Credit Union Expansions: A Fork in the Road for Local Banks? *

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December 18, 2025

Abstract

Exploiting an NCUA policy that deregulated federal credit unions (FCUs), we examine the effect of FCU-induced competition on the heterogeneous responses by banks in local markets. Smaller banks, with advantages in local lending, compete by adjusting deposit and loan rates and increasing credit supply to marginalized borrowers. In contrast, larger banks avoid price competition, cut back information-intensive lending, and even withdraw from local markets as competition intensifies. These heterogeneous responses are further illustrated in a theoretical framework that highlights small banks' advantages in local information and monitoring costs. Furthermore, FCU-induced competition improves credit access to low-income consumers and underserved communities.

Keywords: credit unions, bank competition, credit supply, underserved communities, market segmentation
JEL Code: G21, G23, G28

*We would like to thank Rob Adams, Xudong (Sean) An, Yifan Chen, Claire Célérier, Mustafa Emin, Jim Fuchs, Mariassunta Giannetti, Stefan Gissler, Bjorn Imbierowicz, Anya Kleymenova, Geng Li, Haoyang Liu, Borghan Narajabad, Gregory Nini, Steven Ongena, Amiyatosh Purnanandam, Alberto Rossi, Antoinette Schoar, David Stillerman, Anna-Leigh Stone, Jordan van Rijn, Edison Yu, and seminar participants at the Federal Reserve Board, the 2022 Federal Reserve System Committee Meeting on Banking, the 2024 Community Bank Research Conference at St. Louis Fed, 2024 Financial Management Association Annual Meetings, the 2024 International Banking, Economics, and Finance Association Summer Meeting, the 2025 University of Wisconsin-Madison Credit Union Workshop, the University of Texas at San Antonio, the University of Hawaii, and the University of Wyoming. The authors are grateful to Greg Udell for generously sharing his insights and institutional background on credit union industries. The views expressed in this paper are solely those of the authors and should not be interpreted as reflecting the views of the Federal Reserve System. All errors are our own.

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1. Introduction

In recent decades, the U.S. credit market, once primarily dominated by banks, has experienced significant changes. Credit unions (CUs), which were traditionally small-scale, community-focused financial intermediaries, have greatly expanded their reach, creating competitive pressure on banks. From 2000 to 2023, the total assets of federally insured CUs in the U.S. grew fivefold from $438 billion to $2.26 trillion.[1] In addition, the entire CU system had served more than 139.3 million consumers in the U.S. by the end of 2023.[2] Despite the rapid expansion of CUs, their effect on the competitive landscape and credit supply remains understudied. How do banks react to the rapid expansion of CUs in the local credit market? What are the credit allocation implications in local lending markets and for consumers? A thorough investigation of these questions is warranted not only to improve our understanding of CUs and their interactions with banks, but also to understand the implications of regulation, policymaking, and credit allocation among consumers.

In contrast to the extensive literature on competition among banks and its effect on lending and efficiency, we focus on CUs, an understudied and rapidly emerging type of lender, and examine their competition with banks. CUs differ from banks in several ways. Beyond the tax subsidies and regulatory differences that distinguish CUs from banks, our study focuses on CUs' local orientation and the informational advantages that make CUs uniquely competitive in the local lending market. Compared to large banks, CUs are more locally invested and, as a result, more informed. We show that, both empirically and theoretically, the deregulation of informed CUs leads to different responses of small and large banks. Small banks, with their advantages in local lending, compete more aggressively with CUs to defend market share by adjusting deposit and loan rates and increasing credit supply to marginalized borrowers. In contrast, large banks scale back lending due to the higher costs of

[1] See National Credit Union Administration (NCUA) Annual Reports of 2000 and 2023, available at https://ncua.gov/files/annual-reports/2000AR.pdf and https://ncua.gov/files/annual-reports/annual-report-2023.pdf.

[2] Data are from the NCUA.

information collection and monitoring. Furthermore, our mortgage lending evidence suggests that low-income and underserved communities benefit more from increased competition.

We start by constructing a theoretical framework wherein large and small banks compete for the local market share left by CUs after their expansion, in a manner consistent with Bain (1949), Modigliani (1958), and, in particular, Salop (1979). In the model, we focus on loan underwriting by both small and large banks, with small banks focusing more on lending locally and, therefore, having lower lending costs—i.e., costs associated with lending, such as monitoring. Our model makes two predictions. First, as competition from CUs increases and the market share left for banks becomes smaller, both large and small banks will reduce lending interest rates, but the large bank will reduce the lending interest rate at a pace slower than small banks. Second, as competition from CUs keeps intensifying and the market share left for banks becomes sufficiently small, the large bank will exit the lending market altogether. Overall, the model implies that smaller banks, relative to large banks, are more likely to adjust lending rates and compete for market share in a competitive environment.

