Liquidity Insurance vs. Credit Provision: Evidence from the COVID-19 Crisis*

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Abstract

We study the link between the unexpected surge in credit line drawdowns in March-April 2020 and banks' subsequent lending decisions. We find that banks with larger ex ante credit line portfolios, thus higher risk of drawdowns, tightened loan supply and the terms on new loans, especially to small firms. Exposed banks were also more reluctant to participate in the Paycheck Protection Program. The main mechanism was a reduction of risk tolerance rather than immediate balance sheet constraints. Our findings highlight the tension between banks providing liquidity insurance through precommitted credit while simultaneously sustaining lending to the broader economy during crises.

Keywords: corporate credit line drawdowns, off balance sheet exposures, bank loans, Paycheck Protection Program, COVID-19

JEL Codes: G21, E52, E58, E63

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1 Introduction

The COVID-19 pandemic brought to the fore the banking system's fundamental function of liquidity insurance (Acharya, Almeida, Ippolito and Perez-Orive, 2018b,a; Santos and Viswanathan, 2020). In March 2020, nonfinancial firms experienced sudden and sharp revenue declines amid widespread lockdowns related to the spread of the coronavirus (Figure 1a). As the cash flow shock coincided with disruptions across major funding markets, firms drew down significant amounts from their pre-existing credit lines at banks, up to almost 60% of total capacity (Acharya and Steffen, 2020).[1] Unexpected credit line drawdowns—an early manifestation of the pandemic's impact on the banking system—create liquidity and capitalization pressures for banks, and can change the makeup of borrower risk. In this paper, we examine the effects of the surge in credit line utilization on banks' subsequent lending decisions and discuss policy implications financial stability and monetary policies.

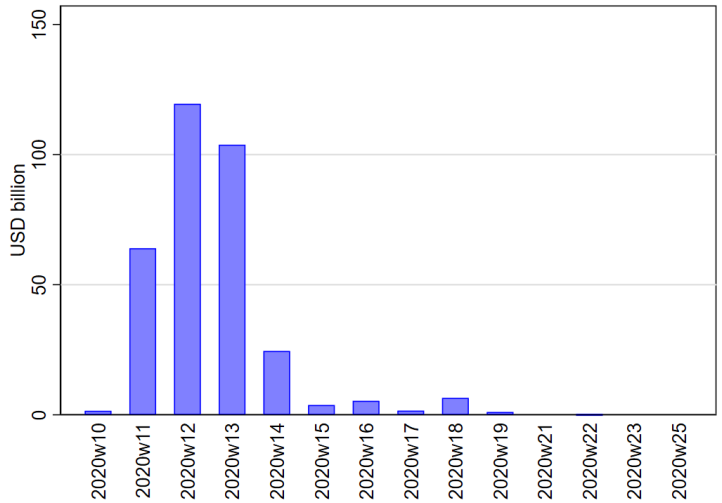
Despite the unprecedented liquidity demands caused by the drawdowns, banks were able to supply precommitted credit, successfully fulfilling their liquidity insurance function to corporate borrowers.[2] However, they also concurrently tightened lending standards by an extent not seen since the 2008 financial crisis (Figure 1b), and reduced the amount of new loan originations in subsequent quarters. The decline in credit and the tightening of lending standards suggest that credit line drawdowns might have affected banks' attitudes towards risk-taking during the crisis, prompting them to be more cautious in lending decisions. The pullback from risk-taking may also have been caused by the immediate or expected constraining effects of drawdowns on bank balance sheets, in spite of the fact that banks entered the crisis with strong financial positions (Li, Strahan and Zhang, 2020).[3]

[1] In March 2020, commercial and industrial (C&I) loan balances started rising rapidly, attaining a growth rate over the four weeks following the outbreak (in the U.S.) that was four times larger than that observed during the 2008 financial crisis after the Lehman Brothers event (Figure A1).

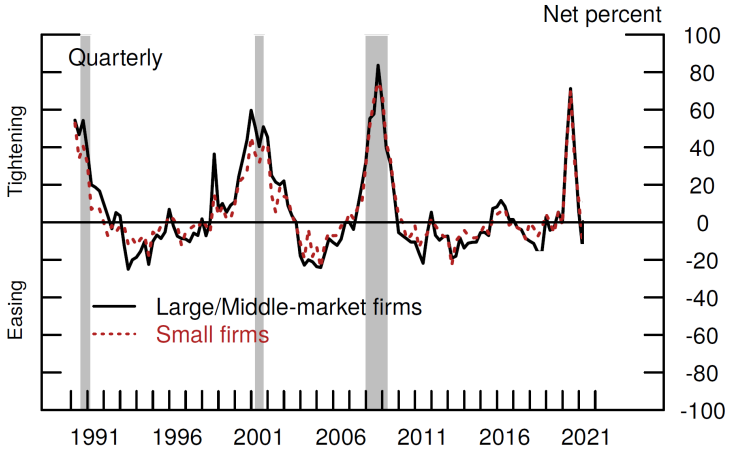
[2] Banks were able to meet the unprecedented liquidity demand due to a number of factors, including strong pre-crisis financial positions, large deposit inflow (Gatev, Schuermann and Strahan, 2009), regulatory relief, and access to emergency credit and liquidity injections from central banks.

[3] Credit line drawdowns also received significant attention in the media, which emphasized their unexpected nature and unprecedented scale. A financial executive remarked that "we've seen an unprecedented flight to liquidity, no one ever thought the whole market would draw their credit lines at once" and noted

Figure 1: **Credit Line Drawdowns at Onset of COVID-19 Crisis**



(a) Drawdowns during COVID-19 Crisis



(b) Change in Standards for C&I Loans at U.S. Banks

Note: Panel (a) plots weekly credit line drawdowns between March 2 and June 30 2020 for public firms and private firms with outstanding public debt, which submit 8-K regulatory filings at the Securities and Exchange Commission (in $ billion). For these firms, total drawdowns during March-June 2020 amounted to $331 billion. Panel (b) shows the net percent of U.S. domestic banks that reportedly tightened standards for C&I loans (positive values indicate an overall tightening, on net—more respondents said that they tightened than that they eased). The figure shows that lending standards tightened significantly at the onset of the pandemic—in the 2020:Q1 and especially the 2020:Q2 survey—when the net shares of banks that reported tightening rivaled those from the 2008 financial crisis, and continued to tighten in 2020:Q3 and Q4, but at a slower pace. The survey addresses changes in the standards and terms on bank loans over the quarter. Small firms have annual sales below $50 million. Source: S&P Global Market Intelligence, Federal Reserve Senior Loan Officer Opinion Survey, available on https://www.federalreserve.gov/data/sloos/about.htm.

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that "most companies are drawing down almost all of their allotted facilities, even those that had never tapped them before" (Financial Times, March 27 2020). Some banks encouraged their corporate clients "to raise as much money as they could before the pandemic's true cost is factored in by investors" (Financial Times, May 31 2020). The credit line drawdowns occurred against the backdrop of many years leading to

In this paper we exploit the unexpected surge in credit line drawdowns in the early phase of the COVID-19 crisis to shed light on the tension that can arise between the provision of liquidity insurance to firms through access to credit lines on the one hand, and the sustained supply of credit on the other hand. Specifically, we examine the link between the bank balance sheet pressures caused by drawdowns and banks' credit provision in subsequent quarters. We study this link using data across a variety of credit markets—including syndicated lending to large firms, small business lending, and lending through government-sponsored credit programs—and in samples of both global and U.S. banks. A unique contribution of our study is that we examine a range of possible mechanisms linking credit line drawdowns to banks' lending decisions and are able to pin down a mechanism that heretofore has not been identified in the literature: the role of changes in risk tolerance caused by unexpected drawdowns against a backdrop of healthy and unconstrained balance sheets.

We ask the following questions: What is the impact of banks' exposure to credit line drawdown risk on subsequent lending decisions to corporate borrowers? What is the impact on both the extensive and intensive margins of loan supply, that is, on lending standards and terms (such as volumes, spreads, covenants, and collateral requirements)? Are there any effects on banks' willingness to participate in government-subsidized credit programs? Through which mechanisms do credit line exposures (CLEs) affect bank lending decisions? With these questions we hope to empirically uncover the tension that can arise between two fundamental functions of the banking system—that of providing liquidity insurance to firms through precommitted credit while simultaneously supplying credit to the broader economy. This tension may have important implications for stress testing and bank risk monitoring.

Our empirical strategy consists of three steps. First, we construct a bank-level measure of exposure to credit line drawdown risk. We use data on credit lines originated by banks

the COVID-19 crisis that had witnessed solid growth of credit line issuances amid low interest rates. As the Financial Times further wrote: "Back when the world was awash with liquidity, lenders would offer low-cost revolving credit facilities—akin to a credit card—as a perk to win other business. The banks believed that most would never be used in full; such was the stigma of large companies drawing them." (March 25, 2020).

in the syndicated loan market[4] and estimate the size of outstanding credit commitments in % of total assets, before the onset of the pandemic (at end-2019). This measure, which has the advantage of being available for both global and U.S. banks, is strongly correlated with (off-balance sheet) unused C&I loan commitments reported by U.S. banks in the Call Reports. Second, we employ comprehensive datasets at the loan- and bank level—including supervisory data on small business lending from the largest U.S. banks, survey data on banks' assessments of changes in credit standards and demand, and loan-level data from the Paycheck Protection Program (PPP)—to establish a robust negative link between pre-pandemic credit line exposure and a variety of lending outcomes. Third, we examine potential mechanisms by which credit line exposures may affect lending decisions using confidential survey data on banks' motivations to tighten lending standards during the crisis.

Main Results First, we show that banks with higher ex ante credit line exposures curtailed the supply of new syndicated loans in 2020:Q2 and Q3 both on the intensive and extensive margins. Specifically, more exposed banks supplied smaller loans than other banks, on average, and were less likely to renew maturing loans, especially credit lines. In addition, large U.S. banks more exposed to credit line drawdown risk reduced the supply of small business loans, notably by cutting down the number of small business loan accounts and the $ amount of credit lines, and by tightening collateral requirements. In survey data, more exposed banks tightened the standards and terms of new C&I loans and credit lines, especially in the first half of 2020. While credit line drawdowns are a phenomenon affecting primarily large banks and large firms, these results suggests that drawdown risk affects not only lending to large firms, but it also crowds out lending to small firms. This finding is particularly important given that the pandemic disproportionately affected smaller firms (Bloom, Fletcher and Yeh, 2021; Bartik, Bertrand, Cullen, Glaeser, Luca and Stanton, 2020).

The estimates are economically significant. In a sample of global banks that account for the majority of syndicated lending, we find that one standard deviation (SD) increase in ex

[4]This market accounts for the vast majority of credit line originations, as discussed in Section 4.

ante credit line exposure is associated with a growth rate of loan volumes lower by 10-11% in the second and third quarters of 2020 compared to the previous year. In a smaller sample of large U.S. banks that report supervisory data on small business lending, we find that a SD increase in ex ante credit line exposure is associated with a decline in the number of small business accounts (outside of the PPP) by about 30%. Among U.S. banks that participate in the Federal Reserve's 2020:Q1 Senior Loan Officer Opinion Survey (SLOOS), higher exposure to credit line drawdown risk by one SD predicts a higher likelihood of reporting tightening standards on commercial and industrial (C&I loans) by 22% to small firms and 13% to large firms at the height of the drawdown surge.

Second, we show that banks at greater risk of credit line drawdowns were more reluctant to lend through government credit-subsidy programs deployed during the pandemic, despite the low risk of these loans for the lender (for instance, the lender can be stuck with some loans on the balance sheet if underwriting quality hinders loan forgiveness, and faces some fraud and audit risk). Loan-level data show that PPP lenders with larger credit line exposures made fewer small loans (<$150,000) under the program to eligible borrowers, including to firms in the same state, industry, and in the same week. This effect suggests that exposed lenders were relatively more reluctant to participate in the low-risk PPP. This result has important implications for the transmission of fiscal policies to firms through banks.

Third, we look for evidence on the mechanisms behind the negative link from credit line drawdowns to bank loan supply. A unique contribution of our paper is to document a key role for changes in risk tolerance at banks. We show that banks with larger credit line exposures were more likely to cite "lower risk tolerance" as an important reason for tightening C&I lending standards, controlling for balance sheet characteristics and shifts in loan demand. Concerns over the bank's own liquidity position featured prominently among exposed banks only in 2020:Q1, when banks were experiencing the drawdown surge. Furthermore, concerns over own capital adequacy did not play a systematic role in banks' decisions to tighten credit standards. These findings suggest that banks' financial positions did not have an

immediate constraining effect on lending decisions after the drawdown episode. Instead, the key friction driving our result is the reduced risk tolerance associated with the sudden surge in drawdowns, which highlights the perils of dormant off-balance sheet risks.

Approach to Empirical Identification Our measure of exposure to credit line drawdown risk should ideally be orthogonal on observable and unobservable characteristics, and should not be influenced by banks' responses to the drawdowns. Our strategy is to construct a measure of bank exposure to *potential credit line drawdowns* once the pandemic begins and unexpected draws start. This credit line exposure is thus constructed *before the onset of the pandemic* is preferable to actual drawdowns because drawdowns can be contaminated by balance sheet adjustments made by the bank to meet the heightened liquidity demand. The most consistent determinant of credit line exposure is bank size, for which we control in all regressions together with standard set of bank characteristics. Placebo tests show that lending outcomes in 2019 are uncorrelated with banks' exposure variable, suggesting that our results are unlikely driven by bank unobservable characteristics.

Additional tests help rule out several competing explanations for our main results. Potential threats to the interpretation of our results include, for instance, the idea that more exposed banks curtailed lending not because of credit line drawdown risk, but because of : (i) exposure to industries particularly hit by the pandemic, which would generate concerns about future loan quality and expected losses; (ii) the riskiness of existing portfolios or legacy assets; and (iii) funding constraints. We show that our main results hold up in alternative specifications that control directly for these factors.

Throughout the analysis we must also control for loan demand in order to convincingly separate loan supply from demand effects as we relate equilibrium lending volumes to bank ex ante CLE. We adopt a different approach depending on the dataset we analyze, depending on the granularity of the data and the available controls. In most specifications we control for demand shocks that are common to small groups of firms (for instance, firms in the

same location and industry, or of similar risk profile) with firm cluster fixed effects.[5] We also include a bank-level measure of exposure to local economic conditions as the result of pandemic intensity. Finally, in regressions that use survey microdata we additionally control for loan demand with banks' own reports of how loan demand changed over the quarter.

Contribution to the Literature Our paper contributes to a large literature on banks as conduits of shocks to the real economy. Most studies take financial shocks such as funding- or asset-side shocks as the starting point and traces their impact to the provision of credit and the performance of bank-dependent firms.[6] Our contribution is to examine the effects of a *real sector shock* that exogenously raised the corporate sector's demand for bank liquidity, causing large off-balance sheet exposures unexpectedly to turn into loans. As loans carry higher risk weights than the unused credit exposures, unexpected drawdowns not only require liquidity, but they also reduce capital ratios. Depending on the risk profile of firms drawing on their revolvers, the drawdowns can also change the credit risk makeup of the banks' loan portfolio. These factors can create balance sheet pressures and can change banks' expectations of future loan losses, with potential negative consequences for loan supply. As a result, a real shock can become a financial shock that reverberates back to the real sector. Indeed, we show that banks more exposed to credit line drawdown risk curtail the supply of loans to both large and small firms, and are less willing to participate in government-sponsored credit programs despite the low risks of loans granted through those programs.

Our paper also adds to the literature on financial crises, with a focus on the COVID-19 shock, in particular two recent studies. The first one is Acharya, Engle and Steffen (2021), who show that bank-level balance-sheet liquidity risk coupled with capital pressures from

[5] See, e.g., Jiménez, Mian, Peydró and Saurina (2020), Acharya, Eisert, Eufinger and Hirsch (2019), and De Haas and Van Horen (2013).

