



# The effect of the Federal Reserve's lending facility on PPP lending by commercial banks<sup>☆</sup>

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Board of Governors of the Federal Reserve System, United States of America

## ARTICLE INFO

### Keywords:

Central bank lending  
PPP lending  
Federal Reserve  
COVID

## ABSTRACT

We investigate whether the Federal Reserve's Paycheck Protection Program Liquidity Facility (PPPLF) boosted commercial bank Paycheck Protection Program (PPP) lending. To determine whether this facility had a causal effect, we use pre-existing familiarity with the Federal Reserve's discount window as an instrumental variable. We show that the PPPLF materially bolstered bank PPP lending and provided a meaningful funding backstop for banks that did not use the facility. Our paper is one of the first to quantitatively illustrate the effectiveness of a central bank facility as a funding backstop.

## 1. Introduction

Many businesses suffered during the COVID-19 public health crisis, as social distancing adversely affected their operations and sales (Aleksiev et al., 2022). In response, the federal government established the Paycheck Protection Program (PPP) which enabled eligible businesses to receive low-cost, potentially forgivable loans from banks and other lenders. Guarantees by the Small Business Administration (SBA) ensured that the PPP lenders were repaid. Studies of the PPP have generally found that it supported businesses during the early months of the pandemic, although there is considerable debate about the size of the effect (Bartik et al., 2020b; Autor et al., 2022; Doniger and Kay, 2022, among others).

To bolster the ability of banks to extend PPP loans, the Federal Reserve provided funding support by quickly establishing the Paycheck Protection Program Liquidity Facility (PPPLF). Use of the facility was linked to PPP loan extensions as banks were required to pledge PPP loans as collateral. The PPPLF provided financial incentives for banks to make PPP loans by offering low-cost long-maturity funds. Moreover, the existence of the PPPLF provided certainty about the availability of funding – regardless of whether the bank used the facility or not – which was likely important in the early months of the program when banks might have been concerned about the stability of their deposit funding base. In this paper, we investigate the extent to which the PPPLF supported the objectives of the PPP program by estimating both

a direct effect of the PPPLF usage on PPP lending, including small dollar loans, and a backstop effect in which PPP lending was boosted because banks were certain of funding availability. Estimating both effects are important to understanding the full impact of the lending facility. Moreover, our estimates of the backstop effect provides novel insights into the role of funding uncertainty in restraining bank lending amid market dysfunction and the ability of the central bank to mitigate those effects.

The PPPLF was one of the most used of the emergency lending program established by the Federal Reserve in 2020 (Fig. 1). Despite this notable use, it is not certain that the facility made a causal contribution to the amount of PPP lending by banks. Instead, banks may have decided on the PPP loans that they wanted to make and then afterwards decided how to fund those loans, including by using the PPPLF. Thus, any linkage between higher lending and PPPLF usage may simply be a consequence of banks already deciding to lend more rather than the presence of the PPPLF causing an increase in bank lending.

To address these endogeneity concerns, we use an instrumental variable approach. Our instrument for PPPLF usage is the familiarity of banks with the operation of the Federal Reserve's discount window prior to the onset of the COVID-19 public health crisis as indicated by their experience with pledging loan collateral. The process of pledging loan collateral in normal times involves a number of administrative steps, such as being able to submit monthly paperwork regarding

<sup>☆</sup> We thank Alyssa Anderson, Lamont Black, Margaret DeBoer, Nathan Foley-Fisher, David Glancy, Bill English, Benjamin Kay, John Kandrac, Beth Klee, David Krause, Lei Li, Marco Macchiavelli, Matthew Malloy, Camelia Minoiu, Bernd Schlusche, Zeynep Senyuz, Gregory Udell, Annette Vissing-Jørgensen, and Eric Zwick for valuable comments. We thank seminar participants at the 2021 Community Banking Conference, the Federal Reserve Board, and the Federal Reserve Bank of Boston. Ethan Cohen, Abigail Roberts and Spencer Sween provided excellent research assistance. The views expressed in this paper are solely those of the authors and do not necessarily reflect the views of the Board of Governors of the Federal Reserve System or its staff. All remaining errors are our own.

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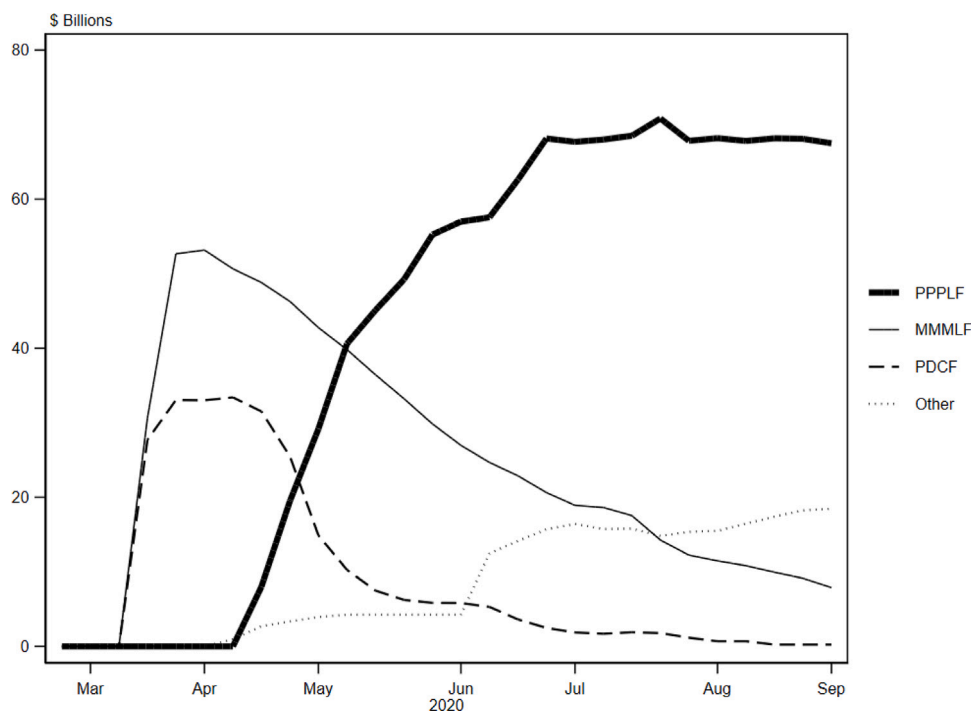


Fig. 1. Borrowing from Section 13.3 emergency facilities.

Note. This figure displays the amount outstanding at Federal Reserve lending facilities between March 2020 and August 2020. Data are Wednesday close-of-business levels. Facilities shown include Paycheck Protection Program Liquidity Facility (PPPLF), Money Market Mutual Fund Liquidity Facility (MMMLF), Primary Dealer Credit Facility (PDCF), and Other, which reflects asset purchases by LLCs of the Corporate Credit Facilities, Commercial Paper Funding Facility, Municipal Lending Facility, Main Street Lending Program, and Term Asset-Backed Securities Loan Facility. Source: Factors Affecting Reserve Balances (H.4.1) Statistical Release from the Board of Governors.

changes in the value of pledged loans, while at the same time is nearly identical to the process required for pledging PPP loans for the PPPLF. Hence, a clear mechanism existed by which familiarity with discount window operations would have made banks more likely to consider the PPPLF as a potential source of funding, while at the same time not being subject to endogeneity concerns.

We first test whether our instrument is related to banks' use of the PPPLF. Even after controlling for a variety of bank attributes, we find that our measure of familiarity mattered. Experience pledging loan collateral increased a bank's probability of using the PPPLF by 9 percentage points, such that these banks had an overall probability of using the facility of 27 percent. This relationship was particularly strong for smaller community banks. These results also suggest that there is value in encouraging familiarity with the discount window as part of preparedness planning.