We then turn to test the model's predictions empirically. A major empirical challenge in identifying the effects of CU growth on bank lending is that the CU expansion may not occur randomly. Indeed, local credit outcomes may be driven by factors other than CU expansion, such as changes in local lending opportunities, consumer and business credit demand, and other economic factors. We address the challenge by exploiting the change in the field of membership (FOM) rule, implemented by the NCUA board in 2017, which allows federally chartered credit unions (FCUs) to relax their membership requirements and expand membership bases.[3]

The direct effect of the FOM rule change was a significant relaxation of the common bond requirements and geographic boundaries for FCUs to include new members. This

[3]A credit union FOM is a common bond among its members that determines who is eligible to join the CU. The FOM is based on a CU's charter, which can be one of three types: single common bond, multiple common bond, or community. The common bond could be based on occupation, association, family, geographic location, or membership in a group. We describe the institutional background with more details about the FOM and CU charters in Section 2.

aligns with the stated goal of the policy, which was to allow more Americans to become eligible for FCU membership. Following the rule change, FCUs were able to (1) expand to a larger geographic area of the local market where they were previously not allowed to operate and (2) add individuals who were previously ineligible to join their membership base. This landmark rule change is perceived as the most impactful and comprehensive since the aftermath of the Great Recession and has ignited substantial opposition from the banking sector.[4]

Critically for our identification strategy, the rule change allows FCUs to expand mostly in their "local market" where they already have branches. As a result, local markets with different FCU fractions *before* the FOM rule change are affected differently. Banks operating in higher-FCU-fraction markets faced higher competitive pressure from the expansion of FCUs after the rule change became effective. Equally important, the FOM rule change only targeted FCUs while leaving other types of lenders unaffected—e.g., commercial banks and state-chartered credit unions (SCUs). The rich nuances in the rule changes allow us to nail down the effects coming only from increased competition from FCUs, but not from other similar institutions that are unaffected by the rule changes, such as SCUs.

We start the empirical analysis by first presenting some simple, general facts on CU lending and deposit activities, CU expansion, and competitive pressure for the local market. We first compare CUs' and banks' deposit and lending rate patterns (Figure 1) and show that CUs generally provide more competitive rates on loans and deposit products than do banks. Next, we look into FCUs' expansion. We find that, relative to SCUs, FCUs expanded their branch networks and geographic footprints and experienced significant growth in membership bases and assets after the FOM rule change. The expansion is economically significant. An increase in the FCU exposure from 0% to 50% is associated with an 11% to 12% increase in

[4]The perceived effect of increased CU competition is especially significant for banks. The American Bankers Association (ABA), the major lobbying group representing the U.S. banking sector, has openly challenged the 2017 rule and brought it to the U.S. Court. Eventually, on June 29, 2020, the U.S. Supreme Court denied the appeal from the ABA to review the NCUA's FOM rule proposed in 2016, ending nearly four years of litigation.

membership base and assets.

We then examine banks' responses to FCU expansion after the FOM rule change. We find that small community banks increase deposit rates and lower loan rates, especially mortgage rates, after controlling for borrower and loan characteristics. In contrast, we find no evidence that large banks adjust deposit rates to defend deposit market share in FCU-heavy markets. This finding is consistent with a price competition channel through which small banks, relying more on local markets, actively compete with FCUs by offering competitive rates and expanding credit supply to marginalized borrowers to defend market share and, eventually, experience deteriorated loan quality.

Exploiting granular mortgage data at the loan level, we find that large banks, relative to their smaller peers, are more likely to securitize mortgages through government-sponsored enterprises (GSEs), and this effect is more pronounced in non-headquarter counties, where large banks have less informational advantages. We find such evidence in both home-purchase and refinancing loans. Since the GSE mortgages are shown to be more reliant on hard information and less costly for lenders (Keys, Mukherjee, Seru, and Vig 2010; Purnanandam 2011; Rajan, Seru, and Vig 2015), our findings suggest that information-intensive competition could be especially costly for large banks, and thereby these banks cut back information-intensive lending and shift more towards transaction lending (i.e., lending that relies more on hard information) in mortgage markets. Furthermore, our findings are consistent with the model prediction. Due to information disadvantages and higher costs, larger banks are less competitive in the local market. As a result, after the expansion of FCUs in this area, market share shift from large banks toward smaller banks.

We further look into the implications on credit distribution and consumer welfare in mortgage-lending markets. Examining the lending outcomes across borrower income categories, we find that low-income borrowers benefit more from the FCU expansion. These borrowers experience significantly higher approval rates of their mortgage applications in FCU-heavy markets, driven by both FCUs and small banks. More importantly, using loan-

level data from Fannie Mae and Freddie Mac, we show that this credit expansion is not accompanied by lower ex ante lending standards or higher ex post default.

We further examine the implications of CU expansion on changes in banks' footprints over time. Our model predicts that as competition from FCUs keeps intensifying and the market share left for banks becomes sufficiently small, the large bank will exit the lending market altogether. Empirically, we find evidence that is consistent with this prediction. We document that large banks are more likely to withdraw from FCU-heavy markets by shutting down branches. An analysis examining the FCU-bank substitution further confirms that changes in FCU presence are negatively correlated with changes in bank presence. Our estimates indicate that a one-unit increase in the FCU (branches) corresponds to a decrease of 0.400 (0.113) banks per million population. Focusing on mortgage lending markets where FCUs and banks largely overlap and compete, we also find that large banks are more likely to withdraw from markets where FCUs grow faster. This finding highlights the competitive disadvantage of larger banks in local markets as they face increased competitive pressure from FCUs. Over time, the markets served by the large banks and FCUs have been further segmented. It should be noted that our finding should not be interpreted as the sole factor causing the retreat of banks in the local market. In fact, other factors beyond the expansion of CUs in the local market, such as the wave of banking consolidation following the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994, technological advancement, and the lowering of operational costs, might have also led to the trend of banks closing branches in the past decades. Instead, our theoretical and empirical findings of this paper suggest that the expansion of FCUs is a prominent factor that has *expedited* bank withdrawal from local markets where FCU exposure is greater.

