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43

Understanding State and Local Government Spending 5 over the Business Cycle *By Huixin Bi, Chaitri Gulati, and Nora Traum*

Addressing Traditional Credit Scores as a Barrier21to Accessing Affordable CreditBy Ying Lei Toh

How Mergers in the Farm Credit System Have Affected Ag Banks *By Francisco Scott*

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State and local (S&L) government spending is essential for providing public services and infrastructure and accounts for more than 10 percent of GDP. How this sector responds during a recession can play an important role in shaping the overall economic recovery.

Huixin Bi, Chaitri Gulati, and Nora Traum document how S&L government expenditures have evolved over the business cycle since the 1950s. They find that from 1950 to the mid-1980s, S&L spending followed no uniform pattern after recessions: spending was sometimes procyclical (declining during recessions) and sometimes countercyclical (rising during recessions). However, since the mid-1980s, S&L spending has followed a consistently procyclical pattern, beginning to recover three years, on average, after the start of a recession. This shift seems consistent with changes in the cyclicality of income tax revenues, which not only became consistently procyclical in the mid-1980s but have also become a larger share of total tax revenues. These results suggest that income tax revenue adjustments are particularly important in accounting for recoveries in the S&L public sector.

Addressing Traditional Credit Scores as a Barrier to Accessing Affordable Credit By Ying Lei Toh

Affordable credit enables consumers to better manage their finances, cope with unexpected emergencies, and pursue opportunities such as entrepreneurship or higher education. However, many consumers face difficulties obtaining the credit they need. A major impediment is lenders' reliance on traditional credit scores to assess consumers' creditworthiness. These credit scores affect not only loan approval decisions but also the interest rates consumers pay on their loans. While credit scores are intended to help lenders make informed decisions about consumers' risk of default, they do not always accurately reflect a borrower's ability to repay. Traditional credit scores may also disproportionately punish consumers from economically disadvantaged groups.

Ying Lei Toh examines the barrier traditional credit scores pose to obtaining affordable credit in the United States and discusses efforts to address this barrier. Using data from the 2019 Survey of Consumer Finances, she finds that traditional credit scores may indeed hinder a sizeable share of consumers from obtaining the credit they desire. Further, disparities in credit access across several sociodemographic groups match the disparities in their likelihood of having high traditional credit scores, suggesting lenders' reliance on traditional credit scores may drive disparities in credit access.

How Mergers in the Farm Credit System Have Affected Ag Banks By Francisco Scott

Commercial banks and the Farm Credit System (FCS) have been the most important sources of agricultural loans in the United States in recent decades. Since the 1990s, however, mergers and acquisitions have increasingly concentrated both the FCS and commercial banks, raising concerns about potential effects on the agricultural credit market. Starting in the 2000s, the FCS gained a substantial market share of total agricultural debt, lending credibility to these concerns. Thus far, however, how the FCS's evolving size and scope affect agricultural bank operations, particularly through mergers, has not been adequately examined.

Francisco Scott explores the effects of FCS mergers on agricultural banks (ag banks) and finds that FCS mergers have had mostly muted long-term aggregate effects on ag banks' interest income, efficiency, and agricultural real estate loans as a share of their total loans. However, he also shows that FCS mergers likely decreased ag banks' agricultural operational loans as a share of their total loans and increased ag banks' interest expenses from historically low levels. These findings suggest that FCS mergers may have altered some strategic portfolio decisions of ag banks in their respective markets, though the effects on ag banks' profitability were relatively minor.

Understanding State and Local Government Spending over the Business Cycle

By Huixin Bi, Chaitri Gulati, and Nora Traum

State and local (S&L) governments are central to providing public services and infrastructure. As S&L government spending accounts for more than 10 percent of GDP, how this sector responds during a recession can play an important role in shaping the overall economic recovery. After the recession in 2001, changes in S&L spending were relatively muted and had a small effect on the overall recovery. After the 2008 financial crisis, however, S&L government spending and investment declined steeply and slowed the economic recovery, with the level of S&L spending not returning to its pre-crisis level in real terms until 2018. Understanding how S&L government spending might change during and following a recession is thus crucial for understanding economic recoveries overall.

In this article, we document how S&L government expenditures have evolved over the business cycle since the 1950s. We find that from 1950 to the mid-1980s, S&L spending followed no uniform pattern after recessions: spending was sometimes procyclical (declining during recessions) and sometimes countercyclical (rising during recessions). However, since the mid-1980s, S&L spending has followed a consistently procyclical pattern, beginning to recover three years, on average, after the start of a recession.

Huixin Bi is a research and policy officer at the Federal Reserve Bank of Kansas City. Chaitri Gulati is an assistant economist at the bank. Nora Traum is an associate professor at HEC Montreal. This article is on the bank's website at **unuv.KansasCityFed.org** In exploring potential explanations for this change in the cyclicality of S&L spending, we find that the shift seems consistent with changes in the cyclicality of income tax revenues. In other words, income tax revenues showed no clear post-recession pattern until the mid-1980s, when they became consistently procyclical. Moreover, income tax revenues have become a larger share of total tax revenues over time, suggesting total tax revenues are now more sensitive to the cyclicality of income tax revenues. Although increasing intergovernmental transfers and S&L debt financing patterns have been suggested as potential reasons for why S&L spending has become procyclical, we find little evidence to support either of these explanations. Altogether, our results suggest that income tax revenue adjustments are particularly important in accounting for recoveries in the S&L public sector.

Section I provides a brief overview of S&L government spending and financing. Section II provides empirical evidence on the cyclicality of changes in S&L government spending over time. Section III explores potential explanations for the changes and finds that changes in the cyclicality of income tax revenues have played an important role.

I. Overview of State and Local Government Expenditures

S&L government expenditures comprise three broad categories: consumption expenditures, gross investment, and transfer payments to households and businesses. Consumption expenditures consist of spending by S&L governments to produce and provide services to the public, such as education, law enforcement, and transportation; this category has historically been the largest contributor to GDP. Gross investment consists of spending on fixed assets, such as the construction of roads, bridges, and waterways. And transfer payments to households and businesses are subsidies and assistance payments that S&L governments provide to the public such as the Temporary Assistance for Needy Families (TANF) program and Medicaid. In line with understanding how goods and services produced by the S&L government sector directly affect the macroeconomy over the business cycle, we limit our analysis to consumption expenditures and gross investment.¹





In 2022, S&L governments' consumption expenditures and gross investment equaled \$2.8 trillion. The blue bars in Chart 1 show S&L governments' combined consumption expenditures and gross investment by category. Education was the largest spending category for S&L governments, comprising \$1.13 trillion in fiscal year 2020; the second and third largest spending categories were for utilities and hospitals.² With expenditures accounting for more than 10 percent of GDP, S&L governments are crucial to the provision of public services and infrastructure investment, and changes in the cyclicality of this sector's spending may have significant effects on the larger economy.

II. Changes in the Cyclicality of S&L Government Spending over Time

S&L government spending is conventionally viewed as procyclical, meaning it declines during recessions (Clemens and Miran 2012; Bohn and Inman 1996; Porterba 1994). Most studies, however, focus on trends since the 1980s, and thus may miss changes or patterns in the cyclicality of S&L government expenditures over a longer period.

We take a longer view of S&L government spending over the business cycle and consider all recessionary periods after 1950 as defined by the National Bureau of Economic Research (NBER). Since our goal is to understand the cyclical contribution of S&L government expenditures to GDP, we apply the method from Hamilton (2017) to remove the time trend in real S&L government consumption and investment expenditures and instead focus on the cyclical component of the detrended time series.

Our analysis suggests that the cyclicality of S&L government spending shifted in the mid-1980s. In Chart 2, Panels A and B split the data for recessions before and after the mid-1980s, respectively.³ The horizontal axes show the number of quarters since the start of a recession, while the vertical axes show the cyclical components of S&L government consumption and investment expenditures relative to their values at the start of each recession.

Panel A illustrates that recessions prior to the mid-1980s do not display a clear pattern of cyclicality. The blue line in Panel A, which represents an average across the recessions during this period, shows both upward and downward patterns. Comparing the gray lines, which correspond to individual recessions, shows that S&L government spending has been procyclical during some recessions and countercyclical in others; in some cases, spending has varied within the same recession. For example, after the 1957 recession (gray triangles), S&L government spending increased in the first year and then began to decline for two years before rising again. Meanwhile, S&L government spending increased (that is, was countercyclical) after the recession that began in 1981 (gray dots) and remained elevated for four years before beginning to decline.

However, Panel B illustrates that since the mid-1980s, S&L government expenditures have shown a much more consistent pattern and been largely procyclical. The blue line highlights that *on average*, S&L government expenditures dropped in the quarter immediately following the start of a recession and only began to recover more than three years after the start of a recession. Comparing the gray lines in Panel B confirms that all recessions after the mid-1980s display this pattern, with expenditures decreasing immediately after the start of the recession as well as again after a couple of years. Overall, the contrast between Panels A and B highlights that the pattern of cyclicality for S&L spending changed after the mid-1980s.

Chart 2 S&L Government Expenditures Became Procyclical after the Mid-1980s



Panel A: Recessions before the mid-1980s



Panel B: Recessions after the mid-1980s

Note: Chart is constructed using the seasonally adjusted annual rate in billions of chained 2012 U.S. dollars. Sources: U.S. Bureau of Economic Analysis (BEA) and NBER (both accessed through Haver Analytics); authors' calculations.

III. Potential Explanations for the Changing Cyclicality of S&L Government Expenditures

To understand why the cyclicality of S&L government expenditures changed after the mid-1980s, we examine the sources of S&L government funding. Almost all states have balanced budget requirements, which can dictate a tight relationship between S&L government expenditures and revenues. The two major revenue sources for S&L governments are receipts from tax collection and transfers from the federal government. Tax receipts account for 78 percent of general revenues, making them the primary source of revenue. Although federal transfers account for only about 22 percent of general revenues, they have been rising steadily over time and play an increasingly important role in S&L budgets.⁴ In addition to these revenue sources, S&L governments also have the ability to borrow or drawdown their savings. We examine each of these possible funding sources in turn.

Tax revenues

During recessions, governments may be forced to cut expenditures due to tax revenue shortfalls (Clemens and Miran 2012). Because tax revenues make up the lion's share of S&L government receipts, changes in the cyclicality of tax revenues may be a key driver of changes in the cyclicality of S&L government spending after the mid-1980s.

The degree to which S&L government tax revenues are cyclical may be influenced by their composition, which has changed markedly since the 1950s. S&L governments collect tax revenues from three primary sources: property taxes, income taxes, and sales and excise taxes.⁵ The orange line in Chart 3 shows that the share of tax revenues from sales and excise receipts has remained largely unchanged over time. In contrast, the shares of tax revenues from property taxes and income taxes have changed substantially. The share of total tax revenue from personal income taxes (blue line) increased from 6 percent in 1958 to 20 percent in the early 1980s and continued to increase into the early 2000s.⁶ However, the share from property taxes (green line) declined from 45 percent in 1958 to about 30 percent in 1980; since then, the share has remained stable, fluctuating at around 30 percent.





The Share of Income Tax Revenues in Total Taxes Has Increased over Time



The declining share of property taxes in total tax revenue may have contributed to the change in the cyclicality of S&L government expenditures in the 1980s. Because property values are reassessed every few years, changes in property taxes generally lag the economic cycle. For most recessions since the 1960s, property taxes do not decline immediately after the start of a recession; instead, they decline only after a couple of years. Because property taxes are less procyclical than income taxes, the shift from property taxes to income taxes likely contributed to the change in S&L expenditure cyclicality since the 1980s.