Having established this link, we look at whether banks that borrowed from the PPPLF extended more PPP loans than other banks using data from the June 2020 Call Report. Our results indicate a notable effect, with use of the facility increasing PPP lending relative to the asset base of the banks by 4.4 percentage points. As the unconditional average ratio of PPP loans to assets in June 2020 for banks that did not use the facility was 5 percent, our result suggests that use of the facility roughly doubled a bank's PPP loan extensions. We find that the boost provided by the facility through this direct channel is particularly strong for smaller community banks, those with assets of \$600 million or less. These results are consistent with the limited number of previous estimates of the effect of the program, such as Lopez and Spiegel (2023), although we are able to provide more specificity on the size of the banks affected.

However, as noted above, looking only at PPPLF usage likely underestimates the effectiveness of the PPPLF. Buch et al. (2015) and Valencia (2017) argue that uncertainty can notably restrain the supply of bank credit; uncertainty was extremely high in the early months of the pandemic. To test whether the Federal Reserve was able to boost

PPP lending by reducing uncertainty about the cost and availability and cost of funding, we compare outcomes for banks that submitted paperwork to use the facility, even if they did not borrow, to outcomes for other banks.<sup>1</sup> Submitting this necessary paperwork required effort by the bank and served as a signal that the bank was incorporating the PPPLF into their funding planning. We find that our instrumental variable, the indicator of a bank's familiarity with the discount window, also increased the probability that a bank filed the paperwork to be able to use the PPPLF. Banks that had pledged loan collateral to the discount window prior to the onset of COVID-19 were 22 percentage points more likely to file paperwork necessary to borrow from the PPPLF, which translates to a 56 percent probability of signing up for the PPPLF overall.

Repeating the earlier analysis, we find that signing up for the PPPLF boosted PPP lending. The effect was strongest for larger community banks where we find that banks that filed paperwork extended, on average, additional PPP loans equal to about 6 percent of their assets. We interpret this finding as indicating that the PPPLF promoted engagement by market participants even when it was not utilized, and that facility take-up should not be the only indicator of success. Accounting for this backstop effect roughly doubles our estimate of the overall effect of the program relative to considering usage alone. This estimate also suggests that previous work, such as Lopez and Spiegel (2023), has underestimated the size of the effect of the PPPLF because it has not accounted for the boost coming from providing funding certainty.

Disentangling the value of the facility as a backstop from the value of the facility in providing funds is a unique result of our paper. It represents an important contribution to the understanding of the benefits of central bank emergency lending programs during periods of financial market stress when uncertainty is often considerably elevated.

<sup>1</sup> Legal documents needed to sign up for the PPPLF include a Letter of Agreement and a Borrower Certification, which are available from the Federal Reserve's Discount Window website under [PPPLF Historical Documents](#).

We also investigate whether the PPPLF had a positive effect on the amount of small (less than \$150 thousand) PPP loan extensions. We are motivated to look at this given small PPP loans were viewed as particularly important by many members of Congress and work by others, including Autor et al. (2022) and Chetty et al. (2022), have noted the benefits of small dollar loans to small firms. To do this, we use loan level data from the SBA and focus on the extension of very small loans as a proxy for loans to smaller business establishments with funding constraints. Our results indicate that small community banks that used the PPPLF extended more of these very small loans, suggesting that the PPPLF bolstered the ability of banks to extend loans to the businesses that Congress had hoped to reach.

The remainder of the paper is organized as follows. We begin in Section 2 with a brief review of literature related to the PPPLF and emergency lending programs in general to place our analysis in context. Valuable background information on the operation of the PPP and PPPLF is provided in Section 3, along with a description of the data that we use to analyze the programs. In Section 4, we describe our instrument and how familiarity with the discount window related to bank engagement (use or filing paperwork) with the PPPLF. In Section 5, we describe the specification and analysis of how the PPPLF bolstered PPP lending. Section 6 concludes.

## 2. Related literature

Few papers examine the effect of the PPPLF even though it was one of the most used of the Federal Reserve's emergency lending programs. One important exception is Lopez and Spiegel (2023), who look at the joint impact of the PPP and use of the PPPLF on small business lending by banks. They also use an instrumental variable approach where their instruments are the prior relationship of the bank with the SBA, to predict PPP use, and having collateral pledged/filing paperwork to use the discount window to predict PPPLF usage. They find that the two programs did boost small business lending overall, with the PPPLF having the strongest effects for small and medium sized banks. As noted in the introduction, this paper further develops our understanding of the PPPLF's overall effectiveness by identifying which banks boosted lending through use of the facility (the smallest community banks) and by accounting for the effect of funding certainty in boosting lending (which occurred mostly at larger community banks).

Work on the PPP and PPPLF is also connected to the broad literature on funding for lending programs. The combination of the PPP and PPPLF had some similarities to funding for lending programs established by other central banks. Examples of such funding for lending programs include the Term Funding Scheme offered by the Bank of England, as described by Ginelli Nardi et al. (2018), and the Targeted Long-term Refinancing Operations offered by the European Central Bank, and described by Andreeva and García-Posada (2021) and Carpinelli and Crosignani (2021). These studies like ours, find that banks responded to the financial incentives provided by these programs.

In addition, our paper is related to an important literature on the effectiveness of Federal Reserve facilities generally. Many Federal Reserve facilities have been shown to improve conditions during financial shocks such as during the 2008 financial crisis (such as Duygan-Bump et al., 2013, Carlson and Macchiavelli, 2020, Fleming, 2012, Fleming et al., 2010, Acharya et al., 2017, Armantier et al., 2015 among others) and the COVID-19 pandemic (such as Li et al., 2021 among others). Studying the effectiveness of these facilities is important for understanding the role central banks and governments play in fighting crises more broadly.

## 3. Operations of the PPP and PPPLF

This section provides more details on the operations of the PPP and PPPLF and discusses the data used in the analysis.

### 3.1. The Paycheck Protection Program (PPP)

The PPP was a part of the Coronavirus Aid, Relief, and Economic Security Act (or CARES Act) passed by the U.S. Congress in response to the economic disruptions caused by efforts to contain the COVID-19 pandemic. The PPP was geared towards providing support for smaller businesses. Indeed, the entities that are eligible to participate in the program include small business concerns as defined by the SBA: sole proprietors, independent contractors, and self-employed persons, among others. The program also featured rules designed to promote employee retention.

Rather than distribute funds directly to businesses, the program used private sector lenders and the SBA to deliver support. Private sector lenders were encouraged to make loans to eligible small businesses, and those loans would be guaranteed by the SBA. These loans could be forgiven if they were used to cover eligible expenses, such as payrolls. The loans resided on the balance sheets of the private sector lenders, but these lenders did not incur any credit risk associated with the loans, as any payments not made by the borrower, due to either default or forgiveness, were covered by the SBA. In addition, the guarantee from the SBA allowed for regulatory relief that reduced the capital requirements associated with these loans. Finally, lenders were paid a fee for originating loans, which further incentivized them to do so.

Funds allocated to the PPP came in several installments. The first was in March 2020, where Congress set aside \$349 billion in funding for the PPP. That funding ran out in mid-April. On April 24, 2020, an additional \$310 billion was allocated as part of the Paycheck Protection Program and Health Care Enhancement Act. A third installment, which provided an additional \$284 billion in funding but modified aspects of the program to favor smaller borrowers and lenders, was included in the Consolidated Appropriations Act that was signed into law in December 2020. Our analysis period ends in June 2020 and thus only includes information from the first two installments. For more details about the PPP program including a literature review, please see Internet Appendix A.

### 3.2. The Paycheck Protection Program Liquidity Facility (PPPLF)

On April 6, 2020, one business day after the official launch of the PPP, the Federal Reserve announced plans to establish a liquidity facility to bolster the ability of depository institutions to lend to small businesses via the PPP (Federal Reserve, 2020). Additional details were released over the next few days. Amid the flurry of announcements, we would expect the PPPLF to affect PPP lending as early as April 6.

