
THE IMPORTANCE OF TECHNOLOGY INVESTMENTS FOR COMMUNITY BANK LENDING AND DEPOSIT TAKING DURING THE PANDEMIC

For many community banks and their customers, the pandemic was a crash course in the use of technology in all facets of banking. At the onset of the pandemic, many community banks turned to technology to provide financial services in the face of temporary branch closures and stay-at-home orders.¹ As restrictions eased, banks continued to use technology for customers and employees who wished to limit physical contact and for whom digital banking had become part of the new normal.

Given the important role of technology during the pandemic, this article examines whether community banks that invested more in technology before 2020 differed from banks that invested less in technology in their core functions of lending and deposit taking.

Based on data from Consolidated Reports of Condition and Income (Call Reports) and other available sources, community banks differed in their technology adoption and spending (hereafter referred to as technology investment) in the years leading up to the pandemic. Community banks with greater technology investment reported larger increases in loan growth in 2020, driven primarily by participation in the Paycheck Protection Program (PPP). These community banks originated a greater share of PPP loans on average to borrowers regardless of the loan size, when the loan was made, or the distance of the borrower from the nearest bank branch. Those banks also reported larger increases in deposit growth in 2020 than did banks with less technology investment. Generally the recent deposit growth at those institutions was due to increases in deposit balances of existing customers rather than from new depositors.

Data on Technology Investment Are Limited and Must Be Estimated

Comprehensive data that directly measure technology investment are not available for all financial institutions, including many community banks. Banks do not report such data on the Call Report, and information available through other regulatory filings is often not comparable for, or is not required of, many entities.

However, available data can approximate technology investment in the absence of more refined measures. This article uses three sources of data—the Call Report, the Conference of State Bank Supervisor’s (CSBS) National Survey of Community Banks, and the Aberdeen Technology Data Cloud—to estimate technology adoption and spending by community banks before the pandemic.

FDIC-insured institutions must report components of noninterest expense, including data processing expenses exceeding certain thresholds, on the Call Report.² While not all institutions met the required reporting thresholds for data processing expenses, many did, and many banks reported these expenses despite not meeting the reporting threshold. A total of 3,424 community banks (76 percent of established community banks) that were active as of December 31, 2020, reported their data processing expenses for the fourth quarter of each year from 2016 to 2019.³ For these banks, average annual growth in data processing expenses from 2017 to 2019 was calculated as a measure of technology spending before the pandemic.⁴

¹This article uses the definition of “community bank” in the Notes to Users of the FDIC’s *Quarterly Banking Profile*. That definition uses criteria outlined in the FDIC’s *2020 Community Banking Study* to identify community banks. The *2020 Community Banking Study* is available at <https://www.fdic.gov/resources/community-banking/report/2020/2020-cbi-study-full.pdf>.

²Selected items that exceed \$100,000 and 7 percent of other noninterest expense must be reported on Schedule RI-E of the Call Report. Before 2018, the reporting threshold was \$100,000 and 3 percent of other noninterest expense. There was no noticeable change in the percentage of institutions that reported data processing expenses before and after the reporting change. The analysis included in this article also did not significantly vary when this measure was limited to expenses reported in 2018 and 2019.

³Established community banks are community banks that have been federally insured for at least five years—those that have been federally insured since December 31, 2015, or earlier.

⁴On the Call Report, expenses are reported as the cumulative amount spent during the calendar year (year-to-date). Average annual growth is calculated using fourth quarter data because it is the period for which a bank is most likely to exceed the required reporting threshold.

In their annual national survey of community banks, CSBS asked if a bank offered a specific product or service. A total of 717 community banks that were active as of December 31, 2020, participated in one or both of the surveys conducted in 2019 and 2020. The number of technology-enabled products or services that a bank offered from among seven included in the survey was calculated as a measure of technology adoption.⁵ While this broad measure does not account for differences between the products and services, including the level of adoption among banks, quality, or use by customers, it should provide an estimation of a bank's level of technology adoption.⁶

Finally, Aberdeen, now Spiceworks Ziff Davis, provided estimates of the number of personal computers (PCs), number of employees, and annual information technology (IT) spending, specified to the branch level.⁷ For community banks where sufficient information was identifiable and available, branch data were aggregated and extrapolated to the institution level, resulting in data for 3,652 community banks (81 percent of established community banks) that were active as of December 31, 2020.⁸ The average number of PCs per employee was calculated as a proxy measure of technology adoption. Annual IT spending as a share of total assets from 2017 to 2019 was calculated as a proxy measure of technology spending.

Not surprisingly, the four measures—IT spending to assets, number of PCs per employee, annual growth in data processing expenses, and number of adopted technologies—were positively correlated with each other. These correlations, however, were relatively weak, suggesting that the four measures captured different components of technology investment, as intended. For example, number of PCs per employee and number of adopted technologies were, arguably, proxies for different components of a community bank's adoption of technology. The number of PCs per employee targeted hardware, while the number of adopted technologies targeted the specific products and services included in the CSBS survey, the adoption of which was more likely driven by software. In the case of IT spending to assets and annual growth in data processing expenses, both were intended to proxy for technology spending; however, data processing expenses included only services performed for the bank by others, while IT spending also included in-house costs, such as IT staff.