Our paper is related to the extensive literature on bank competition and in particular the role of local information in credit supply. Petersen and Rajan (1995), Boot and Thakor (2000), and Dell'Ariccia and Marquez (2006) show how competition in the banking industry and private information can affect relationship lending and credit access. Marquez (2002)

demonstrates that increased competition among banks leads to more dispersed borrower-specific information and credit expansion to low-quality borrowers. The previous literature that examines the deregulation of branching across U.S. states demonstrates that greater competition leads to an increased threat of takeovers and thereby induces banks to make more efficient lending decisions—e.g., Jayaratne and Strahan 1996,1998).[5] Other studies show that greater competition leads to increased credit supply. Dick and Lehnert (2010) and Mian et al. (2020) show that the deregulation of cross-state branching results in increased credit provision to households. Carlson et al. (2022) show that lowering entry barriers for banks can cause increased credit supply and financial instability. Wang (2019) discusses how local information affects the mode of geographic expansion for banks. Liebersohn (2024) shows that antitrust rules can increase bank competition, which induces higher deposit rates and increased mortgage originations. Previous important papers also show that increased banking competition has important effects on the real economy.[6] While previous literature primarily focuses on competition among banks, our paper explores competition between CUs and banks. More specifically, our paper examines the effects of increased competition induced by lenders outside the traditional banking system, namely CUs. Unlike existing literature on banking competition where new entrants are generally "uninformed" banks entering a new market, CUs are heavily invested in local markets and thereby considered "informed" lenders in our setting. Therefore, our paper sheds light on how banks respond to increased competitive pressure from informed lenders.

Our paper also contributes to the strand of emerging literature that examines CUs.For example, Ramcharan et al. (2016) examines the growing repercussions of CUs on broader

[5]Previous theories of intermediation predict that greater lending competition leads to lower borrowing costs, better credit access for marginalized borrowers, and more efficient intermediation. See, e.g., Allen and Gale (2004), Beck et al. (2010), and Vives (2011) and Vives (2016).

[6]This important literature is too large to cite thoroughly. For example, examining the effects of competition or concentration in the banking sector, Black and Strahan (2002) and Cetorelli and Strahan (2006) study the concentration among bank borrowers. Drechsler et al. (2017) discuss monetary policy transmission. Other important studies on the real effects of banking competition include Stiroh and Strahan (2003), Zarutskie (2006), Bertrand et al. (2007), Berger et al. (2022), Beck et al. (2010), Cetorelli (2014), Braggion and Ongena (2019), and Jiang et al. (2019).

financial markets and credit supply [7] Particularly relevant to our study, Gissler, Ramcharan, and Yu (2020) examine the effect of increased competition from CUs and find that nonbanks (e.g., finance companies) expand lending to riskier borrowers and experience worse loan performance, but deposit-taking institutions shift more to relationship lending. Their findings have important policy implications that increased competition could have spillover effects on unregulated (nonbank) financial institutions.

Broadly, our paper contributes to the literature in the following ways. First, when examining the effect of increased competition induced by CUs, we focus on banks and examine their granular cross-sectional variation. Specifically, we divide banks into large and small categories, and we use their differences in local lending advantages to build our theoretical framework. Since large banks are geographically diversified and rely more on arm's-length lending but small banks are more locally invested, separating the two allows us to examine their different responses and the causes that lead to these differences. Therefore, our findings have implications for the segmentation of credit markets in recent decades, and we provide one possible factor that could possibly explain why large banks have been leaving rural and low-income regions. Second, in our paper we examine lending outcomes in mortgage lending markets, where both banks and CUs largely overlap and compete. We exploit the loan-level mortgage data and control for a comprehensive set of borrower and loan characteristics, as well as fixed effects. Doing so allows us to address concerns regarding credit supply or demand changes in these markets. The richness of the loan-level data also allows us to examine the borrower heterogeneity, as well as credit redistribution across geography.

This paper is organized as follows: Section 2 provides an overview of the institutional background, followed by the development of a theoretical framework that leads to our empirical predictions in Section 4. Section 3 describes the construction of the sample data and presents the summary statistics. Section 5 outlines the empirical design and presents

[7] There is a rich literature looking at various perspectives of CUs such as the effects of CUs' tax exemption (Goddard, McKillop, and Wilson, 2023), the sensitivity of consumer credit to monetary policy (Indarte, 2023), and the effects of CUs' nonprofit and cooperative structure (Li and van Rijn, 2024; Shahidinejad, 2024).

the main results, while Section 6 explores the underlying economic mechanisms. Section 7 discusses the implications of our findings, and Section 8 concludes.

2. Institutional background

2.1 Field of membership for credit unions

According to the Federal Credit Union Act of 1934, an FCU charter must include a "proposed Field of Membership (FOM), specified in detail."[8] The Act states that an FCU's FOM covers the potential group of members that the CU may enroll. More specifically, the NCUA's Chartering and Field of Membership Manual defines the "persons and entities eligible for membership" in an FCU based on the FCU's charter type. This is known as the FCU's FOM.[9] In practice, an FCU's FOM is based on a CU's individual charter, which is defined by the individuals or communities a CU may serve. The Federal Credit Union Act allows for three types of federal charters: single common bond (occupational or associational), multiple common bond (multiple groups), and community. We will describe the detailed definitions of these three types of charters below.

