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

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Abstract

We exploit the unexpected surge in corporate credit line drawdowns in the early phase of the COVID-19 pandemic as a bank balance sheet shock and examine the impact on banks' lending decisions. We show that banks with larger ex-ante credit line portfolios—and hence higher risk of drawdowns—reported tightening lending standards on new C&I loans to small and large firms, curtailed the supply of large syndicated loans, and reduced the number and volume of small business loans since March 2020. Exposed banks were also less likely to participate in and grant loans through government-sponsored credit programs such as the Paycheck Protection Program and the Main Street Lending Program. We document that the main mechanism by which the risk of credit line drawdowns likely affected banks' lending decisions was a reduction of risk tolerance rather than balance sheet constraints. Our findings suggest that tension may arise during crises between banks providing liquidity insurance to firms through pre-committed credit lines while at the same time sustaining loan supply to the broader economy, with important implications for monetary policy and financial stability policies.

Keywords: corporate credit line drawdowns, bank lending, bank risk management, Paycheck Protection Program, Main Street Lending Program, COVID-19

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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 1(a)). 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 pre-committed credit, successfully fulfilling their liquidity insurance function to corporate borrowers.[2] However, banks concurrently tightened lending standards by an extent not seen since the 2008 financial crisis (Figure 2), 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 pull-back from risk taking may also have been caused by the immediate or expected 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 1(b)).

[2] Banks met the unprecedented liquidity demand due to a number of factors, including strong pre-crisis financial positions, large inflow of deposits (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

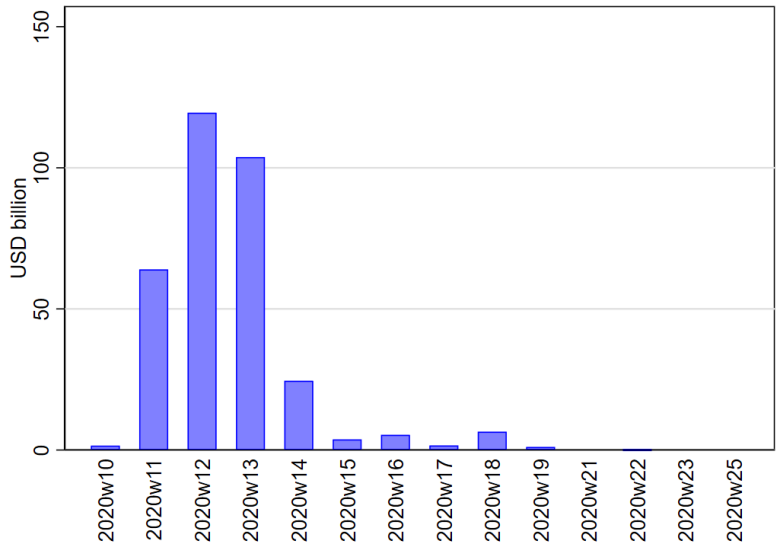
In this paper we exploit the COVID-19 pandemic as an empirical laboratory to shed light on the tension that may arise during crises between the provision of liquidity insurance to firms through access to bank credit lines on the one hand, and the sustained supply of credit on the other hand. Specifically, 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 and mid-sized firms, small business lending, and lending through government-sponsored credit programs—and in samples of both U.S. and foreign 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 otherwise 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 affect bank lending decisions? Our goal is to shed light on the potential tension that may arise between two fundamental functions of the banking system: that of providing liquidity insurance to firms through pre-commited credit vs. that of supplying credit to the broader economy. This potential tension may have important implications for stress testing and bank risk monitoring.

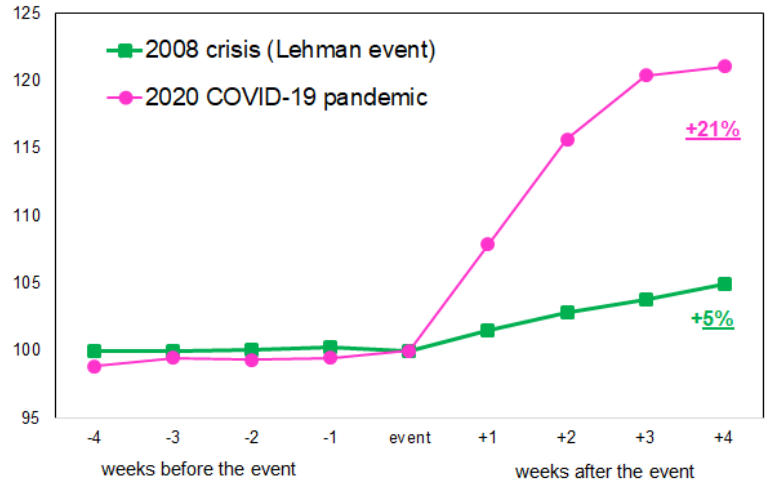
Our empirical strategy consists of three steps. First, we construct a bank-level measure

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 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).

Figure 1: **Credit Line Drawdowns: COVID-19 Pandemic vs. 2008 Financial Crisis**



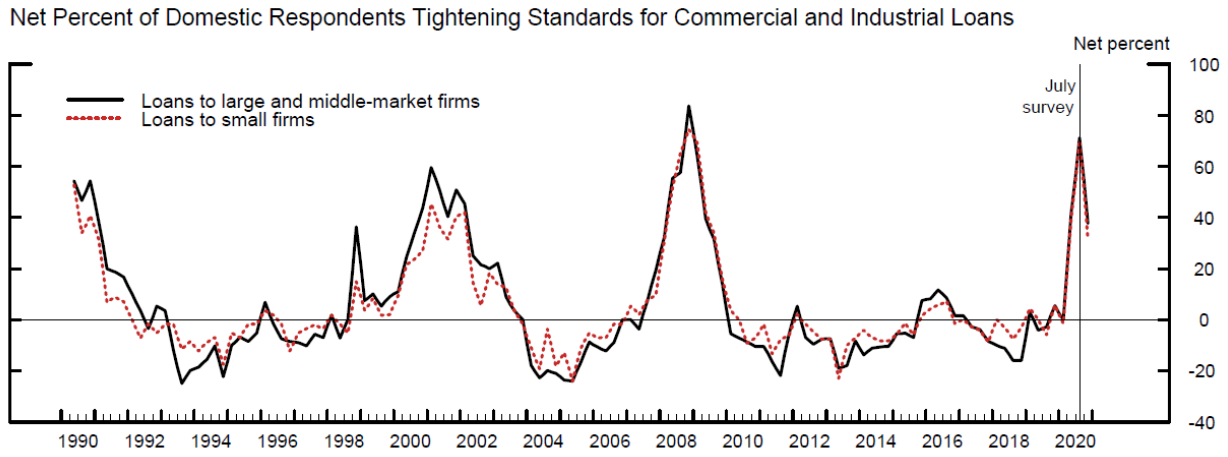
(a) Credit Line Drawdowns by Listed Firms



(b) Normalized C&I Loans: Lehman Brothers Event vs. COVID-19

Panel (a) depicts weekly credit line drawdowns between March 2 and June 30, 2020, across public firms and private firms with public debt that file 8-K regulatory filings with the Securities and Exchange Commission (in $ billion). Total drawdowns over March-June 2020 amounted to $331 billion. Panel (b) depicts the historically large credit line drawdowns during the COVID-19 crisis compared to the 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). 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 2: **Change in Standards for C&I Loans 1990–2020**



The chart depicts the net percent of 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 chart 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, albeit at a slower pace. The survey addresses changes in the standards and terms on bank loans over the quarter. Source: Federal Reserve Senior Loan Officer Opinion Survey, public release.

of exposure to credit line drawdown risk. We use data on credit lines originated by banks in the syndicated loan market and estimate the size of outstanding credit commitments in percent of total assets, before the onset of the pandemic. We show that this measure, which has the advantage of being available not only for U.S. banks, but also for global banks that are active in the syndicated loan market, is strongly correlated with the amount of (off-balance sheet) unused C&I loan commitments reported by U.S. banks in the Call Reports. Second, we employ a variety of datasets at the loan- and bank level to establish a link between pre-pandemic credit line exposure and lending decisions. While credit line drawdowns are a phenomenon affecting primarily large banks and large firms, our datasets cover lending outcomes by banks of all sizes to both large and small borrowers, which enables us to document crowding out effects of drawdowns. This is particularly important given that the pandemic has had a disproportionate impact on smaller firms (Bloom, Fletcher and Yeh, 2021; Bartik, Bertrand, Cullen, Glaeser, Luca and Stanton, 2020). 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.

We have three main results. First, we show that global banks, and especially U.S. banks, with high ex-ante credit line exposures (measured at 2019 year end) curtailed the supply of new syndicated loans in 2020:Q2. On the intensive margin, using the empirical identification strategy of Khwaja and Mian (2008), we show that more exposed banks supplied lower average lending volumes to the same borrower; on the extensive margin, we show that more exposed banks were less likely to renew loans expiring in 2020:Q2 and were also less likely to establish new lending relationships in that quarter. In addition, large U.S. banks more exposed to potential credit line drawdowns reduced the supply of small business loans, in particular by cutting down the volume and number of small business loans, especially new lines of credit, and by tightening loan terms, such as maturity and collateral requirements.[4]

Second, using banks' responses to the 2020 Senior Loan Officer Opinion Surveys (SLOOS) conducted by the Federal Reserve, we show that more exposed banks tightened the standards and terms of new C&I loans and credit lines, especially in 2020:Q2, while controlling for changes in the demand for loans. Then, we study bank participation in two government credit-subsidy programs deployed during the pandemic and find that more exposed banks were more reticent to lend through these programs, despite the low risk of these loans for the lender. Using loan-level data from U.S. Small Business Administration's Paycheck Protection Program (PPP), we show that more exposed PPP lenders made fewer loans under the program, even though PPP loans are forgivable. In bank-level data we also show that more exposed banks were less likely to grant loans through the Federal Reserve's Main Street Lending Program (MSLP).