Community Banks Differed in Their Technology Investment Before the Pandemic

Based on the measures above, community banks differed in their technology investment before the pandemic. As indicated by the dotted blue bars at the top of each panel in Chart 1, community banks above the 25th and below the 75th percentiles for each technology investment measure spent between 0.45 percent and 0.83 percent of their assets on IT, had between 1.42 and 1.67 PCs per employee, and grew their data processing expenses between 1.9 percent and 15.1 percent, on average, from 2017 to 2019.

While the differences in technology investment may appear small in some cases, they are meaningful. For example, a difference of 0.38 percent in IT spending as a share of assets translates to roughly \$820,000 in annual IT spending for a bank with \$216 million in assets—the median size of an established community bank at the end of 2019, just before the start of the pandemic. For the median community bank, that difference of \$820,000 equaled roughly 8 percent of total revenues in 2019.

⁵For institutions that participated in both surveys, only the response from 2020 was used, as that response most likely reflects the status of the bank at the onset of the pandemic. The seven technology-enabled products or services included in the surveys were online loan applications, online loan closure, automated loan underwriting, remote deposit capture, electronic bill payment, mobile banking, and interactive teller machines.

⁶For more information on the adoption rate of each technology-enabled product and service and the distribution of adopted technologies, in total, among community banks, see Chart 6.1 and Table 6.1.1 of the FDIC *2020 Community Banking Study* at <https://www.fdic.gov/resources/community-banking/report/2020/2020-cbi-study-full.pdf>.

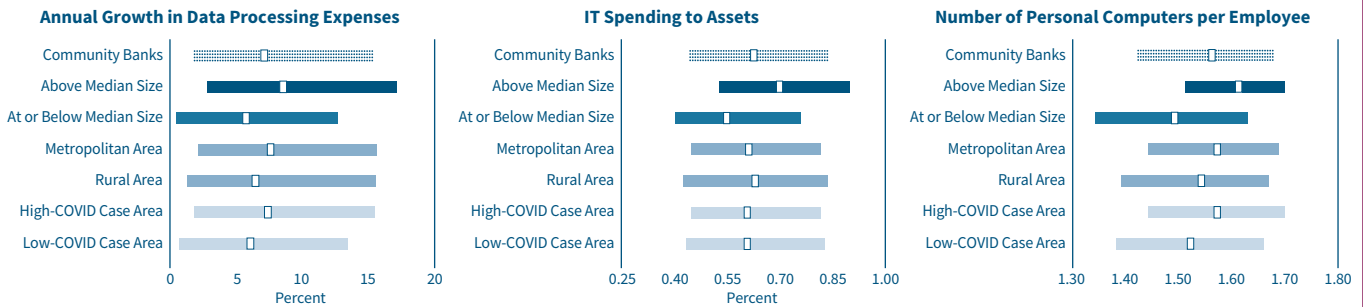
⁷Aberdeen uses web mining of businesses and employee profiles to collect data and redistributes the data for marketing purposes.

⁸The Aberdeen data did not include FDIC certificate numbers. Instead, company name, street address, zip code, and website URL from the Aberdeen data were matched with similar information from FDIC Summary of Deposits data. Only community banks with matched data for more than half of its branches in at least two years from 2017 to 2019 were included.

Chart 1

Larger Community Banks Invested More in Technology, While Differences in Location Were Less Important

Average Technology Investment From 2017 to 2019, Interquartile Ranges



Sources: FDIC, Aberdeen Data Technology Cloud, and Johns Hopkins University.

Note: Shaded bars indicate the interquartile range (25th to 75th percentile). Unshaded areas in the middle of each bar indicate the median. Median size is based on total assets at the end of 2019. Banks in high-COVID case areas were those that had at least half of their branches in a county with cumulative reported cases per 100,000 residents in the upper quartile (75th percentile or greater) as of June 30, 2020. Banks in low-COVID case areas were those that had at least half of their branches in a county with cumulative reported cases per 100,000 residents in the lower quartile (25th percentile or lower) as of June 30, 2020.

Established community banks that were larger—above the median asset size of \$216 million at the end of 2019—invested more in technology before the pandemic. As shown by the dark blue bars in Chart 1, on average from 2017 to 2019, larger community banks reported faster annual growth in data processing expenses, spent more on IT relative to their assets, and had a greater number of PCs per employee than did smaller community banks at the 25th and 75th percentiles and at the median. Similarly, 56 percent of community banks above the median asset size offered at least four of the seven technology-enabled products and services included in the CSBS survey, compared with 24 percent of community banks at or below the median. Greater technology investment, based on the four technology spending and adoption measures, by larger banks is consistent with the finding in the *2020 FDIC Community Bank Study* that community bank size was the strongest indicator of technology adoption as of 2019.⁹

Technology investment also appeared to vary by a community bank’s location, although results were mixed. Before the pandemic, community banks with a main office in a metropolitan area (urban community banks) generally reported faster growth in data processing expenses and had a higher number of PCs per employee than did banks with a main office in a rural area (rural community banks). This is shown by the medium blue bars in Chart 1. However, the median for IT spending as a share of assets was lower among urban community banks than among rural community banks. Similar patterns were found for community banks that operated at least half of their branches in areas with relatively high or low COVID case rates (light blue bars in Chart 1), using data from Johns Hopkins University.¹⁰ While differences in technology investment based on location were not as large as those based on asset size, they are nonetheless important to consider when evaluating any differences in community bank lending and deposit taking during the pandemic.