A single common bond FCU is chartered to serve one group sharing a common bond of either occupation or association. Within this designation, there are three potential charter types: (1) single occupational common bond — a credit union whose FOM is made up of employees from a single occupational sponsor; (2) TIP charter — a credit union that serves an FOM sharing a common bond based on employment in a specific trade, industry, or profession (TIP); (3) single associational common bond — a credit union that may serve all members and employees of a single recognized association.

A multiple common bond FCU is chartered to serve more than one group, each of which shares a distinct, definable single occupational and/or associational common bond. There

[8]The Federal Credit Union Act of 1934 has been amended several times. See, for example, the amended version of 2022, available at https://www.govinfo.gov/content/pkg/COMPS-264/pdf/COMPS-264.pdf.

[9]See the NCUA's Chartering Manual, available at https://ncua.gov/files/agenda-items/AG20180621Item4b.pdf.

are two types of multiple common bond charters. The first one is the select employee groups. These groups that compose, or may be added to, a multiple common bond FOM are referred to as either "select employee groups" or "select groups." The second type is through the "underserved areas." A multiple common bond CU may also add underserved areas to its FOM, provided they meet the definition of such as established in the Federal Credit Union Act.[10]

A community CU is chartered to serve members within specific, well-defined geographic boundaries. Under this designation, there are two possibilities for building an FOM. The first is based on the addition of local communities or neighborhoods, while the second consists of adding rural districts. Once a community FOM is established, a CU may serve all persons and businesses that live, worship, attend school, or work in the specified area.

2.2 Field of membership rule change in 2017

In October 2016, the NCUA board finalized the new FOM rule, which incorporated most of the provisions from the proposed version in 2015. The final rule took effect on February 6, 2017. The new FOM rules in 2017 were designed to loosen some of the FOM restrictions put in place in 2010, and they were viewed as the most significant and comprehensive deregulation of the FOM for FCUs since 2010.[11] As a result, depending on an FCU's specific charter, it became possible and easier for FCUs to either amend or expand an FOM to include additional members or enter a new area.

The detailed 2017 FOM rule changes include the following provisions:

- Permit CUs to serve a well-defined portion of a core-based statistical area (CBSA) or the entirety of a combined statistical area (CSA) (rather than being limited to a

[10] According to the Federal Credit Union Act, an "underserved area" is defined as (1) a "local community, neighborhood, or rural district" that (2) meets the definition of an "investment area" under section 103(16) of the Community Development Banking and Financial Institutions Act of 1994, and (3) is "underserved by other depository institutions" based on data of the NCUA board and the federal banking agencies.

[11] Another major regulatory change regarding the CU membership expansion before the FOM rule change is the Credit Union Membership Access Act in 1998, which led to over 1,000 FCUs converting to community charters, increasing CU membership. For more institutional details, see van Rijn (2024).

metropolitan statistical area), subject to a 2.5 million population cap;

- Expand opportunities for CUs to serve underserved areas;
- Provide FCUs with community charters more flexibility in electing to serve a portion of a CBSA rather than requiring that their FOM include the most populated county or municipality in that area;
- Streamline the process for multiple common bond CUs seeking to serve additional groups, such as independent contractors with strong connections to employee groups under their existing FOM;
- Allow rural district CUs to serve FOMs up to 1 million people; and
- Permit former military members with honorable discharges to join CUs serving active-duty service personnel.

More generally, the new 2017 rules can be summarized as a fourfold deregulation for FCUs: (1) expansion of options for a multiple common bond CU to add potential members, (2) expansion of options available to single common bond CUs based on a TIP, (3) a more streamlined process for applying to expand membership in an FCU, and (4) revised definitions of a well-defined local community to include CSAs and portions of a CBSA.

3. Data and facts

3.1 Data sources

Bank and credit union Call Report. We collect data from multiple sources. First, we obtain data on bank balance sheet components from the quarterly Consolidated Reports of Condition and Income (FFIEC 031 and 041) for commercial banks—i.e., the "Call Report". The data contain detailed quarterly data on income statements and balance sheets of all U.S. commercial banks. We merge data from the Call Report with other data sets using the Federal Reserve identification number (RSSD9001).

Quarterly financial and institutional variables for CUs, including the information of CU branches, are obtained from the Call Report data filed by CUs with the NCUA. The CU Call

Report data contain a comprehensive quarterly panel of balance sheet variables that cover almost all important dimensions of size, lending, profitability, and asset quality. The CU branch data became available after 2010Q3. Key to our study, we exploit the information on the CU branch's county location. We use data from January 2014 to December 2019 in our main analysis. We select this period to include three years before and three years after the policy change in 2017:Q1.[12]

Bank branch data. We collect data on bank branch changes from the National Information Center over the period from January 2014 to December 2019. The data contain information on the start date and the end date of a bank branch, the parent bank, and the address of the branch. We merge the branch change data with the Call Report and deposit data using the Federal Reserve identification number (RSSD9001).

RateWatch. Data on deposit rates and loan rates are obtained from RateWatch from January 2014 to December 2019. RateWatch contains weekly branch-level data on deposit rates and loan rates by product. The data cover more than half of all U.S. bank branches and report deposit rates and loan rates by product. For bank branches that have available rates data at the weekly frequency, we aggregate them to quarters by taking the average across the weeks for a branch.

HMDA mortgage application data. Loan-level mortgage lending data are obtained from the Home Mortgage Disclosure Act of 1975 (HMDA) data. The HMDA collects data on mortgage applications and originations and contains information on the loan size, type (e.g., purchase or refinancing), census tract of the loan application, loan approval, and whether the loan is sold to a third party during the year of origination.