Third, we provide suggestive evidence on the mechanisms behind the negative link from credit line drawdown risk and bank loan supply. The results highlight an important role for

[4]These results are based on Y-14Q loan portfolio segment-level data on loans below <$1 million, reported by large U.S. banks. Approval from the Federal Reserve Board for including these results in the paper is pending.

changes in risk tolerance at banks during the pandemic. A key result and unique contribution of our paper is to show that banks with larger credit line exposures were more likely to cite "lower risk tolerance" as an important reason for tightening 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 key role in exposed banks' decisions to tighten standards in any quarter. These results suggest that pre-pandemic financial position did not constrain banks' ability to grant loans after the drawdown episode, suggesting that capital and liquidity constraints are not the key friction driving our results. Instead, the key friction appears to be the rise in risk aversion associated with the unexpected surge in drawdowns.

Literature Review. Our paper contributes to a large literature on banks as conduits of shocks to the real economy. Most of this literature takes 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.[5] We contribute by studying the effects of a *real sector shock* that exogenously raised the corporate sector's demand for bank liquidity, causing large off-balance sheet exposures to turn into loans unexpectedly. 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

[5]See, e.g., Hale, Kapan and Minoiu (2020); Ongena, Tümer-Alkan and Von Westernhagen (2018); Popov and Van Horen (2015); De Haas and Van Horen (2012b,a); Schnabl (2012); Puri, Rocholl and Steffen (2011); Ivashina and Scharfstein (2010); Khwaja and Mian (2008).

despite the low risks of loans granted through those programs.

Our paper also adds to the literature on financial crises, where a growing number of studies center on the COVID-19 shock. Our paper is closely related to Acharya, Engle and Steffen (2021), who show that bank-level balance-sheet liquidity risk coupled with capital pressures from drawdowns are major factors behind the persistent under-performance of bank equity returns during the pandemic. Our paper takes a step further and examines the effects of credit line drawdown risk on banks' lending decisions across different credit markets, bank and borrower sizes, and examines the precise mechanisms by which this risk may have impacted banks' ability to fulfill their credit provision function. Greenwald, Krainer and Paul (2020) document that banks that experience larger drawdowns restrict term lending more than other banks, crowding out credit to smaller firms. Their analysis emphasizes the redistributive effects of credit supply during downturns towards large firms that tap into their revolvers and away from smaller firms. Our paper, focusing on the COVID-19 episode, shows that exposed banks curtail new loan originations and tighten lending standards to both large and small firms, and explores the mechanisms behind this behavior.

The remainder of the paper is organized as follows. Section 2 describes the empirical hypotheses and mechanisms, the data, and identification challenges. Section 3 discusses the bank-level measures of exposure to credit line drawdown risk. Section 4 presents our main results and Section 5 explores the mechanisms behind those results. Section 6 concludes.

2 Hypotheses, Data, and Identification

2.1 Hypotheses and Mechanisms

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 their revolvers, further amplified 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.[6]

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, e.g., by cutting back on other lending or by selling liquid assets. As one financial executive stated, "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) under-performed relative to those of banks with low balance-sheet liquidity risk.

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 bank's balance sheet; and an expansion of balance sheet size. On-balance sheet credit exposures are significantly more capital-intensive than off-balance sheet loans.

[6]Banks fulfill an important liquidity insurance function for the real sector. Berrospide and Meisenzahl (2015) show that firms with access to credit lines—especially smaller and more financially constrained firms—were better able to maintain capital expenditure during the global financial crisis. Acharya, Almeida, Ippolito and Perez-Orive (2018a) show that access their credit lines is crucial for firms during times of stress. Bank restrictions on the usage of credit lines during the global financial crisis (for instance, by raising spreads, shortening maturities or invoking covenant violations) had real negative effects for borrowing firms.

For instance, a revolver with less than one year maturity has a credit conversion factor of 20%—that is, off-balance sheet short-term unusued credit only takes 20% of the risk weight of its on-balance sheet loan counterpart. When a short-term revolver is drawn, the RWA 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 RWA 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) emphasize 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.

Putting these two effects together, we argue that banks can experience substantial unexpected declines in capital ratios when credit line utilizations exceed expected utilization levels by a significant amount. 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 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.[7] Of the remaining half, BB- and B-rated firms account for 35% of drawdown volume, triple-C and lower rated firms account for 2%, and

[7]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).

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.[8] This phenomenon, too, may bring the banks' capital ratios closer to the regulatory thresholds, reduce risk tolerance, and in turn reduce credit availability.

In the next section we describe the datasets we assemble to take our main hypothesis to the data and then discuss identification challenges of the analysis.

2.2 Data

We assemble comprehensive data on banks' lending decisions from five sources that cover lending outcomes across credit markets, and bank and borrower sizes:

Loan-level data 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.[9] 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.

[8] In fact, according to data from the Call Reports, U.S. banks set aside record levels of loan loss reserves in anticipation of such losses, totalling $120 billion at end-2020:Q3.

[9] About 40% of loans in Dealscan are bilateral. Furthermore, the individual bank-level loan shares are missing for two thirds of the syndicated loans. To preserve sample size, we estimate the missing loan shares using the regression-based approach described in Hale, Kapan and Minoiu (2020) and De Haas and Van Horen (2012b).

Bank-level survey data from the 2020 Senior Loan Officer Opinion Surveys (SLOOS) administered by the Federal Reserve. These data contain the confidential with individual U.S. bank responses to quarterly surveys that assess changes in banks' lending standards and terms. We assemble data from all the surveys deployed during 2020, and match the SLOOS respondents with Dealscan to obtain their credit line exposures. The 2020 surveys had at most 75 domestic respondents in any given survey—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 mega-banks. We were able to match no more than 49 banks to Dealscan in any given survey. 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.[10] All SLOOS respondents are matched on RSSDID with the Call Report for balance sheet information.

Supervisory Segment-level Data (U.S. Credit Register for Small Business Loans). We use loan portfolio segment-level data from the FR Y-14 A.9 schedule "U.S. Small Business," which contains quarterly information on C&I loans with commitment amounts below $1 million. Small business loans are loans that are "scored" or "delinquency managed" for which a commercial internal risk rating is not used or that uses a different scale than other corporate loans. A loan portfolio segment is defined according to borrower risk and loan terms. The segments refer to borrower FICO score (above or below 620) and delinquency status (current, delinquent for 30–59 days, 60–89 days, 90–119 days, or 120+ days); as well as loan type (credit line, term loan, unclassified/other), collateral (secured, unsecured), and maturity (above/below three years). In total, there are 180 segments. The data

[10]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.

are reported by the largest 22 BHCs subject to stress tests in 2020. We manually match each reporting BHC to Dealscan lenders (on an ultimate owner basis) to obtain CLEs and to its main commercial bank (on RSSDID) to obtain Call Report balance sheet information.[11]

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. These loans account for 86.5% of all loans and 27.2% of total lending volume over the period.[12] Given the lack of identifiers for PPP lenders other than their name, we conduct a careful manual match between the 5,000 PPP lenders and the Dealscan lenders and cross-check each matched bank with the FDIC BankFind database for insured depository institutions; in ambiguous cases we use information on the geography of the bank's PPP lending to make an accurate matching decision. 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 mega-banks. For these banks we obtain balance sheet information from the Call Report.

Bank-level data on participation in the Main Street Lending Program (MSLP) are drawn from public sources. The lists of MSLP lenders come from the Federal Reserve's periodic report to Congress on the MSLP webpage, data posted on January 11, 2021, with information on all the loans granted under the program during July and December 2020, along with lender and borrower identities. The lenders are matched on RSSDID with balance sheet information from the Call Report. We supplement these data with bank-level measures of exposure to pandemic-hit areas using information from the Small Business Pulse Survey of the U.S. Census Bureau, COVID-19 cases from the Center for Systems Science and Engineering at Johns Hopkins University, and branch-level deposit-taking activities from the FDIC Summary of Deposits. We describe these measures in more detail in Section 4.3.2.

[11] Approval from the Federal Reserve Board for including results based on these supervisory data in the paper is pending.

[12] 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.

Descriptive statistics for selected regression variables are shown in Table A1.

2.3 Identification Challenges

We face two key identification challenges. First, we need a measure of bank exposure to credit line drawdown risk that is orthogonal on other bank characteristics. Second, we need to credibly separate credit supply from credit demand effects in the lending specifications that form the crux of our empirical approach.

Our strategy is to exploit cross-sectional variation in bank exposure to potential credit line drawdowns once the pandemic begins and unexpected draws start. We measure this variable prior to the pandemic because ex-post draws could be contaminated by balance sheet adjustments made by the bank to meet the liquidity demand, hence partially endogenous. We refer to this pre-pandemic exposure to credit line drawdown risk as "credit line exposure" (CLE) and we show in the next section that it is positively correlated with actual drawdowns.

Identification of the effects of this measure on bank lending standards and volumes hinges on its being uncorrelated with a number of other factors (such as bank size) that might equally affect banks' lending decisions. Notably, we also need to make sure that banks with higher ex-ante credit line exposure do not reduce lending because they also grant riskier loans, for instance by virtue of being exposed to areas hard-hit by the pandemic or to COVID-sensitive industries.[13] The estimated impact of credit line exposures should also not pick up the potential effects of banks' expectations of a worsening in the credit quality of the loan portfolio. To alleviate these potential concerns, in the current draft we control for basic balance sheet characteristics including bank size in all regressions, and show a placebo exercise suggesting that banks with high vs. low credit line exposures did not experience differential propensity to tighten lending standards one year before the crisis. In addition, in Section 4.2 we show that our survey-based lending results are robust to controlling for loan

[13] In a future draft we will refine the specifications to control for pre-pandemic loan exposures to COVID-sensitive industries and to COVID-hit areas. To construct these exposures at end-2019 we will use the data from the Y-14 data collection's H.1. schedule, representing C&I loan commitments at the bank-borrower level, the use of which is currently pending Federal Reserve Board approval.

loss reserves in 2020:Q1, Q2, and Q3 as measures of banks' expected asset quality.