Previous Technology Investment May Have Affected Lending and Deposit Taking During the Pandemic

During the pandemic, differences in previous technology investment may have affected community bank core functions of lending and deposit taking. For community bank staff and customers already familiar with different technologies because of previous investments by their institution, temporary branch closures and the required shift to digital banking may have been less disruptive to ongoing banking activities. Compared with banks that invested less in technology before 2020, these banks may have been

⁹ FDIC, “Technology in Community Banks,” *2020 FDIC Community Banking Study*, pp. 6-1 to 6-20, <https://www.fdic.gov/resources/community-banking/report/2020/2020-cbi-study-full.pdf>.

¹⁰ High-COVID case areas are counties with cumulative cases per 100,000 residents at or above the 75th percentile. Low-COVID case areas are counties with cumulative cases per 100,000 residents at or below the 25th percentile. Both measures are as of June 30, 2020.

better-positioned to grow their deposits and mitigate reductions in loan growth associated with the pandemic.

The following sections study the potential impact of previous technology investment by comparing loan growth, including PPP lending, and deposit growth before and during the pandemic, using the measures described above.

Community Banks With Greater Technology Investment Before the Pandemic Reported Stronger Loan Growth in 2020

Technology investment may have affected community bank lending during the pandemic in several ways. Banks with greater technology investment may have been better equipped to accept and process online loan applications and the required supporting documentation, mitigating the effect of branch closures and customers' desire to limit in-person interaction. Community banks with greater technology offerings may have also been more likely to attract customers from nonbanks that curtailed their lending at the start of the pandemic, particularly nonbanks with a large online presence.¹¹

As shown in Chart 2, community banks with greater previous investment in technology (indicated by the dark blue and dotted blue bars) reported stronger loan growth across all four technology measures in 2020 compared with banks with less investment (light blue and dark red bars). This correlation alone, however, is not enough to establish whether any link between technology investment and lending growth *strengthened*, as anticipated, during the pandemic. It could be that banks with greater technology investment already had stronger loan growth before the pandemic, which continued in 2020. Among community banks in the highest quartiles for number of PCs per employee and average growth in data processing expenses, the medians for average quarterly loan growth from 2017 to 2019 were noticeably higher than the medians for banks in the lowest quartiles.

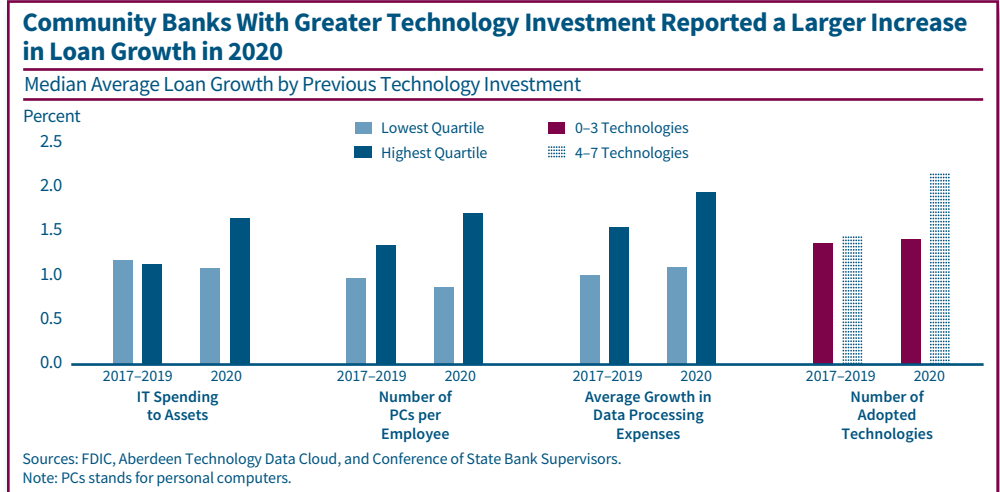
However, Chart 2 also shows that, across all four technology measures, differences in median loan growth between community banks with greater and less investment in technology *grew* in 2020, relative to the three years before the pandemic. Compared with community banks in the lowest quartile, community banks in the highest quartile reported median average loan growth in 2020 that was

- 0.56 percentage points higher for IT spending to total assets (compared with 0.04 percentage points lower from 2017 to 2019)
- 0.84 percentage points higher for the number of PCs per employee (compared with 0.37 percentage points higher from 2017 to 2019)
- 0.85 percentage points higher for annual growth in data processing expenses (compared with 0.54 percentage points higher from 2017 to 2019)