However, we find that changes in the cyclicality of income tax revenues may play a more important role in explaining the changing cyclicality of government expenditures. Using the same methodology employed in Chart 2, Chart 4 suggests that changes in the cyclicality of real personal income tax receipts could explain the increased procyclicality of S&L expenditures. Panel A shows that S&L income tax receipts did not display clear cyclical patterns in recessions prior to the mid-1980s. However, Panel B shows that after the mid-1980s, S&L income tax receipts declined on average in the quarters following the start of a recession and only began to recover after nearly three years (blue line).⁷

Chart 4 Income Tax Revenues Have Become Procyclical since the Mid-1980s



Panel A: Recessions before the mid-1980s





Note: Chart is constructed using the seasonally adjusted annual rate in billions of chained 2012 U.S. dollars. Sources: BEA and NBER (both accessed through Haver Analytics); authors' calculations.

Together, Charts 3 and 4 offer a potential explanation for the changing cyclicality of S&L government spending: after the mid-1980s, income tax revenues became both more cyclical and more important to total S&L government tax revenues. However, they do not explain what may have driven changes in the cyclicality of S&L income tax revenues.

Changes in the cyclicality of income tax revenue after the mid-1980s could arise from variations in the sensitivity of tax revenues to the state of the economy, changes in underlying tax laws, or both. Thus, a natural question is whether the income tax base became more procyclical after 1985 (that is, began decreasing more during recessions), or tax rates became more cyclical (that is, began increasing less or even declining during recessions).

Previous research on this question offers a range of views. Sjoquist and Wallace (2003) show that capital gains increased as a share of taxable income in the mid and late 1990s, indicating the tax base may be more procyclical. However, McGranaham and Mattoon (2012) show that the average marginal tax rate on wages increased during the 1981 and 1990 recessions but remained largely unchanged following the 2001 and 2008 recessions, suggesting tax rates may have previously been countercyclical and become procyclical. Similarly, Maag and Merriman (2003) compare state tax policy responses to the 1990 and the 2001 recessions. They argue that states quickly enacted tax policy changes to raise revenue in the early 1990s but made few tax policy changes and relied more on expenditure cuts in 2001.

Although an in-depth review of these explanations is beyond the scope of this article, Chart 5 sheds some light on whether changes in the cyclicality of tax revenues after the mid-1980s are a result of changes in the tax base or tax policy following recessions. We scale sources of S&L tax revenues by a measure of the corresponding tax base to arrive at an implied average tax rate. A decrease in this ratio during recession-ary periods implies that tax revenues are decreasing at a faster rate than changes in total income available to tax.

Chart 5 provides evidence that the increasing cyclicality of income tax rates may account for changes in the cyclicality of S&L government expenditures.⁸ The blue line shows personal income taxes divided by gross state product (GSP). During the 2001 and 2008 recessions, personal income tax collections declined as a percentage of total income,





or GSP. As a check, we also consider an alternative approach using total employee compensation as a proxy for the tax base. The implied tax rate in this case (green line) yields a similar conclusion as our calculation using GSP, but the declines in recent recessions are steeper. Overall, these results suggest that after the mid-1980s, implied income tax rates began to decline after recessions.⁹

Although an in-depth investigation into the drivers of the decline in implied income tax rates in recent recessions is beyond the scope of this article, we note some possible explanations. S&L governments could have legislated tax cuts in recessions, lowering statutory tax rates. Alternatively, deteriorating economic conditions during recessions such as job losses, lower wages, and lower capital gains—could have shifted individuals into lower marginal tax brackets, reducing the effective tax rate. This channel may be more pronounced in a deep recession. For instance, following the stock market crash of 2001, capital gains, wages for top executives, taxable stock options, bonuses, and other kinds of income related to investment sharply declined. These reductions led to significant declines in income tax revenues.

Intergovernmental transfers

Federal transfers and grants to S&L governments have been increasing over the years, rising from less than 10 percent of total S&L receipts in 1950 to more than 20 percent in 2019. Thus, cyclicality changes in federal transfers could be a potential contributing factor to changes in S&L government expenditures. However, Chart 6, which uses the same methodology employed in Chart 2, suggests otherwise. The blue line in Panel A shows that before the mid-1980s, real federal grants-in-aid to S&L governments showed no clear pattern. The blue line in Panel B shows that after the mid-1980s, federal grants on average increased following a recession, only beginning to consistently decline after three years. In other words, federal grants became countercyclical, in accordance with their purpose to provide monetary assistance to S&L governments following recessions. These increases in transfers should have helped stabilize expenditures; however, S&L expenditures declined more in these recessions (see Chart 2).

Alternative sources of financing

In addition to tax revenues and intergovernmental transfers, we might expect municipal bonds to contribute to the cyclicality of S&L spending, as they are another avenue for S&L financing, particularly for investment. However, a graph of only real S&L consumption expenditures would look virtually identical to the patterns of real S&L consumption and investment expenditures shown in Chart 2, suggesting the change in cyclicality stems from a change in the cyclicality of consumption, rather than investment, expenditures. Because governments face stringent restrictions on short-term borrowing to finance consumption expenditures, only a small portion of short-term municipal notes are used to bridge the gap between the time when expenses occur and revenues become available, while the majority of municipal bonds finance long-term investment. With these institutional constraints, it is hard to account for changes in the cyclicality of S&L government expenditures by movements in the municipal bond market.¹⁰

As an alternative to debt financing, S&L governments could withdraw from their savings to finance expenditures. Rainy day funds, or budget stabilization funds, are an institutionalized form of saving, such that states can save funds during an economic boom and withdraw

Chart 6 Federal Grants-in-Aid Have Been Largely Countercyclical since the Mid-1980s



Panel A: Recessions before the mid-1980s



Panel B: Recessions after the mid-1980s

Note: Chart is constructed using the seasonally adjusted annual rate in billions of chained 2012 U.S. dollars. Sources: BEA and NBER (both accessed through Haver Analytics); authors' calculations.

from them during a recession. The funds are intended to help stabilize expenditures and reduce their procyclicality; however, many states did not adopt these funds until the 1980s. Given that expenditures were less procyclical before rainy day funds were introduced, rainy day funds cannot explain the change in expenditure cyclicality.¹¹ Furthermore, rainy day funds tend to be very small and would have been insufficient to cover budget shortfalls in recent recessions for most state and local governments (McNichol and Boadi 2011).

Conclusion

S&L government expenditures represent a significant portion of aggregate GDP and fulfill an essential role in the provision of public goods and services. S&L government spending is often thought to be procyclical and recover only sluggishly following recessions. We document that this pattern did not systematically emerge until the mid-1980s. In discussing possible explanations for the increased procyclicality, we suggest that changes in the cyclicality of income tax revenues may have played an important role. In particular, a growing reliance on income tax revenues coupled with an increase in the procyclicality of these revenues may account for the change in expenditure cyclicality.

Endnotes

¹Depending on the context of policy discussions, S&L government expenditures can be considered from either a S&L government budgeting perspective or a national income accounting view related to the measurement of GDP. The national income and product accounting (NIPA) view of S&L government expenditures includes only consumption expenditures and gross investment, while the budgeting view covers all outlays including transfer payments to households and businesses.

²The expenditures for each category in Chart 1 include both consumption and investment spending, albeit to varying degrees. For instance, about 10 percent of education expenditures are on capital outlays, while close to 50 percent of highway expenditures are for investment. In addition, the relative comparison in Chart 1 remains unchanged for the pre-COVID period, such as in fiscal year 2019.

³In Chart 2, Panel A covers recessions in 1953, 1957, 1960, 1970, 1974, 1980, and 1981, while Panel B includes recessions in 1990, 2001, 2008, and 2020.

⁴Besides general revenues from intergovernmental transfers and tax receipts, S&L government total revenues also include other miscellaneous receipts, such as insurance trust revenues.

⁵Royalties and severance taxes are not a major revenue source for most states. Although they are important for some states that rely on certain energy resources (such as coal, oil, and gas), these states have seen similar changes in the cyclicality of their S&L expenditures.

⁶For S&L governments, personal income taxes are much more important than corporate income taxes. For instance, corporate income taxes accounted for 3.3 percent of total S&L tax revenues in 2020, while personal income taxes accounted for 23 percent.

⁷We use personal current income tax receipts and convert from nominal to real terms using the S&L consumption and gross investment price index, chained to 2012 U.S. dollars.

⁸We note that federal tax receipts do not exhibit the same change in cyclicality since the mid-1980s, further suggesting that the change in cyclicality at the S&L level is due to changes in S&L government tax policy, as opposed to changes in the sensitivity of the tax base to recessionary episodes.

⁹Property taxes as a share of total income also declined after the 1980s. Since property tax rates tend to be more countercyclical, the declining importance of property taxes may have partially contributed to the change in the cyclicality of S&L expenditures.

¹⁰In addition, total municipal debt increased substantially following most recent recessionary episodes. For instance, total outstanding municipal bonds rose from \$1.5 trillion at the start of the 2001 recession to \$2 trillion by 2004. These debt increases should have helped stabilize expenditures, the opposite of what we have observed.

¹¹By fiscal year 1988, only half of the states had a positive balance in rainy day funds (White 2022).

References

- Bohn, Henning, and Robert P. Inman. 1996. "Balanced-Budget Rules and Public Deficits: Evidence from U.S. States." *Carnegie-Rochester Conference Series* on Public Policy, vol. 45, pp. 13–76. Available at https://doi.org/10.1016/ S0167-2231(96)00017-6
- Clemens, Jeffrey, and Stephen Miran. 2012. "Fiscal Policy Multipliers on Subnational Government Spending." *American Economic Journal: Economic Policy*, vol. 4, no. 2, pp. 46–68. Available at https://doi.org/10.1257/pol.4.2.46
- Hamilton, James D. 2017. "Why You Should Never Use the Hodrick-Prescott Filter." National Bureau of Economic Research, working paper no. 23429, May. Available at https://doi.org/10.3386/w23429
- Maag, Elaine, and David Merriman. 2003. "Tax Policy Response to Revenue Shortfalls." Prepared for "State Fiscal Crises: Causes, Consequences, and Solutions," Urban Institute, Washington, DC, April 3.
- McGranaham, Leslie, and Rick Mattoon. 2012. "State Tax Revenues over the Business Cycle: Patterns and Policy Responses." Federal Reserve Bank of Chicago, *Chicago Fed Letter*, no. 299, June.
- McNichol, Elizabeth, and Kwame Boadi. 2011. "Why and How States Should Strengthen Their Rainy Day Funds." Center on Budget and Policy Priorities, February 3.
- Porterba, James, M. 1994. "State Responses to Fiscal Crises: The Effects of Budgetary Institutions and Politics." *Journal of Political Economy*, vol. 102, no. 4, pp. 799–821. Available at https://doi.org/10.1086/261955
- Sjoquist, David L., and Sally Wallace. 2003. "Capital Gains: Its Recent, Varied, and Growing (?) Impact on State Revenues." *State Tax Notes*, August 18, pp. 497–506.
- White, Kathryn. 2022. "Data Analysis: State Rainy Day Fund Balances over Time." National Association of State Budget Officers, *Budget Blog*, February 22.

Addressing Traditional Credit Scores as a Barrier to Accessing Affordable Credit

By Ying Lei Toh

A ccess to affordable credit is vital to consumers' economic wellbeing and to inclusive economic growth. Affordable credit enables consumers to better manage their finances and cope with unexpected emergencies. Further, affordable credit may empower consumers to pursue opportunities such as entrepreneurship or higher education, which can build wealth and increase socioeconomic mobility. However, many consumers continue to face difficulties obtaining the credit they need. According to the 2019 Survey of Consumer Finances (SCF), about one-quarter of consumers who desired credit reported that they did not obtain any credit or as much credit as they requested.