Throughout the analysis we must carefully control for loan demand in order to convincingly separate loan supply from demand effects when linking lending volumes—an equilibrium outcome—to bank CLE. We adopt a different approach depending on the dataset we analyze, as made possible by the granularity of the data and the available controls; and discuss the strategy in detail prior to presenting the results. In brief, in syndicated and PPP loan-level regressions we employ the Khwaja and Mian (2008) strategy that exploits the presence of multi-bank borrowers (or clusters of similar borrowers) and holds loan demand fixed with borrower (or borrower cluster) fixed effects (Jiménez, Mian, Peydró and Saurina, 2020). In survey-based bank-level regressions we control for loan demand with survey measures of changes in loan demand over the quarter (as perceived by SLOOS survey respondents). Finally, in regressions linking CLEs with bank participation in the MSLP we control for bank-level exposure to local pandemic intensity, which partly captures changes in local loan demand facing each bank.

3 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 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. 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. 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. The median CLE-to- asset ratio at end-2019 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 in Section 4 when interpreting economic magnitudes. Most of our empirical analysis focuses on U.S. banks given their outsized importance as global suppliers of pre-committed credit. As seen in Table 1, larger banks have larger CLEs, therefore in all regressions we will control for bank size.[14] No other bank characteristics appear to be systematically associated with the size of CLEs in the main datasets of our regression analysis.

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

	(1)	(2)	(3)	(4)	(5)	(6)
	High CLE (mean)	Low CLE (mean)	pvalue t-test [1]=[2]	High CLE (median)	Low CLE (median)	pvalue t-test [3]=[4]
			(a) Global banks (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 ratio	0.98	2.47	0.000	1.30	2.59	0.000
LLR ratio	0.98	1.79	0.001	1.10	1.91	0.001
			(b) U.S. SLOOS respondents			
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 ratio	0.83	0.69	0.149	0.81	0.68	0.050
LLR ratio	0.73	0.62	0.289	0.70	0.65	0.326

This table compares average balance sheet characteristics in the sample of 102 global banks from Dealscan and U.S. bank respondents to the Senior Loan Officer Opinion Surveys (SLOOS). The capital ratio in panel (a) is defined as common equity divided by total assets; and as Tier 1 capital divided by risk-weighted assets in panel (b). All balance sheet characteristic are measured at 2019 year end. In columns 1–2, banks are split into high vs. low CLE based on the average CLE and in columns 4–5 based on the median. Sources: Refinitiv Dealscan, Fitch Connect, Federal Reserve Senior Loan Office Opinion Survey, Call Report.

[14] In panel (a) we also see that high-CLE banks tend to have lower non-performing loans, and as a consequence, lower loan loss reserves, therefore in Section 4.2 we check that the results are robust to controlling for loan loss reserves.

One might raise several concerns about the measurement of bank CLEs. One is that in Dealscan we only observe the credit line at origination and do not know what portion of the initial exposure has been retained by the originating bank. We also do not know what portion of the credit line has been utilized by the borrower, or alternatively how much of it remains as an off-balance sheet exposure for the bank.[15]

To alleviate these concerns, we need to externally validate the Dealscan-based CLE measure with an independent measure that is as accurate as possible—ideally based on regulatory filings. Such a measure exists for U.S. banks in the Call Report under the name "undrawn C&I credit commitments." As shown in Figure 3(a), there is a strong correlation between ex-ante CLEs from Dealscan and Call Reports for U.S. banks.[16] 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 3(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.

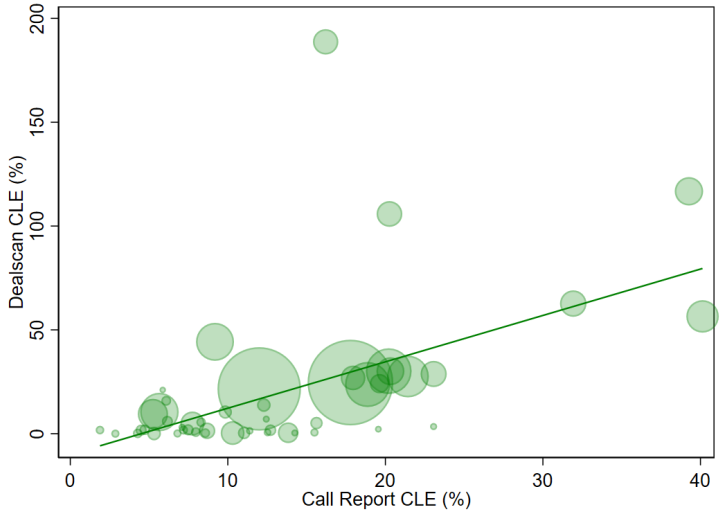
4 Results

In this section we present the baseline results that establish a link from bank exposure to credit line drawdown risk to loan supply. We employ the following data sources: (1) bank originations of syndicated loans; (2) responses to the Federal Reserve's SLOOS; and (3)

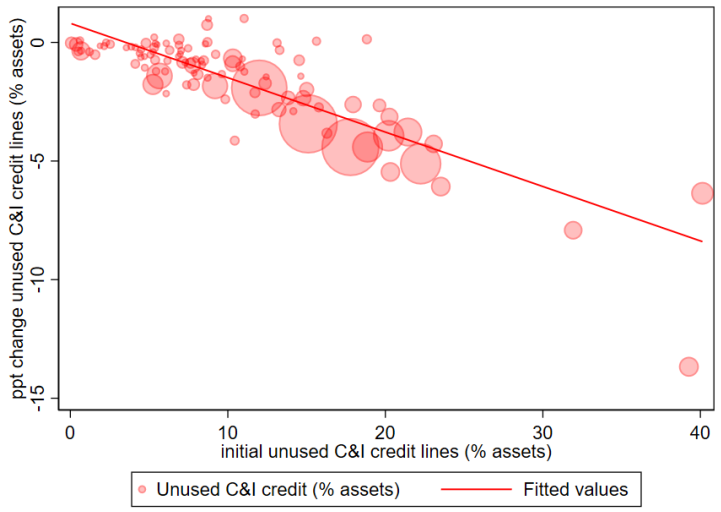
[15]One might also be worried that CLEs are constructed with data from syndicated loans and thus do not reflect bilateral loan contracts. To address this issue, we note that the vast majority of credit lines are extended through syndicated lending. Using supervisory microdata on C&I loans from the Federal Reserve's Y-14Q data collection (H.1 schedule), which assembles information on outstanding loan exposures exceeding $1 million from 34 large banks and covers approximately 75% of total U.S. C&I lending (Favara, Ivanov and Rezende, 2020), syndicated loans accounted for close to 90% of credit line contracts at 2019 year end.

[16]In the next draft we will address the issue of robustness of our main results to employing the Call Report measures for U.S. banks. In the current draft only the MSLP analysis does so.

Figure 3: **Validating the Bank Credit Line Exposure Measure**



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



(b) Ex-ante CLE vs ex-post draws

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 CLEs measured as the unused C&I credit lines in 2019:Q4 (% assets) and the change in unused credit between 2019:Q4 and 2020:Q1 (in ppts), where a decline in unused credit reflects revolver draws over the period. In both charts, bubble size is proportionate to bank size. The sample comprises 506 banks that have non-zero unused C&I commitments. Source: Call Report, Refinitiv Dealscan.

participation in government-sponsored credit programs deployed during the pandemic.

4.1 Results from Syndicated 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.

For identification of intensive margin effects, we compare loan growth from at least two different banks with varying ex-ante CLEs to the same individual firm, across all firms that borrowed in the syndicated loan market in 2020:Q2 compared to any quarter in 2019. Holding the borrower fixed in this empirical setup allows us to control for borrower-level changes in loan demand between the two periods, as discussed in Khwaja and Mian (2008), and as long as borrower-level loan demand does not vary by bank. Controlling for credit demand with borrower fixed effects is crucial in our setting as the COVID-19 outbreak was accompanied by significant changes in credit demand. All coefficients are estimated with Ordinary Least Squares (OLS) and standard errors are clustered at the bank level.

The results are reported in Table 2, where the dependent variable is the growth rate of average loan volume between the year 2019 (before the pandemic) and 2020:Q2 (after the onset of the pandemic). The unit of observation is given by bank-firm pairs in a lending relationship in both periods considered. To avoid contaminating the results with loan dynamics around the start of the pandemic, we drop all loans originated in 2020:Q1.[17] All specifications include standard determinants of loan volumes, such as bank size (log-assets), capital (Tier 1 ratio), return on assets (ROA) and loan-to-asset ratio. These variables as measured at 2019 year end.

The results in columns 1–4, 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. Columns 2 and 4 include firm-cluster fixed effects, where clusters refer to small

[17]The results are robust to assigning loans originated in January and February to the pre-pandemic period and loans originated in March to the post-onset period.

groups of similar firms that likely received a common demand shock (they are in the same country and 3-digit industry). We notice that the estimated coefficients on CLE in columns 1 and 3 (no fixed effects) are larger in absolute value than in columns 2 and 4 (with fixed effects), suggesting that demand weakened in 2020:Q2,[18] and the omission of borrower fixed effects as a demand control generates a downward bias. Furthermore, the coefficients on CLEs for GSIBs are larger than in the full sample (columns 3–4 vs. columns 1–2), 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 estimate of CLE impact on loan growth in column 4 is economically significant, indicating that one percentage point (ppt) increase in CLE ratio translates into a 2 percent decline in the loan growth rate. Translating this estimate to standard deviations, a 5.7 ppt increase in CLE (representing one st. dev.) leads to loan growth rate decline of close to 12 percent. In column 5 we unpack the baseline estimate for U.S. vs non-U.S. banks and notice that this negative effect is larger for U.S. banks, which also have larger CLEs so they were more exposed to the risk of credit line drawdowns.[19] Columns 6–8 show that the results are broadly robust to including more demanding, individual firm fixed effects, but the estimated coefficients on CLE are also smaller.