[6] A non-exhaustive list of contributions includes De Jonghe, Dewachter, Mulier, Ongena and Schepens (2020); Hale, Kapan and Minoiu (2020); Agarwal (2018); Ongena, Tümer-Alkan and Von Westernhagen (2018); Kapan and Minoiu (2018); Cingano, Manaresi and Sette (2016); Ippolito, Peydró, Polo and Sette (2016); Popov and Van Horen (2015); Iyer, Peydró, da Rocha-Lopes and Schoar (2014); De Haas and Van Horen (2012b,a); Giannetti and Laeven (2012); Schnabl (2012); Puri, Rocholl and Steffen (2011); Iyer and Peydro (2011); Ivashina and Scharfstein (2010); Brunnermeier (2009); Khwaja and Mian (2008).

drawdowns are major factors behind the persistent underperformance of bank equity returns during the pandemic. Our paper takes a step further and examines the effects of credit line drawdown risk on a wide range of bank lending decisions across credit markets, bank and borrower sizes. The second study, Greenwald, Krainer and Paul (2020), uses supervisory data on U.S. banks' loans to medium and large firms (with individual loan balances above $1 million) and documents that banks facing larger drawdowns restrict term lending more than other banks, crowding out credit to smaller firms. By comparison, our paper provides direct evidence across multiple segments of the credit market that exposed banks curtail new C&I loan originations for borrowers of all sizes, and tighten lending standards and terms to small and very small firms (with loan balances at banks below $1 million; as well as to PPP-eligible firms with less than 500 employees). Compared to these papers, we also study the mechanisms by which credit line drawdown risk may affect banks' ability to fulfill their credit provision function. Our analysis highlights an important (and previously undocumented) role for rising risk aversion in the face of credit line drawdowns, as opposed to immediate (liquidity and capital) balance sheet constraints, with important implications for monetary policy and financial stability policies.

2 Mechanisms and Empirical Hypotheses

Our main hypothesis is that higher credit line exposures reduce banks' capacity to extend new loans once unexpected drawdowns start, leading them to curtail new lending even as they meet the liquidity demand. Banks would also tighten standards and the terms on new loans (including, for instance, loans spreads, covenants, and collateral requirements).

The key mechanisms by which drawdowns can make banks more cautious in their lending decisions include (a) the immediate liquidity drain experienced by the bank as the drawdown is funded; (b) an immediate reduction in regulatory capital ratios through a rise in risk-weighted assets (RWA) and an increase in the size of the balance sheet; (c) a potential

increase in future loan losses and associated capital erosion due to a change in the risk profile of the borrowers that draw down, which can be amplified further by the economic downturn that typically follows a surge in drawdowns. As banks experience balance sheet pressures and the threat of future such pressures, they may become more risk-averse and decide to pull back from risk-taking. Below we discuss in detail how these mechanisms manifest and their implications for credit provision.[7]

When a credit line is drawn, the new loan needs to be funded. If there is no immediate increase in funding, for instance through an inflow of deposits, the bank may need to meet the higher liquidity need by adjusting its portfolio, for instance, by cutting back on other lending or by selling liquid assets. As one financial executive stated early in the COVID crisis, "Imagine the speed and capacity that our team [showed] to absorb the requests so quickly and get them funded over the course of the quarter." (American Banker, April 15 2020). Credit line drawdowns are therefore a liquidity drain on banks. Acharya, Engle and Steffen (2021) show that the equity returns of banks with high balance-sheet liquidity risk (driven by the drawdowns) underperformed relative to those of banks with low such risk. This correlation is robust to controlling for bank performance measures and is not explained by exposure to the real estate sector, to COVID-sensitive sectors (such as the retail, hotel, and leisure), or to the energy sector, emphasizing the empirical relevance of this channel.

A second key channel is bank capital: drawdowns reduce regulatory capital ratios even if the bank has sufficient liquidity to meet the demand. Pressure on capital and leverage ratios occurs through two effects: an increase in risk weights when off-balance sheet exposures move onto the balance sheet; and a mechanical expansion of balance sheet size. On-balance

[7]Banks fulfill an important liquidity insurance function for the real sector and are crucial for firms during times of stress. Brown, Gustafson and Ivanov (2021) show that bank credit lines are critical in firms' management of cash-flow volatility, especially for solvent, smaller bank borrowers. Crosignani, Macchiavelli and Silva (2020) document a mitigating effect of bank credit line access for firms whose supply chains are damaged by cyberattacks, with such firms being able to maintain investment and employment. Focusing on the global financial crisis, Berrospide and Meisenzahl (2015) show that firms with access to credit lines were better able to maintain capital expenditure during the crisis. Acharya, Almeida, Ippolito and Perez-Orive (2018a) show that bank restrictions on the usage of credit lines during the same crisis—for instance, by raising spreads, shortening maturities or invoking covenant violations—had real negative effects for borrowing firms.

sheet credit exposures are significantly more capital-intensive than off-balance sheet loans. For instance, a revolver with maturity less than one year has a credit conversion factor of 20%—that is, off-balance sheet short-term unsued credit only takes 20% of the risk weight of its on-balance sheet loan counterpart. When a short-term revolver is drawn, the risk weight on the exposure increases five-fold. In a similar vein, the credit conversion factor for long-term revolvers (maturity $>$ one year) is 50%, which means that the risk weight on the exposure will double when that exposure moves onto the balance sheet. Furthermore, drawdowns affect the simple leverage ratio (defined as common equity divided by total assets) through an increase in the size of the balance sheet, assuming that the bank does not immediately adjust common equity with a fresh capital raising. Acharya, Engle and Steffen (2021) highlight the importance of the capital constraint by showing that high-capital banks were rewarded with higher stock market valuations for the same level of drawdowns in the COVID-19 crisis.

These two effects together suggest that banks can experience substantial unexpected declines in capital ratios when credit line utilizations significantly exceed expected utilization levels. Put differently, even if banks are able to meet the liquidity demand and even if they enter the crisis with strong capital and liquidity positions, a significant drawdown episode can bring balance sheets closer to regulatory thresholds, lowering risk tolerance and leading to a tightening of credit standards. Financial executives at large banks warned of such effects in 2020:Q1 earnings calls, when several bank CEOs anticipated seeing a "tightening of credit in the market" and an "eventual increase in spreads" (American Banker, April 15, 2020.)

Another channel highlights the risk profile of the borrowers drawing down their credit lines. According to S&P Leveraged Commentary and Data, between March 5 and June 19, 2020, 41% of corporate revolver drawdown volume was driven by BBB-rated public firms, while only 9% was driven by A-rated firms.[8] Of the remaining half, BB- and B-rated firms

[8]The prevalence of drawdowns from BBB- and lower rated companies led a financial executive to remark that "Firms that do not have investment-grade ratings were more likely to tap into their credit lines" (American Banker, April 15, 2020).

account for 35% of drawdown volume, triple-C and lower rated firms account for 2%, and the rest comes from nonrated firms. Berrospide and Meisenzahl (2015) show that low-cash firms were more likely to tap their bank credit lines in the panics following the Bear Sterns and Lehman events in March and September of 2008. If weaker firms are more likely to draw their credit lines, then the risk profile of a banks' borrowers worsens after such an episode, which can lead to future loan losses and capital erosion above and beyond the banks' expectations. This phenomenon, too, may bring the banks' capital ratios closer to the regulatory thresholds, reduce risk tolerance, and in turn reduce credit availability.

3 Data

Our goal is to examine the link between credit line drawdown risk and banks' lending decisions across multiple segments of the loan market, including loans to large and small firms, and loans extended through public credit support programs. Doing so would allow us to pin down not only the relationship between credit line exposures and lending outcomes for banks and firms directly involved in the drawdowns, but also potential spillover effects on bank lending to small firms and to banks' attitudes towards participating in low-risk government credit-support programs. In addition, we would like the data to be as granular as possible to control for unobserved heterogeneity at the bank and firm level and to minimize the potential impact of confounding factors. To this end, we leverage four key data sources, described in detail below. (See Table A1 for summary statistics.)

Large business loan data come from Refinitiv Dealscan, a global database of syndicated C&I loans to large and mid-sized firms (ranging in size between $100,000 and $50 billion). The dataset includes loans by foreign and U.S. banks. For each individual loan deal we observe the identity of the each lender bank (with the portion it contributes to the deal) and the borrower identity, industry, and country. We construct the sample of banks for which we compute CLEs and conduct the analysis to comprise 102 lenders, including the

top 100 lenders by 2019 deal volume and two additional global systemically important banks (GSIBs) outside the top 100. Therefore, this sample accounts for more than 90% of total syndicated deal volume in 2019 and includes all GSIBs. There are no common identifiers between Dealscan and Fitch Connect, therefore we manually match each of the 102 banks with balance sheet information from Fitch Connect. In the empirical analysis we use data through 2020:Q2.

Supervisory small business loan data are obtained from the FR Y-14 A.9 schedule "U.S. Small Business," a confidential database maintained by the Federal Reserve. The data contain quarterly information on C&I loans with commitment amounts below $1 million. The data exclude corporate and SME credit card loans. A loan portfolio segment is a set of loans that are grouped together based to two borrower risk metrics and several loan terms. In particular, one segments refers to whether the borrower is prime, subprime, or unrated (with FICO score above 620, below 620, or missing); whether delinquency status falls into one of the following categories: current, delinquent for 30–59 days, 60–89 days, 90–119 days, or 120+ days; whether the loan is a credit line, a term loan, or unclassified/other; whether it is collateralized or not (secured versus unsecured); and whether it is short- versus long-term (above or below three years' maturity). In total, there are 180 segments. The data are reported by the largest 22 BHCs subject to stress tests in 2020, which we match to Dealscan (on an ultimate owner basis) to obtain CLEs. Furthermore, for the main commercial bank of each BHC we to obtain balance sheet information from the merger-adjusted Call Report.

Survey-based microdata come from a confidential dataset with bank-level responses to the 2020 Senior Loan Officer Opinion Surveys (SLOOS) administered by the Federal Reserve. The SLOOS assesses changes in banks' lending standards and terms on a quarterly basis. We assemble data from all the surveys in 2020 and match the respondents with Dealscan to obtain their credit line exposures. The surveys have at most 75 domestic respondents—accounting for 75%-80% of outstanding C&I loan commitments depending on the survey—with the smallest bank at about $2 billion in assets and covering all the megabanks. Bank balance

sheet data come from the merger-adjusted Call Report. The SLOOS also collects data on self-reported, perceived changes in loan demand, which we include as a control variable in bank-level lending regressions.[9]

Loan-level data from the Paycheck Protection Program, for loans below $150,000 granted between April and June 2020, come from the U.S. Small Business Administration (SBA) website.[10] These loans account for 86.5% of all loans and 27.2% of total lending volume over the period.[11] Given the lack of external identifiers for PPP lenders (other than their name), we use this information coupled with the state where each bank deployed most PPP funds to carefully match the PPP lenders with syndicated lenders in Dealscan. Then we manually cross-check each matched bank and resolve ambiguous cases with information from the FDIC BankFind and the FFIEC National Information Center databases.[12] We obtain a match for 384 banks accounting for $343 billion of total PPP lending volume. The final sample comprises a large and diverse array of banks ranging from small community banks (with less than $1 billion in assets) to megabanks. For these banks we also obtain balance sheet information from the merger-adjusted Call Report.

4 Bank Exposure to Credit Line Drawdown Risk

We measure banks' ex ante exposure to credit line drawdown risk using detailed microdata on financial contracts from Dealscan's global database of large syndicated loans. Given

[9]The SLOOS is regarded as a valuable and reliable source of information on bank lending decisions, as aggregated indexes of lending standards derived from SLOOS responses have strong predictive power for future lending and economic activity (Bassett, Chosak, Driscoll and Zakrajšek, 2014; Berrospide and Edge, 2010). Bassett, Chosak, Driscoll and Zakrajšek (2014) discusses the ways in which the design of the survey incentivize truthful responses and reduce strategic behavior by banks in the hope of influencing regulatory or monetary policies. Respondents to the survey are informed that the individual responses are treated confidentially and are not available to Federal Reserve System staff that directly supervise and regulate commercial banks. Bassett and Covas (2013) found no evidence that these responses systematically relate to capital regulation.

[10]See https://home.treasury.gov/policy-issues/cares-act/assistance-for-small-businesses/sba-paycheck-protection-program-loan-level-data.

[11]Although data on larger loans (above the $150,000 threshold) are also publicly available, we focus on small loans because we observe the individual loan amount. Loan-level data disclosing loan amounts for larger loans were released in December 2020.

[12]See https://research2.fdic.gov/bankfind/ and https://www.ffiec.gov/NPW.

that most revolving credit is granted through syndications, focusing on the syndicated loan market allows us to capture the vast majority of credit line contracts.[13] In addition, these data enable us to gauge exposures not only for U.S. banks, but also for foreign banks that are major issuers of credit lines, and to analyze subsequent lending decisions of all banks in the syndicated loan market. Specifically, we construct credit line portfolios for each bank using deal-level information on credit commitments originated before end-2019 and outstanding at the end of 2020:Q1, divided by total bank assets.

Bank CLEs are sizeable and vary significantly across banks (see Table A1). The median CLE-to-asset ratio is 8% for GSIBs and 3.3% for other banks, with variation across countries as well: U.S. banks have CLEs of 14.7% on average, compared to 9.1% in Japan, 7.3% in the UK, 4.7% in France, and less than 1% in China. Furthermore, CLEs vary greatly in the sample of banks across the datasets we employ in the regression analyses, as we discuss further in Section 5. As shown in Table 1, larger banks and banks with better asset quality tend to have larger CLEs, therefore in all regressions we control for bank size and NPL ratio. The other bank characteristics (capital ratio, ROA, and loan/asset ratio) do not appear systematically related to CLEs, nevertheless, we include all these variables in the baseline set of controls.

One might raise several concerns about the measurement of bank CLEs. One concern might be that in Dealscan we only observe the credit line at origination and do not know what portion of the initial exposure was retained by the originating bank. We also do not know what portion of the credit line was utilized by the borrower and/or how much of it remained as an off-balance sheet exposure for the bank. To address these issues, we need to check the Dealscan-based CLE measure against an independent and accurate external measure, ideally based on regulatory filings. Such a measure exists, but only for U.S. banks, in the Call Report, under the name "undrawn C&I credit commitments." As shown in Figure

[13] Our own calculations using the supervisory loan-level data on large C&I loans from the Federal Reserve's Y-14 H.1 schedule indicate that syndicated loans accounted for close to 90% of credit line contracts at end-2019.

Table 1: Balance sheet characteristics for high vs. low CLE banks

	(1)	(2)	(3)	(4)	(5)	(6)
	High CLE (around the mean)	Low CLE (around the mean)	pvalue t-test [1]=[2]	High CLE (around the median)	Low CLE (around the median)	pvalue t-test [3]=[4]
	(a) Large business loan sample (Dealscan)					
Total assets ($ bn)	845.56	803.30	0.818	835.78	800.65	0.843
Capital ratio	6.67	6.32	0.439	6.36	6.52	0.843
ROA	0.91	0.68	0.024	0.81	0.71	0.113
Loans/Assets	51.96	53.76	0.579	51.68	54.57	0.322
NPL	0.98	2.47	0.000	1.30	2.59	0.000
	(b) Small business loan sample (Y-14)					
Total assets ($ bn)	646.89	93.86	0.117	870.92	191.848	0.279
Capital ratio	11.95	12.28	0.694	12.20	11.881	0.050
ROA	1.28	1.05	0.016	1.29	1.162	0.279
Loans/Assets	60.89	67.00	0.239	60.37	64.142	0.505
NPL	1.80	1.28	0.180	2.03	1.349	0.279
	(c) Survey sample (SLOOS)					
Total assets ($ bn)	262.00	42.91	0.019	232.82	26.40	0.000
Capital ratio	12.22	12.49	0.540	12.22	12.60	0.326
ROA	1.37	1.22	0.275	1.36	1.19	0.326
Loans/Assets	64.89	67.70	0.374	63.57	71.72	0.141
NPL	0.83	0.69	0.149	0.81	0.68	0.050
	(d) Paycheck Protection Program sample (PPP)					
Total assets ($ bn)	574.08	24.06	0.000	422.43	11.70	0.000
Capital ratio	12.29	12.90	0.000	12.23	13.59	0.000
ROA	0.39	0.63	0.000	0.39	0.83	0.000
Loans/Assets	63.59	72.79	0.000	65.82	73.93	0.000
NPL	1.35	1.52	0.000	1.42	1.44	0.000

Note: This table reports average balance sheet characteristics for high versus low CLE banks in our regression samples. All balance sheet characteristic are measured at end-2019. In columns 1–2, banks are split into high versus low CLE based on the average CLE and in columns 4–5 based on the median. Column 3 reports the p-value of a t-test of equality of means. Column 6 reports the p-value of a nonparametric test of equality of medians. Sources: Refinitiv Dealscan, Federal Reserve Senior Loan Office Opinion Survey (SLOOS), Federal Reserve Y-14, U.S. Small Business Administration (for PPP sample), Fitch Connect, and Call Report.