Community banks that adopted four or more of the technologies included in the CSBS survey reported a median quarterly loan growth that was, on average, 0.74 percentage points higher in 2020 than banks that adopted three or fewer technologies (compared with 0.08 percentage points higher from 2017 to 2019). Averaged across the four measures, the difference in the medians for average quarterly loan growth was three times higher in 2020 than the difference in the medians from 2017 to 2019 (0.75 percentage points versus 0.24 percentage points), in favor of community banks with greater previous investment in technology. Given that loans constitute about two-thirds of a community bank's assets, a half of a percentage point difference in quarterly loan growth would have equaled nearly \$3 million in loans for the median-size community bank in 2020.

¹¹ Analysis by Standard & Poor's, for example, found that origination volume among the major digital lenders for consumers, small and medium businesses, and students fell 36 percent in the first three quarters of 2020, relative to the previous year. See Nimayi Dixit, "U.S. Digital Lender Originations Expected to Rebound Strongly After Painful 2020," *S&P Global Market Intelligence*, February 1, 2021, <https://www.spglobal.com/marketintelligence/en/news-insights/research/us-digital-lender-originations-expected-to-rebound-strongly-after-painful-2020>.

Chart 2



It remains possible that factors other than technology investment may have caused or influenced differences in loan growth in 2020. For example, larger community banks and those in metropolitan areas that tended to invest more in technology may have been more resilient to the effects of the pandemic due to their larger and more geographically diverse customer bases. The widened gap in loan growth shown in Chart 2 may not have resulted from a difference in previous technology investment but instead from bank size and location.

Similar trends in lending growth were found among different subsets of community banks based on size and location. Differences in the median for average loan growth by technology investment widened in 2020 for community banks that were above and below the median asset size before the pandemic, for urban and rural community banks, and for community banks in areas with higher and lower COVID case rates. In each case, the gap in the median for average loan growth widened in favor of community banks that invested more in technology before the pandemic. These findings lend support to the argument that previous technology spending and adoption helped banks better serve their customers during the pandemic.

The PPP Drove Differences in Loan Growth in 2020

Community banks held just over \$150 billion in PPP loans at the end of third quarter 2020 following the conclusion of the second round of the program on August 8.¹² This amount represented nearly one-third of PPP loan balances reported by FDIC-insured institutions, despite community banks holding only slightly more than 10 percent of banking industry assets.¹³

Lending associated with the PPP also appears to be the main reason that the difference in loan growth on the basis of technology investment grew in 2020, relative to the years immediately preceding the pandemic. Excluding PPP loans, the differences in the medians for average loan growth narrowed for all of the technology investment measures, with the average difference across the measures falling from 0.75 percentage points to 0.28 percentage points, or roughly equal to the difference reported before the pandemic.

¹² This article focuses on PPP loan data at the end of the third quarter, as these data include all loans made in the first and second rounds of the program and were not affected by loan forgiveness, which had not yet begun.

¹³ For further analysis of contributions of community banks to the PPP and how factors such as location, specialty, and size affected participation, using data from the Call Report as of June 30, 2020, see Margaret Hanrahan and Angela Hinton, "The Importance of Community Banks in Paycheck Protection Program Lending," *FDIC Quarterly* 14, no. 4. (2020): 31–36, <https://www.fdic.gov/analysis/quarterly-banking-profile/fdic-quarterly/2020-vol14-4/fdic-v14n4-3q2020.pdf>.

Given that PPP lending widened the gap in loan growth during 2020 in favor of community banks with greater technology investment, it is not a surprise that these banks also held more PPP loans than did banks with less technology investment. As shown in Table 1, for each technology investment measure, a larger share of community banks among those with greater investment before the pandemic reported a nonzero PPP loan balance on their third quarter 2020 Call Report compared with banks with less investment. Averaged across the four measures, the share of community banks that held PPP loans at the end of third quarter 2020 was 10.4 percentage points higher for banks with greater previous technology investment than for banks with less technology investment. Among those banks with a nonzero PPP loan balance, banks that invested more in technology also had a median share of PPP loans to assets that was more than 2 percentage points higher than those that invested less.¹⁴ For the median-size community bank, this difference equaled roughly \$4.5 million in PPP lending. The association between greater technology investment before the pandemic and a higher share of PPP loans was not solely driven by larger community banks. Table 1 also shows that all but one of the technology measures—annual growth in