When the PPPLF started operations on April 16, it offered a variety of incentives. The first was low-cost financing: loans extended under the facility have a rate of 0.35 percent. This rate was a bit below those for other funding sources during the time when most PPP loans were originated. For example, rates offered by Federal Home Loan Banks for loans of similar maturities to those of the PPPLF were on the order of 0.60 percent to 0.90 percent at this time. PPPLF loans must be collateralized by PPP loans. Due to the full guarantee of the PPP loans provided by the SBA, there is no haircut on the PPP loans and the amount of each loan extended under the facility is equal to the value of the PPP loans pledged as collateral. Moreover, with the guarantee in place, PPPLF loans were extended on a non-recourse basis to the PPP lenders.<sup>2</sup> The maturity of PPPLF loans is set to match that

<sup>2</sup> The PPPLF was established under the Federal Reserve's emergency lending authority, rather than the standard lending authority, which enables these unusual lending terms. Use of emergency lending authority also allowed the Federal Reserve to make the PPPLF available to all private sector PPP lenders, not just banks. We focus on banks in this paper because of the availability of data on their balance sheets and their history of access to Federal Reserve liquidity.

of the PPP loans so that the PPP lender does not face liquidity risk or maturity mismatch. Consequently, loans from the PPPLF originally had a maturity of two years, but that was later extended to five years when the maturity of PPP loans was lengthened. The PPPLF may also have supported PPP lending through its role as a backstop by reassuring banks about the availability of funding at a known price. That assurance may have been especially important if banks were concerned that the rapid influx of deposits that occurred around the onset of the stress period might rapidly reverse, or if the bank's typical source of market funding were to suddenly prove less available than anticipated.

As of June 2020, the Federal Reserve had extended over \$65 billion in credit through the PPPLF.<sup>3</sup> This amount represented only a modest fraction of the PPP loans outstanding. However this amount was considerably larger than the amount extended through either the corporate credit facilities (which had extended about \$15 billion in loans by the end of 2020) or the Main Street Lending program (which extended slightly over \$15 billion by January 2021). Given its prominent place among the emergency lending facilities, it is particularly important to understand the PPPLF's effectiveness.

Nearly 95 percent of PPPLF borrowers were community banks. In light of this significant use of the PPPLF by these institutions and the findings of James et al. (2021) regarding the importance of community banks in extending PPP loans, we provide analysis that focuses on community banks in addition to our analysis of the banking system as a whole.

### 3.3. Participation in PPP and PPPLF

Our data set is composed of data from the Federal Financial Institutions Examination Council (FFIEC) and from the Federal Reserve for 4225 commercial banks that we identified as PPP lenders. Thus, our sample only includes banks that participated in the PPP. Commercial banks are identified as PPP lenders based on the FFIEC's Consolidated Reports of Condition and Income (Call Reports) for June 30, 2020, which specifically asked respondents to report outstanding PPP loans on their balance sheets. Banks with reported PPP loans outstanding greater than zero are flagged as PPP lenders. Using this approach, the banks in our sample account for over 90 percent of the \$521 billion in net PPP issuance as of June 30, 2020. (The remaining 10 percent of issuance was done by non-bank lenders.)

For each bank in our sample, we gather information on their PPPLF usage between April 16, 2020, and June 30, 2020 (ending the sample at that date aligns with out data on PPP loans). Data on PPPLF borrowings by lender are publicly disclosed on the Board of Governors' public website. We create an indicator that flags whether a bank borrowed from the facility at least once at any point between those dates.

We also gathered data on PPP loans issued by commercial banks through the end of June 2020 from the SBA's loan level disclosures. These data provide some information that is not available on the Call Reports.<sup>4</sup> Most importantly, the SBA data allows us to group loans by size so that we can investigate whether the PPPLF affected small dollar loan originations (where small dollar loans are defined by the SBA as

those with an issuance amount of less than \$150,000). To connect the SBA data with other data sets, we use information on each PPP loan originator's name, city, and state to match each originator to a unique Federal Reserve identifier and thus to relevant bank structure and financial data. That matching process identified 4123 unique commercial banks, which is 102 fewer banks than indicated by the Call Reports. Given the imperfections in the matching process, our main results are based on the Call Reports data and we use the SBA data to look only at small-dollar PPP loans.

As suggested above, we focus our analysis on PPP and PPPLF activity through June 30, 2020. While PPP loan issuance based on the second funding installment continued through August 10, 2020, the bulk of PPP loans issued by commercial banks had occurred by the end of May. Moreover, not many PPPLF loans were extended between July 2020 and December 2020. Additional PPPLF loans were extended once the third installment of the PPP was put in place. However, as there were notable changes to the PPP, as well as a more stable macroeconomic situation where rapid deposit outflows seemed less likely, the benefits of the PPPLF may have changed, and we do not include this later period in our study.

A few banks held very large amounts of PPP loans relative to their assets in June 2020. For most of these banks, the accumulation was the result of the banks acquiring a significant portion of these loans in conjunction with their relationships with FinTech firms and the PPPLF was an important funding source for these loans.<sup>5</sup> While this dynamic is important and highlights the support provided by the facility, it was limited to a few banks. To prevent the very large ratios of PPP loans relative to assets reported by these few banks from distorting our estimates of the relationship between the PPP and PPPLF that prevailed for most of the banking industry, we winsorize the data at the 5 percent level. Doing so modestly reduces the size and noise of the estimated benefits of the PPPLF.

Summary statistics for banks that used the PPP and PPPLF programs are provided in Table 1. Of the banks in our sample, 743 borrowed from the PPPLF at least once (top panel). This group represents about 18 percent of all banks with PPP loans outstanding as of June 30, 2020. Given the interest in the role of community banks in providing PPP loans, the table also shows summary statistics for different size categories of banks: large banks (those with assets of \$10 billion or more); large community banks (those with assets of less than \$10 billion but more than \$600 million); and small community banks (those with assets of less than \$600 million).<sup>6</sup>

We observe from Table 1 that banks that used the PPPLF issued more PPP loans, on average, than banks that did not participate in the PPPLF. For instance, for banks that were PPPLF borrowers, the average bank had PPP loans on their balance sheet in June 2020 of about 11 percent of their December 2019 assets. By contrast, the average bank that was not a PPPLF borrower had PPP loans on their balance sheet that represented 5 percent of their assets at the end of 2019. These differences are particularly apparent for small community banks where banks that borrowed from the PPPLF issued a little more than 2.5x the

<sup>3</sup> Banks could have obtained secured funding from the Federal Reserve's primary credit facility but it seems unlikely that this facility would have been used to support significant PPP lending. Funds from the primary credit facility were available for a period of up to 90 days, rather than being matched to the maturity of the PPP loans as in the PPPLF. Moreover, the primary credit facility has historically been subject to stigma issues where banks have been reluctant to use it out of concern that usage may be perceived as sending a negative signal about their financial condition (Carlson and Rose, 2017). As a brand-new facility specifically introduced in response to a crisis and in order to facilitate lending to small businesses, there were no such issues with the PPPLF.

<sup>4</sup> SBA PPP loan data can be found at <https://data.sba.gov/dataset/ppp-foia>. We used the version dated July 1, 2021, 11:06 AM (UTC-04:00).

<sup>5</sup> For instance, we observe a handful of banks with ratios of PPP loans as of June 2020 relative to total assets as of December 2019 that are greater than 1. Other research, such as Erel and Liebersohn (2022) as well as investigations of these banks on their websites and in media reports indicates that many of these banks bought PPP loans from FinTechs in the secondary market to facilitate FinTechs lending PPP loans to small businesses. FinTechs were not allowed direct access to the PPPLF until April 30, 2020, and were operating with little balance sheet capacity until this date.

<sup>6</sup> The \$600 million cutoff reflects the number set by the SBA and used by federal regulators to assess burden of regulatory changes on smaller banks. The SBA small bank threshold took effect on August 19, 2019. Please refer to size standards for Sector 52 (Finance and Insurance) and Subsector 522 (Credit Intermediation and Related Activities) available at <https://www.sba.gov/document/support-table-size-standards>.



