2019 respectively. Panel B shows U.S. banks' mean equity / total assets. The vertical black dashed line indicates the first COVID quarter Q1 2020.