2(a), there is a strong correlation between ex ante CLEs from Dealscan and Call Reports for U.S. banks.

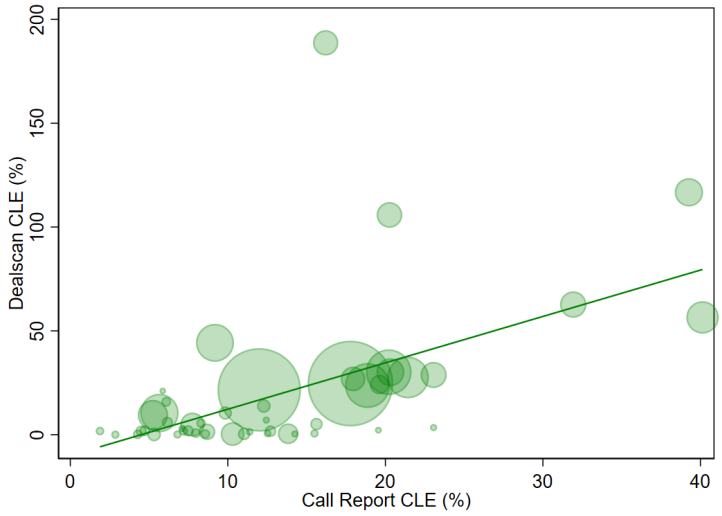
It is also important to show that the ex ante measure of exposure to credit line drawdown risk is correlated with actual drawdowns. Since we do not observe actual drawdowns at the bank level in Dealscan, once again we focus on U.S. banks, for which we have both initial CLEs in 2019:Q4 as well as subsequent drawdowns, computed as the percentage point decline in undrawn C&I credit commitments (between 2019:Q4 and 2020:Q1). Figure 2(b) shows that higher initial CLEs are associated with larger subsequent drawdowns in the sample of approximately 500 U.S. banks with non-zero credit line exposures in the Call Reports.

Finally, one might worry that CLEs are constructed with data from syndicated loans and do not reflect bilateral loan contracts. To address this issue, first we note that about one third of loans recorded in Dealscan are single-lender loans. Secondly, the vast majority of credit lines are extended through syndicated lending. Using supervisory data on C&I loans from the Federal Reserve's Y-14 (H.1 schedule) on loan exposures above $1 million at large U.S. banks, syndicated loans accounted for close to 90% of credit line contracts at end-2019.

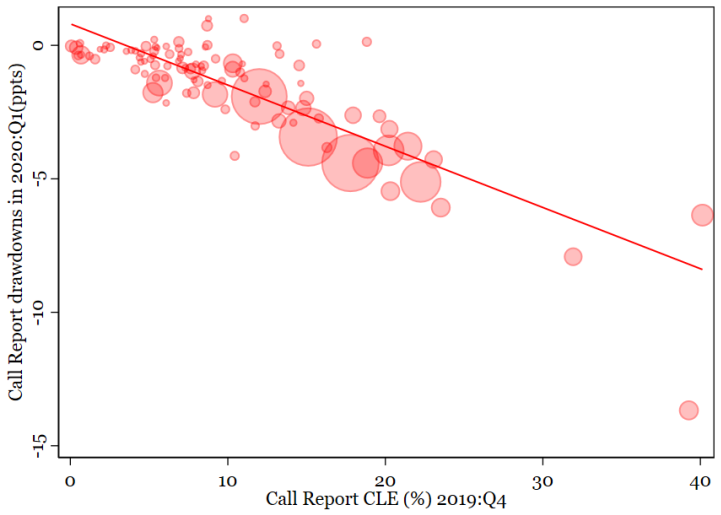
5 Results

In this section we present the baseline results that establish a link from banks' credit line drawdown risk to loan supply. We discuss, in turn, the effects of drawdowns risk on bank originations of syndicated loans (intensive and extensive margin), small business loans (intensive and extensive margin, and loan terms), C&I lending standards and terms (from survey responsess), and bank participation in the PPP (intensive margin). The analysis of syndicated loans examines both foreign and U.S. banks and the remaining analyses zoom in on U.S. banks given their outsized importance as suppliers of corporate lines of credit.

Figure 2: **Validating the Bank Credit Line Exposure Measure**



(a) Dealscan CLE vs. Call Report-based CLE



(b) Ex ante CLE vs Ex post draws

Note: Panel (a) shows the link between CLEs computed as undrawn C&I credit commitments in 2019:Q4 from the Call Reports and CLEs computed from Dealscan based on credit lines (granted before end-2019 and outstanding as of March 2020, both in % of total bank assets). The sample refers to 75 matched banks between Dealscan and SLOOS. Panel (b) shows the link between Call Report CLEs measured as the unused C&I loan commitments in 2019:Q4 (% assets) and the actual drawdowns, measured as the change in unused loan commitments (% total bank assets) between 2019:Q4 and 2020:Q1 (in ppts). The sample comprises 126 banks with assets above $10 billion, where credit line drawdowns were concentrated. In both charts, bubble size is proportionate to bank size. Source: Call Report, Refinitiv Dealscan.

5.1 Results from Large Business Loans

Using loan-level data on syndicated loan deals extended during 2019 and 2020, we analyze loan supply adjustment on the intensive and extensive margins by banks with different exposure to the risk of corporate credit line drawdowns.

Intensive margin For identification of intensive margin effects, we adopt a methodology inspired from Khwaja and Mian (2008) and compare the growth of average loan amounts from at least two different banks with varying ex ante CLEs to the same individual borrower, across all firms that borrowed in the syndicated loan market in 2020 compared to 2019. Holding the borrower fixed allows us to control for borrower-level changes in loan demand between the two periods. Controlling for credit demand with borrower fixed effects is crucial in our setting as the pandemic was accompanied by significant changes in credit demand. However, given the decline in new syndicated loans in 2020, the data are not sufficiently rich to include individual firm fixed effects; instead we follow the literature (see, e.g., Acharya, Eisert, Eufinger and Hirsch (2019) and De Haas and Van Horen (2013)) and group individual firms into country-industry clusters (where industry refers to three-digit SIC classification). By adding firm-cluster fixed effects we control for loan demand shocks that affect all firms in a given cluster without creating any bias in the estimator (Degryse, De Jonghe, Jakovljević, Mulier and Schepens, 2019). Furthermore, in all lending specifications we include the following standard bank characteristics measured at end-2019: size (log-assets), capital (Tier 1 capital/risk-weighted assets), ROA, loan/asset ratio, and NPL ratio).[14]

The results are reported in Table 2, where the dependent variable is the growth rate of average loan volume between the year 2019 ("before") and 2020:Q2 (columns 1–5) or 2020:Q2-Q3 (columns 6–10) ("after") in Panel A.[15] The unit of observation is given by

[14] All coefficients are estimated with Ordinary Least Squares (OLS) and standard errors are clustered at the bank level, given that the main variable of interest—bank CLE—varies on bank. Throughout the remainder of the paper, estimated coefficients are based on OLS.

[15] To avoid contaminating the results with loan dynamics around the start of the pandemic, we drop all loans originated in 2020:Q1 (but the results are robust to including January and February loans in the "before" period), and for symmetry we drop loans granted in 2019:Q1 as well (the results are virtually

bank-firm cluster pairs in a lending relationship in both periods considered. In Panel B we show the results of a placebo test where the lending outcomes refer to the corresponding periods of 2019 versus 2018 and the CLE exposures are kept unchanged.

The results in columns 1–5 show a negative and statistically significant link between CLE and loan growth in the full sample of banks and among GSIBs, consistent with our hypotheses. The estimated coefficients on CLE in columns 1 and 6 (without fixed effects) are larger in absolute value than in columns 2 and 7 (with fixed effects), suggesting that demand weakened in 2020, and the omission of firm cluster fixed effects as a demand control generates a downward bias (as in Khwaja and Mian (2008)). In fact, according to the Federal Reserve's July 2020 SLOOS on bank lending practices, U.S. banks reported dramatically weaker demand for C&I loans from both large and small firms in the first half of 2020. Furthermore, the coefficients on CLEs for GSIBs are larger than in the full sample (columns 4 vs. 2 and 9 vs. 7), suggesting stronger effects for larger banks and consistent with Li, Strahan and Zhang (2020), who document a greater increase in liquidity demand in 2020:Q1 at the largest U.S. banks, which account for the majority of corporate credit line issuance.

The estimates are economically significant. The coefficients on CLE in columns 7 and 9 indicate that one SD increase in the CLE ratio is associated with a decline in the growth rate of lending by 10-11%. Then we unpack this baseline estimate for U.S. and non-U.S. banks and notice that the negative correlation is larger for U.S. banks, which also have larger CLEs so they were more exposed to the risk of credit line drawdowns (columns 3, 5, 8 and 10). The placebo test in Panel B, which simulates as if the pandemic and related credit line drawdowns had occurred one year earlier, yields statistically insignificant coefficients in all specifications. In Section 6 we check that the estimates are robust to further controlling for deposit inflow and loan loss reserves.

Extensive margin To examine the link between ex ante CLEs and the extensive margin of loan supply, we use as dependent variables the probability of renewing a contractually

unchanged and sample sizes slightly larger if we keep those loans).

Table 2: **Results from Syndicated Loans: Intensive Margin**

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Loan growth in 2020:Q2					**Loan growth in 2020:Q2 and Q3**				
	All	All	All	GSIB	GSIB	All	All	All	GSIB	GSIB
					A. Baseline					
CLE	-2.3942***	-1.3519*		-2.1787**		-2.3751***	-1.2840*		-1.9870**	
	(0.890)	(0.727)		(0.904)		(0.872)	(0.750)		(0.846)	
CLE × U.S. bank			-1.7629*		-2.3506**			-1.6766*		-2.1536**
			(0.908)		(0.906)			(0.876)		(0.868)
CLE × non-U.S. bank			-0.9366		-1.7810			-0.8921		-1.6038
			(0.784)		(1.079)			(0.745)		(1.012)
Observations	2,702	2,348	2,348	1,500	1,500	2,735	2,374	2,374	1,519	1,519
R-squared	0.019	0.636	0.636	0.674	0.674	0.019	0.630	0.630	0.669	0.669
					B. Placebo					
CLE	-0.5051	-0.3331		-0.7700		-0.2505	-0.5178		-0.7235	
	(0.352)	(0.441)		(0.550)		(0.290)	(0.351)		(0.450)	
CLE × U.S. bank			-0.3748		-0.7415			-0.6064*		-0.6811
			(0.418)		(0.549)			(0.351)		(0.447)
CLE × non-U.S. bank			-0.2849		-0.8757			-0.4261		-0.8881
			(0.409)		(0.641)			(0.355)		(0.584)
Observations	3,287	2,827	2,827	1,784	1,784	5,010	4,379	4,379	2,724	2,724
R-squared	0.002	0.542	0.542	0.595	0.595	0.001	0.509	0.509	0.562	0.562
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm country×industry		Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes

Note: This table reports regression coefficients on the link between ex ante credit line exposures (CLE) and large business loan volumes—the intensive margin—using syndicated loan data. The dependent variable is the growth rate of average loan volume in 2020:Q2 or 2020:Q2-Q3 ("after") compared to 2019 ("before"). The sample includes all bank-firm pairs for which firms borrow from at least two banks both in the "before" and "after" periods. Loans granted in 2020:Q1 are dropped from the sample. GSIB sample refers to the global systemically important banks according to the BIS, see https://www.bis.org/bcbs/gsib/. All specifications include bank controls (size, capital ratio, ROA, loan/asset ratio, and NPL ratio) measured at end-2019 and firm cluster fixed effects, where clusters are given by all firms in the same country and industry (given by three-digit SIC classification). Standard errors are clustered on bank. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Sources: Refinitiv Dealscan, Fitch Connect.

Table 3: **Results from Syndicated Loans: Extensive Margin**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Renewal in 2020:Q2				**Renewal in 2020:Q2 or Q3**			
	All	All	GSIB	GSIB	All	All	GSIB	GSIB
				A. Probability of loan renewal				
CLE	-0.0025**		-0.0037**		-0.0023**		-0.0012	
	(0.001)		(0.001)		(0.001)		(0.002)	
CLE × U.S. bank		-0.0030***		-0.0038**		-0.0041***		-0.0025
		(0.001)		(0.002)		(0.001)		(0.002)
CLE × non-U.S. bank		-0.0008		-0.0032*		-0.0035*		-0.0028
		(0.002)		(0.002)		(0.002)		(0.002)
Observations	5,166	5,166	3,142	3,142	8,857	8,857	5,378	5,379
R-squared	0.086	0.087	0.036	0.036	0.083	0.022	0.087	0.027
				B. Probability of CL renewal with another CL				
CLE	-0.0040***		-0.0034*		-0.0015**		-0.0004	
	(0.001)		(0.002)		(0.001)		(0.001)	
CLE × U.S. bank		-0.0045***		-0.0036*		-0.0018**		-0.0007
		(0.001)		(0.002)		(0.001)		(0.001)
CLE × non-U.S. bank		-0.0025		-0.0024		-0.0006		0.0006
		(0.002)		(0.002)		(0.001)		(0.001)
Observations	3,885	3,885	2,342	2,342	14,084	14,084	8,666	8,666
R-squared	0.118	0.119	0.115	0.115	0.052	0.052	0.057	0.057
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports regression coefficients on the link between ex ante credit line exposures (CLE) and the probability of loan renewal—the extensive margin—using syndicated loan data. The data are at the bank-firm pair level. In columns 1–4 we examine the probability of loan renewal for bank-firm pairs in a lending relationship involving a loan maturing in 2020:Q2, and in columns 5–8 we focus on the probability of renewal of loans maturing in 2020:Q2 or Q3. In Panel A we consider all loans and in Panel B we zoom in on credit lines. GSIB sample refers to the global systemically important banks according to the BIS, see https://www.bis.org/bcbs/gsib/. All specifications include bank controls (size, capital ratio, ROA, loan/asset ratio, and NPL ratio) measured at end-2019, firm country fixed effects and industry fixed effects (one-digit SIC classification). Standard errors are clustered on bank. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Sources: Refinitiv Dealscan, Fitch Connect.

maturing loan (either credit line or term loan) and the probability of renewing a maturing credit line, focusing on loans that are up for renewal in 2020:Q2 (columns 1–4) or 2020:Q2-Q3 (columns 5–8). The data are at the pair bank-firm level so we can add firm's country and industry fixed effects to capture demand shifts; and the same bank-level covariates as before. In columns 1–4 of Table 3, higher CLEs are associated with a lower probability of loan renewal in 2020:Q2 (Panel A) and in 2020:Q2-Q3 (Panel B) across loan types. The probability of credit line renewal with another credit line is lower for more exposed banks, too (columns 5–8). Moreover, the estimates are more often statistically significant for U.S. banks. Looking at the CLE effect estimates for GSIBs in column 1, one SD increase in the CLE ratio is associated with a loan renewal probability lower by 2.1% for any loan and 1.9% for a credit line. In columns 7–8 we see that the coefficients of interest have intuitive signs but are insignificant, suggesting diminishing effects of CLEs in the second half of 2020.

Taken together, these results suggest that banks facing higher risk of credit line drawdowns had lower growth in large business loans in 2020 compared to 2019, echoing the seminal work of Ivashina and Scharfstein (2010) who show that U.S. banks more susceptible to drawdowns due to co-syndications with Lehman Brothers cut back the volume of syndicated loan originations more after September 2008. In the global sample of banks we analyze there are stronger effects for U.S. banks, which motivates us to explore more deeply the link between drawdown risk on lending standards at these banks.