**Table 1**

Summary statistics on banks that used the PPP and PPPLF programs.

Source: Federal Reserve Bank of Minneapolis, PPPLF Data, FFIEC Call Reports, and SBA PPP loan data.

	N	Mean	Std. Dev.	N	Mean	Std. Dev.
		Borrowed			Did not borrow	
All Banks						
PPP loans/Assets	743	0.11	0.06	3482	0.05	0.04
Share of PPP loans pledged	743	0.51	0.37	3482	0.00	0.00
Small Dollar PPP loans/Assets	720	0.03	0.02	3403	0.02	0.01
Large Banks						
PPP loans/Assets	41	0.06	0.04	75	0.04	0.03
Share of PPP loans pledged	41	0.35	0.42	75	0.00	0.00
Small Dollar PPP loans/Assets	41	0.01	0.01	69	0.01	0.01
Large Community Banks						
PPP loans/Assets	277	0.10	0.05	741	0.07	0.04
Share of PPP loans pledged	277	0.47	0.39	741	0.00	0.00
Small Dollar PPP loans/Assets	270	0.02	0.01	727	0.02	0.01
Small Community Banks						
PPP loans/Assets	425	0.13	0.06	2666	0.05	0.04
Share of PPP loans pledged	425	0.56	0.35	2666	0.00	0.00
Small Dollar PPP loans/Assets	409	0.04	0.02	2607	0.02	0.01
		Filed paperwork			Did not file paperwork	
PPP loans/Assets						
All Banks	1461	0.10	0.06	2764	0.05	0.04
Large Banks	77	0.06	0.03	39	0.03	0.03
Large Community Banks	540	0.09	0.05	478	0.06	0.04
Small Community Banks	844	0.11	0.06	2247	0.04	0.04

Note. "Large Banks" are those with assets greater than \$10 billion, "Large Community Banks" have assets of more than \$600 million and less than \$10 billion, and "Small Community Banks" have assets less than or equal to \$600 million as of December 31, 2019. "PPP loans/Assets" is the ratio of PPP loans outstanding as of June 30, 2020 divided by assets as of December 31, 2019 winsorized at the 5% level. "Small Dollar PPP loans/Assets" are loans with values less than \$150,000 divided by assets as of December 31, 2019, winsorized at the 5% level.

amount of PPP loans relative to assets compared to one that did not borrow. The differences are also apparent, but not as large, for large community banks.

Table 1 also shows that 35 percent of banks filed the paperwork to borrow from the PPPLF. Interestingly, the proportions of large banks and large community banks that filed paperwork at 66 percent and 53 percent, respectively, were a fair bit higher than the proportion of small community banks that filed paperwork (27 percent). Overall, banks that filed the paperwork, on average, extended PPP loans equal to about 10 percent of their December 2019 assets. Banks that did not file paperwork extended PPP loans amounting to only about 5 percent of their assets.

### 3.4. Control variables

We gathered a variety of balance sheet information from the Call Reports to control for other bank characteristics that might influence the provision of PPP loans such as existing small business lending and deposit funding sources. In particular, our control variables include unused C&I loans divided by total C&I loans, small business C&I loans divided by total C&I loans, the amount of liquid assets divided by assets, core deposits divided by assets, large time deposits divided by assets, deposit funding costs, an indicator variable that equals 1 if bank  $i$  was an FHLB borrower, the bank's Tier 1 capital ratio as well as total assets and assets squared (to measure size). In general, these control variables follow Li and Strahan (2021). All variables are measured as of December 31, 2019, prior to the onset of the pandemic event, and are merger adjusted (see Internet Appendix B for additional detail and summary statistics).

## 4. Discount window familiarity and engagement with the PPPLF

We are interested in understanding the extent to which the PPPLF supported PPP lending. We want to distinguish a causal effect from the alternate story that PPP lenders may have simply taken advantage of the facility as a cheap alternative source of funding, and that this source may have become more attractive the more PPP loans banks

needed to fund.<sup>7</sup> (These motivations are not mutually exclusive, and it could be the case that both are operating to some extent.) To make this distinction, we use an instrumental variable approach to model the effect of the facility on bank lending. In this section, we describe our measure of familiarity with the discount window and investigate the relationship between that measure and bank engagement with the PPPLF, both actual use of the PPPLF and readiness to use the PPPLF.

### 4.1. Measuring familiarity with the Fed's discount window

Our instrument is based on bank familiarity with the Federal Reserve's ordinary discount window lending program prior to the onset of the COVID-19 pandemic. We measure familiarity using confidential internal data and look at whether a bank had discount window borrowing documents on file as of year-end 2019 and had loan collateral pledged to the Federal Reserve as of January 31, 2020. Pledging loans to the discount window involves taking steps so that the Federal Reserve can have appropriate custody for the loans serving as collateral and to ensure that there are no other claims on the collateral. Banks also need to conduct ongoing maintenance such as by submitting monthly paperwork on the change in the value of the pledged loans. This process of pledging loan collateral during ordinary times was quite similar to the process of pledging PPP loan collateral to borrow from the PPPLF. Hence, pledging loan collateral suggests that bank staff would have been familiar with the operation of the discount window in ways that would have facilitated engagement with the PPPLF. If bank staff are unfamiliar with these processes, then the unknown administrative hurdles may have deterred banks from signing up for the PPPLF. (Moreover, banks are required to repay funds obtained from the PPPLF as the

<sup>7</sup> Even here though, the lack of causality may be a bit of an extreme interpretation. Presumably a profit maximizing bank would seek to lend more when faced with a lower cost of funds. If the PPPLF lowers the marginal cost of funding for banks – and paying 0.35 percent for 5 years is quite cheap – then the PPPLF would still have a causal effect on their loan growth through this channel.

**Table 2**

Measures of familiarity with discount window operations.

Source: Federal Reserve Bank of Minneapolis, PPPLF Data, and FFIEC Call Reports.

	Borrowed from PPPLF	Did not borrow from PPPLF
<i>All Banks (4,225):</i>		
Pledged loan collateral	233	531
Did not pledge loan collateral	510	2,951
<i>Large Community Banks (1,018):</i>		
Pledged loan collateral	106	246
Did not pledge loan collateral	171	495
<i>Small Community Banks (3,091):</i>		
Pledged loan collateral	93	227
Did not pledge loan collateral	332	2,439
	PPPLF docs on file	No PPPLF docs
<i>All Banks (4,225):</i>		
Pledged loan collateral	445	319
Did not pledge loan collateral	1,016	2,445
<i>Large Community Banks (1,018):</i>		
Pledged loan collateral	223	129
Did not pledge loan collateral	317	349
<i>Small Community Banks (3,091):</i>		
Pledged loan collateral	159	161
Did not pledge loan collateral	685	2,086

Note. Counts of banks that were familiar with discount window operations. “Pledged loan collateral” refers to banks that pledged loan collateral for use at the window. “Did not pledge loan collateral” refers to banks that pledged only securities or did not pledge any collateral. Large Community Banks are banks with assets greater than \$600 million and less than \$10 billion as of December 31, 2019. Small Community Banks are banks with assets less than or equal to \$600 million. There are 4225 banks, 1018 large community banks, and 3091 small community banks. “Borrowed from PPPLF” equals 1 if the bank borrowed from the PPPLF between April 16, 2020, and June 30, 2020. “PPPLF docs on file” equals 1 if the bank had filed the necessary documents in case they wanted to borrow from the PPPLF.