A major impediment to obtaining affordable credit is lenders' reliance on traditional credit scores—specifically, the FICO score and VantageScore—to assess consumers' creditworthiness. These credit scores affect not only loan approval decisions but also the interest rates consumers pay on their loans. And while these credit scores are intended to help lenders make informed decisions about consumers' risk of default, they do not always accurately reflect a borrower's ability to repay. For instance, traditional credit scores persistently penalize borrowers who have experienced derogatory credit events such as delinquencies, even when those events are no longer indicative of their ability to pay.

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Traditional credit scores may also disproportionately punish consumers from economically disadvantaged groups, who tend to experience greater difficulties obtaining their first line of credit as both account age and length of payment history are major factors in the scores. Better understanding the obstacles these scores pose to consumer credit access—as well as potential ways to address them—is thus of critical importance to both efficient credit allocation and economic mobility.

In this article, I examine the barrier traditional credit scores pose to obtaining affordable credit in the United States and discuss efforts to address this barrier. Using data from the 2019 SCF, I find that traditional credit scores may indeed hinder a sizeable share of consumers from obtaining the credit they desire. Further, disparities in credit access across several sociodemographic groups match the disparities in their likelihood of having high traditional credit scores, suggesting lenders' reliance on traditional credit scores may drive disparities in credit access. Although using alternative data or more sophisticated statistical techniques in credit scoring and underwriting could alleviate these disparities, clearer regulatory guidance and more research will likely be necessary to promote the development and adoption of alternative credit-scoring models.

Section I reviews how traditional credit scores affect credit access in the United States. Section II examines disparities in credit scores across several sociodemographic groups and discusses their implications. Section III discusses efforts to address the barrier that traditional credit scores pose to credit access.

I. Traditional Credit Scores and Access to Credit

Mainstream lenders (banks and credit unions) have traditionally been the main source of affordable credit—often defined as a loan with an annual interest rate below 36 percent—for consumers (Saunders 2021). To assess the creditworthiness (or risk of default) of potential borrowers, these lenders have typically relied on credit scores. In theory, credit scores provide lenders with a standardized metric for evaluating consumers' credit risks objectively, consistently, and cheaply, helping to increase the overall availability of credit and the efficiency of credit allocation in consumer credit markets (Board of Governors of the Federal Reserve System 2007). Lenders deem consumers with lower credit

Box FICO Score and VantageScore

To obtain a FICO score or VantageScore, consumers need sufficient credit history. Consumers must have opened at least one credit account to be eligible for a VantageScore and must have at least one account that has been open for six months or longer to be eligible for a FICO score. If a consumer meets these requirements, their score is calculated based on data from their credit bureau files. The chart below shows the categories of data and their relative weighting in FICO Score 8 and VantageScore 3.0, the most commonly used versions of the two scores.

Available credit Recent credit Vantage Score Payment history 3.0 FICO Score 8 credit 10 20 30 40 50 60 70 80 90 100 Percent

Factors that Determine a Consumer's Credit Score

Sources: FICO and VantageScore.

Payment history. A consumer's payment history is the most influential factor in determining both their FICO Score 8 (35 percent) and VantageScore 3.0 (40 percent). A good (and long) track record of on-time payments is critical for a high credit score.

Amount owed. A lower level of credit usage—as measured by factors such as total balance, number and type of accounts with balances, unused or available credit, and credit utilization (specifically, the balance-to-credit-limit ratio)—increases a consumer's credit score.

Age of credit accounts and credit mix. Older accounts and a greater diversity of account types increase a consumer's credit score.

Recent credit. Fewer recent credit accounts and applications are associated with higher credit scores.

Both the FICO score and VantageScore range from 300 to 850. A FICO score or VantageScore above 660 is considered "prime," while a FICO score below 620 or a VantageScore below 600 is considered "subprime."

Table 1

Reasons Borrowers Were Denied or Granted Less Credit Than Requested in Their Most Recent Loan Application

Reasons provided by lender	Percent
Lack of credit history / credit references	9.4
Credit bureau reports / credit ratings	35.9
Other credit records	8.2
Too much debt	21.6
Income / assets / other financial characteristics	10.3
No reason given / bank policy	6.3

Notes: Table is constructed by grouping similar reasons contained in variable X7585 of the 2019 SCF. "Lack of credit history / credit references" corresponds to reason codes 62 and 67; "credit bureau reports / credit ratings" corresponds to reason code 63; "other credit records" corresponds to reason code 64; "too much debt" corresponds to reason code 66, "income / assets / other financial characteristics" corresponds to reason codes 65, 71, 72, 73, 76, 79, and 103; "no reason given / bank policy" corresponds to reason code –1.

Sources: Board of Governors of the Federal Reserve System and author's calculations.

Table 2 Average Annual Percentage Rates (APRs) for Consumer Loans by FICO Score

FICO score	General-purpose credit card (percent)	Personal loan (percent)	30-year fixed rate mortgage (percent)	Used car loan (percent)
760 and above	17.5	10.72 12.50	5.99	2.69
720	1/.5	10./3-12.50	6.21	5.68
690	21.0	13.50-15.50	6.39	5.53
630	22.6	17.80–19.90	7.58	10.33
580	23.3	28 50 22 00	-	16.85
Below 580	23.9	28.30-32.00	-	20.43

Notes: APRs for general-purpose credit cards are based on data from 2020. The personal loan rates are accurate as of February 1, 2023. Mortgage rates are calculated based on a loan size of \$300,000 and are accurate as of February 7, 2022. Used car loan rates are accurate as of 2022;Q2.

Sources: Consumer Financial Protection Bureau (CFPB), Bankrate, myFICO, and Experian.

scores to be less creditworthy and are thus more likely to deny credit to these consumers or charge them higher interest rates.¹

Traditional credit scores—particularly, the FICO score and VantageScore—are derived solely from consumers' credit history and are the type of credit scores lenders most commonly use to evaluate consumers' creditworthiness today.² See the Box for an overview of these two scores, including the minimum requirements for obtaining them.

Data suggest that lenders rely heavily on traditional credit scores to determine whether and at what price consumers can obtain credit. Table 1 shows that according to the 2019 SCF, which is conducted by the Board of Governors of the Federal Reserve System, almost half of consumers who applied but failed to obtain the credit they desired were unsuccessful because of reasons related to their credit bureau records (35.9 percent) or lack thereof (9.4 percent). Moreover, Table 2 shows that consumers with lower FICO scores face higher rates when obtaining various types of consumer loans. For example, a consumer with a FICO score under 580 faces a nearly 17 percentage point higher average rate for a used car loan than a consumer with a FICO score of 720 or above.

II. Implications of Relying on Traditional Credit Scores to Determine Access and Cost of Credit

Lenders' heavy reliance on traditional credit scores for credit underwriting may prevent some consumers from obtaining affordable credit—or discourage them from applying in the first place. According to the 2019 SCF, 9.3 percent of consumers age 18 and above were either denied credit or granted less credit than they requested—and about 45.3 percent of these consumers report being denied or granted less credit than requested because of their credit score.³ Additionally, 7.4 percent of consumers report that they did not apply for credit either because the interest rates were too high or because they did not think they would be approved; both reasons may be related to the lack of a high traditional credit score. In all, up to 11.6 percent of consumers (9.3 × 0.453 + 7.4) may have credit needs that were unmet or undermet due to no or low credit scores.

From both a lending and consumer protection perspective, denying some consumers credit may be desirable to the extent that it prevents them from overborrowing; however, a low or nonexistent credit score may not always reflect a lack of creditworthiness. Instead, it may reflect that a consumer is new to the credit market or that they had a disadvantageous start to their credit history—for example, by not having access to a co-borrower or by having their credit histories established as a result of a third-party debt collection. Evidence suggests these reasons are especially relevant for younger consumers, low- and moderate-income (LMI) consumers, and Black or Hispanic consumers—placing populations that may especially benefit from access to affordable credit at a particular disadvantage in obtaining it.

Consumers new to the credit market

Consumers who lack credit scores are often those who are new to the credit market, such as young adults. These consumers' creditworthiness cannot be observed through traditional credit-scoring methods because they have no or insufficient credit history to generate a credit score.⁴ Moreover, even after becoming scorable, these consumers have lower credit scores on average because they tend to have younger accounts, shorter payment histories, higher credit utilization rates (due to lower credit limits), and a larger number of recent account applications. Thus, lending decisions based solely on traditional credit scores may inefficiently deny credit for consumers new to the credit market.

Indeed, young adults appear to be at a particular disadvantage for this reason. Brevoort, Grimm, and Kambara (2015) estimate that in December 2010, 35.5 percent of consumers between the ages of 20 and 24 had no or insufficient credit history to be scorable compared with 19.3 percent of the overall population. Moreover, Chart 1 shows that when younger consumers are scorable, they have lower credit scores on average.

Consumers with a disadvantageous start to their credit history

Traditional credit-scoring models also tend to persistently assign lower scores to consumers with less advantageous starts to their credit history, even when the disadvantages they faced did not or no longer reflect their true creditworthiness (Bach and others 2023).⁵ Consumers typically establish their credit history by obtaining their first line of credit. Although most consumers do so alone, some leverage the creditworthiness of others-for example, by having a co-borrower with good credit history or by becoming an authorized user on someone else's (often a parent's) credit line. The latter approach is more advantageous because it not only increases the likelihood of approval but may also help consumers boost their credit scores by acquiring the credit history of the established borrower (Bach and others 2023).⁶ However, many consumers are unable to obtain credit this way. For example, Brevoort and Kambara (2017) find that individuals from LMI neighborhoods are less likely to leverage the creditworthiness of others in applications than individuals from higher-income neighborhoods.

Chart 1





Note: A neighborhood is classified as "low income" if its median family income is under 50 percent of the area median family income, "moderate income" if its median family income is between 50 and 80 percent of the area median income, "middle income" if its median family income is between 80 and 120 percent of the area median income, and "high income" if its median family income exceeds 120 percent of the area median income. Sources: Horymski (2022); Kramer-Mills, Landau, and Scally (2020); and ShiftProcessing.com.

A less common but more disadvantageous way of establishing one's credit history is through bankruptcy or third-party debt collection. Credit-scoring models consider these events to be derogatory, meaning consumers who establish their credit scores this way are likely to start off with lower credit scores. Further, because records remain on consumers' credit bureau files for seven years, derogatory events may continue to weigh on consumers' credit scores even when they are no longer indicative of consumers' credit worthiness. Again, Brevoort and Kambara (2017) find that individuals from LMI neighborhoods are more likely to have their credit histories established through these derogatory events than individuals from higher-income neighborhoods.

Given that LMI neighborhoods also tend to have higher shares of Black and Hispanic consumers, we may expect Black and Hispanic consumers to disproportionately experience disadvantages in establishing their credit history (Goodman and others 2022). Indeed, studies have found that the share of consumers without a credit score is higher among both LMI consumers and Black or Hispanic consumers compared with higher-income and white consumers (Brevoort, Grimm, and Kambara 2015; Hepinstall and others 2022). Further, Chart 1 shows that LMI consumers and Black and Hispanic consumers have lower credit scores compared with higher-income consumers and white consumers, on average.