5.2 Results from Small Business Loans

We turn to the experience of U.S. banks and focus on lending outcomes for small businesses. A key motivation is that small firms have been particularly strained during the pandemic, raising questions about their resilience and the potential long-run effects on innovation and growth.[16] In addition, banks treat large and small firms differently. Using supervisory

[16] See, for instance, Bloom, Fletcher and Yeh (2021); Bartik, Bertrand, Cullen, Glaeser, Luca and Stanton (2020); Alekseev, Amer, Gopal, Kuchler, Schneider, Stroebel and Wernerfelt (2020) and Gourinchas, Kalemli-Özcan, Penciakova and Sander (2020).

lending data for the U.S., Chodorow-Reich, Darmouni, Luck and Plosser (2021) document that small firms face tighter bank lending terms—higher spreads, shorter maturity loans, and more stringent collateral requirements and were less likely than large firms to increase revolver utilization. We examine if small firms were hit by crowding-out effects of large firms' drawdowns through the influence of drawdowns on banks' attitudes towards lending.

We relate ex ante CLEs (measured at end-2019) to two outcome variables—the number of small business accounts and the $ value of commitments on credit lines, outside of PPP loans, in 2020:Q2 and Q3 (both in logs). As before, we control for bank balance sheet characteristics also measured at the end of 2019 (size, capital ratio, ROA, loans/assets, and NPL ratio), and we additionally include a measure of pandemic intensity facing each bank in its main areas of operations. This variable aims to capture local economic conditions (including local loan demand) and is measured by the cumulative number of COVID-19 infections between March and July 2020 aggregated at the bank level using the share of each state in the bank's total deposits (see Li and Strahan (2020) for a similar approach). Since the data are at the bank-loan portfolio segment-quarter level, we include interacted portfolio segment×quarter fixed effects, which means that the CLE effect is identified off of variation across banks that grant similar loans each quarter. As discussed in Section 3, loans belong to the same segment if they are of the same type (credit lines or term loans), have similar maturity (above or below three years), collateral requirements (unsecured or secured), and are granted to borrowers with similar risk profile (FICO score or delinquency status).

Table 4 reports the baseline effects (columns 1-6) with data for 2020:Q2-Q3 and placebo test (columns 7-8) that use lending outcomes for 2019. Across the coefficient estimates in columns 1-6, we find that higher ex ante CLEs are associated with fewer loan accounts and lower $-commitments for small business loans. Focusing on the coefficients in columns 1–3, we see that an increase in CLEs by one SD is associated with fewer small business accounts by 32% (-37% for credit lines and –26% for term loans).[17] The placebo test estimates in

[17]These baseline results are robust to including data from 2020:Q4 in the sample period (see Panel A in Table A3). Furthermore, breaking down the CLE coefficient by quarter in 2020 shows that the negative

columns 7–8 show that there is no systematic relation between CLEs and the number of accounts in 2019, and, if anything, a positive association with loan commitments in 2019. These results suggest that the baseline correlations in columns 1-6 are unlikely to be driven by unobservable bank characteristics.

In Table A2 we explore the link between CLEs and the terms of small business loans, in particular collateral requirements and maturity. In Panel A we unpack the baseline average effect of CLEs by secured versus unsecured loans and in Panel B by loans with maturity above or below three years. The estimates indicate that more exposed banks reduced the number and commitments on uncollateralized small business loans more than other banks. P-values of one-sided t-tests indicate that we fail to reject that the coefficient on "unsecured" is larger than that on "secured" at conventional levels of significance in five out of six specifications. Differences by loan maturity are more muted, which may be due to the coarse nature of the maturity variable.

Overall, these findings complement those for large syndicated loans in Section 5.1 and show that a surge of large credit line drawdowns can lead banks to cut business lending not only to large firms, but also to small firms. The crowding-out effect of drawdowns on lending to small firms is particularly concerning because small firms are more financially constrained (Dinlersoz, Kalemli-Özcan, Hyatt and Penciakova, 2018) and face relatively more lender discretion in the utilization of credit lines when they experience negative shocks (Chodorow-Reich, Darmouni, Luck and Plosser, 2021).

5.3 Results from Survey Data

Here we exploit detailed quarterly information on bank lending decisions from the Federal Reserve's Senior Loan Officer Opinion Survey (SLOOS)—a confidential dataset with information on how and why banks change their lending standards and terms. The SLOOS microdata has the advantage that it splits responses by borrower size (large and medium

effects of CLEs become statistically noticeable in Q3 and remain large and statistically significant in Q4 (see Panel B in Table A3).

Table 4: **Results from Small Business Loans: Extensive and Intensive Margins**

Dependent variables:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	# Accounts			**$ Commit.**			**# Accounts**	**$ Commit.**
	All	**CLs**	**TLs**	**All**	**CLs**	**TLs**	**All**	**TLs**
	A. Baseline						**B. Placebo**	
CLE	-0.0043***	-0.0049***	-0.0034***	-0.0012***	-0.0012**	-0.0010	0.0002	0.0008**
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pandemic intensity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Segment × Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,482	2,747	1,735	4,403	2,745	1,658	4,271	4,216
R-squared	0.593	0.581	0.660	0.638	0.625	0.665	0.643	0.679

Note: This table reports regression coefficients on the link between ex ante credit line exposures (CLE) and small business loan outcomes (that is, for C&I loans with commitment amounts below $1 million). The data are at the bank-loan portfolio-segment-quarter level over 2020:Q2-2020:Q3. Dependent variables are the number of small business accounts (columns 1-3 and 7) and $ commitments for the segment (columns 4–6 and 8) (both log-transformed). These variables are available for all loans and separately for credit lines (CL) and term loans (TL). In Panel A, the dependent variables refer to lending outcomes in 2020 (baseline) and in Panel B they refer to 2019 (placebo). All specifications include bank controls (size, capital ratio, ROA, loan/asset ratio, and NPL ratio), a proxy for pandemic intensity facing each bank (measured by state-level exposure to COVID-19 cases weighted by the bank's deposit-taking activities in each state), and interacted loan portfolio segment×quarter FE. All variable definitions are as in Table A1. Standard errors are double clustered on bank and loan portfolio segment. * represents significance at the 10% level, ** at 5%, and *** at 1%. Source: Federal Reserve Y-14, FDIC Summary of Deposits, Refinitiv Dealscan, Call Reports, and JHU Center for Systems Science and Engineering.

versus small firms, with annual sales below $50 million) and covers a comprehensive set of lending terms including spreads and premiums on risky loans, maturities, maximum size of credit lines, covenants, and collateral requirements.

To examine changes in standards and terms of C&I loans—the extensive and intensive margins—we create a dummy variable that takes value one for banks that reported a considerable or somewhat of a tightening in lending standards in response to the questions "*Over the past three months, how have your bank's credit standards for approving applications for C&I loans or credit lines other than those to be used to finance M&As to large and mid-sized firms and to small firms changed?*" and "*For applications for C&I loans and credit lines that your bank is willing to approve, how have the terms of those loans changed over the past 3 months?*." (The individual terms are discussed further below.) We construct a measure of changes in C&I loan demand at the bank level as a dummy variable taking value one if the bank indicated a substantial or moderate strengthening of loan demand according to the

question: "*Apart from seasonal variation, how has demand for C&I loans changed over the past 3 months? (Please only consider funds actually disbursed as opposed to requests for new or increased lines of credit.).*"

Table 5: **Results from Survey Data: Lending Standards**

	(1)	(2)	(3)	(4)	(5)
Dependent variable:	Bank tightened lending standards				
	2020:Q1	2020:Q2	2020:Q3	2020:Q4	2019
					Placebo
			A. To small firms		
CLE	0.0064***	0.0067***	0.0040*	0.0017	0.0000
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
Observations	42	45	42	43	165
R-squared	0.364	0.610	0.161	0.356	0.057
			B. To large firms		
CLE	0.0036*	0.0009	-0.0018	-0.0002	0.0006
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Observations	44	48	45	47	180
R-squared	0.288	0.096	0.278	0.214	0.052
Bank controls	Yes	Yes	Yes	Yes	Yes
Loan demand	Yes	Yes	Yes	Yes	Yes

Note: This table reports regression coefficients on the link between ex ante credit line exposures (CLE) and the probability that banks report tightening C&I lending standards based on survey responses. The data are at the bank-level. The period of analysis is 2020:Q1–2020:Q3 for the baseline (columns 1–4) and all quarters in 2019 for the placebo (column 5). The dependent variable is a dummy variable taking value one if the bank reported that they somewhat or considerably tightened standards on new C&I loans and credit lines over each quarter in 2020 in the baseline (columns 1–4) or at any point during 2019 in the placebo test (column 5). In Panel A the responses refer to small firms (with annual sales below $50 million) and in Panel B the responses refer to large and middle-market firms. All specifications include bank controls (size, capital ratio, ROA, loan/asset ratio, and NPL ratio) and "Loan demand", a variable that takes value one if the banks reported a substantial or moderate strengthening of loan demand over the quarter from each type of firm (small or large). All variable definitions are as in Table A1. Regression estimates are weighted by bank size. Standard errors clustered on bank. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Source: Federal Reserve Senior Loan Officer Opinion Survey (SLOOS), Refinitiv's Dealscan, Call Report.

Figure A2(a) shows the fraction of survey respondents that report tightening lending standards each quarter by ex ante CLE size, to small and large firms. We can see that relatively larger shares of high-CLE banks report tightening throughout 2020 except in Q4 when the difference between the two groups disappears. This figure is extended to include 2019 as a placebo in Figure A2(b), which shows no relation between CLE and the propensity to report tightening lending standards.

We check these patterns formally in linear probability models on bank-level data where

the dependent variable is a dummy variable for "tightening" and the regressor of interest is CLE (therefore we cluster the standard errors at the bank level). The results are reported in Table 5. Given the small sample sizes, we keep the models parsimonious and control for the core set of bank characteristics (size, capital, ROA, loan/asset ratio, and NPL) measured at end-2019. As a direct measure of loan demand we include the dummy "demand strengthened" which reflects bank's own assessment of changes in loan demand. We examine changes in lending standards in 2020 (columns 1–4) to small firms (Panel A), large firms (Panel B), and a placebo test that stacks survey data across all quarters in 2019 (column 5).

The results suggest a positive relation between CLE and the likelihood of tightening lending standards. A broad comparison of estimates across panels A and B indicate that small firms appear to experience the brunt of the tightening. Across specifications in Panel A, there is a statistically significant association between CLE and the probability of tighter standards in 2020:Q1-Q3. The coefficient estimates is smaller in Q3 and becomes statistically insignificant in Q4, suggesting a diminishing effect of drawdown risk. Exposed banks were also more likely to tighten C&I lending standards to large firms, but this effect is only statistically significant in 2020:Q1. The estimates in Table 5 are economically significant—a one SD increase in CLE ratio is associated with a higher likelihood of reporting tighter standards on C&I loans by 22% to small firms and 13% to large firms in 2020:Q1 (column 1). Note that the 2020:Q1 survey—conducted between March 23 and April 3 2020—was strongly influenced by the shift in the economic outlook caused by the unfolding pandemic in the last weeks of March.[18]

Previous research suggests this result is not specific to the COVID-19 crisis but occurs after monetary policy tightenings as well. Using the Y-14 (Schedule H.1) data on business loans above $1 million over 2012:Q3-2020:Q1, Greenwald, Krainer and Paul (2020) show that large firms' credit line drawdowns after negative macroeconomic shocks create an externality for smaller firms; and that this redistributive effect amplifies the decline in aggregate invest-

[18]For a discussion of these issues, see the SLOOS public release on https://www.federalreserve.gov/data/sloos/sloos-202004.htm.

ment despite the rise in total credit growth. Finally, the statistically insignificant estimates in column 5 (placebo test) suggest that our baseline results capture the effect of credit lines themselves and not that of confounding factors.

In Table A4 we examine the link between CLE and the terms of approved C&I loans. The SLOOS collects detailed information on loan terms, including the maximum size of credit lines, maturity, covenants, collateral requirements, as well as terms referring to the banks' pricing strategy: loan spreads, premia charged on riskier loans, and interest rate floors. Using the same approach as in Table 5, we look at the relation between CLE and the likelihood of tightening individual loan terms during 2020:Q1-Q3 (the data are stacked across surveys). The estimates suggest that higher CLEs are associated with greater likelihood of tightening select loan terms, but coefficient estimates tend to be larger and are more likely statisticall significant for small firms. More exposed banks were more likely to tighten loan spreads, the cost of credit lines, and premiums on risky loans to small firms (columns 3–5, Panel A); they were also more likley to tighten spreads and maturities on new loans to large firms (columns 2–4, Panel B).

5.4 Results from Government-Sponsored Credit Programs

So far we have shown that exposure to credit line drawdown risk is negatively related to the supply of bank loans on both the intensive and extensive margins and across borrower sizes. Here we examine if CLEs also relate to banks' willingness to participate in government credit support programs. For empirical evidence we turn to the PPP, a large and innovative grant-making program deployed in the early stages of the COVID-19 crisis. We also briefly discuss bank participation in the Main Street Lending Program (MSLP), the Federal Reserve's emergency lending program aimed at supporting the flow of bank credit to small and mid-sized businesses, which was operational between June and December 2020.

Results from the PPP The PPP offered forgivable collateral-free loans to small businesses with fewer than 500 employees with the goal of keeping workers on payroll during the pandemic. The program deployed $521 billion through banks—which received origination fees in addition to the 1% loan interest rate—to more than 5 million small firms between April and August 2020. We examine loans approved between April 3 and the final deadline of August 8 2020.

What risks are associated with granting PPP loans? Loans are forgiven if the borrower presents documentation that it complied with the rules of the program. Thus, PPP loans are in principle risk free from the perspective of the lender, who expects compliant loans to be reimbursed by the SBA in full. However, in reality PPP loans carry some non-negligible risks. For instance, if the borrower fails to comply with the required documentation, SBA may not approve the loan for forgiveness, which means that the credit exposure would remain on the lender's balance sheet. This risk has in fact prompted some banks to sell PPP loan portfolios to nonbanks in anticipation of difficulties with the forgiveness process.[19] Additional sources of uncertainty include the lack of clarity on whether specific loans can be written off (for instance, loans with poor initial self-certification or underwriting errors may not qualify for full forgiveness), some fraud risk, and audit risk.[20]

We aggregate the loan-level data at the bank-state-industry-week level, where state refers to firm's location, and industry is the three-digit NAICS classification. We adopt this approach to average out recording errors that are apparent in the loan-level data and have been widely flagged elsewhere.[21] The sample comprises 384 banks lending to small firms in all states and territories across 107 three-digit NAICS industries and the dependent variable the total PPP loan amount (log). A wide range of interacted fixed effects—borrower

[19] See More banks opt to sell PPP loans as heavy lifting nears (American Banker, August 5, 2020).

[20] There is extensive coverage of these issues in the financial media. See, for instance, PPP loans for billions have fraud risk, Oversight Panel Says (Bloomberg, September 17, 2020) for a discussion of fraud risk. See S.B.A. finds anomalies in hundreds of thousands of small business relief loans (New York Times, January 27, 2020) for a discussion of "data mismatches and eligibility concerns".

[21] See PPP data errors raise questions about effectiveness of stimulus in the Los Angeles Times (July 13, 2020) and Small business coronavirus relief loan database contains some big errors, firms say at CNBC (July 6, 2020).

state×week fixed effects, industry×week fixed effects, and even triple interacted borrower state×industry×week fixed effects—allow shifts in unobserved loan demand to vary across locations and industries every week during the rollout of the program. This is critical for identification given the uneven geographic and sectoral impact of the pandemic (Kaplan, Moll and Violante, 2020). Similar to previous regressions, we include standard bank controls measured at end-2019 (size, capital, ROA, loan/asset ratio, and NPL ratio).