PPP loans are forgiven. Banks familiar with pledging and submitting revised values for loan collateral may well have viewed this process as straightforward, while banks less familiar with this process may have viewed this step as yet another administrative burden.) This causal relationship goes only one way; a bank that makes more PPP loans now could not go back in time and become more familiar with the operation of the discount window in a previous time. Further, it does not seem likely that being familiar with the operation of the discount window would have boosted PPP lending other than by making banks more willing to use Federal Reserve lending support to do so.<sup>8</sup>

Table 2 presents the counts of banks that borrowed from the PPPLF based on whether they pledged loan collateral to the Federal Reserve or did not pledge loan collateral. We identify 764 banks with positive loan collateral positions at a Federal Reserve Bank as of January 31, 2020. Of these 764 banks, approximately 30 percent borrowed from the PPPLF. For comparison, of the 3461 banks that did not pledge loan collateral, only 510, or 15 percent, borrowed from the PPPLF.<sup>9</sup>

Table 2 also presents counts of banks that had submitted paperwork to participate in the PPPLF. Borrowing from the facility required some paperwork in addition to the borrowing documents for ordinary discount window use. Here, again, we observe that banks that had collateral pledged were much more likely to file documents to enable borrowing from the PPPLF than banks that had not pledged loan collateral. The table indicates that only about half of the banks that filed the additional paperwork and had loan collateral pledged actually

<sup>8</sup> We also considered whether borrowing from the discount window is a useful indicator of familiarity. We find generally similar, though not quite as strong, results if we use an indicator for whether the bank had borrowed from the discount window in the past few years as our measure of familiarity. We speculate that the act of pledging loan collateral is the key hurdle for determining PPPLF participation and that taking the extra step to actually call the local Federal Reserve Bank to request a loan offers only a marginal benefit.

<sup>9</sup> There is high persistence in collateral pledging behavior, especially for loan collateral, likely owing to the documentation process and fixed costs associated with establishing collateral custody arrangements. Consequently, while our measure of prior experience focuses on collateral pledged at a point in time, using alternatives based on collateral pledged during other periods yields very similar results.

borrowed from the facility (233 borrowed of the 445 banks filing paperwork). Interestingly, notably greater portions of large community banks filed PPPLF documents but did not borrow (52 percent) than was the case for small community banks (42 percent).

#### 4.2. Predicting the use of the PPPLF

We investigate the relationship between our measure of familiarity with the discount window and whether a bank borrowed from the PPPLF using a probit regression. Table 3 presents the results reported as marginal effects at the means. The most important result for our purposes is in the first line of the table. In the specifications using all banks and small community banks our measure of “Familiarity with DW” is positively associated with use of the PPPLF and is quite precisely estimated. Looking at the specification using all banks (column 1), we find that being familiar with the discount window increased the likelihood of using the PPPLF by 9 percentage points. The effect of discount window familiarity on PPPLF use is even stronger for smaller community banks, where it is associated with an increase in the likelihood of using the facility by 11 percentage points. Given that the baseline probability of a small community bank using the facility is 14 percent, our estimates indicate that familiarity with the discount window operations nearly doubles the probability that a small community bank used the PPPLF.

Many of our control variables are associated with use of the PPPLF. Banks that borrowed from the FHLBs as of the end of 2019 were also more likely to use the facility, with the effect being about as large as our measure of familiarity with the discount window. That finding is consistent with the idea that non-market sources of funding were important for supporting the activities of some banks despite the high level of deposit inflows to the banking system during this period (Glancy et al., 2021). Further, we find that banks with high average funding costs were more likely to use the PPPLF, which is not surprising given the attractively priced term funding offered.

We also find that banks that had more unused C&I loan commitments relative to C&I loan exposures at the end of 2019 were more likely to use the PPPLF. It is possible that these banks were more likely to be facing funding pressures if these credit lines were drawn and the banks were also trying to originate PPP loans. Somewhat surprisingly,

**Table 3**  
Predicting PPPLF borrowing (Marginal effects).  
Source: Federal Reserve Bank of Minneapolis, PPPLF Data, and FFIEC Call Reports.

	(1) All Banks	(2) Large Banks	(3) Large Community	(4) Small Community
Familiarity with DW	0.091** (0.01)	0.048 (0.12)	-0.002 (0.03)	0.107** (0.02)
Assets	-0.003 (0.00)	-0.006 (0.01)	-0.028 (0.27)	3.840* (1.60)
Assets <sup>2</sup>	0.000 (0.00)	0.000 (0.00)	-0.058 (0.32)	-46.247 (26.83)
Unused C&I/Total C&I	0.327** (0.05)	-1.013 (0.64)	0.257 (0.16)	0.266** (0.05)
Small Business C&I/Total C&I	-0.108** (0.02)	-0.527* (0.26)	-0.067 (0.07)	-0.064** (0.02)
Liquid assets/Assets	-0.186* (0.08)	-1.375 (0.89)	-0.683* (0.27)	-0.013 (0.07)
Core deposits/Assets	0.101 (0.11)	-0.940 (0.87)	0.381 (0.29)	0.039 (0.12)
Large time deposits/Assets	0.055 (0.13)	-2.266 (1.33)	-0.307 (0.34)	0.202 (0.14)
Deposit funding costs	0.388** (0.08)	0.642 (0.57)	0.924** (0.20)	0.212** (0.08)
FHLB borrower	0.093** (0.01)	0.178 (0.19)	0.104** (0.04)	0.068** (0.01)
T1 capital ratio	0.030 (0.04)	-1.942 (1.39)	-1.392** (0.54)	0.029 (0.03)
Observations	4225	116	1018	3091
Wald	314.4	15.6	69	196.2

Standard errors in parentheses.

Note. Marginal effects at the means of a probit regression predicting whether a bank borrowed from the PPPLF between April 16, 2020, and June 30, 2020. "Familiarity with DW" equals 1 if the bank had access to the Federal Reserve's discount window and had loan collateral pledged to the facility. Balance sheet variables are from Call Reports as of December 31, 2019. "All Banks" include the 4225 banks with PPP loans outstanding as of June 30, 2020. "Large Banks" are those with assets greater than \$10 billion. "Large Community" are banks with assets greater than \$600 million and less than \$10 billion. "Small Community" are banks with assets less than or equal to \$600 million.

\* $p < 0.05$ .

\*\* $p < 0.01$ .

we find that banks with higher ratios of existing small business lending to total C&I loans were less likely to use the facility. The coefficient relating the ratio of liquid assets relative to total assets has the expected negative sign indicating that having more liquid assets reduced the likelihood that the bank borrowed from the facility.

#### 4.3. Predicting readiness to use the PPPLF

Here we look at whether our measure of familiarity with the discount window is related to whether the bank filed the paperwork to be able to borrow from the PPPLF. The results of this alternative probit regression are in Table 4; we again present marginal effects at the means. The coefficient on "Familiarity with DW" is positive and significant, which indicates that banks that were familiar with pledging loan collateral were more likely to sign up to participate in the PPPLF. Indeed, familiarity boosted this likelihood by about 22 percentage points. Notably, we find a relationship between discount window familiarity and filing paperwork for large community banks that was not evident in Table 3. Being familiar with the discount window increased the probability of large community banks filing the necessary paperwork to borrow from the PPPLF by 9 percentage points. We interpret this result as indicating that familiarity with the discount window made large community banks more willing to incorporate the PPPLF into their funding options, which may in turn have affected their decisions on PPP lending, even if they did not actually borrow from the facility.

### 5. Effect of the PPPLF on PPP lending

In this section, we turn to the question of whether use, and readiness to use, the PPPLF bolstered PPP lending. Analyzing this question using our instrumental variables approach provides causal evidence about the effect of the facility for different groups of banks. We are also able to

study whether the PPPLF promoted the extension of certain types of PPP loans, particularly small PPP loans.