Next we turn to the extensive margin of loan supply adjustment to credit line drawdown risk. To document a link between ex-ante CLEs and the extensive margin of loan supply, we define the following dependent variables: the probability of loan renewal (including renewal of credit lines) in 2020:Q2 for loans falling due that quarter, and the probability of observing a completely new lending relationship (not present over the past five years). The results from estimating linear probability models are shown in Table 3. In columns 1–3 we examine the probability of loan renewal; columns 4–6 look at renewal of credit lines and columns 7–9 look

[18] According to the Federal Reserve's July 2020 SLOOS on Bank Lending Practices, U.S. banks reported weakening demand for C&I loans from both large and small firms over 2020:Q2.

[19] The control variables do not appear consistently correlated with loan growth, with the exception of bank profitability (ROA), which has a robust positive association with loan growth.

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

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:				**Loan Volume Growth**				
Sample of banks:	All	All	GSIB	GSIB	GSIB	GSIB	GSIB	GSIB
Credit line exposure (CLE)	-2.2174***	-1.1869**	-3.5721***	-2.0808**		-0.8090**	-0.7227***	
	(0.571)	(0.603)	(0.995)	(1.006)		(0.388)	(0.260)	
CLE x U.S. bank					-4.0007***			-0.6299*
					(1.136)			(0.345)
CLE x non-U.S. bank					-1.3388*			-0.7632**
					(0.734)			(0.290)
Size (log-assets)	8.6629	-2.5546	25.8455**	2.6714	-1.0468	4.9434	-3.2859	-3.0872
	(5.266)	(4.022)	(10.854)	(9.036)	(7.606)	(4.684)	(2.739)	(2.664)
Capital	11.5856***	-2.9708	2.0152	-12.9102***	-19.1508***	0.8597	-1.7171	-1.3919
	(3.198)	(2.655)	(4.089)	(4.228)	(5.317)	(1.835)	(1.202)	(1.330)
ROA	49.4118***	21.5581*	39.5061*	44.1279***	34.1463***	26.4918***	4.9620	5.5308
	(16.306)	(12.009)	(20.513)	(15.069)	(9.917)	(5.208)	(3.422)	(3.733)
Loans/Assets	-0.0520	-0.3991	-0.0826	-0.5894	-0.4304	-0.0482	-0.0465	-0.0535
	(0.325)	(0.275)	(0.433)	(0.364)	(0.313)	(0.128)	(0.105)	(0.102)
Firm (country-industry) fixed effects		Yes		Yes	Yes			
Individual firm fixed effects							Yes	Yes
Observations	3,163	2,877	1,949	1,797	1,797	1,351	1,204	1,204
R-squared	0.023	0.627	0.020	0.669	0.670	0.021	0.871	0.871

This table shows baseline (OLS) results on the effect of credit line exposures on bank loan volumes—the intensive margin—using syndicated loan data. The dependent variable is the growth rate of average loan volume in 2020:Q2 compared to 2019. The sample includes all bank-firm pairs for which firms borrow from at least two banks both in 2020:Q1 and in 2019. Loans granted in 2020:Q1 are dropped from the sample. "GSIB" sample refers to 30 global systemically important banks according to the BIS definition. All specifications implement the Khwaja and Mian (2008) identification approach with borrower fixed effects: in columns 1–5 the borrower refers to clusters of firms in the same country and 3-digit SIC industry, similar to the approaches of Hale, Kapan and Minoiu (2020) and Acharya, Eisert, Eufinger and Hirsch (2019); in columns 6–9 the borrower refers to individual firms. Bank controls are measured at end-2019 and include: size (log-assets), capital (Tier 1 ratio), return on assets (ROA), and loan-to-asset ratio. 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.

at new relationship formation. We control for the same bank balance sheet characteristics as in the intensive-margin regressions, but add borrower's country and industry fixed effects to capture demand shifts. As seen in columns 1–3, higher CLEs are associated with a lower probability of loan renewal in 2020:Q2 for falling-due loans, including if the maturing loan is a credit line (columns 4–6). Looking at the CLE effect estimates for GSIBs in columns 2, 5 and 8, one ppt increase in the CLE ratio leads to 0.3% lower loan renewal probability (0.18% if it is a credit line) and 0.3% lower probability of lending to a completely new borrower. Interpreting the estimates in terms of st. dev. moves, an increase in the CLE ratio by one st. dev. (or 5.7 ppts) reduces the probability of loan renewal by 1.7% (or about 17% of the mean renewal probability for any loan and 13% of the mean for credit lines) and that of new lending relationship by close to 1.02% (or 9% of the mean).

Taken together, these results suggest that banks facing higher risk of credit line drawdowns reduced the supply of large corporate loans relatively more in 2020:Q2. These findings echo those in 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 than other banks after the Lehman event in September 2008. In our global sample of lenders, we found strong effects at U.S. banks, which motivates us to explore further the impact of drawdown risk on lending standards at these banks.

4.2 Results from Senior Loan Officer Opinion Survey on Bank Lending Practices

We now turn to the experience of U.S. banks. Here we exploit detailed quarterly information on bank lending decisions from the Federal Reserve's SLOOS— a comprehensive source of information on whether and why banks change their lending standards and terms—to study the link between bank CLE and the likelihood of tightening C&I loan standards and the terms of approved loans. A key advantage of the SLOOS microdata is its timely availability—

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

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Prob(Loan Renewal)			**Prob(CL Renewal with CL)**			**Prob(New Relationship)**		
Sample of banks:	All	GSIB	GSIB	All	GSIB	GSIB	All	GSIB	GSIB
Credit line exposure (CLE)	-0.0021**	-0.0031*		-0.0010**	-0.0018**		-0.0032***	-0.0030*	
	(0.001)	(0.002)		(0.000)	(0.001)		(0.001)	(0.002)	
CLE x U.S. bank			-0.0041**			-0.0026**			-0.0037*
			(0.002)			(0.001)			(0.002)
CLE x non-U.S. bank			-0.0027			-0.0015**			-0.0028
			(0.002)			(0.001)			(0.002)
Size (log-assets)	0.0110	0.0208	0.0189	0.0012	-0.0052	-0.0068	0.0087	0.0021	0.0007
	(0.007)	(0.018)	(0.018)	(0.004)	(0.009)	(0.008)	(0.007)	(0.020)	(0.021)
Capital	-0.0097*	-0.0071	-0.0111	0.0003	0.0005	-0.0022	-0.0070	-0.0086	-0.0113
	(0.006)	(0.008)	(0.009)	(0.003)	(0.003)	(0.004)	(0.006)	(0.009)	(0.012)
ROA	0.0236	-0.0005	-0.0055	0.0099	0.0056	0.0017	0.0198	0.0190	0.0158
	(0.021)	(0.030)	(0.035)	(0.010)	(0.012)	(0.011)	(0.021)	(0.027)	(0.029)
Loans/Assets	-0.0000	0.0001	0.0002	0.0002	-0.0000	0.0000	-0.0004	-0.0001	-0.0001
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Firms' country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firms' industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,458	3,350	3,350	34,087	20,297	20,297	4,103	2,501	2,501
R-squared	0.081	0.031	0.031	0.007	0.026	0.026	0.113	0.107	0.108

This table shows baseline (OLS) results on the effect of credit line exposures on the probability of loan renewal—the extensive margin—using syndicated loan data. The data are at the bank-firm pair level. In columns 1–3 we examine the probability of loan renewal (in 2020:Q2) for bank-firm pairs in a lending relationship involving a loan falling due in that quarter. In column 4–5 we examine the probability of credit line (CL) renewal. In columns 7–8 the dependent variable is a dummy taking value 1 for bank-firm pairs that appear for the first time in 2020:Q2, reflecting new relationship formation, compared to existing relationships formed in the prior five years. "GSIB" sample refers to 30 global systemically important banks according to the BIS definition. In all specifications we control for demand with borrower country fixed effects and one-digit SIC industry fixed effects. Bank controls are measured at end-2019 and include: size (log-assets), capital (Tier 1 ratio), return on assets (ROA), and loan-to-asset ratio. 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.

survey responses regarding lending practices over a given quarter arrive in the first week of the following quarter. Furthermore, the data splits responses by borrower size, which allows us to examine lending practices concerning large and small corporate borrowers, a particularly important distinction in the current crisis, which has hit smaller firms hard (Bloom, Fletcher and Yeh, 2021; Bartik, Bertrand, Cullen, Glaeser, Luca and Stanton, 2020).

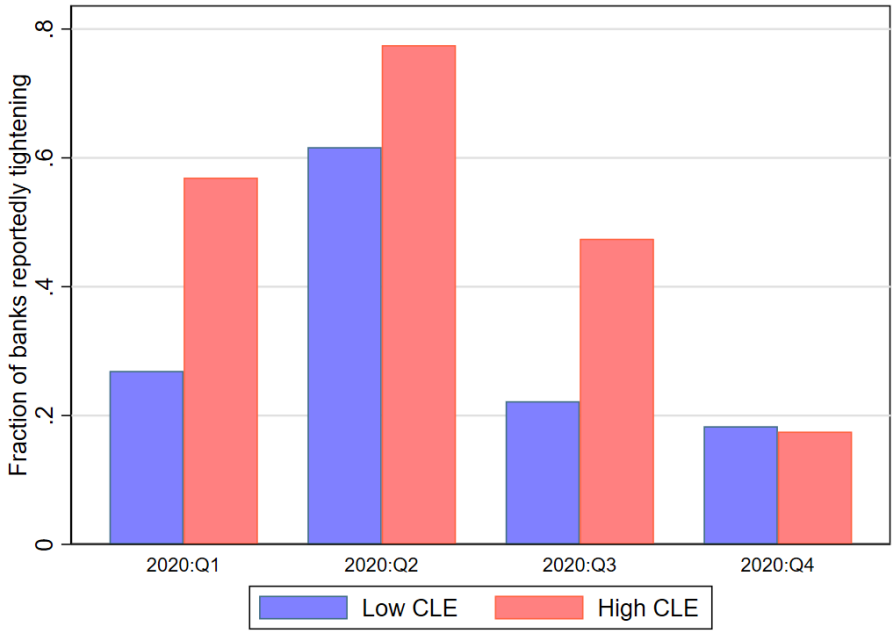
To examine changes in standards and terms of C&I loans—the extensive and intensive margins—we create a dummy variable that takes value 1 for banks that reported a considerable or somewhat of a tightening in lending standards in response to the questions "*Over the past three months, how have your bank's 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 1 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.)*."