The results are reported in Table 6. We examine total lending volumes for small PPP loans (< \$150,000) in columns 1–3 and large PPP loans (> \$150,000) in column 6, with the expectation—informed by our earlier results—that CLEs should be strongly associated with (risky) lending to very small and opaque businesses. In addition, we study lending volume separately in the first and second rounds of the PPP given the uncertainties that prevailed in the program's rules before the first week of June 2020, when the PPP Flexibilty Act was passed. Following Balyuk, Prabhala and Puri (2020), we separate PPP loans into the first and second rounds using the cutoff date of June 2 2020.[22]

Columns 1–3 of Table 6 show that ex ante CLEs are negatively related to PPP loan amounts to small firms. The stability of coefficients on CLEs across specifications and combinations of fixed effects echo the finding by Granja, Makridis, Yannelis and Zwick (2020) that the heterogeneity across banks in terms of PPP loan granting seems unrelated to differences in underlying loan demand. The point estimate in column 3 indicates that one SD increase in the CLE ratio is associated with PPP small-loan volumes lower by 18%. Given that the average loan volume at bank-state-industry-week level is \$223,000, this implies an economically meaningful reduction of about \$40,000. This effect is drastically smaller in the second phase of the program (columns 4–5), which was marked by more clarity and transparency in program rules and fewer risks for lenders. Finally, the estimate in column 6 shows there is no link between CLEs and the volume of large PPP loans, consistent with our

[22]The PPP Flexibility Act, signed into law on June 2 2020, amended the PPP to give borrowers more flexibility while maintaining full forgiveness. It also reduced the minimum required payroll spending from 75% to 60% of the proceeds and expanded the forgiveness period from 8 to 24 weeks.

previous results that the tightening of credit supply by more exposed banks mainly affected small firms.

Table 6: **Results from the Paycheck Protection Program**

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
	Log(loan amount)					
	Small	**Small**	**Small**	**Round 1**	**Round 2**	**Large**
CLE	-0.0059***	-0.0054**	-0.0055**	-0.0059**	-0.0029*	0.0016
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
Bank controls	yes	yes	yes	yes	yes	yes
Borrower state FE	yes	yes	yes	yes	yes	yes
Borrower industry FE	yes	yes	yes	yes	yes	yes
Week FE	yes	yes	yes	yes	yes	yes
Borrower state×week		yes	yes	yes	yes	yes
Borrower industry×week		yes	yes	yes	yes	yes
Borrower state×industry×week			yes	yes	yes	yes
Observations	308,038	307,981	292,793	227,635	65,158	292,793
R-squared	0.474	0.495	0.528	0.265	0.921	0.425

Note: This table reports regression coefficients on the link between ex ante credit line exposures (CLE) and PPP loan volume. The data are at the bank-state-industry-week level, for 384 banks lending to firms in all states and territories, comprising all loans approved between April 3 and August 8 2020. The dependent variable is log(loan amount); columns 1–3 refer to small PPP loans (<$150,000), columns 4–5 split the sample in loans approved before versus after the June 2 2020 cutoff date marking the approval of the PPP Flexibility Act of 2020, and column 6 referrs to large PPP loans (>$150,000). All specifications include the baseline controls (size, capital ratio, ROA, loan/asset ratio, and NPL ratio) and bank entity dummies (national bank, nonmember bank, and state-member bank). Borrower industry refers to the three-digit NAICS classification. Standard errors are clustered on bank. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Source: U.S. Small Business Administration's PPP loan-level data, Refinitiv's Dealscan, Call Report.

Results from the MSLP We complement the analysis of the PPP with a study of the MSLP, a novel policy program whose goal was to support bank lending to small and medium-sized businesses so they can maintain operations and payroll during the pandemic. While both the PPP and MSLP deployed emergency funds through the banking sector, the MSLP did not offer grants, rather, it offered loans while at the same time removing 95% of the banks' exposure to credit risk (see Minoiu, Zarutskie and Zlate (2021)). The MSLP was operational in the second half of 2020. In Appendix A.1, we show that banks with larger ex ante CLE were less likely to enroll in the program, controlling for a host of bank characteristics. Together with our findings for the PPP, these results reveal a rather unexpected negative association between credit line drawdown risk and banks' willingness to participate in government credit support programs, despite the fact that participation in these programs carried little risk for

the lender.

6 Ruling Out Alternative Explanations

In this section we present additional tests help rule out a number of competing explanations for our main results. Below we discuss each potential threat to the interpretation of our results and the tests we conducted to alleviate these threats.

First, one might worry that more exposed banks curtailed lending in 2020 not because of credit line drawdown risk, but because the same banks were more exposed to industries particularly hit by the pandemic. Such sectors might include contact-intensive industries such as health care, transportation, accommodation and food services, and arts, entertainment and recreation services. As a result, banks may have become more concerned about future loan quality and expected losses. Second, it is possible that banks with more drawdown risk cut lending because they had riskier loan portfolios (legacy assets) to start with. Third, more exposed banks may have had lower deposit inflows than other banks, more difficulty meeting the sudden liquidity demand, and thus might be more cautious in lending decisions.[23]

To alleviate these concerns, we start with new specifications for the supervisory small business lending data for large U.S. banks Y-14 (A.9 Schedule). For each reporting bank we construct three detailed measures of pre-pandemic credit risk in the banks' existing portfolios: the share of credit exposures to COVID-sensitive industries (using the classification from Kaplan, Moll and Violante (2020)), the share of credit exposures to high-yield (HY) borrowers (where the rating refers to banks' internal assessment of risk for its borrowers, and high-yield refers to double-B ratings and below), and the average risk rating of the existing loan portfolio (computed as unweighted or the loan-size weighted average of the

[23]One may raise the additional concern that firms with multiple banking relationships demanded more liquidity from lenders in poor financial health, causing balance sheet pressures and lower subsequent lending. Our main specifications control for this possibility by including end-2019 regulatory capital ratios. In addition, in Figure A3 we show that changes in unused C&I credit are uncorrelated with initial measures of bank financial strength, including capital, liquidity, net charge-offs, and NPL ratios.

numeric internal bank rating across borrowers).[24] The loan-level data to construct these variables—measured at end-2019—come from the Federal Reserve's Y-14 (H.1 Schedule) and refer to banks' large business loan commitments (>$1 million), covering three-quarters of outstanding C&I loan commitments in the U.S. (Favara, Ivanov and Rezende, 2020).

The results in Table 7 show that negative link between ex ante CLEs and small business lending is robust to the inclusion of these controls and that the controls themselves have intuitive signs.[25] In panels A and B, banks' exposures to low-rated firms and to firms in COVID-sensitive industries at end-2019 are negatively related to the number of subsequent small business loan accounts, regardless if we measure the share of exposures on the banks' total *on- and off-balance sheet* loan commitments (columns 1–3) or on the banks' *on-balance sheet* loan utilizations (columns 4–6). Similarly, in panel C, there is a negative association between the average risk rating of banks' loan portfolios at end-2019 and small business lending in 2020; meanwhile, our coefficient estimates for CLE remain unaffected.

Next, across all datasets, we conduct additional tests with conventional measures of asset quality and funding constraints. Specifically, we examine if the coefficients on CLE are robust to controlling for loan loss reserves at end-2020:Q2 and Q3; and the growth rate of deposits over 2019:Q1-2020:Q2 and 2020:Q1-2020:Q3. In anticipation of pandemic-related losses, and in part due to the adoption of the Current Expected Credit Losses (CECL) methodology for computing loan losses over the entire lifetime of loans, U.S. banks set aside record levels of loan loss reserves in 2020, totalling $120 billion at end-2020:Q3. In addition, banks received record deposit inflows in 2020: total commercial bank deposits rose from about $13 trillion in January to $16 trillion by the end of the year (Levine, Lin, Tai and Xie, 2020). The estimates in Tables A5-A8 show that all our main results across different segments of the credit market and borrower sizes are robust to the inclusion of these additional controls.

[24] Numeric rating values range between 1 for triple-A rated firms to 10 for D-rated firms.

[25] For brevity we only show the number of small business loan accounts, but the results for $-commitments are also virtually unchanged.

Table 7: **Robustness—Controlling for Riskiness of Existing Exposures**

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
	# Accounts					
	All	**CLs**	**TLs**	**All**	**CLs**	**TLs**
	A. Control for exposure to COVID-sensitive industries					
	Total exposure			**On BS exposure**		
CLE	-0.0038***	-0.0043***	-0.0033***	-0.0037***	-0.0042***	-0.0032***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% exposure COVID-sensitive industries	-1.4675***	-1.7109***	-0.5718	-1.5589***	-1.7612***	-0.7090
	(0.334)	(0.395)	(0.537)	(0.332)	(0.403)	(0.524)
Observations	4,482	2,747	1,735	4,482	2,747	1,735
R-squared	0.597	0.587	0.661	0.597	0.587	0.661
	B. Control for exposure to HY Borrowers					
	Total exposure			**On BS exposure**		
CLE	-0.0035***	-0.0044***	-0.0024**	-0.0045***	-0.0054***	-0.0032***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% exposure HY borrowers	-0.7748**	-0.5802	-1.0249**	0.2283	0.6121	-0.3035
	(0.312)	(0.418)	(0.452)	(0.312)	(0.420)	(0.460)
Observations	4,482	2,747	1,735	4,482	2,747	1,735
R-squared	0.594	0.582	0.662	0.593	0.582	0.660
	C. Control for average riskiness of loan portfolio					
	Unweighted			**Loan-size weighted**		
CLE	-0.0042***	-0.0051***	-0.0029**	-0.0029***	-0.0037***	-0.0019*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Avg. risk rating of loan portfolio	-0.0610	0.0683	-0.2326	-0.6118***	-0.5581***	-0.6575***
	(0.147)	(0.193)	(0.219)	(0.143)	(0.190)	(0.209)
Observations	4,482	2,747	1,735	4,482	2,747	1,735
R-squared	0.593	0.581	0.660	0.596	0.584	0.663
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Pandemic intensity	Yes	Yes	Yes	Yes	Yes	Yes
Segment × Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table shows that the link between ex ante credit line exposures (CLE) and bank lending outcomes to small businesses (that is, C&I loans with commitment amounts below $1 million) is robust to controlling for additional factors. The data are at the bank-loan portfolio-segment-quarter level over 2020:Q2-2020:Q3. The dependent variable is the number of small business accounts for all loans, credit lines (CL), and term loans (TL) (indicated as column headings). In Panel A, we control for the the share of credit exposures to COVID-sensitive industries, where these industries are identified using the NAICS-based classification from Kaplan, Moll and Violante (2020)). In Panel B we control for the share of credit exposures to high-yield (HY) borrowers, using banks' internal assessment of risk for its borrowers, and high-yield refers to double-B ratings and below. In panel C we control for the average risk rating of the bank's existing loan portfolio, computed as unweighted or the loan-size weighted average of the numeric internal bank rating across borrowers. Numeric rating values range between 1 for triple-A rated firms to 10 for D-rated firms. All these additional controls are measured at end-2019 using data from the Federal Reserve's Y-14 (H.1 Schedule) which comprises banks' large business loan commitments (>$1 million). The specifications are as in Table 4 and include bank controls (size, capital ratio, ROA, loan/asset ratio, and NPL ratio), a proxy for pandemic intensity facing each bank (measured by state-level exposure to COVID-19 cases weighted by the bank's deposit-taking activities in each state), and interacted loan portfolio segment×quarter FE. All variable definitions are as in Table A1. Standard errors are double clustered on bank and loan portfolio segment. * represents significance at the 10% level, ** at 5%, and *** at 1%. Source: Federal Reserve Y-14, FDIC Summary of Deposits, Refinitiv Dealscan, Call Reports, and JHU Center for Systems Science and Engineering.

7 Mechanisms

So far, we have documented a strong and robust negative association between credit line drawdown risk and bank loan supply. Here we explore the potential mechanisms by which credit line exposures may affect lending decisions. What are the key banking frictions driving the crowding-out effect of credit lines? Did banks tighten standards and curtail loan volumes because they were experiencing immediate funding or capital strains? Did the unexpected surge in drawdowns increase awareness about dormant off-balance sheet risks? To study these potentially coexisting channels, we return to the SLOOS microdata on loan officers' motivations for changing C&I lending standards at U.S. banks.

We use information from the following survey question: *"If your bank has tightened its credit standards or its terms for C&I loans or credit lines over the past three months, how important have been the following possible reasons for the change?"*. The respondent is given a list of possible reasons that includes: a deterioration in your bank's current or expected capital or liquidity position, reduced tolerance for risk, a less favorable or more uncertain economic outlook, a worsening of industry specific problems (please specify industries), decreased liquidity in the secondary loan market, less competition from nonbanks, and concerns about changes in the legislative, regulatory, and supervisory landscape. The survey asks the bank to rate each option as not important, somewhat important, or very important.

We focus on the first three possible responses as potential mechanisms by which drawdown risk may impact a bank's willingness to extend loans. For example, the bank's own liquidity and capital positions may deteriorate as off-balance sheet credit exposures move onto the balance sheet (as discussed in Section 2). Similarly, more exposed banks particularly vulnerable to a surge in drawdowns may have become more aware of risks and vulnerabilities associated with their large off balance sheet exposures at the onset of the crisis and decided as a consequence to pull back from risk-taking. The remaining variables can offer additional insight into banks' lending behavior. For instance, decreased liquidity in the secondary loan market may be of particular concern to more exposed banks because these banks are more

likely to underwrite and originate credit lines through the syndicated loan market, and thus more likely to manage their credit exposures and liquidity needs by trading in the secondary loan market. Furthermore, exposed banks may be more worried about an unfavorable economic outlook and industry-specific problems given the change in credit risk profile of the loan portfolio potentially caused by drawdowns.

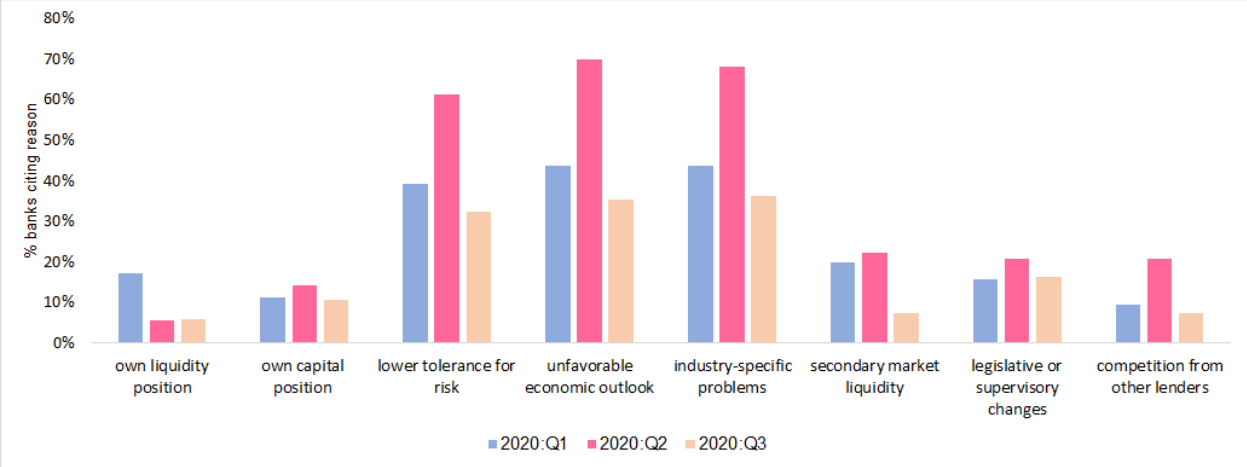
To assess the empirical relevance of the channels, we define dummy variables taking value one for the banks that cited each reason as being "somewhat" or "very" important in their decision to tighten standards (and zero if the bank rated these reasons as not important). The percentage of banks citing any of the available reasons is shown in Figure 3, where we see that only 5%-18% of banks cited a deterioration in the current or expected liquidity and capital position as relevant factors behind their lending decisions in any given quarter.[26] By contrast, substantially larger fractions of banks cited a general reduction in risk tolerance, a more unfavorable or uncertain economic outlook, and a worsening of industry-specific problems. The share of banks citing these factors as leading drivers of their decision to tighten credit standards hovers around 40-45% in 2020:Q1, peaks at 60-70% in 2020:Q2, and comes down to 30-35% in 2020:Q3.