Table 1

Community Banks That Invested More in Technology Held More PPP Loans				
PPP Loan Balances by Previous Technology Investment, Third Quarter 2020				
	Percentage of Community Banks With Nonzero PPP Loan Balances at the End of Third Quarter 2020		Median PPP Loan Balance as a Percentage of Assets	
	All	Below Median Asset Size	All	Below Median Asset Size
Annual IT Spending to Assets				
Lowest Quartile	72.1	63.1	2.3	1.2
Middle Quartiles	86.6	79.6	4.1	2.6
Highest Quartile	90.7	81.9	5.1	3.2
Number of PCs per Employee				
Lowest Quartile	76.2	71.8	2.7	2.0
Middle Quartiles	86.3	77.1	4.3	2.4
Highest Quartile	87.7	78.2	4.7	2.7
Annual Growth in Data Processing Expenses				
Lowest Quartile	84.6	78.0	3.9	2.6
Middle Quartiles	85.9	77.2	4.5	2.9
Highest Quartile	87.3	76.5	5.1	2.7
Number of Technologies Adopted				
0–3 Technologies	87.5	82.9	4.0	2.9
4–7 Technologies	96.1	90.8	6.4	5.3
Average of All Technology Measures				
Less Technology Investment	80.1	74.0	3.2	2.2
Greater Technology Investment	90.5	81.9	5.3	3.5
All Community Banks	84.4	76.1	4.0	2.4

Sources: FDIC, Aberdeen Technology Data Cloud, and Conference of State Bank Supervisors.

Note: PPP = Paycheck Protection Program. Given the strong association between asset size and technology investment, quartiles for each technology investment measure were recalculated for community banks below the median asset size.

¹⁴Total assets held by community banks grew 14.2 percent in 2020, compared with 1.2 percent in 2017, 2.2 percent in 2018, and –1.2 percent in 2019. This article measured PPP lending as a share of assets using total assets reported by the bank at the end of 2019, rather than third quarter 2020 when PPP lending was reported. This approach prevents other effects that technology investment may have had on asset growth in 2020, unrelated to participation in the PPP, from influencing the measure.

data processing expenses—were positively related to PPP lending among community banks at or below the median asset size. Averaged across the four technology measures, greater technology investment among these smaller banks was associated with an 8 percentage point increase in the share of banks holding PPP loans as well as a 1.3 percentage point increase in PPP loans as a share of assets relative to those with less technology investment.

Beyond the reasons previously discussed, other reasons unique to the PPP and the environment in which it was implemented could explain why technology investment may have facilitated faster loan growth. Some possible explanations include limited funding, strong demand, and a restricted ability and limited desire for borrowers and lenders to use nondigital processes.

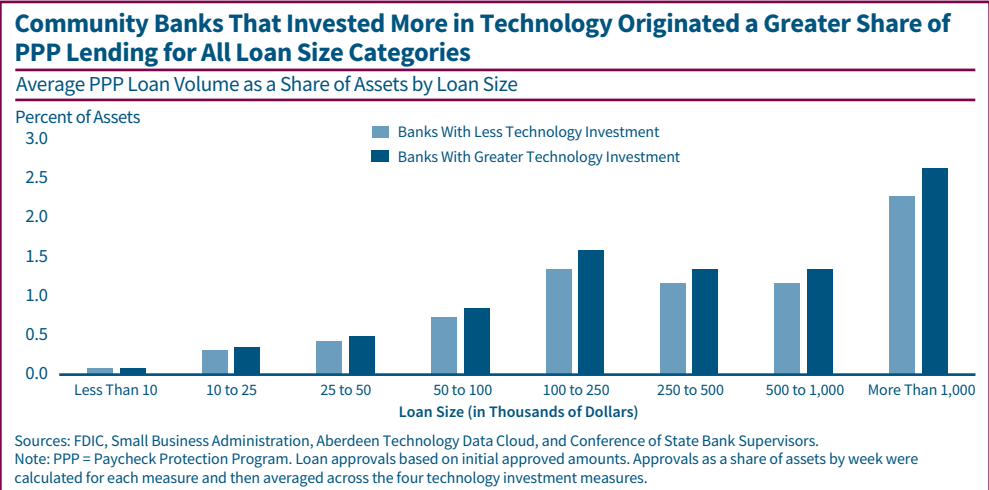
Some, but Not All, of the Difference in PPP Lending by Technology Investment Stemmed From Larger Loans

At the aggregate level, measuring PPP lending based on PPP loans as a share of assets does not fully address whether a community bank served more or different PPP borrowers during the pandemic. A smaller loan, for example, had less impact on lending as a share of assets than a larger loan, despite affecting the same number of borrowers. Applied to the findings above, it could be that community banks with greater previous investment in technology reported a greater share of PPP loans because they made larger loans, and not because they served more borrowers.

Based on total PPP loan volume and number of PPP loans as reported on the third quarter 2020 Call Report, the median for average PPP loan size among community banks with greater technology investment was, on average across the four measures, about \$13,500 greater than the median for banks with less technology investment. This difference at least partly explains the higher share of PPP lending for banks with greater technology investment.