Moreover, Blattner and Nelson (2021) find that while credit scores are generally predictive of default risks, they are less predictive for consumers with "noisier" credit bureau files—that is, those that contain fewer records, lack diversity in account types, or include past derogatory events. These factors also tend to lower credit scores, suggesting lower credit scores may not always be indicative of lower creditworthiness—especially for consumers who are new to the credit market or had less advantageous starts to their credit histories.⁷

Indeed, data from the 2019 SCF suggest that disparities in credit scores across age, income, and racial and ethnic groups have contributed to similar disparities in credit access. Chart 2 shows that around 60 percent of consumers desired credit in the 12 months preceding the 2019 SCF.8 This share does not vary widely by consumer characteristic, except for age-consumers under the age of 35 were 28.7 percentage points more likely to desire credit than those 65 years or older. In contrast, the share of consumers who desired credit but had credit needs that went unmet or undermet—either because they did not apply (blue bars) or because they applied but were denied or granted less credit than requested (green bars)-varied widely across age, income, and racial and ethnicity groups. Consumers who were below age 65, earned less than \$75,000 a year, or were Black or Hispanic were substantially more likely to have their credit needs unmet or undermet. Lower-income consumers-particularly, those making less than \$50,000 a year-and Black or Hispanic consumers were less likely to have applied for credit and more likely to be denied conditional on applying compared with consumers earning \$75,000 or more a year and white consumers. And although consumers with income between \$50,000 and \$75,000 and those under the age of 65 were not substantially less likely to have applied for credit compared with higher-income and older individuals, they were more than twice as likely to be denied credit either partially or fully.

Chart 2

Disparities in Credit Access Mirror Disparities in Credit Scores across Income, Age, and Race and Ethnicity Groups



The data in this section suggest that traditional credit scores pose critical barriers to accessing affordable credit. In addition, traditional credit scores are less predictive of creditworthiness for consumers with lower or no credit scores, implying that some of these consumers may be inefficiently denied access to credit or charged higher prices. While barriers to access may be transitory for young consumers, they are likely to be persistent for lower-income and Black or Hispanic consumers, who have lower credit scores on average.⁹ These consumers would likely benefit the most from access to lower-cost credit, as both lower-income and Black or Hispanic consumers tend to lack savings that could help them cover unexpected emergencies. Access to lower-cost credit could help these groups avoid taking on high-cost debt and could enhance their economic mobility by allowing them to purchase homes, invest in the education of their children, and pursue other economic opportunities such as entrepreneurship. As such, addressing the barriers that traditional credit scores pose to credit access may be critical in enhancing economic mobility and financial inclusion.

III. Efforts to Address the Barrier of No or Low Traditional Credit Scores

Although the barriers to credit access are pervasive for consumers with no or low credit scores, federal agencies and lenders have, until recently, done relatively little to address them. Lenders traditionally addressed these barriers by offering credit-building products to consumers seeking to establish or improve their traditional credit scores, while federal agencies primarily focused on financial education. In more recent years, however, lenders (particularly, fintech lenders) and federal agencies have begun developing credit-scoring models that leverage alternative data sources and exploring the use of more advanced machine learning techniques in credit scoring. These efforts could expand the share of consumers who are scorable and improve the accuracy of credit risk prediction (particularly for underserved consumers), thereby improving overall access to credit.

Traditional credit-building products

One way financial institutions have traditionally helped consumers with low or no credit scores access low-cost credit is by offering products designed to help them build or improve their credit history. Although these products are reported to credit bureaus as standard credit products, they do not, in fact, offer consumers additional liquidity. Instead, these products require consumers to either secure the credit line with a deposit or pre-pay for the loan. This feature minimizes the default risks that lenders face, making them more willing to extend these "loans" to consumers of unknown or possibly high default risk. By obtaining and making timely payments on these products, consumers can establish or improve their credit scores.

Two common types of credit-building products are credit-builder loans (CBLs) and secured credit cards. CBLs are reported as installment loans to credit bureaus. However, unlike regular installment loans, lenders do not provide borrowers with funds upfront; instead, they require borrowers to pre-pay for their loans. Specifically, the loan is disbursed to borrowers with each installment payment that they make. For example, if a borrower took out a 12-month CBL for \$600, which implies a monthly payment of \$50 plus interest, the lender would deposit \$50 into the borrower's account each time they made their monthly payment. A secured credit card is an "alternative" credit card that works like a regular credit card but requires cardholders to post a security deposit (typically, equal to the credit limit) to reduce lenders' exposure to default risk (White 2022).

Research on credit-building products is relatively scant, and previous studies find that the adoption of these products has mixed effects on consumers' credit scores. Studies on CBLs generally find that taking out a CBL both increases the probability of having a credit score and increases credit scores for those with existing scores who also have little to no existing debt. However, studies also find that taking out a CBL can actually hurt the credit scores of consumers with a higher level of existing debt (see, for example, Burke and others 2022; CFPB 2020).¹⁰ Opening a secured credit card likewise benefits some consumers while hurting others. Santucci (2016) finds that secured cardholders who kept their cards open over the course of two years experienced an increase of about 24 points in their credit scores. CFPB (2017) suggests that secured cardholders who maintain a good payment history may even have their cards converted into unsecured credit cards and their deposits returned after a period. However, secured credit cardholders who closed their accounts within two years-whether their accounts were in good standing or otherwise-saw their credit scores decline by over 40 points (Santucci 2016). Those whose accounts were in default at the time of closure experienced an especially sharp drop in their credit scores of around 60 points.

Moreover, although credit-building products can help some consumers obtain and improve their credit scores, they are likely to have limited effects on expanding access to lower-cost credit overall. Surveys consistently find that many U.S. consumers—particularly, lowerincome and younger consumers—lack basic knowledge about credit scores (see, for example, Capital One 2022, Quinn 2021, and Consumer Federation of America 2020). Thus, consumer awareness of credit-building products is likely to be low. Even when consumers are aware of these products, they may face barriers obtaining them, including insufficient funds to fulfill the deposit requirement of secured credit cards, a lack of trust in the lender, and an inability to pass the ability-topay (ATP) test (CFPB 2017; Levy and others 2016).¹¹

Fintech credit-building products

In recent years, some financial technology ("fintech") firms have also begun offering credit cards that do not require consumers to have a traditional credit score to apply, providing consumers with an alternative product for building credit.¹² Instead of relying on security deposits or prepayments, these fintech lenders minimize their exposure to default risks by only lending to consumers whom they determine to be creditworthy based on alternative metrics, such as bank account data.¹³ To help consumers build their credit scores, these credit cards also have features that help maintain good payment behaviors. For instance, one fintech credit card does not allow consumers to carry a balance and offers a seven-day automatic repayment feature, which helps cardholders to make timely payments and keep their credit card utilization level low. And another rewards cardholders by increasing their credit limit if they make consistent, timely payments.

Outside studies on the effectiveness of these fintech products are limited, though data shared by the representatives of one fintech credit card provider suggest that these products have helped some consumers establish and obtain high credit scores.¹⁴ According to this provider, consumers who opened a credit card with them without a traditional credit score obtained a VantageScore of 681—a prime score—on average, 12 months after opening the card. In addition, these cards appear to help provide credit to consumers who are underserved by mainstream lenders. In particular, 40 percent of the consumers this fintech provider approved for a card in 2022 had previously been denied credit by a mainstream lender. Fintech credit cards are likely to have a small effect on expanding credit access to consumers (both directly and indirectly) at present, given that these cards are relatively new and many consumers may still not be aware of them.¹⁵ That said, these fintech credit cards have the potential to reach more consumers than secured credit cards, as they are both more accessible and provide real liquidity to cash-flowconstrained consumers.

Financial education and credit counseling

Traditionally, agencies in both the public and private sectors have engaged in efforts to improve consumers' personal finance knowledge, including their knowledge about credit scores, borrowing, and debt management. Many consumers lack a basic understanding of credit scores; surveys also indicate that many consumers lack financial knowledge more generally, including knowledge about borrowing (Contretras and Bendix 2021). To improve general financial literacy, many federal agencies have developed dedicated financial education websites that provide educational materials and financial management tools to consumers (Toh 2022). State and local governments have also worked to promote the inclusion of financial education in school curriculums (Contretras and Bendix 2021). In addition, various nonprofit organizations, such as the National Foundation for Credit Counseling or American Consumer Credit Counseling, offer credit counseling services that can help consumers improve their financial knowledge and better manage their debts, thereby improving their credit scores (Roll and Moulton 2016).¹⁶

Relatively little is known about the effectiveness of the various public sector financial education efforts on financial literacy, and subsequently, consumer credit behaviors and credit scores, as these efforts often lack measurable goals (GAO 2006). However, research on financial education in general suggests that these efforts may have limited effects. Financial literacy surveys consistently find that many U.S. consumers lack the financial knowledge needed to make sound financial decisions-on average, consumers only answer around half of the financial literacy questions in these surveys correctly (Contretras and Bendix 2021). Moreover, depending on the survey, the share of questions that consumers answer correctly has either been relatively stagnant or declining over time, suggesting that financial education efforts may not have been effective at improving consumers' financial knowledge.¹⁷ Studies on financial education generally find little to no effect on consumer financial behaviors, implying financial education may not help consumers obtain and improve traditional credit scores (Fernandes, Lynch, and Netemeyer 2014). However, some evidence suggests that credit counseling may improve consumers' credit scores. For example, Roll and Moulton (2016) find that consumers who underwent credit counseling reduced their debts and experienced larger increases in their credit scores compared with those who did not undergo credit counseling.

Promoting the use of alternative data in credit scoring and underwriting

More recently, lenders and federal agencies have turned their efforts to developing and promoting the use of alternative data in credit scoring. Because traditional credit scores are generated solely from credit records from the three main credit bureaus, their predictiveness of a consumer's default risk is limited by the availability and quality of the consumer's credit bureau data. As discussed in Section II, traditional credit scores may not be as informative about the creditworthiness of consumers with no credit history or noisier credit bureau data. Moreover, past credit history may not always be a good predictor of future creditworthiness (Di Maggio, Ratnadiwakara, and Carmichael 2022).

One way to address the limitations of credit bureau data is by using alternative data in credit scoring. These alternative data may include data on bill payments (for example, rent and utilities), transactions or cash flow (for example, bank accounts), and income or assets (for example, employment history and property ownership). They may also include non-financial data—for example, on social media use or type of mobile device (FinRegLab 2020). Studies find that credit-scoring models that use alternative data (particularly, cash flow data)—either alone or as a supplement to traditional credit bureau data—are not only able to score more consumers but also perform as well as or better than traditional credit scores at predicting consumers' default risks (see, for example, Di Maggio, Ratnadiwakara, and Carmichael 2022; FinRegLab 2020; Turner and others 2006).

Both the public and private sectors have been actively developing credit-scoring models that use alternative data in recent years. In 2020, the Office of the Comptroller of the Currency (OCC) launched Project REACh (Roundtable for Economic Access and Change) to promote financial inclusion by improving access to credit and capital. One objective of Project REACh is to help develop an alternative credit-scoring system that can serve as a safe and fair tool for underwriting.¹⁸ Traditional credit score creators and credit bureaus have been developing new scoring models that include alternative data such as bill payment data (for example, Experian Boost) and transaction data (for example, UltraFICO).¹⁹ Additionally, fintech firms Petal Card and Nova Credit have developed cash-flow-based credit-scoring models—CashScore and Cash Atlas, respectively—that use permissioned transaction data to predict credit risk.

Although using alternative data in credit scoring may, in theory, expand access to low-cost credit, its effects may be limited at present due to its low adoption by mainstream lenders (FinRegLab 2020). Many mainstream lenders may lack the motivation to use alternative data since they do not lend to subprime consumers, for whom alternative data is more predictive of credit risks. Technology or resource constraints, regulatory uncertainty, higher compliance risks associated with the use of alternative data, and a lack of data on the performance of underwriting models that incorporate alternative data are a few other factors that may hinder mainstream lenders from using alternative data in underwriting (GAO 2021).