#### 5.1. Two stage approach

To analyze the effect of using the facility on PPP lending, we estimate the following 2SLS cross-sectional regression for 4225 banks where  $i$  denotes the bank:

$$\frac{PPPLending}{assets}_i = \beta_0 + \beta_1 1(i = PPPLFBorrower)_i + \delta_{1i} + \epsilon_i \quad (1)$$

$$1(i = PPPLFBorrower)_i = \alpha_0 + \alpha_1 1(i = FamiliaritywithDW)_i + \delta_{1i} + \gamma_i \quad (2)$$

Eq. (1) represents the second stage of our 2SLS regression. The dependent variable is PPP lending as of June 30, 2020, divided by assets as of December 31, 2019. We think of this ratio as indicating the banks' involvement with the PPP scaled by a broad measure of the size of the banks' operations and hence their ability to provide PPP loans.<sup>10</sup> The coefficient indicating the effect of the facility is  $\beta_1$ . A positive coefficient indicates that borrowing from the PPPLF increased PPP lending.  $\delta_i$  is a vector of our control variables and measured as of December 31, 2019.

Eq. (2) represents the first stage of our 2SLS regression, where we instrument for  $1(i = PPPLFBorrower)$  in Eq. (1) using the indicator variable  $1(i = Familiarity with DW)$  that equals 1 if bank  $i$  is familiar with the discount window using our measures.  $\delta_i$  is the same vector

<sup>10</sup> Recall that the data are winsorized at the 5 percent level. Estimating our regressions without winsorizing the PPP-loan-to-assets ratio results in larger, and less precisely estimated, coefficients, though these coefficients continue to be statistically significant at the 5 percent level.

**Table 4**  
Predicting PPPLF documents on file (Marginal effects).  
Source: Federal Reserve Bank of Minneapolis, PPPLF Data, and FFIEC Call Reports.

	(1) All Banks	(2) Large Banks	(3) Large Community	(4) Small Community
Familiarity with DW	0.218** (0.02)	0.157 (0.11)	0.094** (0.04)	0.172** (0.02)
Assets	-0.007 (0.00)	-0.013 (0.01)	0.065 (0.33)	11.769** (2.23)
Assets <sup>2</sup>	0.000 (0.00)	0.000 (0.00)	0.026 (0.39)	-123.312** (37.65)
Unused C&I/Total C&I	0.720** (0.08)	-0.512 (0.08)	0.326 (0.19)	0.552** (0.08)
Small Business C&I/Total C&I	-0.143** (0.03)	-0.167 (0.30)	-0.158 (0.09)	-0.006 (0.03)
Liquid assets/Assets	-0.444** (0.11)	-0.855 (0.85)	-1.174** (0.31)	-0.031 (0.10)
Core deposits/Assets	0.349* (0.16)	0.070 (0.89)	0.725* (0.35)	0.168 (0.17)
Large time deposits/Assets	0.138 (0.19)	-1.823 (1.26)	-0.202 (0.41)	0.325 (0.20)
Deposit funding costs	0.389** (0.10)	0.108 (0.58)	0.654** (0.22)	0.277* (0.11)
FHLB borrower	0.150** (0.02)	0.231 (0.16)	0.140** (0.04)	0.086** (0.02)
T1 capital ratio	0.084 (0.05)	-2.256 (1.50)	-2.364** (0.60)	0.087* (0.04)
Observations	4225	116	1018	3091
Wald	482.6	18.2	120.2	291.8

Standard errors in parentheses.

Note. Marginal effects at the means of a probit regression predicting whether a bank had PPPLF documents on file between April 16, 2020, and June 30, 2020. “Familiarity with DW” and equals 1 if the bank had access to the Federal Reserve’s discount window and had loan collateral pledged to the facility. Balance sheet variables are from Call Reports as of December 31, 2019. “All Banks” include the 4225 banks with PPP loans outstanding as of June 30, 2020. “Large Banks” are those with assets greater than \$10 billion. “Large Community” are banks with assets greater than \$600 million and less than \$10 billion. “Small Community” are banks with assets less than or equal to \$600 million.

\* $p < 0.05$ .

\*\* $p < 0.01$ .

of control variables as in Eq. (1). We calculate our standard errors via Newey–West.

## 5.2. Effect of use of the PPPLF

We start by looking at whether actual borrowing from the PPPLF is associated with greater PPP lending. Results using all banks are shown in column 1 of Table 5.<sup>11</sup> These results indicate that borrowing from the PPPLF is associated with a notable increase in the amount of PPP loans on banks’ books relative to their assets at the end of 2019.<sup>12</sup> To understand which banks may have benefited most from the PPPLF, we present IV regressions for banks of different sizes alongside the total. The results, shown in the remaining columns of Table 5, indicate the strongest and most significant effect of use of the PPPLF in boosting PPP lending by smaller community banks (column 4). The larger size of the coefficient for small community banks is consistent with the sizable difference in PPP loans to assets between PPPLF borrowers and non-borrowers shown in Table 1. The estimated effect of PPPLF use on boosting PPP lending at large banks (column 2) is minimal and is modest at large community banks (column 3). Neither coefficient is significant, possibly reflecting our first-stage regressions where we found that our measure of familiarity was not strongly associated with PPPLF usage for these banks.<sup>13</sup>

<sup>11</sup> Please see Internet Appendix C for a comparison of OLS and IV results.

<sup>12</sup> We also check whether our results are specific to using the pledging of loan collateral as an instrument or whether we obtain similar results if we consider pledging any collateral (which might indicate “sophistication”). Consistent with the mechanics described above, we find the results are specific to the use of loan collateral. See Internet Appendix D for details.

<sup>13</sup> The results for large banks are consistent with reports on the September 2020 Senior Financial Officer Survey. The September 2020 survey collected

Using the coefficient for small community banks from Table 5, we construct a back-of-the-envelope estimate of the additional PPP loans extended as a result of the PPPLF. We calculate that small community bank loans were boosted by around \$11 billion because of the PPPLF, a nontrivial amount considering these banks originated around \$53 billion in PPP loans over the analysis period.

When considering whether use of the PPPLF increased the amount of PPP loans issued by banks, especially small community banks, one concern is that these additional PPP loans may simply have substituted for other C&I loans rather than representing an overall boost to bank lending. We test for substitution by looking at whether the stock of non-PPP C&I loans decreased more at banks that used the PPPLF and do not find evidence of substitution. (For more detail, please refer to Internet Appendix E). These results are in line with Lopez and Spiegel (2023), who also find a net positive effect of the PPP and PPPLF on bank lending.

The results indicate that providing banks with longer-term low-cost funding supports their lending. This finding is consistent with findings from other work on the PPPLF, such as Lopez and Spiegel (2023). It is also consistent with work on the effect of Federal Reserve lending programs on banks in the financial crisis of 2008. For instance, Berger et al. (2017) study the effect of the Term Auction Facility (TAF) which auctioned discount window funding to banks for periods of up to 84 days in amounts large enough that the auction price was fairly low. They also find that this liquidity provision tool was quite valuable in supporting bank lending, including small business lending at smaller banks.

information from 46 domestic banks and these respondents tend to be skewed towards the larger end of the asset spectrum. A majority of the respondents to that survey, that had extended PPP loans, reported that they had not used the PPPLF due to the availability of alternative low-cost sources of funds.



**Table 5**

How Use of the PPPLF affected PPP issuance.

Source: Federal Reserve Bank of Minneapolis, PPPLF Data, and FFIEC Call Reports.