Further analysis of loan size is not possible using Call Report data; however, the Small Business Administration (SBA) released individual loan-level data, which included approved loan amounts and identifying lender information.¹⁵ Chart 3 uses that data to compare PPP lending by previous technology investment, broken down by loan size. The largest difference in the average share of PPP loans (by volume) to assets was for PPP loans with an initial approved amount of more than \$1 million. For loans of this size, community

Chart 3



¹⁵ Several versions of PPP data have been released by the SBA since the program’s inception. This analysis uses data downloaded from the SBA website as of February 2021. The SBA data did not include FDIC certificate numbers. Matching techniques were used to link individual loans to FDIC-insured institutions, when applicable. See <https://data.sba.gov/dataset/ppp-foia>.

banks with greater technology investment (indicated by the dark blue bars in Chart 3) originated a volume that was 0.35 percentage points higher, as a share of assets, than banks with less investment. This finding is consistent with the argument that community banks with greater previous investment in technology made larger loans. However, Chart 3 also shows that community banks with greater technology investment originated a greater share of PPP loans in smaller size categories than did banks with less investment. This suggests that banks with greater technology investment made a larger share of loans of all sizes through the PPP, and that the association between greater technology investment and a higher share of PPP lending did not stem solely from larger loans.

Community Banks With Greater Previous Investment in Technology Also Approved More PPP Loans Across Time and Distance

Beyond loan size, community banks with greater investment in technology before the pandemic may have been able to originate more PPP loans than did banks with less investment because their speed of approval was faster or because they had easier access to borrowers outside of their local geographic market and vice versa. Previous technology investment may have accelerated the loan approval process to the extent that it allowed lenders to accept applications and the required supporting documentation online and automated the submission process. On the other hand, the impact of technology investment may have been reduced by the unique nature of the PPP, last-minute changes to SBA policy, and reports of difficulties connecting with E-Tran, the SBA's loan servicing portal.

Speed of approval may have been particularly important for PPP borrowers, given that funding for the program, while unprecedented in size, was ultimately limited by borrower demand. The first round of funding—\$342 billion—was exhausted within two weeks. The second round of funding—\$317 billion—remained available for almost 15 weeks (see box below). The PPP's limited funding and time frame arguably gave an advantage to financial institutions with a faster approval process.

As indicated by the sizes of the dark blue and light blue bars in Chart 4, the gap in PPP loan volume as a share of assets was largest during the early weeks of the program, with community banks that invested more in technology before the pandemic approving a larger share of loans than did banks with less investment. While this does not necessarily indicate a difference in approval times, the largest difference in the share of PPP loans by volume in favor of banks with greater technology investment occurred during the first week of the program. During that week, PPP loans as a share of assets was 25 percent higher for those banks with higher technology investment than for banks with less technology investment. This difference was larger than in any other week during which more than 1 percent of loans were approved, and provides some evidence that banks with greater previous investment in technology were faster out of the gate in approving PPP loans.

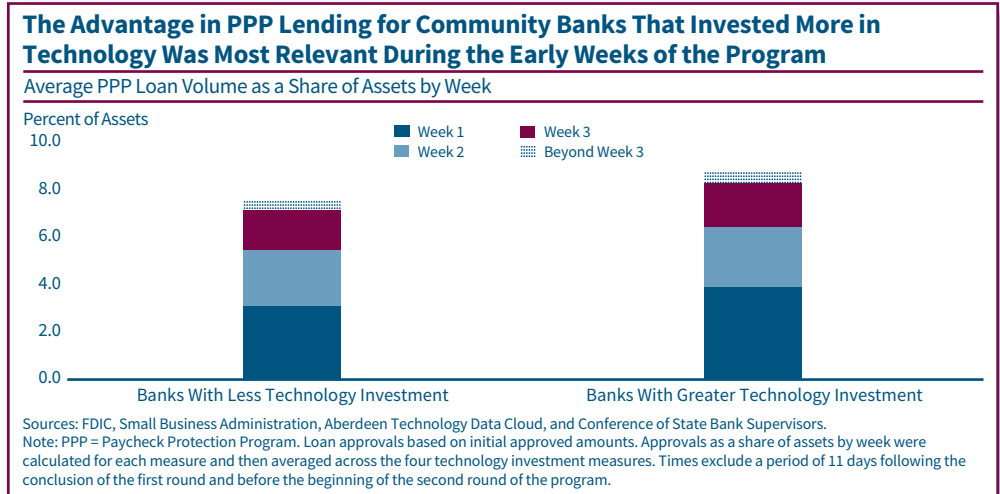
The Paycheck Protection Program in 2020

In the first months of the pandemic, Congress provided \$659 billion to the U.S. Small Business Administration (SBA) to guarantee loans to small businesses to pay up to 24 weeks of eligible employee salaries, payroll costs, and benefits, as well as other qualified expenses such as mortgage interest, rent, and utilities, and to pay banks for the forgiven loans and accrued interest. Lenders received an origination fee of 1 to 5 percent, depending upon the size of the loan.

Applications for the first round of funding were accepted from April 3, 2020, through April 16, 2020, and for the second round of funding from April 27, 2020, through August 8, 2020. During both rounds, more than 5.2 million loans were approved for a total of \$525 billion.^a

^a SBA, "PPP Report: Approvals Through 08/08/2020," (August 2020).

Chart 4



The difference in PPP lending in favor of community banks with greater technology investment was not limited to the early weeks of the program, however. Throughout all but one week of the program, community banks with greater technology investment originated more PPP loans when measured as a share of their assets than did community banks with less investment. Similar to the findings for loan size, speed of approval was not likely the only reason why community banks with greater technology investment originated a greater share of PPP lending.