Recent developments in both the regulatory and market spaces may encourage broader adoption of alternative data in credit underwriting, though their effects remain to be seen. In recent years, federal financial regulators have taken steps to reduce regulatory uncertainty surrounding alternative data in credit underwriting. In 2019, for example, federal financial regulators issued a joint statement encouraging responsible use of alternative data such as cash flow data in credit underwriting (Board of Governors of the Federal Reserve System and others 2019). And in 2021, the CFPB modified its definition of "qualified mortgage" under the Truth in Lending Act (Regulation Z) to allow for greater use of alternative data in mortgage lending. To further incentivize the use of alternative data, federal regulators have also stated that they may consider lenders' use of alternative data in underwriting mortgages for LMI consumers to be an innovation, potentially helping lenders to meet Community Reinvestment Act goals (GAO 2021).²⁰ More off-the-shelf credit-scoring models that incorporate alternative data have also become available in the market in recent years; their availability may facilitate mainstream lenders' use of alternative data in credit underwriting by addressing challenges in obtaining and integrating alternative data into their in-house underwriting models.

Exploring the use of machine learning in credit underwriting

In recent years, lenders, researchers, and regulators have also been exploring the use of advanced machine learning models in credit underwriting. These models use sophisticated algorithms that can help uncover complex relationships between numerous data points, enabling lenders to leverage massive amounts of alternative consumer data to improve credit risk prediction and access (FinRegLab 2022). Indeed, studies have found that the credit-scoring models of some fintech firms that leverage both machine learning and alternative data result in higher rates of credit approvals or lower interest rates for underserved consumers compared with models using traditional credit scores (Di Maggio, Ratnadiwakara, and Carmichael 2022; Jagtiani and Lemieux 2019).

Even when using only traditional credit data, most studies agree that sophisticated machine learning models generally outperform logistic models (which are commonly used for credit risk assessments) in predicting default risks of borrowers; however, studies differ on whether these improved predictions benefit underserved consumers. Some studies find that machine learning can help score a larger number of consumers even when using only traditional credit data, which may improve credit access among consumers who are not scoreable with the traditional credit-scoring model (Albanesi and Vamossy 2019; VantageScore 2021). However, other studies find that machine learning may have little to no benefit for populations that tend to have lower traditional credit scores, as it does not eliminate-and may even worsen-disparities in the accuracy of default risk predictions for consumers who are underserved relative to those who are not (Blattner and Nelson 2021; Mersault and others 2021; Wang and Perkins 2019). For example, Fuster and others (2022) find that the use of machine learning marginally improves loan approval rates for Black and Hispanic consumers but substantially increases the range of interest rates these consumers face, which may make them worse off overall. MacCarthy (2019) and Klein (2020) have also warned of machine learning's potential to perpetuate or worsen existing disparities in credit access or enable discrimination by proxy. More research is needed to examine the implications of using machine learning methods in credit underwriting on credit access for underserved populations and to inform regulation, particularly as the technology continues to evolve.

Conclusion

The lack of a high traditional credit score is a barrier to accessing affordable credit for many consumers in the United States. A lower ability to obtain affordable credit as needed may adversely affect consumers' financial well-being and impede economic mobility, particularly among economically disadvantaged consumers. In this article, I discuss the barrier traditional credit scores pose to credit access and highlight that traditional credit scores not only hinder many consumers from obtaining credit, they may also drive disparities in credit access across socioeconomic groups. I then review both public- and privatesector efforts to address this barrier. Earlier efforts largely focused on helping consumers establish or increase their traditional credit scores (for instance, by providing consumers with credit-building products, financial education, and credit counseling), while more recent efforts have concentrated on developing credit-scoring models that can better predict default risks by leveraging alternative data and more advanced machine learning techniques.

Although these efforts may improve consumers' access to affordable credit, they are currently limited by low adoption rates. Consumer adoption of credit-building products has thus far been low due to both a lack of data and lack of awareness. Once more data on the efficacy of credit-building products are available, more consumer outreach and promotion efforts may be needed to boost adoption of the bestperforming products. Lenders' adoption of alternative credit-scoring models, too, may be limited due to regulatory uncertainty, resource constraints, and inadequate data and research demonstrating their effectiveness. More research—especially on the use of machine learning methods for credit scoring—is needed to help establish the benefits and risks of alternative credit-scoring models.

Moreover, credit-building products and alternative credit-scoring models mostly serve to improve the accuracy of credit scores in predicting consumers' underlying creditworthiness (or default risks) and do not address consumers' lack of creditworthiness itself (except for credit counseling). These measures will only improve consumers' access to credit to the extent that their repayment behavior and the alternative data on consumers reflect low default risks. Measures to address consumers' lack of creditworthiness will likely be necessary to ensure that all consumers are able to access the credit they need.

Endnotes

¹Lenders may be especially reluctant to lend to subprime borrowers, as subprime lending subjects lenders to stricter lending standards and thus to higher compliance costs and risks. Examples of regulations that impose stricter requirements on subprime lending include the Credit Card Accountability and Disclosure (CARD) Act of 2009 and the Dodd-Frank Act of 2010. Studies have found that the CARD Act and Dodd-Frank Act led, respectively, to a decline in subprime credit card lending and a decline in mortgage lending in the mainstream credit markets (Elliehausen and Hannon 2017; Kramer-Mills, Landau, and Scally 2020).

²The FICO score was created in 1989 by FICO, while VantageScore was jointly created in 2006 by the three main credit bureaus—Equifax, Experian, and Transunion. Of the two scores, the FICO score is used more widely; according to FICO, over 90 percent of top lenders use the FICO score in credit underwriting.

³I assume the first two groups of reasons listed in Table 1 to be credit-score related.

⁴A consumer may also be unscorable if they have stale credit records, with no recent credit activities.

⁵Bach, Campa, and Giorgi (2023) find that consumers' initial credit scores are highly persistent and underpin the evolution of their credit scores. Higher initial credit scores tend to lead to better credit access, higher credit limits, and lower utilization rates, which result in high credit scores.

⁶In contrast, those who apply for credit alone may face a Catch-22 situation, in which they are unable to obtain a loan because they do not have a credit score and are unable to obtain a credit score because they are unable to get their first line of credit. Although most of these consumers eventually become scorable, they may take longer to obtain a credit score and have lower credit scores when they do, both because their accounts are younger and their credit utilization rates are higher (due to lower credit limits).

⁷Traditional credit scores may either under- or over-predict default risks for consumers with noisier credit files, leading to inefficient approval or rejection of credit applications, respectively. Blattner and Nelson (2021) find inefficient rejections (that is, rejections of consumers who are creditworthy) are more common among LMI and minority consumers.

⁸I consider any consumers who did not apply for credit for reasons other than not needing additional credit or preferring not to use credit as having a desire for credit.

⁹Race or ethnicity is time-invariant, and income mobility in the United States is limited, especially over the short term (Congressional Research Service 2021).

¹⁰Although each principal payment that a CBL borrower makes is returned to them in the form of a bank deposit they can withdraw almost immediately, taking out a CBL appears to worsen their ability to manage their other existing debt obligations. Burke and others (2022) find that borrowers who had a high level of existing debt (in the form of other installment loans) experienced higher non-CBL delinquencies when taking out CBLs.

¹¹Although consumers effectively pre-pay for their loans through the security deposit they post when obtaining a secured credit card, secured credit card lenders are still required to perform the ATP test as stipulated by the CARD Act of 2019. CFPB (2017) finds that about 12 percent of secured card applicants were denied because they did not pass the ATP test.

¹²Examples of such fintech firms include Petal and TomoCredit.

¹³By not requiring consumers to post a security deposit, these fintech credit cards are likely to be more accessible to consumers with cash flow constraints than secured credit cards.

¹⁴I am thankful to Petal's CEO, Jason Rosen, and Petal's vice president of communications, Matt Graves, for sharing this information with me.

¹⁵As of February 2023, Petal had over 350,000 cardholders. No data on the number of Tomo cardholders are available, though TomoCredit's CEO disclosed in 2022 that they have received over 2.5 million applications over time (Azevodo 2022).

¹⁶Some employers have also recognized the importance of employees' financial well-being on their engagement and productivity and have introduced or expanded their employee financial wellness programs, providing services such as financial counseling (CFPB 2014).

¹⁷The share of questions that consumers answered correctly, on average, in the Financial Industry Regulatory Authority Investor Education Foundation's National Financial Capability Study fell from 59.8 percent in 2009 to 51.6 percent in 2021. The share of questions that consumers answered correctly for the TIAA Institute-GFLEC Personal Finance Index has fluctuated at around 50 percent from 2017 to 2022 (Urban and Valdes 2022; Yakoboski, Lusardi, and Hasler 2022).

¹⁸Project REACh's alternative credit assessment workstream has so far collaborated with financial institutions to explore integrating permissioned deposit account data, shared across participating financial institutions, with traditional credit bureau data to assess consumer's creditworthiness. The workstream also plans to further explore the use of other permissioned alternative data, particularly for consumers without a deposit account for credit scoring (OCC 2023).

¹⁹Due in part to additional compliance requirements and data accuracy issues, these products are available to consumers only on an opt-in basis. As of January 2022, nearly 9 million consumers have signed up for Experian Boost (Boundy 2022).

²⁰The 2021 GAO report provides other examples of initiatives and efforts to expand the use of alternative data in mortgage lending, including incorporating rental payment data into Fannie Mae's underwriting model.

References

- Albanesi, Stefania, and Domonkos F. Vamossy. 2019. "Predicting Consumer Default: A Deep Learning Approach." National Bureau of Economic Research, working paper no. w26165, August. Available at https://doi.org/10.3386/ w26165
- Bach, Helena, Pietro Campa, Giacomo De Giorgi, Jaromir Nosal, and Davide Pietrobon. 2023. "Born to Be (Sub)Prime: An Exploratory Analysis." AEA Papers and Proceedings, vol. 113, pp. 166–171. Available at https://doi. org/10.1257/pandp.20231096
- Burke, Jeremy, Julian Jamison, Dean Karlan, Kata Mihaly, and Jonathan Zinman. 2022. "Credit Building or Credit Crumbling? A Credit Builder Loan's Effects on Consumer Behavior and Market Efficiency in the United States." *Review* of *Financial Studies*, vol. 36, no. 4, pp. 1585–1620. Available at https://doi. org/10.1093/rfs/hhac060
- Board of Governors of the Federal Reserve System. 2007. "Report to the Congress on Credit Scoring and Its Effects on the Availability and Affordability of Credit." Submitted to Congress pursuant to section 215 of the Fair and Accurate Credit Transactions Act of 2003, August.
- Board of Governors of the Federal Reserve System, Consumer Financial Protection Bureau (CFPB), Federal Deposit Insurance Corporation, National Credit Union Administration, and Office of the Comptroller of the Currency. 2019. "Interagency Statement on the Use of Alternative Data in Credit Underwriting." Press release. December 3.
- Boundy, Craig. 2022. "Experian Go: The Next Step in Our Commitment to Consumers." Experian Global News Blog, January 26.
- Brevoort, Kenneth P., and Michelle Kambara. 2017. "CFPB Data Point: Becoming Credit Visible." Consumer Financial Protection Bureau, June.
- Capital One. 2022. "Americans Top Misconceptions about Credit Scores." Capital One Insights Center, December 14.
- CFPB (Consumer Financial Protection Bureau.) 2020. "Targeting Credit Builder Loans: Insights from a Credit Builder Loan Evaluation." Committee on Financial Services of the U.S. House of Representatives, "Diversity and Inclusion: Holding America's Large Banks Accountable," 116th Congress, Second Session, February.
 - —. 2017. "The Consumer Credit Card Market," December.
- ———. 2014. "Financial Wellness at Work: A Review of Promising Practices and Policies," August.
- Consumer Federation of America. 2020. "Annual Survey Reveals That Low-Income Consumers Are Most Likely to Seek Credit Yet Know the Least about Credit Scores: Dissemination of CreditScoreQuiz.org Will Prioritize This Population." Press release, July 20.
- Contretras, Oscar, and Joseph Bendix. 2021. "Financial Literacy in the United States." Milken Institute, August 17.
- Di Maggio, Marco, Dimuthu Ratnadiwakara, and Don Carmichael. 2022. "Invisible Primes: Fintech Lending with Alternative Data." National Bureau of Economic Research, working paper no. 29840, March. Available at https:// doi.org/10.3386/w29840