Fannie Mae and Freddie Mac mortgage performance data. In an additional analysis, we merge the HMDA data with Fannie Mae and Freddie Mac single-family loan-level data sets to construct the GSE loan sample. Fannie Mae and Freddie Mac loan-level data sets start in 2000 and 1999, respectively. These data sets provide loan interest rates

[12]Our results are not sensitive to the selection of the sample period, and, for example, we obtain robust results using 2012 to 2020.

at origination, a rich set of underwriting variables (such as FICO, loan to value (LTV), and debt to income), other property information (such as the three-digit Zip code of the property and the occupancy status), and ex post loan performance (such as delinquency status and foreclosure). To merge HMDA data with Fannie Mae and Freddie Mac data, we use the loan-level information, including the year of origination, the three-digit Zip code of the property, the loan size, the loan purpose (purchase or refinancing), occupancy status, and co-borrower status, that is available in both data sets. To ensure matching accuracy, we only keep loans that are uniquely matched between HMDA and the Fannie Mae and Freddie Mac data sets—i.e., we discard loans that have duplicates after matching. From the merged data set, we obtain the mortgage interest rates at origination, an extensive list of underwriting variables, mortgage insurance coverage, and ex post loan performance measures.

Other data. To construct our control variables, we obtain data on county characteristics from the Bureau of Economic Analysis, including total income, income per capita, and total employment at the county-year level. We obtain the quarterly housing price index (HPI) data from the Federal Housing Finance Agency at the state level.

3.2 Summary statistics and empirical facts

Table 1 presents the summary statistics of the variables used in our regression analyses at different levels. Panel A provides the summary statistics at the year-quarter level for CUs. The average FCU exposure (FCU fraction) is 10.8% in our CU sample. The average number of branches for a CU is 8.75. The average size of a CU is about $727 million. On average, an FCU is smaller than an SCU. Panel B provides the summary statistics at the year-quarter level for banks. The average FCU fraction is 5.5%, and the average capital ratio is 11.2%.

Table 2 presents the summary statistics of the HMDA data at the loan application level. Consistent with our institution-level statistics, the average FCU fraction (in a county) is about 10.8% for purchase loans and 12.0% for refinance loans among CUs. For banks, the average FCU fraction is about 6.6% for purchase loans and 6.7% for refinances, which is also

consistent with the institution-level data. For purchase loans, CUs and banks both deny about 10% to 11% of loan applications, but the average denial rate for refinances is higher for both banks and CUs. Consistent with the conventional wisdom, CUs process smaller loans than banks on average, face borrowers with lower income, and properties more likely to be owner occupied. Next, we document several novel facts regarding the comparison between CUs and commercial banks in terms of pricing of financial products, geographic distribution, and changes in footprints.

Fact 1: Credit unions offer higher deposit rates and lower loan rates than banks. Figure 1 plots the average deposit spreads (i.e., the difference between the average deposit rate and the effective fed funds rate in a given quarter) and the average loan spreads (i.e., the difference between the average loan rate and the effective fed funds rate in a given quarter) for banks and CUs. We obtain the branch-level deposit or loan rates data from RateWatch, and we average the rates across all banks or all CUs across the period from 2012:Q1 to 2020:Q1. Panel A of Figure 1 shows that the deposit spreads for CUs are consistently higher than banks, ranging from certificate of deposits (CD) to money market accounts. For example, CUs offer the deposit spread for $10k CD with a 60-month maturity 37 basis points higher, on average, than the same product offered by banks. Panel B of Figure 1 shows that the average loan spreads across various loan products are lower for CUs than for banks, including auto loans, home equity loans, home equity lines of credit (HELOCs), and mortgages. The simple facts shown in Figure 1 are consistent with prior literature that shows that CUs—relative to other financial institutions, including banks—charge lower loan rates and offer higher deposit rates (see, e.g., Feinberg and Rahman 2001; Heinrich and Kashian 2008; van Rijn, Zeng, and Hellman 2021; Goddard, McKillop, and Wilson 2023; van Rijn 2024).

Fact 2: Federal credit unions' growth is evenly distributed across the U.S. Panel A of Figure 2 plots the growth of FCUs' footprint from 2014 to 2019. The changes of CUs' footprints in the plot are calculated based on the number of branches per capita in

a county sorted into deciles. Panel A of Figure 2 shows that the growth of FCUs is evenly distributed across the country and not clustered in certain regions. In contrast, Panel B of Figure 2 shows that the growth of bank branch footprint is most concentrated in the Midwest and Southwest.

Fact 3: Changes in federal credit unions and banks in local markets. The U.S. banking sector has experienced a striking trend of consolidation in the past decades, and small and community banks have been disappearing through mergers and acquisitions mostly initiated by large banks. Due to regulatory burdens, especially after the Great Recession, and many other factors such as technology advancements, large banks have been leading the process of closing physical branch locations in the past decade (see, e.g., Nguyen 2019; Bonfim, Nogueira, and Ongena 2021). More broadly, this credit redistribution can have implications for credit provision, local business dynamics, and the cost of access to financial services (Philippon 2015). On the other hand, U.S. credit unions have maintained a relatively stable footprint or even increased their branch presence in most local markets.[13]

Figure 3 illustrates the bank-CU substitution graphically with binned scatterplots. The x-axis shows equal-sized quintile bins of counties sorted on changes in bank per million population (from 2014 to 2019), and the y-axis shows the averages of the change in FCU per million population for these quintile bins. The dashed trend line illustrates a clear negative relationship between the FCU presence and bank presence. We then confirm this bifurcation pattern estimating a change-on-change specification similar to Equation (8). We report the results in Table A1.