Next, we examine how the likelihood of citing each factor loads on ex ante bank exposure to drawdown risk. To this end, we pool the responses across the surveys conducted during 2020:Q1-Q3 in a bank-level Panel And regress the dummy variables capturing our hypothesized channels on CLE and the standard controls (bank size, capital, ROA, loans/asset ratio, NPL ratio) as well as two "loan demand" dummmy variables for banks that reported an increase in loan demand from small or large firms. The results are reported in Table 8 for the full period and by quarter. The estimated coefficients on CLE in columns 1–3 are statistically significant and suggest that liquidity and risk aversion may have induced

[26]Drawdown risk significantly affected banks' reserve management in the early phase of the pandemic. In the Federal Reserve's September 2020 Senior Financial Officer Survey, available on https://www.federalreserve.gov/data/sfos/files/senior-financial-officer-survey-202009.pdf, 70% of respondents indicated that the need to be prepared for potential drawdowns on committed credit lines was an important or very important driver that led to their higher reserve balances during March-April 2020 compared to February 2020.

exposed banks to tighten credit standards, but capital did not.

Figure 3: **Reasons for Tightening Lending Standards in 2020**



Note: This figure depicts the percentage of domestic banks that rated each of six reasons as a "somewhat" or a "very" important reason for tightening lending standards or the terms on new C&I loans or credit lines. The survey addresses changes in the bank lending standards and terms over the quarter. Source: Federal Reserve Senior Loan Officer Opinion Survey (SLOOS).

When we unpack the coefficients by quarter (columns 4–6 in Table 8), we find that liquidity constraints had a short-lived effect on the decision to tighten standards at more exposed banks, as the coefficient is only significant in 2020:Q1, during the most acute phase of the drawdowns. By contrast, the coefficient on CLE are statistically insignificant in 2020:Q1 and Q2, and if anything it turns negative and significant in Q3, suggesting no role for capital. Consistent with these findings, in Table A9 we show that the baseline coefficients on CLE for the sample of syndicated loans and survey data do not vary across banks with high versus low initial capital; if anything, the negative relation between CLE and lending outcomes is often larger for high-capital banks. These results reinforce the survey-based evidence that liquidity and capital do not appear to be binding constraints in banks' lending decisions. These results are also not surprising given that banks had strong financials before the crisis, received large inflows of deposits in 2020, and may have additionally benefited from central bank liquidity injections and regulatory relief (Li, Strahan and Zhang, 2020). Importantly, the estimates on CLE in column 6 of Table 8 suggest that a decline in risk tolerance plays

a role in the tightening of lending standards at more exposed banks, suggesting that risk aversion may be the key friction behind our results.

Table 8: **Exploring the Mechanisms: Evidence from Survey Data**

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	**Bank cites the following reason for tightening C&I lending standards:**					
	own liquidity position	**own capital position**	**lower tolerance for risk**	**own liquidity position**	**own capital position**	**lower tolerance for risk**
	A. Full period (2020:Q1-Q3)			**B. By Quarter**		
CLE	0.0009**	-0.0008*	0.0053***			
	(0.000)	(0.000)	(0.001)			
CLE × 2020:Q1				0.0030**	-0.0002	0.0036**
				(0.001)	(0.001)	(0.002)
CLE × 2020:Q2				0.0001	-0.0006	0.0084***
				(0.000)	(0.000)	(0.002)
CLE × 2020:Q3				-0.0002	-0.0013*	0.0036*
				(0.000)	(0.001)	(0.002)
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Loan demand	Yes	Yes	Yes	Yes	Yes	Yes
Observations	129	125	129	129	125	129
R-squared	0.127	0.055	0.215	0.265	0.063	0.275

Note: This table reports regression coefficients on the link between ex ante credit line exposures (CLE) and the probability that banks cited the reasons listed as column headings as important in their decision to tighten C&I lending standards and terms. The data are at the bank-level and are stacked across the three surveys between 2020:Q1 and 2020:Q3. The dependent variable is a dummy variable taking value one if the respondent cited each of the six terms listed as a "'somewhat" or a "very" important possible reason for tightening standards or terms of C&I loans or credit lines. (The banks are asked to rate each possible reason using the following scale: 1=not important, 2=somewhat important, 3=very important.) The survey addresses changes in the bank credit standards and terms over the past quarter. All regressions include the baseline controls from Table 3, with the only difference that we include two dummies for loan demand strengthening at both large and small firms, as the survey questions on reasons for changing lending standards are for loans to all borrowers. The sample contains only those banks that reported tightening lending standards and also cited specific reasons for doing so. Regression estimates are weighted by bank size. Standard errors clustered on bank. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Source: Senior Federal Reserve Senior Loan Officer Opinion Survey (SLOOS), Refinitiv's Dealscan, Call Report.

In Table A10 we examine the correlation between the remaining reasons for tightening and bank exposure. The positive and significant coefficient estimate on CLE in column 1 suggests that secondary loan market illiquidity contributed to the tightening of lending standards in 2020:Q1 at more exposed banks. Higher-CLE banks are more likely to use the secondary loan market as a liquidity management tool by trading syndicated credits during periods of stress. Irani and Meisenzahl (2017) show that funding-strained banks "fire-sold" loan exposures to meet unexpected liquidity needs, generating secondary market price and liquidity pressures in this market during the 2008 financial crisis. However, this

channel became muted in the following quarters as conditions normalized across financial markets. By contrast, more exposed banks were no more likely to tighten standards because of worries about the economic outlook or industry-specific problems (columns 2–3) than were other banks. Finally, more exposed banks were, if anything, relatively less likely to cite legislative, regulatory, or supervisory changes; or competition from nonbanks as reasons for tightening credit standards.

Overall, our survey-based evidence suggests that a general rise in risk aversion in the face of dormant off-balance sheet risks materializing in a short amount of time and potentially creating a range of balance sheet strains appear to have led banks to pull back from lending. These results speak to the findings of Liu and Stebunovs (2021) that during periods of expansionary monetary policy banks increase risk-taking by issuing credit lines to risky borrowers, but price them to make drawdowns unattractive, in the hope that they remain undrawn. Some banks have lower capital buffers and are thus less well prepared for generalized drawdowns in a systemic stress episode. The COVID-19 crisis highlighted the vulnerabilities for credit intermediation associated with massive credit line drawdowns that awaken off-balance sheet risks, even when banks enter the crisis with strong balance sheets.

8 Conclusions

In this paper we highlight the tension that can arise during economic crises between banks' fulfillment of their fundamental function of liquidity insurance and that of supplying credit. To this end, we exploit the sudden and large corporate credit line drawdowns that occurred in the early phase of the COVID-19 pandemic as a shock to bank balance sheets and their subsequent willingness to take risk. We start by constructing a measure of ex ante exposure to the risk of credit line drawdowns and examine its link with banks' subsequent lending decisions across several segments of the loan market and borrowers of different sizes.

Our results document a close link between drawdown risk and banks' willingness to supply

new credit during a crisis. We show that banks with larger ex ante credit line exposures reported tighter lending standards on new C&I loans to small and large firms, and curtailed the supply of large syndicated loans and small business loans since March 2020. Results are stronger for lending to small firms, suggesting a negative externality from large firms' credit line drawdowns. Exposed banks were also less likely to participate in government-sponsored credit programs with very low risk of lending.

Our findings suggest that tension can arise during crises between banks' providing liquidity insurance to firms while continuing to intermediate credit, with important implications for fiscal and monetary policies where the banking sector plays a key intermediary role. Our analysis suggests that banks' exposure to precommited credit can constrain credit provision after unexpected surges in drawdowns. The resulting pullback from risk-taking can, in turn, diminish the effectiveness of public policies that channel subsidized credit to firms through the banking system. Whether government policies can mitigate the *aggregate* negative effects of credit line drawdowns is an important area for future research.

Our results also have implications for financial stability policies, in particular, stress testing. For instance, in light of the substantial credit line utilization rates in March and April 2020, especially in sectors severely hit by the pandemic, the "stressed" drawdown assumptions used in the Basel 3 liquidity coverage ratio (LCR) calculation may need to be tightened. Currently, the LCR assumes a 10% drawdown rate of the undrawn portion of existing credit lines—a figure calibrated on the experience of the global financial crisis. The COVID-19 crisis showed that significantly larger drawdown rates may be warranted.[27]

[27] We arrive at a conservative estimate for drawdown rates in the 20% to 30% range as follows. According to the Federal Reserve's May 2020 Financial Stability Report (https://www.federalreserve.gov/publications/financial-stability-report.htm), at end-December 2019 the nonfinancial corporate sector had credit lines of $2.558 trillion with utilization rate of 31%, implying that the undrawn portion of credit lines was $1.765 trillion. Based on data from S&P Global Market Intelligence, Leveraged Commentary and Data, total drawdowns during March-June 2020 at public firms and large private firms that submit 8-K regulatory filings at the SEC, amounted to $331 billion. This is likely an underestimate because it excludes drawdowns by smaller private firms. An analysis of supervisory data on small business lending from the largest U.S. banks suggests that drawdowns from small firms were negligible at large banks (Chodorow-Reich, Darmouni, Luck and Plosser, 2021) but they may have been larger at regional banks. Li, Strahan and Zhang (2020) use balance sheet data for more than 800 banks from the Federal Reserve's H.8 data release to estimate a total drawdown amount closer to $500 billion. Therefore, a plausible range for the actual

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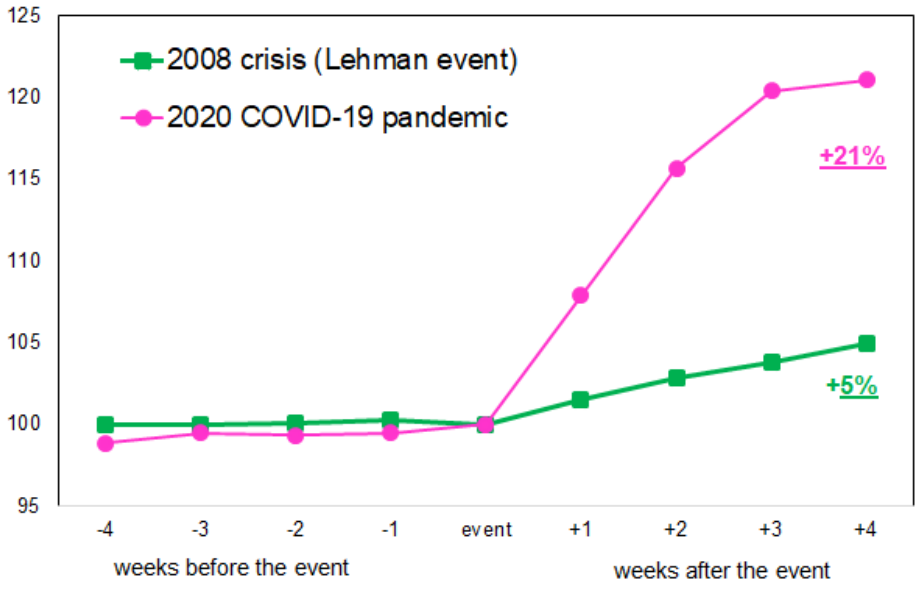
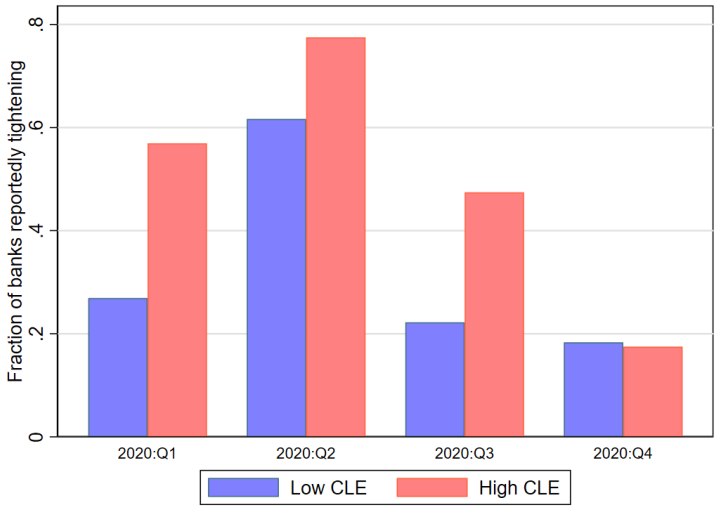
Internet Appendix

Figure A1: **Credit Line Drawdowns: COVID-19 vs. Lehman Event**

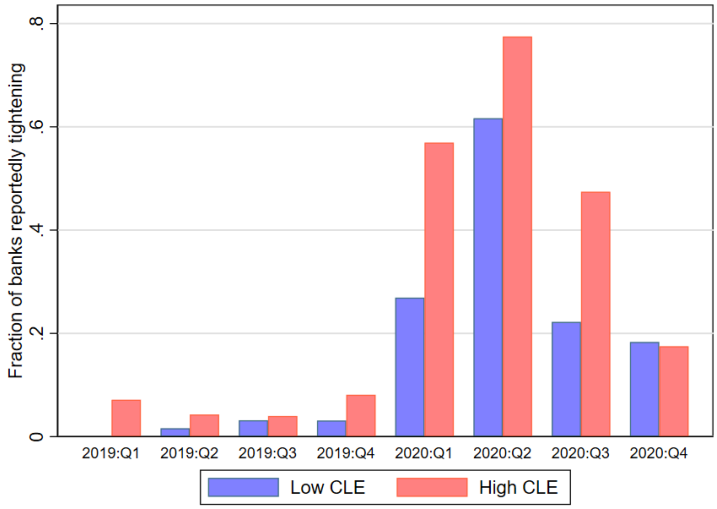


Note: This figure depicts the historically large credit line drawdowns during the COVID-19 crisis compared to the 2008 Lehman event. In the four weeks starting on 9/17/2008 (Lehman event) C&I lending at U.S. domestic banks grew by 5% vs. 21% in the four weeks starting on 3/11/2020 (national emergency declaration for COVID-19). C&I loan balances are normalized at 100 in the week of the event. Source: Federal Reserve Board's "Assets and Liabilities of Commercial Banks in the United States"—H.8 data release; S&P Global Market Intelligence, Leveraged Commentary and Data (LCD).

Figure A2: **Credit Line Exposure and C&I Lending Standards**



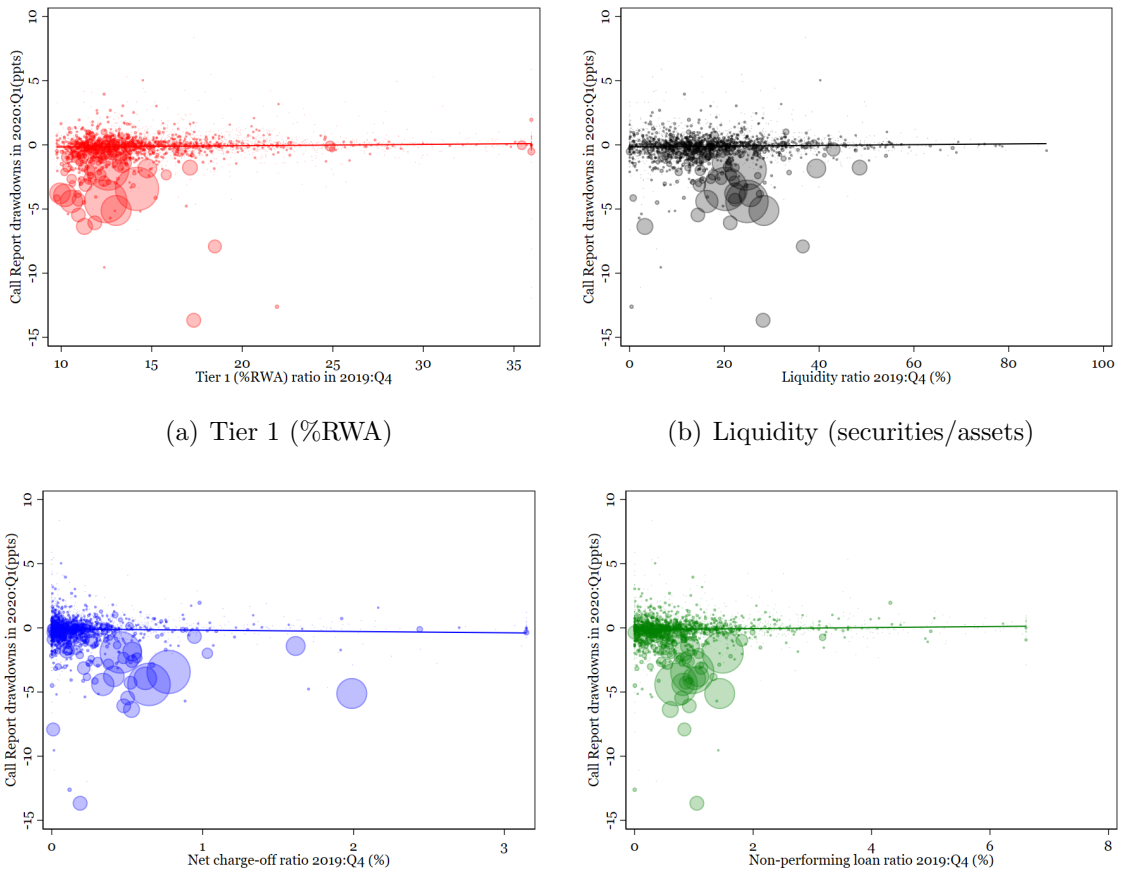
(a) Baseline: 2020



(b) Placebo: 2019

Note: This figure shows the fraction of banks reporting that they tightened lending standards on C&I loans to large or small firms each quarter over 2020 (Panel A) and 2019–2020 (Panel B) by high/low CLE size (above/below mean). The year 2020 is the baseline period in the analysis and the year 2019 serves as a placebo. Source: Senior Federal Reserve Senior Loan Officer Opinion Survey (SLOOS), Refinitiv's Dealscan, Call Report.