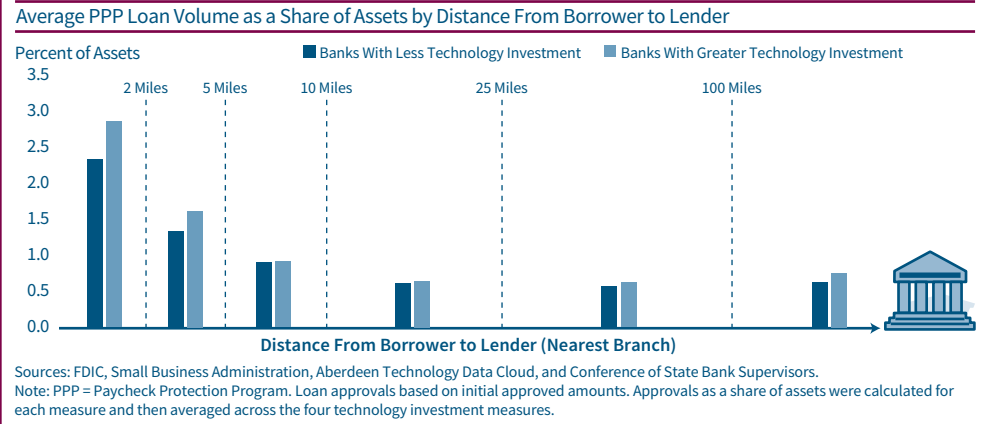
Another way in which technology may have aided community banks is through easier access to PPP borrowers outside of their geographic market. Some community banks, regardless of previous technology investment, may have viewed the PPP as a low-risk opportunity to test and develop new lending relationships outside of their market area, given that the loans were fully guaranteed by the SBA. Greater previous investment in technology, however, may have helped these banks better reach and target new customers—for example, through social media as well as marketing using data and machine learning. Technology-enabled services, such as online loan applications and servicing portals and chatbots, may have also allowed customers that were located far from a branch to more easily apply for a loan and navigate the loan process.

The same SBA data used to analyze the size and timing of PPP loans also included data on borrowers, which was used to approximate the distance between PPP borrowers and their lenders.¹⁶ As shown in Figure 1, the share of PPP loans originated by community banks for borrowers located more than 100 miles from a bank branch was higher for banks with greater technology investment than for those with less technology investment, as expected. However, the largest difference in PPP lending on the basis of technology investment was for “local” PPP loans—loans made to borrowers located within five miles of a bank branch. Community banks with greater technology investment approved local PPP loans totaling 4.5 percent of their assets, on average, compared with an average of 3.7 percent for banks with less technology investment. For a community bank with the median asset size of \$216 million, this difference of 0.8 percent of assets equaled about \$1.7 million in PPP loans.

¹⁶ Data on the latitude and longitude of PPP borrowers were obtained from Geocodio and are available at <https://www.geocod.io/geocoded-ppp-loan-data/>. These data were used to calculate the distance from each borrower to the nearest branch of the community bank lender, using the latitude and longitude of bank branches from FDIC Summary of Deposits data.

Figure 1

Community Banks That Invested More in Technology Originated a Greater Share of PPP Loans Regardless of a Borrower’s Proximity to a Bank Branch



Generally, community banks made most of their PPP loans to borrowers within five miles of their branch network consistent with research indicating that local bank relationships strongly predicted PPP credit.¹⁷ Table 2 examines how technology may have differently affected community banks that entered the pandemic with relatively larger shares of commercial and industrial (C&I) loans—a likely indicator of strong existing relationships with local businesses. For banks with C&I loans at or above the 75th percentile (highest quartile) for all established community banks at the end of 2019, the difference in local PPP loans to assets on the basis of technology investment was 1.1 percentage points. For banks with C&I loans at or below the 25th percentile (lowest quartile), the difference was 0.6 percentage points. The larger difference in local PPP lending by technology investment among banks with larger shares of C&I loans leading into the pandemic suggests that greater previous investment in technology may have contributed to additional PPP lending, in part, by facilitating loans to existing borrowers.

Overall, several factors likely drove the relationship between PPP lending and technology investment before the pandemic in favor of community banks with greater investment. Community banks with greater technology investment made larger PPP loans, but also made more PPP loans of all sizes, during all stages of the program, and both inside and outside of their local geographic market.

Table 2

The Advantage in PPP Lending Associated With Greater Investment in Technology Was Higher for Community Banks With More Business Loans		
C&I Loans to Assets	Previous Technology Investment	
	Banks With Less Investment	Banks With Greater Investment
Banks in Lowest Quartile	3.3 %	3.9 %
Banks in Highest Quartile	4.4 %	5.5 %
All Community Banks	3.7 %	4.5 %

Sources: FDIC, Small Business Administration, Aberdeen Technology Data Cloud, and Conference of State Bank Supervisors.
 Note: PPP = Paycheck Protection Program. C&I = Commercial and Industrial. Local PPP loans defined as PPP loans made to borrowers located within five miles of a lending bank branch. C&I loans to assets based on amounts reported at the end of 2019, before the onset of the pandemic. Loan approvals based on initial approved amounts. Approvals as a share of assets were calculated for each measure and averaged across the four technology investment measures.