- Elliehausen, Gregory E., and Simona M. Hannon. 2017. "The Credit Card Act and Consumer Finance Company Lending." Board of Governors of the Federal Reserve System, Financial and Economics Discussion Series, no. 2017-072, June.
- Fernandes, Daniel, John G. Lynch, Jr., and Richard G. Netemeyer. 2014. "Financial Literacy, Financial Education, and Downstream Financial Behaviors." *Management Science*, vol. 60, no. 8, pp. 1861–1883.
- FinRegLab. 2022. "Machine Learning Explainability and Fairness: Insights from Consumer Lending."
 - 2020. "The Use of Cash-Flow Data in Underwriting Credit: Market Context & Policy Analysis."
- Fuster, Andreas, Paul Goldsmith-Pinkham, Tarun Ramadorai, and Ansgar Walther. 2022. "Predictably Unequal? The Effects of Machine Learning on Credit Markets." *Journal of Finance*, vol. 77, no. 1, pp. 5–47. Available at https://doi. org/10.1111/jofi.13090
- GAO (Government Accountability Office). 2021. "Mortgage Lending: Use of Alternative Data is Limited but Has Potential Benefits." Report to Congressional Requesters, no. GAO-22-104380, November.
 - ——. 2006. "Financial Literacy and Education Commission: Further Progress Needed to Ensure an Effective National Strategy." Report to Congressional Committees, no. GAO-07-100, December.
- Hepinstall, Mike, Chaitra Chandrasekhar, Peter Carroll, Nick Dykstra, and Yigit Ulucay. 2022. "Financial Inclusion and Access to Credit." Oliver Wyman.
- Horymski, Chris. 2022. "What Is the Average Credit Score in the U.S.?" Experian, February 22.
- Jagtiani, Julapa, and Catharine Lemieux. 2019. "The Roles of Alternative Data and Machine Learning in Fintech Lending: Evidence from LendingClub Consumer Platform." *Financial Management*, vol. 48, no. 4, pp. 1009–1029. Available at https://doi.org/10.1111/fima.12295
- Klein, Aaron. 2020. "Reducing Bias in AI-Based Financial Services." Brookings Center for Technology Innovation, July 10.
- Kramer-Mills, Claire, Rebecca Landau, and Joelle Scally. 2020. "The State of Low-Income America: Credit Access and Debt Payment." Federal Reserve Bank of New York, November.
- MacCarthy, Mark. 2019. "Fairness in Algorithmic Decision-Making." Brookings Institution's Artificial Intelligence and Emerging Technology Initiative, December 6.
- Mersault, Vitaly, Daniel Moulton, Larry Santucci, and Nathan Schor. 2021. "One Threshold Doesn't Fit All: Tailoring Machine Learning Predictions of Consumer Default for Lower-Income Areas." Federal Reserve Bank of Philadelphia, Research Department Working Paper no. 22-39. Available at: https:// doi.org/10.21799/frbp.wp.2022.39
- OCC (Office of the Comptroller of the Currency). 2023. "Alternative Credit Assessment Workstream." OCC.
- Quinn, Tom. 2021. "How Much Do People Know About Credit Scores?" Credit News & Current Events, myFICO, April 29.

- Roll, Stephen, and Stephanie Moulton. 2016. "The Impact of Credit Counseling on Consumer Outcomes: Evidence from a National Demonstration Program." Working paper.
- Santucci, Larry. 2016. "The Secured Credit Card Market." Federal Reserve Bank of Philadelphia, Payment Cards Center Discussion Paper no. 16-3. Available at https://doi.org/10.21799/frbp.dp.2016.nov
- Saunders, Lauren. 2021. "Why Cap Interest Rates at 36%?" National Consumer Law Center, *Issue Brief*, August 4.
- Toh, Ying Lei. 2022. "Promoting Payment Inclusion in the United States." Federal Reserve Bank of Kansas City, *Payments System Research Briefing*, October 7.
- Turner, Michael A., Alyssa S. Lee, Ann Schnare, Robin Varghese, and Patrick D. Walker. 2006. "Give Credit Where Credit Is Due: Increasing Access to Affordable Mainstream Credit Using Alternative Data." Brookings Institution Urban Markets Initiative, Political and Economic Research Center.
- Urban, Carly, and Olivia Valdes. 2022. "Why Is Measured Financial Literacy Declining and What Does It Mean? Maybe We Just 'Don't Know." Financial Industry Regulatory Authority Investor Education Foundation, *Insights: Financial Capability*, August.
- VantageScore 2021. "Credit With a Conscience: Driving Financial Inclusion with Data and Analytics." VantageScore.
- Wang, J. Christina, and Charles B. Perkins. 2019. "How Magic a Bullet Is Machine Learning for Credit Analysis? An Exploration with FinTech Lending Data." Federal Reserve Bank of Boston, working paper no. 19-16. Available at https://doi.org/10.29412/res.wp.2019.16
- Yakoboski, Paul J., Annamaria Lusardi, and Andrea Hasler. 2022. "How Financial Literacy Varies Among U.S. Adults: The 2022 TIAA Institute-GFLEC Personal Finance Index."

How Mergers in the Farm Credit System Have Affected Ag Banks

By Francisco Scott

ommercial banks and the Farm Credit System (FCS) have been the most important sources of agricultural loans in the United States in recent decades. Since the 1990s, however, mergers and acquisitions have increasingly concentrated both FCS and commercial banks, raising concerns about potential effects on the agricultural credit market. Economic theory suggests that the merger of two or more competitors can change banks' portfolio choices and use of resources, potentially changing the prices and availability of agricultural credit.

The FCS gained a substantial market share of total agricultural debt starting in the 2000s, lending credibility to these concerns. Bankers' associations have argued that Congress has granted the FCS unfair advantages that have helped it expand in local credit markets, possibly altering the equilibrium in market prices and the distribution of ag loans across different lending institutions. Policymakers and researchers have noted the need to include the FCS in analysis of competition and concentration in the credit market; thus far, however, how the FCS's evolving size and scope affect agricultural bank operations, particularly through mergers, has not been adequately examined.

In this article, I explore the effects of FCS mergers on agricultural banks (ag banks), defined as commercial banks with more than 25

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percent of their loans allocated to agricultural operations or real estate. I find that FCS mergers have had mostly muted long-term aggregate effects on ag banks' interest income, efficiency, and agricultural real estate loans as a share of their total loans. However, I also show that FCS mergers likely decreased ag banks' agricultural operational loans as a share of their total loans and increased ag banks' interest expenses from their historical low levels. These findings suggest that FCS mergers may have altered some strategic portfolio decisions of ag banks in their respective markets, though the effects on ag banks' profitability were relatively minor.

Section I describes the institutional structure of the FCS. Section II describes trends in outcomes for ag banks and the FCS. Section III describes the effects of FCS mergers on ag banks.

I. Structure of the Farm Credit System

Created in 1916 to increase credit access for the U.S. agricultural industry, the FCS is a private, for-profit, federally chartered set of cooperatives that holds the legal status of a government-sponsored enterprise (GSE). As a GSE, the FCS accrues tax benefits and has been suggested to hold an implicit federal loan guarantee (Turvey and Wang 2012; Monke 2016; Turvey, Carduner, and Ifft 2020). To be part of the cooperative, borrowers must buy FCS stock every time they take out a loan, which allows them to receive patronage (essentially, a small share of the cooperative's profits) at the end of a fiscal year. Since its inception, the FCS has succeeded in expanding credit access to agricultural businesses and has recently expanded lending activity to other parts of the agricultural supply chain (Jensen 2000; Hutchins 2022).

The FCS and commercial banks provide similar services to borrowers, albeit under different operational and regulatory frameworks. While commercial banks fund their operations largely by taking deposits, the FCS funds operations mostly by issuing bonds and notes (Monke 2016). Figure 1 shows how the FCS is structured, with a linear flow of funds from investors all the way down to agricultural borrowers. First, the Federal Farm Credit Banks Funding Corporation collects funds from investors and issues bonds. Second, the Funding Corporation allocates funding to FCS banks. The Funding Corporation takes no margins from its bond issuance, and FCS banks are jointly liable

Figure 1 FCS Supply Chain



Note: Adapted from Federal Farm Credit Banks Funding Corporation (2022) and Monke (2016).

for the debt. Third, FCS banks distribute funds to the *de facto* retail operation of the FCS, the FCS associations. Finally, the FCS associations grant loans to farmers.¹ Although all FCS banks have associations under them who distribute loans to farmers, some FCS banks also lend directly to farmers and businesses as reflected in Figure 1. Banks profit from the repayment of allocated funds from associations, and associations profit from farmers' repayment of loans.

Each FCS bank distributes funds to a set of associations, and each association has a specific charter territory in which no other association can operate (excluding a few special cases). When FCS banks or associations merge, they consolidate their assets and liabilities as well as their chartered territories. In recent decades, mergers have led the number of FCS banks and associations to decline substantially, from around 900 banks and associations in the 1980s to only 71 in 2022. The FCS argues that these mergers improve efficiency. The Farm Credit Administration, which regulates the FCS, reports that smaller associations face resource constraints that effectively impede them from obtaining IT services and complying with regulations and examinations (Farm Credit Administration 2023). In theory, mergers can soften these resource constraints and increase the capacity of smaller associations to fund more projects—which can in turn affect competition for lending.

However, competition from the FCS has long been a point of contention for ag banks. The FCS has drawn heavy criticism from the American Bankers Association (ABA) not only for advantages granted by its GSE status, but also for its expansion in lending activity. For example, the ABA has argued that the FCS provides services that could be provided by banks, putting unfair competitive pressure on local credit markets (American Bankers Association 2015).

Whether FCS mergers have made it harder or easier for banks to compete has so far remained an open question. Economic theory suggests that mergers can significantly disrupt market equilibrium (Clark, Houde, and Kastl 2021; Klein 1971; Monti 1972; Vives 2016). These disruptions tend to manifest through changes in the quantity and prices of loans (Allen, Clark, and Houde 2014). If FCS mergers lead to more competition between the FCS and banks (for example, by improving FCS associations' access to funds), then loan prices are likely to decrease. In contrast, if FCS mergers lead to greater segmentation of the demand for ag credit across different types of borrowers, and thus less competition, then loan prices are likely to increase.

II. Trends in Lending, Profitability, and Efficiency

Understanding trends in the agricultural credit market can help contextualize any changes in market equilibrium that might result from an FCS merger. If ag banks and FCS associations respond similarly to economic conditions over time, for example, then they may also compete for the same set of borrowers in the economy. In this case, FCS mergers have the potential to influence ag banks' decisions as they compete in the ag credit market. In contrast, if ag banks and FCS associations *do not* respond similarly to economic conditions, then they may serve different customers; in this case, FCS mergers are likely to have less influence on ag banks' decisions.

To assess whether FCS associations and ag banks respond similarly to changes in the economy, I examine three long-term trends—lending, profitability, and efficiency—that have been used by other researchers to capture the core activity of ag banks (for example, Morris, Wilkinson, and Hogue 2015; Marsh and Sengupta 2017; Jacewitz 2022). To analyze these trends for banks, I use the Federal Reserve Board's merger-adjusted database of bank balance sheet and income statements as described by English and Nelson (1998) and derived from the Consolidated Reports of Condition and Income (Call Reports). To analyze the same trends for FCS associations, I use the FCS Call Reports, which provide information about the financial operations of FCS institutions, as well as the archives of reports from the Farm Credit Administration.