Figure A3: **Credit Line Drawdowns and Initial Bank Health**



(a) Tier 1 (%RWA)

(b) Liquidity (securities/assets)

(c) Net Charge-Offs (% gross loans)

(d) Non-Performing Loans (% gross loans)

Note: This figure depicts the lack of correlation between credit line drawdowns measured as the change in unused loan commitments (% total bank assets) between 2019:Q4 and 2020:Q1 (in ppts), and initial bank health (measured at end-2019:Q4). Bank health is measured with four metrics: Tier 1 ratio (Panel A), liquidity (securities-to-asset) ratio (Panel B), net charge-offs (panel c), and non-performing loan ratio (panel d). The sample comprises all banks with available data. In all panels, bubble size is proportionate to bank size. Source: Call Report.

Table A1: **Descriptive Statistics for Selected Variables**

	N	Mean	St. Dev.	p25	p50	p75
	A. Dealscan large business loan sample					
CLE (% assets), all banks	102	8.02	8.32	2.04	4.70	12.06
CLE (% assets), GSIBs	30	8.38	5.71	3.66	8.00	13.02
CLE (% assets), non-GSIBs	72	7.87	9.22	1.78	3.33	10.75
CLE (% assets)*	2735	12.06	8.03	5.78	9.36	16.89
1: GSIB	2735	0.61	0.49	0.00	1.00	1.00
Size (log-assets)	2735	27.62	0.94	26.98	27.70	28.45
Capital ratio	2735	14.31	2.33	12.84	13.90	15.93
ROA	2735	0.70	0.44	0.32	0.69	1.06
Loans/Assets	2735	48.12	13.88	37.82	48.69	59.98
NPL ratio	2732	1.66	1.47	0.78	1.14	2.23
Loan growth (%)	2735	67.83	199.61	-48.06	-0.55	89.50
Probability(Loan renewal)	8873	0.20	0.40	0.00	0.00	0.00
Probability(CL renewal with CL)	14097	0.15	0.36	0.00	0.00	0.00
	B. Y-14 small business loan sample					
CLE (% assets)	4482	54.73	75.57	10.44	23.69	65.54
Size (log-assets)	4482	5.37	0.96	4.69	5.11	5.99
Capital ratio	4482	12.20	1.63	10.95	12.17	13.03
ROA	4482	1.24	0.20	1.07	1.25	1.36
Loans/Assets	4482	63.50	9.62	60.58	66.08	70.09
NPL ratio	4482	1.80	0.85	1.34	1.44	1.68
Pandemic intensity	4482	27.12	5.64	23.29	25.11	32.43
No. small business accounts (mn)	4482	912.78	4653.94	0.00	2.00	27.00
Log-No. small business accounts	4482	2.18	2.63	0.00	1.10	3.33
$ Commitments (credit lines)	4396	67.50	633.87	0.00	0.07	1.02
Log-$ Commitments (credit lines)	4396	0.81	1.62	0.00	0.07	0.70
	C. Survey data from SLOOS					
CLE (% assets), stacked surveys	190	19.657	35.145	1.382	5.33	23.927
	D. PPP sample					
CLE (% assets)	308766	18.66	32.77	1.29	9.23	23.69
Loan amount	359381	223764	1884220	4100	33330	119692
Log-Loan amount	359381	8.59	4.77	8.32	10.41	11.69

Note: This table reports descriptive statistics for selected variables used in the regression analysis. In Panel A we refer to the cross-section of 102 lenders in Dealscan (Section 5.1). Loan volume growth is computed at the bank-firm cluster level (where firm clusters include all borrowers in the same country and three-digit SIC industry) and represents the growth rate of average lending volumes between 2019 and 2020:Q2-Q3. All bank balance sheet variables are defined at end-2019, wiht the exception of pandemic intensity variable which is measured as the cumulative number of COVID-19 infections between March and July 2020 aggregated at the bank level using the share of each state in the bank's total deposits. GSIB refers to a dummmy variable for 30 global systematically important banks according to the BIS, see https://www.bis.org/bcbs/gsib/. In Panel B the variable refers to the large U.S. banks reporting supervisory small business lending data to the FR Y-14 (A.9 Schedule). The data are at the bank-loan portfolio segment level, where loan portfolio segment is a set of loans that are grouped together based on borrower risk metrics (FICO score and delinquency status) and loan terms (maturity and collateral requirements) (see Section 3). In panel C, summary statistics for CLE are for the pooled sample of SLOOS surveys in 2020. In panel D the loan-level data are aggregated (summing up loan amounts) at the bank-state-industry-week level (where industry is given by three-digit NAICS classification), for 384 banks lending to firms in all states and territories. The data comprise all PPP loans approved between April 3 and August 8 2020. The CLE measure across is computed from Dealscan credit line data, described in detail in Section 4.

Table A2: **Results for Small Business Loans: Terms of Lending**

Dependent variables:	(1)	(2)	(3)	(4)	(5)	(6)
	# Accounts			**$ Commitments**		
	All	**CLs**	**TLs**	**All**	**CLs**	**TLs**
			A. Collateral requirements			
CLE × Unsecured (1)	-0.0054***	-0.0066***	-0.0034***	-0.0019***	-0.0019***	-0.0017***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
CLE × Secured (2)	-0.0032***	-0.0033***	-0.0035**	-0.0005	-0.0006	-0.0002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	4,482	2,747	1,735	4,403	2,745	1,658
R-squared	0.594	0.584	0.660	0.639	0.626	0.666
p-value t-test Ha: |1| > |2|	0.006	0.001	0.498	0.002	0.014	0.046
			B. Loan maturity			
CLE × Maturity>3 yrs (1)	-0.0043***	-0.0049***	-0.0035***	-0.0014***	-0.0013**	-0.0015**
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
CLE × Maturity<3 yrs (2)	-0.0043***	-0.0050***	-0.0034***	-0.0010*	-0.0012*	-0.0005
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	4,482	2,747	1,735	4,403	2,745	1,658
R-squared	0.593	0.581	0.660	0.638	0.625	0.665
p-value t-test Ha: |1| > |2|	0.487	0.436	0.485	0.205	0.444	0.119
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Pandemic intensity	Yes	Yes	Yes	Yes	Yes	Yes
Segment × Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports regression coefficients on the link between ex ante credit line exposures (CLE) and bank loan terms to small businesses (that is, C&I loans with commitment amounts below $1 million), focusing on collateral requirements (Panel A) and loan maturity (Panel B). The data are at the bank-loan portfolio-segment-quarter level over 2020:Q2-2020:Q3. Dependent variables are the number of small business accounts (columns 1–3) and $ commitments on the segment (columns 4-6) (both log-transformed). These variables are available for all loans and separately for credit lines (CL) and term loans (TL). All specifications include bank controls (size, capital ratio, ROA, loan/asset ratio, NPL ratio), a proxy for pandemic intensity facing each bank (measured by state-level exposure to COVID-19 cases weighted by the bank's deposit-taking activities in each state), and interacted loan portfolio segment×quarter FE. All variable definitions are as in Table A1. Standard errors are double clustered on bank and loan portfolio segment. * represents significance at the 10% level, ** at 5%, and *** at 1%. Source: Federal Reserve Y-14, FDIC Summary of Deposits, Refinitiv Dealscan, Call Reports, and JHU Center for Systems Science and Engineering.

Table A3: **Results for Small Business Loans: 2020:Q4 Data and Effects by Quarter**

Dependent variables:	(1)	(2)	(3)	(4)	(5)	(6)
	# Accounts			**$ Commitments**		
	All	**CLs**	**TLs**	**All**	**CLs**	**TLs**
			A. Baseline with data through 2020:Q4			
CLE	-0.0051***	-0.0067***	-0.0034***	-0.0014***	-0.0019***	-0.0010
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Observations	6,977	3,664	1,735	6,856	3,666	1,658
R-squared	0.587	0.589	0.660	0.632	0.633	0.665
			B. Baseline CLE effect by quarter			
CLE×2020:Q2	-0.0010	-0.0020*	0.0002	0.0003	-0.0001	0.0010
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
CLE×2020:Q3	-0.0055***	-0.0059***	-0.0049***	-0.0016***	-0.0016***	-0.0015**
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
CLE×2020:Q4	-0.0060***	-0.0067***	-0.0050***	-0.0018***	-0.0019***	-0.0016**
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Observations	6,977	4,280	2,697	6,856	4,279	2,577
R-squared	0.589	0.575	0.657	0.633	0.619	0.662
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Pandemic intensity	Yes	Yes	Yes	Yes	Yes	Yes
Segment × Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports regression coefficients on the link between ex ante credit line exposures (CLE) and bank lending outcomes to small businesses (that is, C&I loans with commitment amounts below $1 million) in an expanded sample covering 2020:Q2-Q4 (that is, one additional quarter compared to the baseline in Table 4 (Panel A) and by quarter (Panel B). The data are at the bank-loan portfolio-segment-quarter level over 2020:Q2-2020:Q4. Dependent variables are the number of small business accounts (columns 1–3) and $ commitments on the segment (columns 4-6) (both log-transformed). These variables are available for all loans and separately for credit lines (CL) and term loans (TL). All specifications include bank controls (size, capital ratio, ROA, loan/asset ratio, NPL ratio), a proxy for pandemic intensity facing each bank (measured by state-level exposure to COVID-19 cases weighted by the bank's deposit-taking activities in each state), and interacted loan portfolio segment×quarter FE. All variable definitions are as in Table A1. Standard errors are double clustered on bank and loan portfolio segment. * represents significance at the 10% level, ** at 5%, and *** at 1%. Source: Federal Reserve Y-14, FDIC Summary of Deposits, Refinitiv Dealscan, Call Reports, and JHU Center for Systems Science and Engineering.

Table A4: **Results from Survey Data: Terms of New Loans**

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Bank tightened the following terms on new C&I loans:							
	maximum size of credit lines	maximum maturity	costs of credit lines	loan spreads	premiums on risky loans	loan covenants	collateral requirements	interest rate floors
				A. To Small Firms				
CLE	-0.0349	0.1126	0.5933***	0.4284***	0.2019**	-0.0815	-0.0426	0.4615***
	(0.100)	(0.116)	(0.153)	(0.114)	(0.084)	(0.093)	(0.090)	(0.147)
Observations	129	129	128	129	129	129	127	128
R-squared	0.273	0.135	0.434	0.210	0.162	0.304	0.302	0.505
				B. To Large Firms				
CLE	0.1170	0.2376**	0.1944*	0.2060*	0.1166	0.1268	0.1372	-0.0034
	(0.114)	(0.091)	(0.110)	(0.115)	(0.115)	(0.109)	(0.107)	(0.094)
Observations	138	137	137	138	138	137	136	138
R-squared	0.075	0.202	0.134	0.176	0.070	0.098	0.157	0.131
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan demand	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports regression coefficients on the link between ex ante credit line exposures (CLE) and the probability that banks report tightening several terms (indicated as column headings) on new C&I loans based on survey responses. The data are at the bank-level over 2020:Q1–2020:Q3. The dependent variable is a dummy variable taking value one if the bank reported that they somewhat or considerably tightened standards on new C&I loans and credit lines over the quarter. In Panel A the responses refer to small firms (with annual sales below $50 million) and in Panel B the responses refer to large and middle-market firms. All specifications include bank controls (size, capital ratio, ROA, loan/asset ratio, and NPL ratio) and "Loan demand", a variable that takes value one if the banks reported a substantial or moderate strengthening of loan demand over the quarter from each type of firm (small or large). All variable definitions are as in Table A1. Regression estimates are weighted by bank size. Standard errors clustered on bank. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Source: Federal Reserve Senior Loan Officer Opinion Survey (SLOOS), Refinitiv's Dealscan, Call Report.

Table A5: **Robustness—Controlling for Loan Loss Reserves in Small Business Lending and Survey-based Specifications**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variables:	**# Accounts**						**Bank tightened lending standards on new C&I loans in to small firms:**			
	All	**CLs**	**TLs**	**All**	**CLs**	**TLs**				
	2020:Q2-Q3						**2020:Q2**	**2020:Q3**	**2020:Q2**	**2020:Q3**
CLE	-0.0056***	-0.0054***	-0.0058***	-0.0062***	-0.0060***	-0.0063***	0.0066***	0.0033**	0.0066***	0.0032**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Loan loss reserves 2020:Q2	-0.5095***	-0.1831	-0.8580***				15.5962	61.3163		
	(0.103)	(0.136)	(0.150)				(34.421)	(44.690)		
Loan loss reserves 2020:Q3				-0.7021***	-0.4075***	-0.9878***			9.8116	87.7285*
				(0.111)	(0.152)	(0.160)			(40.047)	(49.901)
Observations	4,482	2,747	1,735	4,482	2,747	1,735	45	42	45	42
R-squared	0.597	0.582	0.671	0.599	0.583	0.673	0.613	0.243	0.611	0.296
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan demand							Yes	Yes	Yes	Yes
Pandemic intensity	Yes	Yes	Yes	Yes	Yes	Yes				
Segment×Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes				

Note: This table shows that the link between ex ante credit line exposures (CLE) and bank lending outcomes to small businesses (in the FR Y-14 data and SLOOS survey data) is robust to controlling for loan loss reserves (% of gross loans). The data are at the bank-loan portfolio-segment-quarter level over 2020:Q2-2020:Q3 in columns 1–6 and at the bank-level in columns 7–10. Dependent variables are the number of small business accounts (all loans, credit lines (CL), and term loans (TL), and respectively a dummy variable taking value one for banks that report tightening lending standards on new C&I loans to small firms (and zero otherwise). The specifications in columns 1–6 have the same bank controls and fixed effects as in Table 4 and the specifications in columns 7–10 have the same controls and fixed effects (and are weighted by bank size) as in Table 5. All variable definitions are as in Table A1. Standard errors are double clustered on bank and loan portfolio segment in columns 1–6 and on bank in columns 7–10. * represents significance at the 10% level, ** at 5%, and *** at 1%. Source: Federal Reserve Y-14, Federal Reserve Senior Loan Officer Opinion Survey, FDIC Summary of Deposits, Refinitiv Dealscan, Call Reports, and JHU Center for Systems Science and Engineering.