Figure 4 shows the fraction of survey respondents that report tightening lending standards each quarter, to small and large firms, with data pooled across responses, by ex-ante CLE size (split around the mean). We can see that larger shares of high-CLE banks report tightening than is the case for low-CLE banks, except in 200:Q4 when the difference between the two groups disappears. The gap in the shares of high vs. low-CLE banks that report tightening is 20–25 ppts in Q1 and Q3. The difference is smaller in Q2, when significant shares of 60% of high-CLE banks and 80% of low-CLE banks report tightening.[20]

We check these patterns formally in bank-level linear probability models where the de-

[20]Such large shares of banks reporting tightening had not been seen in the SLOOS since the global financial crisis.

Figure 4: **Credit Line Exposure and C&I Lending Standards**



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 by CLE size (high/above-mean vs. low/below-mean). Source: Senior Loan Officer Opinion Survey of the U.S. Federal Reserve Board, Refinitiv's Dealscan, Call Report.

pendent 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 4. Similar to the syndicated loan regressions, and given the small sample sizes, we keep the models parsimonious and control for bank size (log-assets), capital (Tier 1 ratio), and loan-to-asset ratio, all measured, like CLE, at 2019 year end.[21] To control for loan demand, we also include the dummy "demand strengthened" which reflects bank-specific change in loan demand. In columns 1–4 we focus on lending standards to large firms, and in columns 5–8 on standards to small firms (defined as having annual sales below $50 million).

The results indicate a positive association between CLE and the likelihood of tightening, with interesting time variation, as follow: in 2020:Q1, more exposed banks were more likely to tighten C&I lending standards to large firms, but not in subsequent quarters. This finding

[21] In Table A4 we show that the results are robust to controlling for loan loss reserves at end-2020Q1, Q2, and Q3 as proxies for banks' expected asset quality. Therefore, our baseline estimates are not confounded by the potential correlation between ex-ante CLEs and the quality of loan portfolios.

Table 4: **Results from Senior Loan Officer Opinion Survey: Extensive Margin**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	**Bank reports tightening credit standards for approving C&I loan applications to:**							
Firm size:	**(a) Large and mid-sized firms**				**(b) Small firms**			
Period:	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Credit line exposure (CLE)	0.0042**	0.0013	-0.0019	-0.0003	0.0064***	0.0061***	0.0041*	0.0023
	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Bank size (log-assets)	0.0413	-0.0301	-0.1681***	-0.0575**	-0.1642*	-0.2703***	-0.0604	-0.0352
	(0.135)	(0.123)	(0.043)	(0.028)	(0.093)	(0.073)	(0.050)	(0.046)
Capital	-6.3472	-1.6041	-1.1085	5.2957	-15.7103	-19.1205***	-3.9484	6.9800*
	(6.137)	(9.424)	(5.896)	(3.277)	(11.680)	(4.978)	(9.149)	(3.835)
Loans/Asssets	-1.8176**	-0.0654	-1.1229**	0.6850*	-1.9114	-2.2382	-0.1128	0.2412
	(0.790)	(1.344)	(0.519)	(0.398)	(2.479)	(1.548)	(1.601)	(0.759)
Demand strengthened	-0.3578	0.1783	-0.4788***	-0.1812*	-0.2403	-0.0876	-0.0017	0.0155
	(0.311)	(0.201)	(0.111)	(0.102)	(0.158)	(0.141)	(0.151)	(0.189)
Observations	44	48	45	47	42	45	42	43
R-squared	0.166	0.068	0.277	0.213	0.360	0.555	0.159	0.342

This table shows baseline (OLS) results on the effect of credit line exposures on the probability of banks reporting that they tightened lending standards according to survey responses. The dependent variable is a dummy variable taking value 1 if the bank reported that they considerably or somewhat tightened standards on new C&I loans and credit lines over the quarter. The variable "Demand strengthened" takes value 1 if the banks reported a substantial or moderate strengthening of loan demand over the quarter from large firms (columns 1-4) or small firms (columns 5-8), and 0 otherwise. Small firms have annual sales below $50 million. The sample contains SLOOS respondents matched to Dealscan. 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 Loan Officer Opinion Survey of the U.S. Federal Reserve Board, Refinitiv's Dealscan, Call Report.

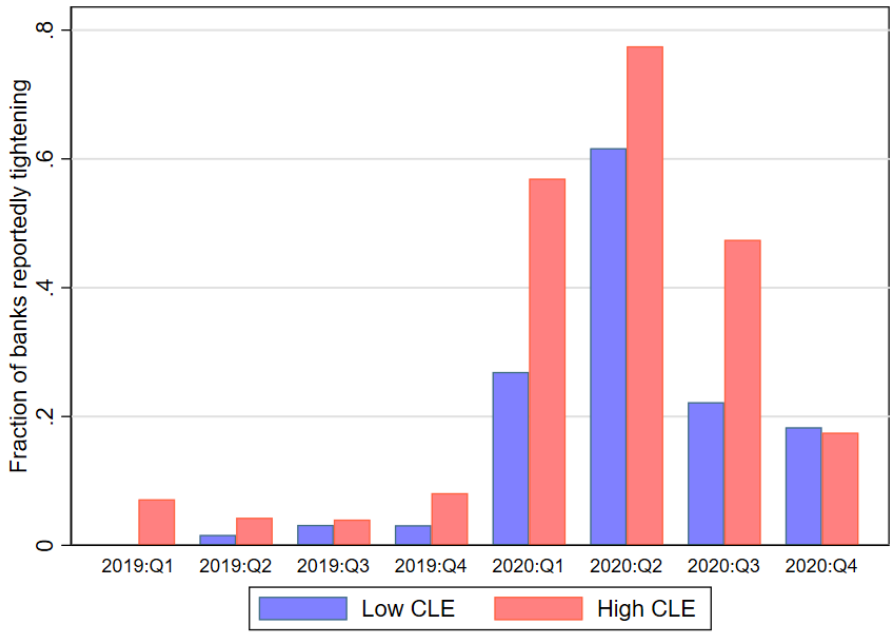
is consistent with large firms taking advantage of low borrowing costs in the corporate bond market starting in Q2 to refinance their debt and pay down credit line borrowings (and later in the year, some existing bank debt), see Darmouni and Siani (2020). By contrast, small firms appear to experience the brunt of the tightening. During Q1–Q3 there is a positive and statistically significant association between CLE and the probability of tighter standards, although the coefficient estimate is smaller in Q3 than in the previous two quarters, and statistically insignificant in Q4. This result for the COVID crisis echoes a more general result shown in Greenwald, Krainer and Paul (2020)—that by drawing down their credit lines after adverse shocks, large firms crowd out bank lending to smaller, more constrained, firms.

The estimates in Table 4 are economically significant. Looking at the estimates in columns 1 and 5, we find that one ppt increase in CLE ratio leads to 0.42% increase in probability of reporting tighter standards to large firms and 0.64% of doing so to small firms in 2020:Q1. Translating to one st. dev. moves, a 35 ppt increase in CLE (one st. dev.) raises the likelihood of tightening standards on C&I loans to large firms by 14.7% and to small firms by 22.4% (40% and 72% of the respective means).

Next 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 4, we estimate linear probability models that link the likelihood of tightening individual loan terms to variation in bank CLE. For brevity, we pool the responses across Q1 and Q2; the results are shown in Table 5. We can see that higher CLEs are consistently (and statistically significantly) associated with greater likelihood of tightening individual loan terms. This link is strong for both large and small firms, but coefficient magnitudes tend to be higher for small firms: this is notably the case

for maximum size of credit lines, loan covenants, and collateral requirements.[22]

Figure 5: **Credit Line Exposure and C&I Lending Standards: Placebo**



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 2019 and 2020 by CLE size (high/above-mean vs. low/below-mean). The year 2019 is interpreted as a placebo period. Source: Senior Loan Officer Opinion Survey of the U.S. Federal Reserve Board, Refinitiv's Dealscan, Call Report.

Our results may be subject to the concern that banks with higher credit line exposures may have differential lending behavior during the pandemic due to some omitted unobservable bank characteristics. If this were the case, we should find an increased propensity to tighten lending standards at high-CLE banks outside the pandemic period as well. To test whether this is the case, we plot the share of banks that tightened lending standards in each quarter of 2019—the last benign year before the crisis—separately for high vs. low-CLE banks. As seen in Figure 5, there is no evidence of a link from CLE to the banks' inclination to tightening standards on new C&I loans and credit lines, suggesting that our main findings in Tables 4–5 capture the effects of credit lines themselves, and not some other potentially

[22]In Table A2 we show that the results are broadly similar if we pool the data over Q1–Q3, and in Table A3 we show that these effects largely disappear in 2020:Q4, suggesting a diminishing impact of credit line exposure over time.

Table 5: **Results from Senior Loan Officer Opinion Survey: Intensive Margin**

Dependent variable: Bank tightened:	(1) maximum size of credit lines	(2) maximum maturity	(3) cost of credit lines	(4) loan spreads	(5) premium on risky loans	(6) loan covenants	(7) collateral requirements	(8) interest rate floors
				(a) Large and mid-sized firms				
Credit line exposure (CLE)	0.0029*	0.0037**	0.0030*	0.0017*	0.0044***	0.0039*	0.0037***	0.0056***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	93	92	92	93	93	93	92	93
R-squared	0.082	0.102	0.094	0.238	0.082	0.067	0.146	0.170
				(b) Small firms				
Credit line exposure (CLE)	0.0055***	0.0038**	-0.0002	0.0018	0.0027	0.0055***	0.0073***	0.0018
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	87	87	87	87	87	87	85	87
R-squared	0.410	0.181	0.396	0.194	0.170	0.416	0.416	0.482

This table shows baseline (OLS) results on the effect of credit line exposures on the probability of banks reporting that they tightened the terms of approved loans according to survey responses. The dependent variable is a dummy variable taking value 1 if the bank reported that they considerably or somewhat tightened the terms of new C&I loans and credit lines during 2020:Q1 or Q2. All regressions include the baseline controls from Table 4, including the variable "Demand strengthened", a dummy variable that takes value 1 when banks report significant or moderate strengthening of demand (from large firms in panel (a) and from small firms in panel (b)), and zero otherwise. Small firms have annual sales below $50 million. The sample contains SLOOS respondents matched to Dealscan. 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 Loan Officer Opinion Survey of the U.S. Federal Reserve Board, Refinitiv's Dealscan, Call Report.

confounding effects.