4. Theoretical framework

We commence with a simple incomplete competition model in the spirit of Salop (1979). We derive the optimal loan origination rate for small and large banks amid competition

[13]For example, a 2019 November report by the Federal Reserve Board of Governors finds that branches remain important for services such as deposit and withdrawal transactions, and, in some locations, CUs maintained or grew their branch presence.

and present equilibrium outcomes resulting from changes driven by CU market expansion. Subsequently, we delve into the testable predictions of our equilibrium results.

4.1 Economy

Consider an economy with a unit mass of borrowers who each seeks to borrow one unit of funds from a bank or CU. The economy contains N small banks indexed by $i = 1, ..., N$, together with one large bank indexed by $i = 0$, and a CU. Banks and CUs are competing for the borrowers. Moreover, CUs are subject to regulations that limit their size.

Both the large and small banks choose the optimal interest rate r_i to maximize their profit while lending to borrowers. Small bank i's profit is $\pi_i = s_i (r_i - \kappa)$ for $i > 0$, whereas the large bank's profit is $\pi_0 = s_0 (r_0 - \kappa_0)$. s_i indicates the market share taken by the small bank i, and s_0 indicates the market share taken by the large bank. We consider κ to be the marginal funding cost of a small bank and κ_0 for the marginal funding cost of a large bank. Notably, we assume the CU, as an endogenously grown cooperative but with a size constraint, operates with a sufficiently low marginal cost in loan origination. As a result, it captures a share of $1 - S$ of the borrowers first, leaving a market of size S over which small and large banks compete.

The rest of the borrowers' preferences over small banks and large banks are described by a Salop (1979) circle with a perimeter $S < 1$. Both the N small banks and borrowers are uniformly spaced around the circle. Borrowers reach out to one of the two adjacent small banks or the large bank, which stays at the center of the Salop circle. Therefore, the large bank has the same distance to all the borrowers.

When the borrower obtains a loan from an adjacent small bank i with a distance x_i, the borrower obtains a value $\rho - r_i - \delta x_i$. The distance x_i is not meant to be interpreted literally but as product differentiation or monitoring costs.[14] We consider ρ the maximum interest rate the borrower would accept if there were no distance between the borrower and

[14]The importance of distance is emphasized in many contributions, including Degryse and Ongena (2005).

the bank. Notice the borrower can also choose to borrow from another adjacent small bank i' with distance $\frac{S}{N} - x_i$ and obtain value $\rho - r_{i'} - \delta\left(\frac{S}{N} - x_i\right)$. With depositors uniformly distributed, the optimal arrangement of small banks corresponds to a symmetric placement of the N small banks. Consequently, the maximum distance a borrower travels to reach the nearest small bank is $\frac{1}{2N}$, while the average distance is $\frac{1}{4N}$.

When the borrower chooses to borrow from the large bank, the borrower obtains a value $\rho - r_0 - \delta_0 \frac{S}{4N}$. Moreover, we assume $\delta_0 > \delta$. In other words, on average, the borrowers on the Salop circle incur a higher cost when borrowing from the large bank than small banks, conditional on the same borrowing rate.

4.2 Equilibrium

As we focus on the effect of CU expansion after the 2017 FOM rule change on the banking industry, we choose to model the bank and CU's loan origination and depositing taking under a competitive equilibrium following the two-stage game, as in Bain (1949), Modigliani (1958), and Salop (1979).

The following proposition characterizes the equilibrium:

Proposition 1. *If the market size S for small and large banks is greater than the threshold*

$$\underline{S} = \frac{4N\left(\kappa_0 - \kappa\right)}{4\delta - \delta_0}, \tag{1}$$

then each small bank i's market share is

$$s_i = \frac{S}{6N\delta}\left(\delta + 2\delta_0\right) + \frac{2}{3\delta}\left(\kappa_0\text{-}\kappa\right),$$

whereas the large bank's market share is

$$s_0 = S - Ns_i = S - \frac{S}{6\delta}\left(\delta + 2\delta_0\right) - \frac{2N}{3\delta}\left(\kappa_0\text{-}\kappa\right).$$

Moreover, small banks charge interest rate

$$r_i = \frac{\kappa_0 + 2\kappa}{3} + \frac{S\delta}{6N} + \frac{S\delta_0}{12N},$$

whereas for the large bank

$$r_0 = \frac{2\kappa_0 + \kappa}{3} + \frac{S\delta}{3N} - \frac{S\delta_0}{12N}.$$

Otherwise, each small bank obtains a market share of $\frac{S}{N}$ *and charges interest rate* $r_i = \kappa + \frac{S\delta}{N}$*, whereas the large bank has a market share of* 0.

From Proposition 1, we can derive the following two testable predictions to bring to the data.

Prediction 1. When increased CU market share due to deregulation leads to a sufficiently small market over which banks compete, the large bank will exit the market—i.e., $s_0 = 0$.

Prediction 2. When increased CU market share due to deregulation leads to a smaller market S for the large and small banks, the large bank reduces its lending rate r_0 at a slower pace than small bank i reduces its lending rate r_i.

The first prediction follows from the threshold value of $\underline{S}$ in Equation (1): When competition is strong enough, small banks' advantage in local lending eliminates the large banks' market share. The second prediction follows from the fact that increased competition from a CU leaves small banks with a smaller customer base, therefore reducing the monitoring costs or making it easier for the bank to provide more customized products; both refer to a closer distance.