Table A6: **Robustness—Controlling for Deposit Growth in Small Business Lending and survey-based Specifications**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variables:	**# Accounts**						**Bank tightened lending standards on new C&I loans in to small firms:**			
	All	**CLs**	**TLs**	**All**	**CLs**	**TLs**				
	2020:Q2-Q3						**2020:Q2**	**2020:Q3**	**2020:Q2**	**2020:Q3**
CLE	-0.0023***	-0.0023**	-0.0027***	-0.0040***	-0.0044***	-0.0034***	0.0067***	0.0040*	0.0067***	0.0042**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Deposit growth 2019:Q4-2020:Q2	-7.5550***	-9.6563***	-3.2879***				-0.4779	2.3088		
	(0.898)	(1.213)	(1.232)				(13.923)	(18.580)		
Deposit growth 2020:Q1-2020:Q3				-4.7141***	-5.9314***	-0.7851			0.5317	14.1936
				(0.997)	(1.320)	(1.419)			(12.628)	(22.229)
Observations	4,482	2,747	1,735	4,482	2,747	1,735	45	42	45	42
R-squared	0.607	0.604	0.663	0.597	0.588	0.660	0.610	0.161	0.610	0.178
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan demand							Yes	Yes	Yes	Yes
Pandemic intensity	Yes	Yes	Yes	Yes	Yes	Yes				
Segment x Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes				

Note: This table shows that the link between ex ante credit line exposures (CLE) and bank lending outcomes to small businesses (in the FR Y-14 data and SLOOS survey data) is robust to controlling for deposit growth (the growth rate of total customer deposits). The data are at the bank-loan portfolio-segment-quarter level over 2020:Q2-2020:Q3 in columns 1–6 and at the bank-level in columns 7–10. Dependent variables are the number of small business accounts (all loans, credit lines (CL), and term loans (TL), and respectively a dummy variable taking value one for banks that report tightening lending standards on new C&I loans to small firms (and zero otherwise). The specifications in columns 1–6 have the same bank controls and fixed effects as in Table 4 and the specifications in columns 7–10 have the same controls and fixed effects (and are weighted by bank size) as in Table 5. All variable definitions are as in Table A1. Standard errors are double clustered on bank and loan portfolio segment in columns 1–6 and on bank in columns 7–10. * represents significance at the 10% level, ** at 5%, and *** at 1%. Source: Federal Reserve Y-14, Federal Reserve Senior Loan Officer Opinion Survey, FDIC Summary of Deposits, Refinitiv Dealscan, Call Reports, and JHU Center for Systems Science and Engineering.

Table A7: **Robustness—Controlling for Loan Loss Reserves and Deposit Growth in PPP Lending Specifications**

Dependent variable:	(1)	(2)	(3)	(4)
	Log(loan amount)			
	Small	**Small**	**Small**	**Small**
CLE	-0.0055**	-0.0056**	-0.0053**	-0.0061***
	(0.002)	(0.002)	(0.002)	(0.002)
Deposit growth 2019:Q4-2020:Q2	0.0025			
	(0.005)			
Deposit growth 2020:Q1-2020:Q3		-0.0180*		
		(0.009)		
Loan loss reserves 2020:Q2			-0.1811	
			(0.161)	
Loan loss reserves 2020:Q3				-0.6718**
				(0.311)
Observations	290,269	290,269	290,269	290,269
R-squared	0.530	0.533	0.530	0.532
Bank controls	yes	yes	yes	yes
Borrower state FE	yes	yes	yes	yes
Borrower industry FE	yes	yes	yes	yes
Week FE	yes	yes	yes	yes
Borrower state×*week	yes	yes	yes	yes
Borrower industry×week	yes	yes	yes	yes
Borrower state×industry×week	yes	yes	yes	yes

Note: This table shows that the link between ex ante credit line exposures (CLE) and PPP loan volume (for small loans <$150,000) is robust to controlling for deposit growth (the growth rate of total customer deposits) and loan loss reserves (% gross loans). The data are at the bank-state-industry-week level, for 384 banks lending to firms in all states and territories, comprising all loans approved between April 3 and August 8 2020. The dependent variable is log(loan amount). All specifications include bank controls (size, capital ratio, ROA, loan/asset ratio, and NPL ratio), and bank entity dummies (national bank, nonmember bank, and state-member bank). Standard errors are clustered on bank. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Source: U.S. Small Business Administration's PPP loan-level data, Refinitiv's Dealscan, Call Report.

Table A8: **Robustness—Controlling for Loan Loss Reserves and Deposit Growth in Large Business Loan (Dealscan) Lending Specifications**

Dependent variables:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Loan growth in 2020:Q2				**Loan growth in 2020:Q2 and Q3**			
	All	**All**	**All**	**All**	**All**	**All**	**All**	**All**
CLE	-1.4447*		-1.4654*		-1.4476*		-1.4629*	
	(0.825)		(0.802)		(0.829)		(0.806)	
CLE × U.S. bank		-1.7857*		-1.8737**		-1.7909*		-1.8760**
		(0.959)		(0.845)		(0.964)		(0.849)
CLE × non-U.S. bank		-0.8669		-0.8612		-0.8659		-0.8514
		(0.794)		(0.798)		(0.801)		(0.803)
Deposit growth 2019:Q4-2020:Q2	0.7416	0.7037			0.7491	0.7110		
	(0.494)	(0.474)			(0.496)	(0.477)		
Loan loss reserves 2020:Q2			1.2979	2.2512			1.3378	2.3024
			(4.212)	(4.417)			(4.252)	(4.458)
Observations	1,705	1,705	1,962	1,962	1,705	1,705	1,962	1,962
R-squared	0.604	0.604	0.599	0.600	0.604	0.604	0.599	0.600
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm country×industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table shows that the link between ex ante credit line exposures (CLE) and syndicated loan volume is robust to controlling for deposit growth (the growth rate of total customer deposits) and loan loss reserves (% gross loans). The dependent variable is the growth rate of average loan volume in 2020:Q2 or 2020:Q2-Q3 ("after") compared to 2019 ("before"). The sample includes all bank-firm pairs for which firms borrow from at least two banks both in the "before" and "after" periods. Loans granted in 2020:Q1 are dropped from the sample. All specifications include bank controls (size, capital ratio, ROA, loan/asset ratio, and NPL ratio) measured at end-2019 and firm cluster fixed effects, where clusters are given by all firms in the same country and industry (given by three-digit SIC classification). We examine robustness only to deposit growth and loan loss reserves upto 2020:Q2 as later data is not available for Canadian and Japanese banks at the time of writing in Fitch Connect. Standard errors are clustered on bank. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Sources: Refinitiv Dealscan, Fitch Connect.

Table A9: **Exploring the Role of Capital: Evidence from Large Business Loans and Survey Data**

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variables:	**Loan growth in 2020:Q2**			**Loan growth in 2020:Q2-Q3**		
	All	**All**	**GSIB**	**All**	**All**	**GSIB**
	A. Large business loan data					
CLE × Low capital	-2.2974**	-0.7493	-2.0571**	-2.2792**	-0.7136	-1.8878*
	(0.912)	(0.849)	(1.004)	(0.902)	(0.818)	(0.955)
CLE × High capital	-2.7326**	-2.5001***	-2.4219**	-2.7128**	-2.3744***	-2.1863**
	(1.223)	(0.914)	(0.918)	(1.177)	(0.861)	(0.824)
Observations	2,702	2,348	1,500	2,735	2,374	1,519
R-squared	0.019	0.637	0.674	0.019	0.631	0.669
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm country × industry		Yes	Yes		Yes	Yes
	B. Survey data					
Dependent variable:	**Bank tightened lending standards to:**					
	Small firms			**Large firms**		
	2020:Q1	**2020:Q2**	**2020:Q3**	**2020:Q1**	**2020:Q2**	**2020:Q3**
CLE × Low capital	0.0085***	0.0085	0.0024	0.0037	-0.0040	0.0031
	(0.003)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)
CLE × High capital	0.0055***	0.0059***	0.0047***	0.0036*	0.0027	-0.0039**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	42	45	42	44	48	45
R-squared	0.371	0.614	0.166	0.288	0.115	0.318
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Loan demand	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports regression coefficients on the link between ex ante credit line exposures (CLE) and syndicated loan growth (Panel A) and the probability that banks tightened lending standards and terms on new C&I loans and credit lines (Panel B) by level of initial banks capital. Low/high capital is defined as below/above median level of regulatory capital ratio (Tier1/RWA) in 2019:Q4. The specifications in Panel A correspond to specifications 1, 2, and 4 in baseline Table 2, with the same controls and fixed effects. The specifications in Panel B correspond to specifications 1,2, and 3 in in baseline Table 5. We do not include similar specifications for small business lending data because of the extremely small sample of 21 banks. Standard errors clustered on bank. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Source: Senior Federal Reserve Senior Loan Officer Opinion Survey (SLOOS), Refinitiv's Dealscan, Call Report.

Table A10: **Additional Evidence from Survey Data**

Dependent variable:	(1)	(2)	(3)	(4)	(5)
	Bank cites the following reason for tightening C&I lending standards:				
	secondary market liquidity	**unfavorable economic outlook**	**industry-specific problems**	**legislative / supervisory changes**	**competition from other lenders**
CLE × 2020:Q1	0.0040**	0.0020	0.0027	-0.0007***	-0.0012*
	(0.002)	(0.002)	(0.002)	(0.000)	(0.001)
CLE × 2020:Q2	0.0021	0.0031	-0.0004	-0.0009***	-0.0012
	(0.002)	(0.002)	(0.001)	(0.000)	(0.001)
CLE × 2020:Q3	-0.0001	0.0012	-0.0006	-0.0009***	-0.0018
	(0.001)	(0.002)	(0.001)	(0.000)	(0.001)
Bank controls	Yes	Yes	Yes	Yes	Yes
Loan demand	Yes	Yes	Yes	Yes	Yes
Observations	129	128	128	129	129
R-squared	0.159	0.378	0.377	0.123	0.082

Note: This table reports regression coefficients on the link between ex ante credit line exposures (CLE) and the probability that banks cited the reasons listed as column headings as important in their decision to tighten C&I lending standards and terms. The data are at the bank-level and are stacked across the three surveys between 2020:Q1 and 2020:Q3. The dependent variable is a dummy variable taking value one if the respondent cited each of the six terms listed as a "'somewhat" or a "very" important possible reason for tightening standards or terms of C&I loans or credit lines. (The banks are asked to rate each possible reason using the following scale: 1=not important, 2=somewhat important, 3=very important.) The survey addresses changes in the bank credit standards and terms over the past quarter. All regressions include the baseline controls from Table 3, with the only difference that we include two dummies for loan demand strengthening at both large and small firms, as the survey questions on reasons for changing lending standards are for loans to all borrowers. The sample contains only those banks that reported tightening lending standards and also cited specific reasons for doing so. Regression estimates are weighted by bank size. Standard errors clustered on bank. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Source: Senior Federal Reserve Senior Loan Officer Opinion Survey (SLOOS), Refinitiv's Dealscan, Call Report.

A.1 Results from Main Street Lending Program

We complement the analysis of the PPP with a study of the MSLP, a novel emergency lending program of the U.S. Treasury and Federal Reserve aimed at helping small and mid-sized businesses maintain operations and payroll during the pandemic. The program's goal was to deploy bank loans to firms that were deemed financially sound before the pandemic and were experiencing temporary distress (akin to "bridge loans"). In total, the MSLP deployed a little more than $16 billion to about 1,000 businesses between July and December 2020, when it expired. At the end of 2020, 614 banks were registered to participate in the program, of which 304 banks actually granted MSLP-eligible loans.

The MSLP was designed to encourage lending by removing a large portion of credit risk, 95%, from the lender's balance sheet. In addition, borrowers have to meet certain eligibility criteria on size, maximum indebtedness and overall financial standing, for instance borrower leverage (measured by the debt-to-EBITDA ratio) cannot be more than 4 or 6 (depending on the precise type of MSLP loan), and the borrower must have at least a "pass" internal bank credit rating.[28] Eligible borrowers should also be current on financial obligations prior to the pandemic and expected to recover after the pandemic. Banks responding to a September 2020 survey about their experience with the program raised concerns about the uncertainty surrounding the loss-sharing arrangement with the MSLP in the case of borrower default.[29] These risk factors make the MSLP is an interesting program to study as well.

Our data on bank participation in the MSLP are drawn from public sources. The list of registered banks comes from the MSLP webpage of the Federal Reserve Bank of Boston. We derive the list of MSLP lenders from the Federal Reserve's periodic report to Congress comprising all the loans granted under the program between July and December 2020, along with lender and borrower identities. Balance sheet information comes from the Call Report.

[28] See detailed term sheets for the program on the Federal Reserve's MSLP webpage at https://www.federalreserve.gov/monetarypolicy/mainstreetlending.htm.

[29] See the September 2020 SLOOS on Bank Lending Practices on https://www.federalreserve.gov/data/sloos/sloos-202009.htm.

We supplement these data with bank-level measures of exposure to pandemic-hit areas using information on COVID-19 cases from the Center for Systems Science and Engineering at Johns Hopkins University, and bank branch-level deposit-taking activities from the FDIC Summary of Deposits.

We estimate bank-level specifications that link bank exposure to credit line drawdown risk before the start of the program with the likelihood of bank being registered or granting MSLP-eligible loans. The key explantory variable is CLE (alternately measured at end-2019:Q4 or 2020:Q2 given that the program opened on June 15 2020) along with the full set of baseline controls: bank size (log-assets), capital, loan/asset ratio, ROA, and NPL ratio. In addition, as a proxy for loan demand, we include bank's local exposure to pandemic intensity (specifically, state-level COVID-19 infections per capita weighted by the banks' branch deposit market share in each state). Following Minoiu, Zarutskie and Zlate (2021), we include two additional robust determints of MSLP registration, namely C&I loans (in % of total loans) and core deposits (% liabilities).

The results are shown in Table A11. Across specifications, we obtain a robust and statistically significant negative association between ex ante CLE and the probability of participating in the MSLP (either by being registered or by actually granting MSLP-eligible loans). This result suggests that banks with greater CLEs were systematically less likely to participate in the program given the various risks involved. Similar to our findings for the PPP, these results reveal an unexpected negative effect of credit line drawdown risk on banks' willingness to participate in public credit-support programs despite the loans carrying relatively low risk for the lender.

Table A11: **Results from the Main Street Lending Program**

	(1)	(2)	(3)	(4)
Dependent variables:	Registered		Lender	
CLE (end-2019:Q4)	-0.0059*		-0.0058***	
	(0.003)		(0.002)	
CLE (end-2020:Q2)		-0.0066*		-0.0077***
		(0.004)		(0.003)
Observations	799	799	799	799
R-squared	0.153	0.153	0.090	0.093
Bank controls	Yes	Yes	Yes	Yes
Pandemic intensity	Yes	Yes	Yes	Yes

Note: This table depicts the link between ex ante credit line exposure (CLE) and the probability of bank participation in the Main Street Lending Program (MSLP). The sample refers to large banks (with total assets above $1 billion), as participation among small banks (with total assets below $1 billion was less than 6%). The dependent variable "Registered" takes value one for banks that registered in the program between June 15 and December 30 2020 (columns 1–2) (and zero otherwise). The dependent variable "Lender"' takes value one for the registered banks that extended MLSP-eligible loans (columns 3–4) (and zero otherwise). All bank balance sheet variables are measured as of 2020:Q2 except credit line exposure which is alternately measured either at end-2019:Q4 (as in the baseline analysis) or 2020:Q2 (before the program opened for registration on June 15 2020). We include all the baseline controls (size, capital, ROA, loans/asset ratio, and NPL ratio) as well as two additional robust determinants of MSLP registration from Minoiu, Zarutskie and Zlate (2021), C&I loans (% total loans) as a measure of bank business model, and core deposits (% liabilities). Pandemic intensity is measured similar to the baseline, as the state-level number of COVID infections per capita between March and December 2020 weighted by the bank's branch deposit share in that state. Standard errors are clustered on bank state. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Source: Call Report (for CLE as well), Federal Reserve Bank of Boston and Federal Reserve Main Street public reports to Congress (for the list of registered and lending banks), FDIC Summary of Deposits, and Center for Systems Science and Engineering at Johns Hopkins University.