Lending trends

The FCS has gained significant market share over the last 20 years. Chart 1 shows that in 2000, the FCS held around 28 percent of farmers' outstanding debt (green bar) in the United States, while commercial banks held around 46 percent (blue bar). By 2021, the FCS market share had increased to 44 percent, while commercial banks' market share declined to 36 percent.²

Most of the growth in market share by the FCS can be traced to the agricultural real estate market. Chart 2 shows that over the last 12 years, the volume of ag real estate loans in the United States has increased at both the FCS and commercial banks (solid green and dashed green lines). Since 2010, the FCS has experienced the highest growth in ag real estate loans (solid green line). And while banks still hold the most ag operational loans, the share of ag operational loans on their balance sheets has been declining since 2017 (dashed blue line).³ These trends partially explain the fast increase in market share for the FCS.

Profitability trends

Over the last 20 years, the FCS and ag banks in particular have both earned and spent less on interest operations. Chart 3 shows that median values of both interest income and expenses as a percentage of average



Chart 1 Shares of Farm Debt

Sources: U.S. Department of Agriculture and author's calculations.

Chart 2 Evolution of Agricultural Loans by Type in National Markets



Note: Chart shows the evolution of agricultural loans for the FCS and commercial banks, measured by a fourquarter moving average in 2022 dollars.

Sources: FDIC Consolidated Reports of Condition and Income, FCS Call Reports, and author's calculations.

Chart 3





Note: Chart shows median values for interest expenses and income as a percentage of earning assets for the FCS and ag banks.



earning assets declined between 2000 and 2022. Earning less from interest operations implies that ag banks take in lower revenue for each dollar they lend. At the same time, spending less in interest operations implies that the cost of obtaining funds for loan activity has decreased.

Although the FCS and ag banks make similar interest income from their assets (blue lines), the gap between their interest expenses (green lines) is noteworthy. I define interest income as a measure of returns (yields) weighted by the share of assets. These figures suggest that the returns on assets (weighted by the share of assets) do not differ substantially between the FCS and ag banks in aggregate. The gap in interest expenses, on the other hand, reflects structural differences in how ag banks and the FCS are funded. As discussed previously, ag banks tend to acquire funds from depositors, while the FCS funds itself through notes and bonds. As a result, the effects of an increase in the federal funds rate (orange line) have historically had a more pronounced effect on the FCS and may have made it more expensive for the FCS to acquire funds.

Efficiency trends

Overall, the FCS appears to be more efficient than ag banks in producing income. Bank efficiency is commonly measured by an "efficiency ratio," which divides the level of noninterest expenses a financial institution uses to produce a dollar of income by the sum of its interest and noninterest income. The lower the efficiency ratio, the more efficient the bank's use of resources (Jacewitz 2022). Chart 4 shows that the FCS has a lower efficiency ratio than ag banks. Ag banks' efficiency ratio (blue line) generally has remained constant at around 65 since the early 2000s, implying ag banks spent 65 cents to produce a dollar of income. The efficiency ratio for the FCS (green line), too, has remained relatively stable at around 45, suggesting the FCS spent around 45 cents to produce a dollar of income over the same period. This suggests that operational costs for banks are higher than for the FCS.

In sum, many FCS and ag banks' outcomes have moved similarly over time. Ag real estate loans have become an important part of agricultural debt for both ag banks and the FCS. Interest income and expenses have declined for both types of institutions, while efficiency ratios have been relatively stable, suggesting FCS associations have been more efficient than ag banks for some time.

In the analysis in the next section, I focus on ag banks in local markets that have been affected by FCS merger activity. Specifically, a total of 20 FCS associations have been merged or acquired since 2009, and I collect the counties affected by each of these merger activities.⁴ I identify the ag banks likely to be affected by FCS mergers by exploring the areas of operation of each FCS association.⁵ Out of the 20 FCS mergers (see Appendix A for a full list), I identify 10 that are likely to have large effects on local markets in that they feature a relatively small association merging with a relatively larger association-thus capturing associations that may have been more resource constrained. I call the area served by these relatively small FCS associations before mergers "local markets of interest." Figures in Appendix B show that trends in lending, profitability, and efficiency do not differ substantially between outcomes at the national level and at the level of local markets most likely to be affected by FCS mergers, suggesting that these local markets follow the major trends of



Chart 4 Efficiency Ratios for Ag Banks and the FCS

agricultural credit markets.⁶ Thus, mergers have the potential to change portfolio choices in this environment.

III. The Effects of FCS Mergers on Local Markets of Interest

To assess whether FCS mergers influenced ag banks in markets most likely to be affected ("local markets of interest"), I examine the following outcomes at ag banks before and after FCS mergers: the volume and share of agricultural loans at ag banks, banks' interest income and expenses, and bank efficiency. Charts 5 through 8 center the merger events in each local market as year 0 and extract the median of ag bank outcomes in local areas of interest five years before and after the merger and by quarter. Outcome values are indexed to 100 at the quarter of the merger (year 0), such that values below 100 imply a decline in the outcome in relation to the merger event, and values above 100 imply an increase. All charts also show the projected trend of the median outcome using data from the five years before the merger. While these aggregate measures captured by the median do not consider the variability of outcomes for each bank, they suggest the direction of the effects of mergers.⁷

Note: Efficiency ratios are median four-quarter moving averages. Sources: FDIC Consolidated Reports of Condition and Income, FCS Call Reports, and author's calculations.

Chart 5 shows that FCS mergers did not significantly change the volume of agricultural operational loans at ag banks in the local areas of interest but likely changed the volume of agricultural real estate loans. The volume of ag operational loans (in constant 2022 dollars before being converted to an index) follow the projected trend after merger events, while ag real estate loans increased sharply above trend after merger events.

Although the volume of ag operational loans was not significantly affected by mergers, Chart 6 shows that FCS mergers may have affected ag operational loans as a share of total loans (blue line). The median share of ag operational loans trends down after mergers, indicating mergers may have decreased ag banks' ag operational loans as a share of their total loans. However, median volume of ag real estate loans as a share of total loans (green line) follows a similar trend before and after mergers, indicating FCS mergers had a muted effect on the share of ag real estate loans.⁸ Altogether, mergers seem to have decreased the importance of ag operational loans in the loan portfolio of ag banks.

FCS mergers do not seem to have affected ag banks' asset-derived income but may have affected ag banks' interest expenses. Chart 7 shows that median interest income as a share of average earning assets (blue line) tends to jump above its pre-merger trend right after the merger events but converges to trend after three years. Median interest expenses as a share of average earning assets (green line), however, shifts above its pre-merger trend immediately after the event, implying a post-merger increase in interest expenses for ag banks compared with its pre-merger declining trend. Thus, FCS mergers may have affected the expense side of ag banks through, for example, increased deposit rates to capture funds as ag banks adjust funding needs. However, changes in interest expenses remains low (as shown in the dashed green line in Chart 3).

Chart 8 shows that the median efficiency ratio varies little before and after mergers and largely stays within the projected trend. After mergers, ag banks do not appear to change how they allocate resources to generate income, though median efficiency ratios become volatile about four years after the merger. Ag banks in the local markets of interest do not appear to allocate resources differently in the aftermath of an

Chart 5

Volume of Agricultural Loans by Type at Ag Banks before and after FCS Mergers



Notes: Chart shows the evolution of the median volume of agricultural loans for agricultural banks in local markets of interest before and after the merger. Merger events are centered at year 0. The dotted lines represent the linear trends of the median outcomes before the merger (projected trend). Sources: FDIC Consolidated Reports of Condition and Income, FCS Call Reports, and author's calculations.



Notes: Chart shows the evolution of the median share of agricultural loans out of total loans for agricultural banks in local markets of interest before and after the merger. Merger events are centered at year 0. The dotted lines represent the linear trend of the median outcome before the merger (projected trend).

Sources: FDIC Consolidated Reports of Condition and Income, FCS Call Reports, and author's calculations.

Chart 7

Interest Income and Interest Expenses as a Share of Average Earning Assets at Ag Banks before and after FCS Mergers



Note: Dotted lines represent the linear trends of the median outcomes before the merger. Sources: FDIC Consolidated Reports of Condition and Income, FCS Call Reports, and author's calculations.

Chart 8





Note: Dotted line represents the projected trend of the median outcome before the merger. Sources: FDIC Consolidated Reports of Condition and Income, FCS Call Reports, and author's calculations. FCS merger, even though the downward trend in their efficiency ratio implies ag banks have used fewer resources to generate income over time.

Conclusion

Mergers can disrupt local credit markets by changing financial institutions' optimal portfolios. I find evidence suggesting that FCS mergers may have affected some outcomes for banks in the markets most likely to be affected by mergers. In the short run, FCS mergers could have influenced these ag credit markets along two margins. Mergers may have contributed both to a decline in ag banks' ag operational loans as a share of total loans and to an increase in ag and non-ag real estate loans as a share of total loans in ag banks' portfolios. Mergers may also have led ag banks to incur higher interest expenses as a percent of earning assets than what pre-merger trends indicated. Although higher interest expenses likely have a minimal effect on the level of profits, even small movements in interest expenses may be important to profitability: thus far, low interest expenses have kept ag banks more profitable than the FCS.

Although I find little evidence that FCS mergers affected ag banks' efficiency ratios or interest income as a share of earning assets, banks that operate closer to important FCS branches and submarkets could have experienced larger effects than my results imply. Banks that operate closer to FCS associations in the credit product space could also be more affected by FCS mergers. Overall, my descriptive analysis suggests that FCS mergers likely have had an effect on some important outcomes for ag banks.

Appendix A

Information about Local Areas of Interest

Merger event	Association name	Date	FCS ag loans one quarter before the merger	Ag bank ag loans one quarter before the merger
	Farm Credit East, ACA	January 2022	6,881,253.26	56,720.20
2	North Dakota, ACA	January 2022	930,466.94	1,150,891.78
2	AgCountry, ACA	January 2022	6,144,023.19	5,458,274.22
3	AgPreference, ACA	January 2021	243,776.56	221,921.55
3	Western Oklahoma, ACA	January 2021	1,000,790.82	1,375,558.77
4	American AgCredit, ACA	July 2019	9,253,973.11	6,065,506.09
5	Badgerland Financial, ACA	July 2017	3,792,373.52	5,219,149.50
5	1 st Farm Credit Services, ACA	July 2017	4,549,504.66	4,038,557.49
5	AgStar, ACA	July 2017	7,060,876.05	4,344,101.58
9	United FCS, ACA	July 2017	1,491,172.60	2,138,703.66
6	AgCountry Farm Credit Services, ACA	July 2017	4,285,978.96	3,399,145.53
7	Southwest Kansas, ACA	January 2017	744,134.76	1,270,289.14
7	American AgCredit, ACA	January 2017	6,686,160.00	4,990,288.62
8	Chisholm Trail, ACA	January 2016	323,783.45	818,838.83
8	East Central Oklahoma, ACA	January 2016	753,555.50	1,484,136.36
6	FCS Southwest, ACA	December 2015	983,550.61	2,734,480.53
6	Farm Credit West, ACA	December 2015	6,690,284.01	5,170,881.40
10	Great Plains Ag Credit, ACA	January 2015	565,919.41	2,567,815.85