With the insights from the model, we then conduct our empirical analysis, which examines the bank's competitive response to the 2017 FCU rule change. We begin by scrutinizing their responses in loan interest rates and their decisions regarding market exit.

5. Empirical design and main results

In this section, we begin by describing the econometric model and then examine the effects of the new FOM rule on (federally chartered) CUs and banks. More specifically, we analyze changes in their balance sheet components.

5.1 Institution-level changes: Federal credit union expansion

In this study, we focus on the 2017 NCUA policy change aimed at relaxing the agency's FOM regulations and allowing FCUs to expand their membership bases. Because the NCUA board approved the policy at the federal level, local economic conditions or the lending environment carry little contribution to the rule change. Therefore, we exploit the policy change as an instrument to obtain regional variations in the exposure to FCUs' expansion and analyze its effects on banks. The main variable of interest in our analysis, *FCU fraction*, is defined as the market share of FCUs in a local lending market—i.e., a county. The choice of using the market share of FCUs is guided theoretically by our model in Section 4, in which banks compete for the market share (S) left by CUs. In the baseline tests, we use mortgage applications to calculate the FCU fraction because mortgage lending is one of the CUs' primary businesses and we have the exact census tract of each mortgage application in the HMDA data, which is finer and more accurate than other proxies, including the county-level deposits data. In other tests, we use alternative measures for the FCU fraction, such as the number of lending institutions or branches, to check robustness. The essence of this empirical strategy relies on the fact that the 2017 policy was at the national level and thereby, in the local exposure to FCUs in a local market, can be thought of as plausibly orthogonal to the policy change. We calculate the local FCU exposure using the 2015:Q4 data, five quarters before the event quarter, 2017:Q1, to mitigate the endogeneity concern that the treatment effect on FCU-heavy areas might determine the post-FOM FCU exposure.[15]

[15] We also use other measures, such as the 2012:Q4 measure, to calculate the FCU fraction, which can be viewed largely exogenous to what we observe during the entire sample period. We obtain qualitatively similar results.

The identifying assumption for the empirical strategy is that if the short-run local credit demand is inelastic or imperfectly elastic, the competitive landscape in different areas will be affected differently by the before-policy FCU exposure, and commercial banks would adjust their lending behavior in response to the policy shock. Based on the identifying assumption, we use a difference-in-differences approach based on cross-region differences in the local FCU exposure before the FOM rule change.

Our continuous difference-in-differences approach is similar to those of Card (1992) and Lucca et al. (2019).[16] In our setting, we estimate the impact of the FCU expansion policy on local lending using a cross-region treatment effect based on the local exposure to FCUs. In contrast to a conventional difference-in-differences regime, our treatment variable is measured by a continuous quantity rather than as an indicator. This approach is broadly similar to approaches that attempt to estimate the effects of aggregate economic shocks by exploiting cross-sectional variation in the importance of these shocks across geographic regions (see Goldsmith-Pinkham, Sorkin, and Swift 2020 for a comprehensive analysis).

To examine changes in an FCU's balance sheet components relative to an SCU, we use a CU-only sample of lenders and estimate the following specification:

$$\begin{aligned} Y_{i,t} = {} & \beta_1 FCU_i \times FCU\ fraction_i \times Post_t \\ & + \beta_2 FCU\ fraction_i \times Post_t + \beta_3 FCU_i \times FCU\ fraction_i + \beta_4 Post_t + \beta_5 FCU \\ & + \gamma_t + \delta_i + \varepsilon_{i,t}, \end{aligned} \tag{2}$$

where the dependent variable is a balance sheet component or an operation-related variable such as the total number of branches or the natural log of assets for CU i in year-quarter t. *FCU fraction* is the 2015:Q4 measure of the fraction of FCUs over all lenders in all counties where CU i operates. We then aggregate this measure to the lender level. The fraction is

[16] Card (1992) studies the treatment effect of a change in national minimum wage standards that varies across states depending on the fraction of workers earning less than the new minimum. Lucca et al. (2019) identify the effect of federal student loan caps on tuition using an institution-specific treatment intensity measure based on the fraction of students in each institution that are eligible for and take out the program maximums.

calculated based on the mortgage application volume.[17] *Post* is an indicator variable that equals 1 if year-quarter t is in or after 2017:Q1. The sample includes FCUs and SCUs, and the indicator *FCU* equals 1 if the CU is a federally chartered in a given year-quarter, and zero if the CU is a state chartered. We include FCUs and SCUs in the sample because these two types of lenders are comparable due to similar regulatory requirements, business models, clientele, and profit margins. Since a major difference between the two is that FCUs are subject to the FOM policy change while SCUs are not, we can better identify the effect of the policy change on FCUs relative to SCUs. We also include the institution fixed effects (δ_i) and year-quarter fixed effects (γ_t). Because of the time fixed effects, the standalone variable *Post* is absorbed. We cluster standard errors at the CU level.