4.3 Results from Government-Sponsored Credit Programs

Next, we study the effects of credit line exposures on banks' willingness to participate in government credit-subsidy programs deployed during the pandemic. For empirical evidence we turn to the PPP, a large and innovative small business lending program deployed in the early stages of the COVID-19 crisis by the U.S. Small Business Administration, and then to the MSLP, the Federal Reserve's program aimed at supporting the flow of credit to small and mid-sized businesses.

The two programs differ in their design and scope—while the initial round of the PPP deployed more than half a trillion USD of funds to 5.2 million businesses between April and August 2020, the MSLP deployed a little more than $16 billion to about 1,000 businesses during July and December 2020. Funds were disbursed under both programs through the banking system (the PPP also allowed participation by eligible nonbank lenders). We discuss evidence from each program in turn below.

4.3.1 Results from Paycheck Protection Program

The PPP granted forgivable loans to small businesses with fewer than 500 employees with the aim of keeping workers on payroll during the pandemic. Lenders receive origination fees in addition to the 1% loan interest rate for participating in the program. A total of $521 billion were lent out in the first phase of the program, between April 3 and June 30 2020, the period over which we examine the data. The PPP is an interesting case because loans granted under this program 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. However, in reality they carry some risk. For instance, if the borrower fails to comply with the required documentation, loan forgiveness may not be approved and the loan could remain on the lender's balance sheet. This risk has prompted

some banks to sell PPP loan portfolios to nonbanks.[23] Other 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.[24]

For the regression analysis we aggregate the loan-level data at the bank-borrower state-industry-week level, where industries are given by 3-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.[25] We estimate several specifications using as dependent variable the total PPP loan amount (log-transformed). The sample comprises 384 banks lending to small firms in all states and territories across 107 NAICS-3 industries. The granular data structure enables us to control for loan demand with a wide range of interacted fixed effects, including borrower state×week fixed effects, borrower 3-digit industry×week fixed effects, or triple interacted borrower state×3-digit industry×week fixed effects. These demanding fixed effects allow unobserved loan demand to vary across locations and industries every week during the rollout of the program, which is critical given the uneven spread of the pandemic across states and the heterogeneity in sectoral impact. Similar to previous regressions, we include standard bank controls measured at end-2019 (bank size, capital, loan-to-asset ratio, profitability, and loan loss reserves). We present OLS estimates with double-clustered standard errors on bank-week.

The results in Table 6 show that higher ex-ante CLEs are systematically associated with smaller PPP loan volumes across all specifications. The estimated coefficients for CLEs are remarkably stable across demand controls, echoing the finding by Granja, Makridis, Yannelis and Zwick (2020) that the significant heterogeneity across banks in terms of PPP

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

[24] 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".

[25] 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).

loan granting seems unrelated to differences in underlying loan demand. The coefficient estimate in column 3 indicates that one ppt increase in the CLE ratio leads to 0.14% lower PPP lending volumes; therefore, a 35 ppt (one st. dev.) increase in CLE reduces PPP loan volumes by close to 5%. Given that the average loan volume at bank-state-industry-week level is $262,000, this implies a reduction of $13,000.[26]

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

	(1)	(2)	(3)
Credit line exposure (CLE)	-0.0014***	-0.0013***	-0.0014***
	(0.000)	(0.000)	(0.000)
Bank size (log-assets)	0.1797***	0.1898***	0.2024***
	(0.014)	(0.013)	(0.015)
Loans/Assets	0.2060	0.2544	0.2985
	(0.223)	(0.219)	(0.247)
Capital	-0.1785	-0.0127	-0.0267
	(1.010)	(0.969)	(1.093)
Net interest margin	-0.0049	-0.0060	-0.0048
	(0.006)	(0.006)	(0.007)
Loan loss reserves	0.0006**	0.0006***	0.0007***
	(0.000)	(0.000)	(0.000)
Bank entity type dummies	Yes	Yes	Yes
Borrower state	Yes	Yes	Yes
Borrower industry	Yes	Yes	Yes
Borrower state × week		Yes	Yes
Borrower industry × week		Yes	Yes
Borrower state × industry × week			Yes
Observations	255,286	255,260	245,123
R-squared	0.297	0.320	0.374

This table shows baseline PPP-lending results linking credit line exposures with total PPP loan volume. The data are at the bank-state-industry-week level, for 384 banks lending to firms in all states and territories, and in 107 industries (NAICS-3). The dependent variable is log(loan amount). Bank controls include size (log-assets), capital (Tier 1 ratio), loan-to-asset ratio, net interest margins, and loan loss reserves, all measured at 2019 year end (coefficients not shown). Bank entity dummies refer to national bank, nonmember bank, and state-member bank. Standard errors are double clustered on bank and week. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Source: U.S. Small Business Administration's PPP loan data (for loans granted during the first phase, April to August 2020), Refinitiv's Dealscan, Call Report.

[26] In specifications not shown, these results are robust to additionally controlling for loan demand with borrower-level employment (proxied by the self-reported number of jobs retained). We chose not to employ this variable in the baseline specifications because it has been widely flagged as mismeasured and prone to misreporting, taking value 0 for a significant number of loans although PPP loans are premised on safeguarding at least 75% of payroll.

Overall, these results reveal an unexpected negative effect of bank exposures to credit line drawdown risk in the context of a government-subsidized credit program with very low risk of lending. To provide further validity to this evidence, next we analyze the MSLP.

4.3.2 Results from Main Street Lending Program

We complement the analysis of the PPP with a study of the MSLP, a novel 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"). As of 2020 year end, 614 banks were registered to participate in the program, of which 304 banks granted MSLP loans.[27]

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 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. In addition, the borrower should have been current on its financial obligations prior to the pandemic and expected to recover after the pandemic. Despite these tight eligibility requirements aimed at reducing credit risk, bank still required a satisfactory rate of return on the exposure they retained in order to actually make loans (Hanson, Stein, Sunderman and Zwick, 2020). In addition, banks responding to a survey about experience with the program expressed concerns about the uncertainty surrounding the loss-sharing arrangement with the MSLP in the case of default.[28] These risk factors make the MSLP is an interesting program to study as well.

We set up bank-level specifications that link bank exposure to credit line drawdown risk

[27] Size-eligible firms have less than 15,000 employees or $5 billion in revenues. See detailed term sheets for the program on the Federal Reserve's Main Street Lending Program webpage.

[28] See September 2020 Senior Loan Officer Opinion Survey on Bank Lending Practices.

before the start of the program with the likelihood of bank granting MSLP loans during the program. Following the approach in Minoiu, Zarutskie and Zlate (2021), who study program takeup and credit spillover effects, we regress a dummy variable for MSLP-granting banks on CLE (at end-2020:Q2 or Q3 given that the program opened on June 15 and began accepting loan submissions on July 6, 2020)[29] and standard bank controls: size (log-assets), proxies for business model (loan-to-asset ratio, C&I loan-to-total loan ratio), capital (Tier 1 ratio), funding (core deposits as % assets), and two additional variables that partly capture shifts in loan demand. These variables are bank exposure to local economic conditions, proxied by pandemic intensity (specifically, COVID-19 infections per capita and the share of local small firms reportedly hit by the pandemic). The measures of bank-level exposure to local economic conditions are constructed by weighting these variables by the banks' branch deposit market share in each geography.

The results are shown in Table 7. Across specifications, we obtain a robust and statistically significant negative association between ex-ante CLE and the probability of participating in the MSLP. This result suggests that banks with greater CLEs were less likely to participate in the program given the various risks involved. Similar to our findings for the PPP, these results too reveal an unexpected negative effect of credit line drawdown risk on banks' willingness to participate in government-sponsored credit programs even despite the loans carrying little risk for the lender.

5 Mechanisms

So far, we have used multiple datasets and empirical approaches to establish a strong and robust 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 is the key banking friction driving the crowding-out effect of credit lines? Did banks tighten standards and curtail loan volumes because they were funding or capital constrained? Did

[29] This is the only regression analysis where we employ the Call Report-based CLE variable.

Table 7: **Results from the Main Street Lending Program: Extensive Margin of Program Participation**

	(1)	(2)	(3)	(4)
CLE (end-2020:Q2)	-0.0059*		-0.0062*	
	(0.003)		(0.003)	
CLE (end-2020:Q3)		-0.0064*		-0.0071**
		(0.003)		(0.003)
Size (log-assets)	0.0465***	0.0477***	0.0423***	0.0437***
	(0.012)	(0.012)	(0.012)	(0.012)
Loans/Assets	0.4956***	0.5105***	0.4212**	0.4183**
	(0.188)	(0.187)	(0.193)	(0.194)
C&I Loans/Loans	0.6721***	0.6929***	0.7071***	0.7293***
	(0.167)	(0.171)	(0.170)	(0.173)
Capital	-0.2620	-0.1359	-0.8291*	-0.8724**
	(0.314)	(0.244)	(0.436)	(0.437)
Core Deposits/Assets	-0.1515	-0.1436	-0.1790	-0.1748
	(0.193)	(0.193)	(0.196)	(0.195)
Local economic exposure (COVID infections pc)			-1.2460	-1.2379
			(1.179)	(1.177)
Local economic exposure (% firms hit by COVID)			-0.3312	-0.3515
			(0.415)	(0.408)
MSLP facility fixed effects	Yes	Yes	Yes	Yes
Observations	602	603	594	594
R-squared	0.062	0.064	0.066	0.068

This table shows baseline MSLP-lending results linking credit line exposures to the probability of granting MSLP loans. The dependent variable takes value 1 for banks that are registered in the program and lending, 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-Q2 or Q3. Capital is measured as the Tier 1 regulatory ratio. Local economic exposure measures, at the bank level, are constructed by weighting pandemic intensity at the local level (measured as the county-level number of COVID infections per capita between March and December 2020 or the state-level average share of small firms that report having been moderately or significantly affected by the pandemic during the period between April and November) by the bank's branch deposit share in that geography. The state-level share of small firms affected by the pandemic comes from the Small Business Pulse Survey of the U.S. Census Bureau. The regressions include MSLP facility fixed effects, where facilities refer to the five loan categories with slightly different eligibility requirements and loan characteristics. (See detailed description in the MSLP term sheets). Standard errors are robust. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Source: Call Report, Federal Reserve Bank of Boston and Federal Reserve Main Street webpages as of January 11, 2021 (for the list of registered and lending banks), FDIC Summary of Deposits, Center for Systems Science and Engineering at Johns Hopkins University, Call Report, U.S. Census.

the unexpected surge in drawdowns increase awareness about dormant off-balance sheet risks? To study the channels at work, we use extensive microdata from the SLOOS on the motivations behind the tightening of C&I lending standards at U.S. banks.