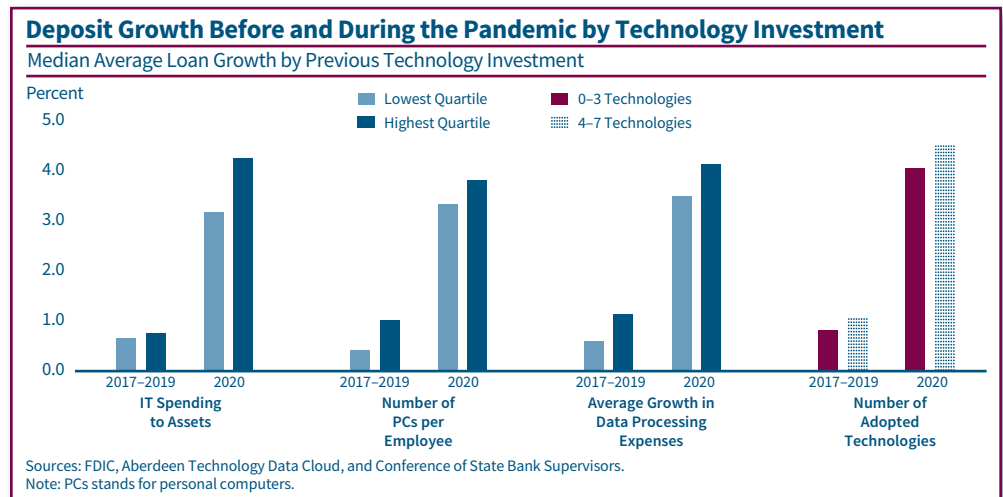
¹⁷ Lei Li and Philip Strahan, “Who Supplies PPP Loans (And Does it Matter)? Banks, Relationships, and the COVID Crisis,” (Working Paper, no. 28286, National Bureau of Economic Research, December 2020), <https://www.nber.org/papers/w28286>.

Community Banks With Greater Technology Investment Before the Pandemic Reported Larger Deposit Growth in 2020

Bank deposits increased significantly at the onset of the pandemic, growing 17.8 percent over the first three quarters of 2020. Among community banks, deposits grew 11.4 percent. This growth likely stemmed from multiple factors such as lower consumption and higher savings by consumers, credit line drawdowns, expansionary monetary policy, and increased spending by the federal government, including direct payments to individuals. The PPP also likely influenced deposit growth to the extent that borrowers (and others for whom the loan proceeds were intended, including employees) directed loan funds into deposit accounts.

Previous investment in technology might have affected deposit growth during the pandemic to the extent that it facilitated remote deposit capture, remote payments, and other functionality that enabled customers to conduct deposit transactions at a time when face-to-face interactions were more difficult or not possible. If technology investment attracted more PPP borrowers, as previously indicated, faster deposit growth may also have resulted from those borrowers depositing the proceeds of the loan into the same institution.

Chart 5



As shown by the differences between the light blue and dark blue bars and the difference between the dark red and dotted blue bars in Chart 5, during the three years before the pandemic, greater technology investment was associated with higher average deposit growth across all four measures. The differences ranged in magnitude from 0.11 percentage points (for IT spending to assets) to 0.60 percentage points (for number of PCs per employee), with an average of 0.38 percentage points across the four measures. In 2020, differences in the median for average deposit growth widened for three out of the four technology investment measures. Averaged across the measures, community banks with greater previous investment in technology reported a median average deposit growth that was 0.66 percentage points higher than the median for banks with less previous investment.

The larger difference in deposit growth by previous technology investment for 2020 likely stemmed from higher average account sizes rather than an increase in the number of accounts. Median growth in the number of nonretirement deposit accounts was, on average, 31 basis points higher for community banks with greater technology investment than for banks with less technology investment, from 2017 to 2019. During 2020, the difference declined to 23 basis points, indicating that the increased difference in deposit growth on the basis of technology investment reported during the pandemic was not likely caused by an increased inflow of depositors.

**Technology Will Continue
to Be Important to
Community Banks
Beyond the Pandemic**

This article provides compelling evidence that community banks with more technology investment before the pandemic were better able to serve their customers as a lender and deposit-taker amid the challenges of the pandemic. Further data and research are needed to better understand the ways that technology may have assisted banks during the pandemic, and whether the advantage in loan and deposit growth enjoyed by community banks that invested more in technology during 2020 will become part of the new normal. Differences in loan growth and potentially deposit growth can be sustained if new relationships created through the PPP lead to non-PPP lending and deposits after the pandemic. Given the rising use of digital banking channels before and during the pandemic, it appears likely that an effective approach to technology and technology investment will continue to be important for community banks in the future.

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