	(1) All Banks	(2) Large Banks	(3) Large Community Banks	(4) Small Community Banks
PPPLF Borrower	0.044** (0.01)	0.001 (0.05)	0.041 (0.03)	0.111** (0.01)
Assets	-0.003** (0.00)	-0.001** (0.00)	-0.039 (0.03)	0.731** (0.23)
Assets <sup>2</sup>	0.000** (0.00)	0.000* (0.00)	0.005 (0.03)	-8.250* (3.96)
Unused C&I/Total C&I	0.126** (0.01)	0.026 (0.04)	0.100** (0.02)	0.099** (0.01)
Small Business C&I/Total C&I	-0.003 (0.00)	0.016 (0.03)	-0.007 (0.01)	0.003 (0.00)
Liquid assets/Assets	0.039** (0.01)	-0.146* (0.06)	0.100** (0.03)	0.050** (0.01)
Core deposits/Assets	0.077** (0.01)	0.098 (0.06)	0.070* (0.03)	0.036* (0.02)
Large time deposits/Assets	0.030 (0.02)	-0.025 (0.13)	0.004 (0.03)	-0.024 (0.02)
Deposit funding costs	0.036** (0.01)	-0.035 (0.04)	-0.015 (0.03)	0.037** (0.01)
FHLB borrower	0.003 (0.00)	-0.001 (0.01)	-0.004 (0.00)	-0.004 (0.00)
T1 capital ratio	0.11* (0.00)	-0.171 (0.11)	-0.198** (0.04)	0.009* (0.00)
Observations	4225	116	1018	3091
Wald	850.4	93.1	350.9	688.0

Standard errors in parentheses.

Note. Estimated using a 2SLS approach, second stage results presented; first stage results available in Table 3. The dependent variable is the ratio of PPP loan amount outstanding as of June 30, 2020, divided by assets as of December 31, 2019, winsorized at the 5% level. Large Banks are those with assets greater than \$10 billion. Large Community Banks have assets greater than \$600 million and less than \$10 billion. Small Community Banks have assets less than or equal to \$600 million. "PPPLF borrower" equals 1 if a bank borrowed from the PPPLF between April 16, 2020, and June 30, 2020; otherwise zero. Balance sheet variables are from Call Reports as of December 31, 2019.

\* $p < 0.05$ .\*\* $p < 0.01$ .

The coefficients on the control variables are generally in line with our expectations. We find some support for the idea that the liability structure of the banks mattered for PPP participation. Banks that funded their assets to a greater extent with core deposits tended to have more PPP loans; this result is in line with other research on the benefits of stable funding in supporting PPP lending (such as Li and Strahan, 2021) and with the benefits of core deposit funding more generally (Berlin and Mester, 2015; Cornett et al., 2011).<sup>14</sup> In our specification, a one standard deviation increase in the ratio of core deposits to total assets boosted the ratio of PPP loans to total loans by 8 percentage points. We do not find a relationship between the use of large time deposits or being an FHLB borrower and PPP lending. We find a positive association of deposit funding costs and PPP issuance. This finding might suggest that banks with easier access to relatively more expensive marketable liabilities were better able to meet surging loan demand.

We also find that, all else equal, banks that had more unused C&I loan commitments relative to their total C&I loan exposures (commitments plus loans on the balance sheet) at the end of 2019 also tended to make more PPP loans relative to their total assets, in line with findings from Li and Strahan (2021). We do not find a relationship between

<sup>14</sup> Soon after the onset of the pandemic, some banks received substantial deposit inflows which might have affected their ability to make PPP loans. We are cautious about including deposit flows directly in the analysis because it is hard to separate exogenous deposit inflows from any boost to deposits that would occur if some PPP borrowers simply held funds received as deposits. If we ignore these causality concerns and include the dollar change in deposits between December 2019 and June 2020 scaled by assets at December 2019 as an additional control variable, we continue to find that borrowing from the PPPLF is associated with a notable increase in PPP lending. We do observe that a larger increase in core deposits is associated both with an increased likelihood of using the PPPLF and an increase PPP lending, but this does not seem to take away from our main result.

prior small business lending and PPP lending; however there were anecdotes in 2020 that some banks used the PPP program to expand their small business lending operations.<sup>15</sup> We observe that banks that had more liquid assets made more PPP loans, consistent with the idea that more liquid assets allow greater flexibility to respond to stresses (as in Cornett et al., 2011 and Li et al., 2020). We note that there is a nonlinear effect on PPP lending by bank size. Our results, however, are consistent with Granja et al. (2022) who find that the largest banks issued the largest share of PPP loans.<sup>16</sup>

### 5.3. Effect of use of the PPPLF by loan size

We are also interested in understanding whether the PPPLF had a positive effect on the amount of small (less than \$150 thousand) PPP loan extensions. As suggested by the re-focusing of the PPP in 2021, these small PPP loans were viewed as particularly important by the members of the U.S. Congress. In addition, Autor et al. (2022) and Chetty et al. (2022) find that smaller PPP loans that were extended to small firms, proxied by firms employing less than 250 people, had larger employment effects than PPP loans given to firms employing more than 250 people. Thus, analysis of whether the PPPLF boosted

<sup>15</sup> Interviews of community bankers from the period, such as one featured in Banking Dive on "How community banks plan to keep their new PPP customers" (see Hrushka, 2020), document bankers' motivations for participating in the PPP program. Interest in expanding their bank's small business lending base was listed as an important factor driving the bank's participation in the PPP.

<sup>16</sup> As an alternative to controlling for bank characteristics directly, we also used an alternative approach where we construct pairs of similar banks in which one bank used the PPPLF and the other did not. See (Internet Appendix F) for details.

**Table 6**

How use of the PPPLF affected small PPP loan issuance.

Source: Federal Reserve Bank of Minneapolis, PPPLF Data, FFIEC Call Reports, and SBA PPP loan data.

	(1) Small Community Banks
PPPLF Borrower	0.023** (0.00)
Assets	0.090 (0.07)
Assets <sup>2</sup>	-1.592 (1.12)
Unused C&I/Total C&I	0.018** (0.00)
Small Business C&I/Total C&I	0.005** (0.00)
Liquid assets/Assets	0.008** (0.00)
Core deposits/Assets	0.023** (0.00)
Large time deposits/Assets	0.009 (0.01)
Deposit funding costs	0.004 (0.00)
FHLB borrower	0.000 (0.00)
T1 capital ratio	0.003* (0.00)
Observations	3016
Wald	366.8

Standard errors in parentheses.

Note. Estimated using a 2SLS approach, second stage results presented; first stage results available upon request. The dependent variable is the ratio of small dollar PPP loans originated as of June 30, 2020, divided by assets as of December 31, 2019, winsorized at the 5% level. Small PPP loans are defined as an individual PPP loan with a value of less than \$150,000, a definition we borrow from the SBA. Of the 3091 small community banks with PPP loans outstanding as of June 30, 2020, according to the Call Report, only 3016 could be identified as originating lenders in SBA data. A small community bank is a bank with assets of \$600 million or less. Balance sheet variables are from Call Reports as of December 31, 2019.

\* $p < 0.05$ .\*\* $p < 0.01$ .

small-dollar PPP loans improves our understanding of whether the facility benefited firms that were especially likely to use the funds to maintain employment. Some evidence shows that smaller banks were particularly important in originating small PPP loans – for instance (Cordova et al., 2020) – so we focus our analysis on small community banks.<sup>17</sup>

The summary statistics reported in Table 1 are supportive of the idea that the PPPLF boosted issuance of small-dollar PPP loans as they show that the average small community bank that used the PPPLF issued twice as many small PPP loans scaled by assets as other small banks. To formally test the effect of the PPPLF, we repeat the earlier analysis but with the dependent variable now being small-dollar PPP loans issued through June 2020 scaled by December 2019 assets. (We also repeated the earlier analysis to confirm that we get very similar results when examining the overall effect of the PPPLF on PPP lending using data from the SBA. See Internet Appendix G). Table 6 presents our results. The coefficient on PPPLF borrowers is positive and statistically significant, which indicates that the PPPLF boosted the issuance of small-dollar loans for this group of banks. Repeating the back-of-the-envelope calculation from earlier suggests that the PPPLF resulted in \$2.5 billion more small dollar PPP loans than would have been issued otherwise. For reference, these banks issued around \$17 billion in small dollar loans through June 30, 2020.

<sup>17</sup> We also looked at whether the PPPLF affected the origination of small PPP loans at larger institutions but did not find any effect.