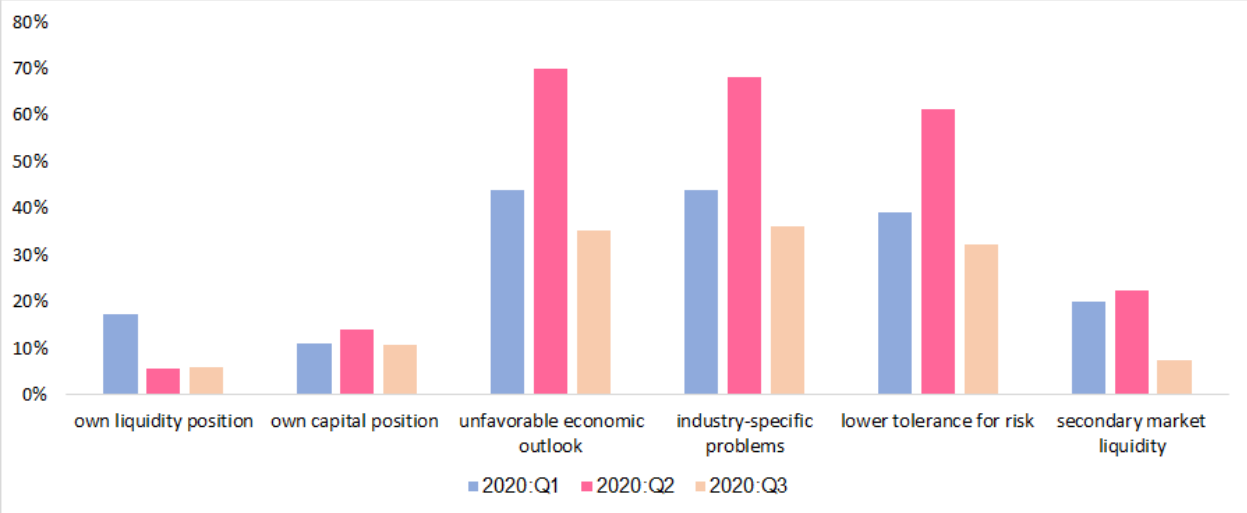
We employ information from the following survey question: *"If your bank has tightened its credit standards or its terms for C&I loans or credit lines over the past three months, how important have been the following possible reasons for the change?"*. The bank is then given a list of possible reasons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

All of these reasons are potential mechanisms by which drawdown risk may impact a bank's willingness to extend loans. For example, liquidity and capital positions may deteriorate as off-balance sheet credit exposures move onto the balance sheet and may have funding demand and regulatory capital-ratio implications. Similarly, decreased liquidity in the secondary loan market may be of particular concern to high-CLE 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 market for syndicated credits. Exposed banks may also be more worried about an unfavorable economic outlook and sectoral problems given the change in credit risk profile of the loan portfolio potentially caused by drawdowns (as discussed in Section 2.1). Finally, high-CLE banks may have become more aware of risks and vulnerabilities associated with the large off balance sheet CLEs during the drawdown surge and decided as a consequence to pull back from risk-taking.

To assess the empirical relevance of these channels, we define dummy variables taking value 1 for the banks that cited each reason as being somewhat or very important in their decision to tighten standards each quarter (and 0 for those banks that rated these reasons as

unimportant). We report the fraction of banks citing these factors in Figure 6. These raw tabulations show that fractions of only 5%-18% banks cited a deterioration in the current or expected liquidity and capital position as relevant factors behind their lending decisions in any given quarter.[30] By contrast, larger fractions of banks cited a more unfavorable or uncertain economic outlook, worsening of industry-specific problems (specifically, in COVID-sensitive industries), and a general reduction in their risk tolerance. The share of banks citing these factors as leading drivers of their decision to tighten standards hovers around 40-45% in Q1, peaks at 60-70% in Q2, and comes down to 30-35% in Q3.

Figure 6: **Reasons for Tightening Lending Standards in 2020**



The chart depicts the fraction of domestic banks that rated each of six reasons as a somewhat or a very important possible reason for tightening credit standards or terms 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 standards and terms on bank loans over the quarter. Source: Federal Reserve Senior Loan Officer Opinion Survey.

Next, we pool the data across the three surveys in a bank-level panel and regress the dummy variables on ex-ante CLE and the standard bank controls (size, capital, loan-to-asset ratio, "stronger demand" dummmy). Based on the data tabulations, we allow these

[30] 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, 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.

reasons to correlate with CLE differently by quarter, therefore we unpack the changing role of each channel with quarterly spline terms. The estimates, shown in Table 8, deliver three takeaways.

First, the estimates on the quarterly spline terms for CLE in columns 1–2 suggest that liquidity and capital constraints did not pay a major role in determining exposed banks to tighten loan supply. Banks' liquidity constraints seem to have had some effect on lending only in 2020:Q1, during the most acute phase of the drawdowns. However, given large inflows of deposits into a well capitalized banking system coupled with ample central bank liquidity injections and regulatory relief starting in late 2020:Q1, banks were able to meet the unprecedented liquidity demand (Li, Strahan and Zhang, 2020), and our results show that they did not feel very constrained in their lending capacity. That balance sheet (liquidity and capital) constraints were not the key friction is a key result in our paper.

Second, the positive and significant coefficient on CLE×2020:Q1 in column 6 suggests that illiquidity in the secondary loan market also contributed to the tightening of lending standards in 2020:Q1 at more exposed banks. High-CLE banks are also more likely to use the secondary loan market as a liquidity management tool, by trading syndicated credits, during periods of stress. For instance, 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 started to normalize across financial markets.

Third, the estimates on the CLE-quarter spline terms in column 5 suggest that a decline in risk tolerance was the dominant channel behind the tightening of lending standards at exposed banks. By contrast, exposed banks were not relatively more likely to tighten standards because of the less favorable economic outlook, nor because of potential exposures to industries that were experiencing problems (columns 3–4). Overall, the rich quarterly survey data we assembled to gauge the mechanisms of our findings suggest that capital and

Table 8: **Results from Senior Loan Officer Opinion Survey: Exploring the Mechanisms**

	(1) own liquidity position	(2) own capital position	(3) unfavorable economic outlook	(4) industry-specific problems	(5) lower tolerance for risk	(6) secondary market liquidity
CLE × 2020:Q1	0.0026**	-0.0006	0.0020	0.0016	0.0055***	0.0037***
	(0.001)	(0.001)	(0.003)	(0.002)	(0.002)	(0.001)
CLE × 2020:Q2	0.0001	-0.0006	0.0032	-0.0000	0.0085***	0.0021
	(0.000)	(0.000)	(0.002)	(0.001)	(0.002)	(0.002)
CLE × 2020:Q3	0.0000	-0.0012*	0.0015	-0.0013	0.0034*	-0.0000
	(0.000)	(0.001)	(0.003)	(0.001)	(0.002)	(0.001)
Bank size (log-assets)	0.0069	-0.0327	-0.1728***	-0.0429***	-0.1363***	-0.0525*
	(0.010)	(0.022)	(0.039)	(0.010)	(0.041)	(0.030)
Capital	1.5872*	0.1702	-7.9550	0.6083	-10.0966	-2.2292
	(0.911)	(1.508)	(6.437)	(1.512)	(7.116)	(3.372)
Loans/Assets	0.7471**	-0.0399	-1.5612*	-0.4346**	-0.6641	-0.1025
	(0.300)	(0.583)	(0.885)	(0.173)	(1.208)	(1.069)
Demand Strengthened	-0.0176	-0.0103	-0.0039	-0.0480	-0.0385	0.0142
	(0.024)	(0.035)	(0.091)	(0.052)	(0.085)	(0.042)
Observations	129	125	128	128	129	129
R-squared	0.243	0.058	0.353	0.353	0.274	0.156

This table shows baseline (OLS) results on the effect of credit line exposures on the probability that banks cited the reasons listed as column headings as important in their decision to tighten C&I lending standards and terms in the SLOOS. The dependent variable is a dummy variable taking value 1 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 standards and terms on bank loans over the past quarter. All regressions include the baseline controls from Table 4. The sample contains SLOOS respondents matched to Dealscan. 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 Loan Officer Opinion Survey of the U.S. Federal Reserve Board, Refinitiv's Dealscan, Call Report.

liquidity constraints are not the key friction driving our results. Instead, 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.

6 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, on the extensive and intensive margin, across different segments of the loan market, and across large and small banks and borrowers alike.

Our results document a close link between drawdown risk and bank's willingness to supply new credit during a crisis. We show that banks with larger ex-ante credit line exposures tightened lending standards and the terms of new C&I loans in the first three quarters of 2020. They did so especially vis-a-vis small firms, seemingly crowding out lending to constrained firms. They also curtailed the supply of large syndicated loans in 2020:Q2 and were less likely to renew expiring loans or to start new lending relationships. Exposed banks were also less likely to participate in low-risk government-sponsored credit programs; they deployed fewer PPP loans to small businesses and were less likely to grant MSLP loans.