Table A-1 List of Relevant FCS Association Merging Events

Merger event	Association name	Date	FCS ag loans one quarter before the merger	Ag bank ag loans one quarter before the merger
10	AgTexas Farm Credit Services	January 2015	603,440.65	997,868.99
11	Texas Land Bank, ACA	January 2014	560,695.29	139,615.64
11	Lone Star, ACA	January 2014	888,206.28	393,284.65
12	Farm Credit East, ACA	January 2014	4,964,100.01	62,809.77
13	AgriLand Farm Credit Services, ACA	January 2014	287,820.53	516,778.98
13	Texas AgFinance Farm Credit Service, ACA	January 2014	525,706.80	516,459.83
14	Jackson Purchase, ACA	July 2012	288,277.70	144,809.20
15	The Mountain Plains, ACA	January 2012	1,083,507.37	586,513.68
15	American AgCredit, ACA	January 2012	4,425,674.26	2,970,125.20
16	Southwest Florida, ACA	January 2011	165,495.10	254,526.91
16	North Florida, ACA	January 2011	510,677.18	123,405.17
17	Louisiana Ag Credit, ACA	December 2010	87,601.26	31,439.43
17	Southern AgCredit, ACA	December 2010	729,918.04	344,803.61
18	AgCredit of South Texas, ACA	July 2010	126,812.58	4,512.70
18	Texas AgFinance Farm Credit Services	July 2010	380,069.29	530,535.42
19	Farm Credit Western New York ACA	January 2010	1,016,739.86	20,200.41
19	First Pioneer, ACA	January 2010	3,504,123.31	1,786.10
20	Heartland, ACA	December 2009	1,209,916.30	2,326,440.64
20	American AgCredit. ACA	December 2009	3,950,437.46	657,365.24

Table A-1 (continued)

Notes: ACA refers to Agricultural Credit Association. Ag loan numbers compare the mass of FCS associations and ag banks operating in the chartered area of the FCS association. Values in thousand dollars. Merger events 1, 4, and 14 involve associations that were operating in areas where no ag banks were operating. These mergers were therefore excluded from the analysis of the main text. Source: Farm Credit Association.

Table A-2 Algorithm to Select Local Areas of Interest

Steps	Selection of local area of interest
(a)	For each FCS merger event, take the set of ag loans (AgL) of FCS associations that merged in the quarter right before the merger
	<i>Ex</i> : associations A, B, and C merged; The set of total ag loans for the quarter before merger is S = {AgLA, AgLB, AgLC}
(b)	Take the largest value of agricultural loan in the set and divide this largest value by each indi- vidual ag loan value in the set. The result will be the ratio of the value of ag loans of the largest association to the value of ag loans for each individual association.
	<i>Ex</i> : from S, AgLA is the largest value in the set. Divide all values in the set by AgLA to find {AgLA/ AgLA, AgLB/ AgLA, AgLC/ AgLA}.
(c)	Take all ratios larger than 2. This is the threshold value by which I consider that a large associa- tion merged to a relatively smaller association. This is the local market of interest.
	<i>Ex</i> : If the ratio AgLB/ AgLA larger than 2, I consider the operating area of association B as part of the local market of interest. The same rationale applies to AgLC/ AgLA

Map A-1 Headquarter Location of Ag Banks Affected by FCS Mergers in Local Areas of Interest



Note: Map highlights the counties within local areas of interest where the headquarters of banks in the sample are located.

Appendix B

Outcomes of Ag Banks in Local Areas of Interest

Chart B-1 Evolution of Agricultural Loans by Type in Local Areas of Interest



Note: Chart shows the evolution of agricultural loans, measured by a four-quarter moving average in 2022 dollars for agricultural banks in local markets of interest.

Sources: FDIC Consolidated Reports of Condition and Income and author's calculations.

Chart B-2

Evolution of Interest Income and Interest Expenses as a Share of Average Earning Assets in Local Areas of Interest



Note: Interest income and interest expenses are a percentage of earning assets. Sources: FDIC Consolidated Reports of Condition and Income and author's calculations.



Chart B-3 Efficiency Ratio of Ag Banks in Local Areas of Interest

Note: Efficiency ratio is the median four-quarter moving average. Sources: FDIC Consolidated Reports of Condition and Income and author's calculations.

Appendix C

Outcomes for Ag Banks Located in Areas That Did Not Experience FCS Mergers around FCS Merger Events

Chart C-1

Volume and Share of Agricultural Loans by Type for Ag Banks in Areas That Did Not Experience an FCS Merger



Notes: Chart shows median volume and median share of loans for ag banks in areas that did not experience an FCS merger five years before and after each merger event in the sample. The dotted lines represent the linear trends of the median outcomes before the merger (projected trend).

Sources: FDIC Consolidated Reports of Condition and Income and author's calculations.

Chart C-2

Evolution of Interest Income and Interest Expenses as a Share of Average Earning Assets for Ag Banks in Areas That Did Not Experience an FCS Merger



Note: Chart shows median interest income and median interest expenses of ag banks in areas that did not experience an FCS merger five years before and after each merger event in the sample. The dotted lines represent the linear trends of the median outcomes before the merger (projected trend). Sources: FDIC Consolidated Reports of Condition and Income and author's calculations.

Chart C-3

Evolution of the Median Efficiency Ratio for Ag Banks around Other Merger Events in Areas That Did Not Experience an FCS Merger



Years before and after merger

Note: Chart shows median efficiency of ag banks in areas that did not experience an FCS merger five years before and after each merger event in the sample. The dotted lines represent the linear trends of the median outcomes before the merger (projected trend).

Sources: FDIC Consolidated Reports of Condition and Income and author's calculations.

Endnotes

¹Some associations obtain funds from internally generated earnings, which mostly come from the issuance of equities (common and preferred) and subordinated debt (Farm Credit Banks Funding Corporation 2022).

²"Other" includes credit offered by input suppliers and insurance companies, among others.

³Large and smaller commercial banks experienced the same trends (see Appendix B for additional details).

⁴Since 2009, an average of 50 ag banks per year have also merged or been acquired by other banks. However, most mergers between ag banks involve small institutions, which are unlikely to disrupt market equilibrium due to smaller asset sizes (Kim and Katchova 2022). We abstract, then, from the effect of ag bank mergers on FCS outcomes in this paper. These numbers represent mergers in which the predecessor commercial bank transfers 95 percent or more of its assets to the successor commercial bank. They do not include bank failures.

⁵I use data from the Summary of Deposits (SOD), which tracks the location of branches and headquarters of banks. However, SOD register data are affected by centrally booked deposits, meaning banks do not have to report the deposits in the branch in which they were collected. This issue is mostly pervasive among larger banks and likely not a big problem for smaller ag banks, which are the focus of my analysis. See the map in Appendix A for counties where bank headquarters in our sample are located.

⁶Together, the high correlation between local and national trends and the theoretical argument that the effects of FCS mergers can be more pronounced in the local markets of interest suggest that the analysis in this paper is an upper bound for the overall effect of FCS mergers in general. In other words, other markets that are not the local markets of interest would show a smaller change in bank outcomes from FCS mergers.

⁷Appendix C shows the trends of outcomes in areas that did not experience a merger between FCS associations from 2009 to 2022. Under standard assumptions as outlined by Cunningham (2021), comparing trends from outcomes in the local areas of interest with trends in outcomes of areas that did not experience mergers could resemble a control and treatment experiment. A detailed check of these assumptions is beyond the scope of this paper.

⁸Loans secured by all kinds of real estate represent the larger share of total loan portfolio in the sample. After mergers, the median loan volume secured by real estate increased substantially, pushing median total loans up. As a result of a general increase in total loans, the share of ag operational loans decreased, and the share of ag real estate loans remained consistent with the linear trend before mergers.

References

- Allen, Jason, Robert Clark, and Jean-François Houde. 2014. "The Effect of Mergers in Search Markets: Evidence from the Canadian Mortgage Industry." *American Economic Review*, vol. 104, no. 10, pp. 3365–3396. Available at https://doi.org/10.1257/aer.104.10.3365
- American Bankers Association (ABA). 2015. "Letter to Senate Committee on Agriculture, Nutrition, and Forestry." February 2.
- Clark, Robert, Jean-François Houde, and Jakub Kastl. 2021. "The Industrial Organization of Financial Markets," in *Handbook of Industrial Organization*, vol. 5, no. 1, pp. 427–520. Available at https://doi.org/10.1016/ bs.hesind.2021.11.015
- Cunningham, Scott. 2021. Causal Inference: The Mixtape. Yale University Press.
- English, William B., and William R. Nelson. 1998. "Profits and Balance Sheet Developments at U.S. Commercial Banks in 1997." Board of Governors of the Federal Reserve System, *Federal Reserve Bulletin*, vol. 84, no. 6, pp. 391– 419. Available at https://doi.org/10.17016/bulletin.1998.84-6
- Farm Credit Administration (FCA). 2023. "Small Associations." February 24.
- Federal Farm Credit Banks Funding Corporation. 2022. "2021 Annual Information Statement of the Farm Credit System." March 1.
- Hutchins, Jared. 2022. "The U.S. Farm Credit System and Agricultural Development: Evidence from an Early Expansion, 1920–1940." *American Journal of Agricultural Economics*, vol. 105, no. 1, pp. 3–26. Available at https://doi. org/10.1111/ajae.12290
- Jacewitz, Stefan. 2022. "The Increasing Brick-and-Mortar Efficiency of Community Banks." Federal Reserve Bank of Kansas City, *Economic Review*, vol. 107, no. 2, pp. 19–35. Available at https://doi.org/10.18651/ER/v107n2Jacewitz
- Jensen, Farrell E. 2000. "The Farm Credit System as a Government-Sponsored Enterprise." *Applied Economic Perspectives and Policy*, vol. 22, no. 2, pp. 326– 335. Available at https://doi.org/10.1111/1058-7195.00025
- Kim, Kevin N., and Ani L. Katchova. 2022. "Agricultural Bank Acquisitions and Postacquisition Performance: An Examination of the Role of Shared Knowledge." *Agribusiness*, vol. 38, no. 4, pp. 743–770. Available at https://doi. org/10.1002/agr.21751
- Klein, Michael A. 1971. "A Theory of the Banking Firm." Journal of Money, Credit and Banking, vol. 3, no. 2, pp. 205–218. Available at https://doi. org/10.2307/1991279
- Marsh, W. Blake, and Rajdeep Sengupta. 2017. "Competition and Bank Fragility." Federal Reserve Bank of Kansas City, Research Working Paper no. 17-06, June. Available at https://doi.org/10.2307/1991279
- Monke, Jim. 2016. "Farm Credit System." Congressional Research Service, report no. RS21278, May 17.
- Monti, M. 1972. "Deposit, Credit and Interest Rate Determination under Alternative Bank Objective Function," in G.P. Szego and K. Shell, eds., *Math-ematical Methods in Investment and Finance*. Amsterdam: North-Holland.

- Morris, Charles S., James Wilkinson, and Eric Hogue. 2015. "Competition in Local Agricultural Lending Markets: The Effect of the Farm Credit System." Federal Reserve Bank of Kansas City, *Economic Review*, vol. 100, no. 4, pp. 51–78.
- Turvey, Calum G., Amy Carduner, and Jennifer Ifft. 2020. "Market Microstructure and the Historical Relationship between the U.S. Farm Credit System, Farm Service Agency and Commercial Bank Lending." *Agricultural Finance Review*, vol. 81, no. 3, pp. 360–385. Available at https://doi.org/10.1108/AFR-06-2020-0089
- Turvey, Calum G., and Yiwo Wang. 2012. "The Effects of Government Sponsored Enterprise (GSE) Status on the Pricing of Bonds Issued by the Federal Farm Credit Banks Funding Corporation (FFCB)." Agricultural Finance Review, vol. 72, no. 3, pp. 488–506. Available at https://doi. org/10.1108/00021461211277303
- Vives, Xavier. 2016. "Competition and Stability in Banking," in *Competition and Stability in Banking*. Princeton University Press.

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