#### 5.4. The effect of funding certainty provided by PPPLF

Here, we examine whether banks' preparedness to use the facility, rather than actual usage, affected PPP lending. During the early days of the pandemic, many banks, especially larger and medium ones, experienced rapid deposit inflows (Glancy et al., 2021); however, the durability of these flows was highly uncertain. As discussed by Valencia (2017) and Buch et al. (2015), banks are especially dependent on external financing and uncertainty about the cost and availability of that financing can restrain their lending. Simply by knowing that funding would be available from the Federal Reserve through the PPPLF if it was needed, banks may have felt more comfortable moving ahead with extending PPP loans. To conduct this test, we repeat our analysis but adjust the first stage so that the dependent variable is whether the bank filed documents to enable borrowing from the PPPLF rather than actual use of the PPPLF. This analysis sheds light on whether the PPPLF supported PPP lending to an even greater extent than might be indicated simply by looking at the amount of loans extended through the facility.

The results are reported in Table 7. From the first row of the table, we see that having borrowing documents in place boosted PPP lending for both large and small community banks. The effect for large community banks is particularly notable as the beneficial effect we find here is in some contrast to the lack of any effect associated with actual borrowing. These differences are consistent with the results from Tables 3 and 4, which indicated that familiarity with discount window operations was more strongly associated with whether large community banks had their PPPLF documents on file versus whether they borrowed from the facility. These larger community banks also tended to be more likely than the small banks to have been recipients of the rapid deposit inflows at the start of the pandemic. Based on our estimated coefficient, a back-of-the-envelope calculation suggests that, all else equal, these banks extended \$10 billion more PPP loans because of the presence of the facility. Hence, accounting for the boost to lending stemming from funding certainty roughly doubles the estimated impact of the PPPLF.

This approach focuses on the intensive margin and whether the certainty of funding provided by the PPPLF increased PPP lending conditional on having decided to extend PPP loans at all. It is also possible that certainty of funding availability might have been helpful on the extensive margin in convincing banks to become a PPP lender. In that case, our approach might underestimate the benefit of the PPPLF. Here the work of Lopez and Spiegel (2023), who find support for the idea that the PPPLF mattered for the decisions of banks to become PPP lenders, provides a useful complement.

The idea that the PPPLF was valuable as a funding backstop is also consistent with shifts in the liquid asset holdings of different groups of banks. We compared changes between December 2019 and June 2020 in the ratios of cash and U.S. Treasury securities to total deposits for banks that used the PPPLF, banks that filed paperwork but did not use the facility, and banks that did not engage at all with the facility. For the first and last groups of banks, these ratios increased over that period. However for banks that filed paperwork but did not use the facility, this ratio held steady which might suggest that these institutions were more willing to maintain lower liquid assets to deposit positions because the PPPLF provided them with an easy way to rebuild liquidity quickly if needed.

For small community banks, shown in column 5, the effect of having documents on file is fairly similar to the effect of actually using the PPPLF. Thus, for these institutions, there appears to be minimal, if any, additional impact from the potential to borrow relative to actual borrowing. We find little evidence that large banks thought of the facility as a backstop and conclude that the PPPLF did not, on the margin, change the PPP lending of these institutions.

**Table 7**

How the PPPLF as a backstop affected PPP loan issuance.

Source: Federal Reserve Bank of Minneapolis, PPPLF Data, and FFIEC Call Reports.

	(1) All Banks	(2) Large Banks	(3) Large Community	(4) Small Community
Has PPPLF docs in place	0.051** (0.01)	0.005 (0.03)	0.056** (0.02)	0.082** (0.01)
Assets	-0.003** (0.00)	-0.001* (0.00)	-0.050 (0.03)	0.297 (0.25)
Assets <sup>2</sup>	0.000** (0.00)	0.000* (0.00)	0.006 (0.03)	-4.838 (3.93)
Unused C&I/Total C&I	0.105** (0.01)	0.027 (0.03)	0.092** (0.02)	0.087** (0.01)
Small Business C&I/Total C&I	0.000 (0.00)	0.016 (0.02)	-0.002 (0.01)	-0.003 (0.00)
Liquid assets/Assets	0.052** (0.01)	-0.143** (0.05)	0.129** (0.03)	0.053** (0.01)
Core deposits/Assets	0.066** (0.01)	0.097* (0.04)	0.039 (0.03)	0.025 (0.02)
Large time deposits/Assets	0.030 (0.02)	-0.020 (0.09)	-0.004 (0.03)	-0.023 (0.02)
Deposit funding costs	0.034** (0.01)	-0.035 (0.03)	-0.015 (0.02)	0.040** (0.01)
FHLB borrower	-0.001 (0.00)	-0.002 (0.01)	-0.008 (0.00)	-0.003 (0.00)
T1 capital ratio	0.009* (0.00)	-0.160 (0.12)	-0.155** (0.04)	0.004 (0.00)
Observations	4225	116	1018	3091
Wald	1004.6	100.1	367.6	799.3

Standard errors in parentheses.

Note. Estimated using a 2SLS approach, second stage results presented; first stage results available in Table 4. The dependent variable is the ratio of PPP loan amount outstanding as of June 30, 2020, divided by assets as of December 31, 2019, winsorized at the 5% level. Large banks are those with assets greater than \$10 billion. "Large community banks" have assets greater than \$600 million and less than \$10 billion. "Small community banks" have assets less than or equal to \$600 million. "Has PPPLF documents on file" equals 1 if a bank had PPPLF documents on file and was ready to borrow from the PPPLF between April 16, 2020, and June 30, 2020; otherwise zero. The balance sheet variables are from Call Reports as of December 31, 2019.

\* $p < 0.05$ .\*\* $p < 0.01$ .

## 6. Conclusion

In this paper, we study the PPPLF and whether it had an impact on bank PPP lending. We do so using an instrumental variable approach where pre-existing familiarity with the Federal Reserve's discount window, as indicated by having previously gone through the process of pledging loan collateral, is used to predict engagement with the PPPLF. We find that prior familiarity is indeed strongly predictive of whether the bank used the PPPLF, even after accounting for the other factors associated with an increased likelihood of using the PPPLF. Moreover, being familiar with the process of pledging loan collateral appears to have encouraged banks to take steps to be ready to use the PPPLF, as indicated by their completion of the paperwork to enable borrowing, even if they never used the facility.

Using this instrumental variable approach, we find that the PPPLF had a statistically and economically significant effect in supporting PPP lending by banks during the period from April 2020 to June 2020, the early months of the pandemic when there was the greatest uncertainty about future economic and financial developments. Funding from the PPPLF boosted PPP lending at smaller banks and greater certainty about funding availability boosted PPP lending at larger community banks. Use of the facility was particularly important in boosting the issuance by smaller community banks of small dollar loans to, presumably, very small borrowers. This latter finding suggests that when the third installment of the PPP was established in late 2020 and the terms were adjusted to target smaller borrowers and community lenders, that the PPPLF was well positioned to provide support.

In addition, our results inform the debate on the design of emergency lending facilities in two ways. First, we demonstrate the importance of the financial incentives provided by central bank lending facilities. The benefit provided from using the PPPLF was the low-cost longer-term funding and our finding points to the strength of those

financial incentives in affecting behavior. Second, we find that the backstop aspect of a central bank facility is also quite valuable. Even though they were not notable users of the facility, large community banks that positioned themselves to use the PPPLF made more PPP loans than similarly sized banks. This latter result provides important evidence that central bank facilities can have important effects on the behavior of institutions even when those facilities are not used.

## CRedit authorship contribution statement

**Sriya Anbil:** Conceptualization, Methodology, Formal analysis, Writing. **Mark Carlson:** Conceptualization, Methodology, Formal analysis, Writing. **Mary-Frances Styczynski:** Conceptualization, Methodology, Formal analysis, Writing, Data curation.

## Declaration of competing interest

The authors have no declarations of interest to disclose.

## Data availability

The data that has been used is confidential.

## Appendix A. Supplementary data

Supplementary material related to this article can be found online at <https://doi.org/10.1016/j.jfi.2023.101042>.

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