Our findings suggest that tension may arise during crises between banks' providing liquidity insurance to firms while continuing to intermediate credit, with important implications for monetary policy and financial stability. Our analysis suggests that banks' exposure to pre-commited credit constrains financial intermediation after periods of unexpected surges

in drawdowns. Banks' heightened caution in in their lending decisions, in turn, may diminish the effectiveness of monetary policy, for instance in relation to channeling subsidized credit to firms through the banking system.

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 drawdown rates in the 20% to 30% range may be warranted.[31]

[31]This is a conservative estimate obtained as follows. According to the Federal Reserve's May 2020 Financial Stability Report, 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 the U.S. credit register suggests that drawdowns from small firms were negligible at large banks (Chodorow-Reich, Darmouni, Luck and Plosser, 2020) 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 drawdown rate during the early phase of the COVID-19 crisis is between 18% and 28%.

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

	N	Mean	SD	p25	p50	p75
A. Cross-section of banks						
Credit line exposure (% assets), all banks	102	8.02	8.32	2.04	4.7	12.06
Credit line exposure (% assets), GSIBs	30	8.38	5.71	3.66	8	13.02
Credit line exposure (% assets), non-GSIBs	72	7.87	9.22	1.78	3.33	10.75
Total assets (USD bn)	102	818.21	879.7	215.35	514.99	993
Size (log-assets)	102	26.9	1.09	26.1	26.97	27.62
B. Dealscan (intensive-margin)						
Loan volume growth (%)	3163	67.6	194.5	-47.4	-0.8	89.5
1: GSIB	3163	0.6	0.5	0.0	1.0	1.0
C. Dealscan (extensive-margin)						
Credit line exposure (% assets)	10046	12.0	7.9	5.8	10.0	17.3
Probability(Loan renewal)	10046	0.10	0.30	0.00	0.00	0.00
Probability(CL renewal with CL)	7065	0.11	0.31	0.00	0.00	0.00
Probability(New relationship)	34087	0.13	0.33	0.00	0.00	0.00
D. SLOOS						
Credit line exposure (% assets), pooled	190	19.7	35.1	1.4	5.3	23.9
1: Standards tightened (large firms), Q1	44	0.4	0.5	0.0	0.0	1.0
1: Standards tightened (small firms), Q1	42	0.3	0.5	0.0	0.0	1.0
1: Standards tightened (large firms), Q2	48	0.7	0.5	0.0	1.0	1.0
1: Standards tightened (small firms), Q2	45	0.6	0.5	0.0	1.0	1.0
1: Standards tightened (large firms), Q3	45	0.3	0.5	0.0	0.0	1.0
1: Standards tightened (small firms), Q3	42	0.2	0.4	0.0	0.0	0.0
E. Paycheck Protection Program						
Credit line exposure (% assets)	2098668	27.2	34.7	4.8	27.9	30.5
PPP loan volume (USD)	2296993	$ 35,438	$ 34,006	$ 10,627	$ 21,300	$ 49,655
PPP loan volume (log)	2296993	10.0	1.1	9.3	10.0	10.8
F. Main Street Lending Program						
Credit line exposure (% assets), end-2020:Q2	610	6.0	5.8	2.7	4.9	8.0
Credit line exposure (% assets), end-2020:Q3	609	6.2	5.9	2.7	5.0	8.4
MSLP lender	614	0.5	0.5	0.0	0.0	1.0

This table reports descriptive statistics for selected variables in the regression analysis. In panel A we report descriptive statistics for credit line exposures (CLE) in the cross-section of 102 lenders in Dealscan. In panels B-C we focus on the Dealscan regression samples. In panel A, loan volume growth is computed at the bank-firm cluster level (where firm clusters include all borrowers in the same country and 3-digit SIC industry) and represents the growth rate of average lending volumes between 2019 and 2020:Q2. All variables are defined at end-2019. GSIB refers to a dummmy variable for 30 global systematically important banks according to the BIS definition. In panel E, summary statistics for CLE are in the pooled sample of SLOOS surveys for 2020 and for the dummy "Standards tightened" they are broken down by survey. The CLE measure in panels A-E is based on Dealscan credit line origination data (see Section 3) and in panel F it is from the Call Report.

Table A2: **Results from Senior Loan Officer Opinion Survey: CLE and C&I Loan Terms over 2020:Q1–Q3**

Dependent variable: Bank tightened:	(1) maximum size of credit lines	(2) maximum maturity	(3) cost of credit lines	(4) loan spreads	(5) premium on risky loans	(6) loan covenants	(7) collateral requirements	(8) interest rate floors
				(a) Large and mid-sized firms				
Credit line exposure (CLE)	0.0014	0.0020*	0.0008	-0.0007	0.0019*	0.0017	0.0015	0.0035**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	138	137	137	138	138	137	136	138
R-squared	0.038	0.114	0.102	0.160	0.061	0.043	0.130	0.081
				(b) Small firms				
Credit line exposure (CLE)	0.0038**	0.0028*	0.0001	0.0003	0.0022	0.0048***	0.0059***	0.0020
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	129	129	128	129	129	129	127	128
R-squared	0.264	0.134	0.429	0.210	0.162	0.304	0.300	0.464

This table shows that the baseline (OLS) results on the effect of credit line exposures on the probability of banks reporting that they tightened the terms of approved loans according to survey responses, is robust over the first quarters of 2020. The dependent variable is a dummy variable taking value 1 if the bank reported that they "somewhat tightened" or "considerably tightened" the terms of new C&I loans and credit lines during 2020:Q1, Q2, and Q3. All regressions include the baseline controls from Table 4. Small firms have annual sales below $50 million. The sample contains SLOOS respondents matched to Dealscan. 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 Loan Officer Opinion Survey of the U.S. Federal Reserve Board, Refinitiv's Dealscan, Call Report.

Table A3: **Results from Senior Loan Officer Opinion Survey: CLE and C&I Loan Terms over 2020:Q4**

Dependent variable: Bank tightened:	(1) maximum size of credit lines	(2) maximum maturity	(3) cost of credit lines	(4) loan spreads	(5) premium on risky loans	(6) loan covenants	(7) collateral requirements	(8) interest rate floors
				(a) Large and mid-sized firms				
Credit line exposure (CLE)	-0.0004	0.0002	-0.0001	-0.0023	0.0012	0.0002	-0.0003	0.0020
	(0.000)	(0.001)	(0.000)	(0.001)	(0.002)	(0.001)	(0.000)	(0.002)
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	47	47	46	46	47	47	47	45
R-squared	0.134	0.114	0.177	0.263	0.334	0.127	0.088	0.330
				(b) Small firms				
Credit line exposure (CLE)	-0.0004	0.0023	-0.0023	0.0032**	-0.0025	-0.0006	0.0005	0.0016
	(0.000)	(0.002)	(0.003)	(0.001)	(0.003)	(0.002)	(0.001)	(0.004)
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	43	43	43	42	43	43	43	42
R-squared	0.069	0.350	0.201	0.347	0.187	0.204	0.158	0.121

This table shows that the effect of credit line exposures on the probability of banks reporting that they tightened the terms of approved loans according to survey responses, is statistically negligible in 2020:Q4. The dependent variable is a dummy variable taking value 1 if the bank reported that they "somewhat tightened" or "considerably tightened" the terms of new C&I loans and credit lines during 2020:Q4. All regressions include the baseline controls from Table 4. Small firms have annual sales below $50 million. The sample contains SLOOS respondents matched to Dealscan. 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 Loan Officer Opinion Survey of the U.S. Federal Reserve Board, Refinitiv's Dealscan, Call Report.

Table A4: **Results from the Senior Loan Officer Opinion Survey: Control for Loan Loss Reserves**

	(1)	(2)	(3)	(4)	(5)	(6)
	Bank reports tightening credit standards for approving C&I loans to:					
	Large and mid-sized firms			Small firms		
	Q2	Q3	Q4	Q2	Q3	Q4
Credit line exposure (CLE)	0.0014	-0.0018	-0.0003	0.0061***	0.0042**	0.0023
	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Bank size (log-assets)	0.0004	-0.1908***	-0.0600**	-0.2236***	-0.0541	-0.0362
	(0.105)	(0.046)	(0.029)	(0.069)	(0.056)	(0.049)
Capital	3.3885	1.9784	5.9528*	-12.7474**	0.0377	6.4644*
	(8.350)	(4.655)	(3.129)	(5.380)	(8.290)	(3.309)
Loan/Asssets	-0.5174	-1.6915**	0.5576	-1.5667	0.2384	0.2096
	(1.428)	(0.685)	(0.366)	(1.445)	(1.691)	(0.845)
1: Strengthening demand	0.2014	-0.6434***	-0.1736	-0.0570	0.0387	0.0195
	(0.186)	(0.184)	(0.105)	(0.138)	(0.152)	(0.195)
Loan loss reserves (end-Q1)	76.3848*			52.4146*		
	(39.930)			(27.354)		
Loan loss reserves (end-Q2)		51.6583*			33.1771	
		(25.885)			(35.661)	
Loan loss reserves (end-Q3)			11.8371			-5.5634
			(12.969)			(17.199)
Observations	48	45	47	45	42	43
R-squared	0.194	0.356	0.222	0.598	0.198	0.345

This table shows that the baseline survey-based regression results are robust to controlling for loan loss reserves as measure of banks' expectations of the quality of its loan portfolio. The dependent variable is a dummy variable taking value 1 if the bank reported that they "somewhat tightened" or "considerably tightened" standards on new C&I loans and credit lines over the past three months. All specifications include bank controls measured, as in the baseline, at the end of 2019: size (log-assets), capital (Tier 1 ratio), and loan-to-asset ratio. Loan loss reserves are in % of total gross loans. The sample contains SLOOS respondents matched to Dealscan. These regression results are weighted by bank size. Standard errors clustered on bank. Source: Senior Loan Officer Opinion Survey of the U.S. Federal Reserve Board, Refinitiv's Dealscan, Call Report.