We report the results in Table 3. In columns 1 and 2, we find that FCUs, relative to SCUs, expand their geographic footprint by opening more branches and in more counties after the policy shock. In column 1, the coefficient estimate suggests that increasing the FCU exposure from 0% to 50% for an FCU is associated with 1.35 more branches for an average FCU than for an average SCU. Since the average number of branches for an FCU in our sample is 8.13, the magnitude of the branch increase translates to a 16.6% increase. In column 2, we find that FCUs expand their footprint by crossing county borders when they operate in more FCU-exposed areas. In column 3, the coefficient estimate for β_1 is positive and significant, suggesting that FCUs significantly expand their membership base, which is consistent with the goal of the 2017 FOM rule. The estimate magnitude suggests that increasing the FCU exposure from 0% to 50% is associated with an 11.6% increase in the member base size for an average FCU relative to an average SCU, after the policy shock. In column 4, we find that FCUs' assets grow significantly after 2017:Q1 if they operate in FCU-heavy areas. The estimated magnitude suggests that an increase in the FCU fraction from 0% to 50% is associated with a 12.0% increase in the total assets for an average FCU

[17] Previous literature has shown that the mortgage volume is a reliable measure for the CU fraction in a local market (e.g., Chatterji et al. 2020, 2021). The underlying assumption of this proxy is that the amount of deposits in each market is highly correlated with mortgage applications.

relative to an average SCU after the policy shock. Column 5 suggests that FCUs significantly expand their deposit size, and the effect has a similar magnitude to the effect for the assets.

Next, in columns 6 and 7 of Table 3, we find that, for FCUs after the policy shock, the loan ratio and the interest income do not change significantly. However, column 8 suggests that the interest expense ratio (scaled by assets) increases significantly for FCUs after the policy shock. Furthermore, the net interest income ratio does not change much for FCUs (column 9). Our results in columns 10 and 11 show that FCUs' asset quality does not deteriorate after the policy shock—i.e., the FCU expansion is not at the expense of asset quality. Overall, Table 3 shows a large cross-sectional variation in FCU exposures across geography and across lenders. The evidence indicates that the 2017 FOM rule led to more significant expansion for FCUs that already had a larger market share before the regulatory change.

5.2 Institution-level changes: Banks

In this subsection, we examine how banks respond to the FOM rule change by analyzing banks' balance sheet components. We estimate the following specification:

$$Y_{i,t} = \beta_1 FCU\ fraction_i \times Post_t + \beta_2 FCU\ fraction_i + \beta_3 Post_t + \gamma_t + \delta_i + \varepsilon_{i,t}, \quad (3)$$

where the dependent variable is a bank's balance sheet component for bank i in year-quarter t. The bank-level *FCU fraction* is defined the same way as in Equation (2). *Post* is an indicator variable that equals 1 if year-quarter t is in or after 2017:Q1. We also include the institution fixed effects (δ_i) and year-quarter fixed effects (γ_t). We cluster standard errors at the bank level.

We report our estimates in Table 4. To better understand the effect across bank sizes, we separate our sample banks into large and small ones based on the $100 billion assets threshold. Smaller community banks are less diversified geographically and thereby focus more on local lending, which relies more on soft information collected by loan officers. We

find that, after FCUs' liberalization, small banks and large banks behave differently. Panel A reports results for small banks in our sample. Column 1 suggests that, after 2017:Q1, banks that are more exposed to FCUs grow their assets marginally. For these banks, there is no significant change in capital or the loan ratio (columns 2 and 3). In columns 4 and 5, we find that small business lending by these banks decreases significantly, both statistically and economically. In column 5, the coefficient estimate suggests that increasing the FCU exposure from 0% to 50% leads to a 0.009 reduction in the small business lending ratio (scaled by total assets), which is about 11% of the average small business lending ratio in our sample. Columns 6 and 7 suggest that, although the savings deposits ratio does not change significantly, time deposits decrease, which implies that rate-sensitive depositors are more likely to shift to FCUs after the policy shock. Columns 8 to 10 suggest that banks suffer worse asset quality after the policy shock, measured by nonperforming loans and charge-offs. In contrast, these effects on large banks (in Panel B) are largely muted, except for the withdrawal from small business lending.

Our results show that asset growth and time deposit outflow are mostly concentrated among small banks, although both types of banks reduce lending to small businesses. More importantly, asset quality deterioration is only concentrated among small banks. This finding is consistent with the view that small banks, directly competing with CUs for local market and customer base, expand lending to marginal borrowers to defend market share and thus suffer worse asset quality.

5.3 Parallel trends

The parallel trends assumption in this unique continuous difference-in-differences context is that counties with high or low FCU exposures would have continued on similar trajectories in the absence of the FOM rule in 2017. However, systematic differences between high- and low-FCU counties and pre-existing trends of FCUs' and banks' footprint might bias our estimates. For instance, a county with a high FCU exposure before the 2017:Q1 FOM rule

might have already consistently experienced FCU expansions before the FOM rule became effective. If valid, our estimate is driven by the pre-existing trend, not the policy change itself. To assess this endogeneity concern, we estimate the following specification:

$$Y_{i,t} = \sum_{k=-3}^{6} \beta^{\tau} FCU\ fraction_i \times Quarter_{t+\tau} + \delta_t + \zeta_i + \varepsilon_{i,t}, \tag{4}$$

where the dependent variable is lender i's balance sheet component in quarter t. *FCU fraction* is the local market's (county's) FCU fraction measured in 2015:Q4 using mortgage application volumes, aggregated to the lender level. *Quarter* is an indicator variable for each quarter during the sample period for this specification, 2016:Q2 to 2018:Q3. Quarter $t = -1$ serves as the omitted benchmark. We control for time fixed effects and lender fixed effects. We cluster standard errors at the lender level.

Figure 5 presents the dynamics for FCUs during the period around the rule change. In Panel A, the dependent variable is the log of total number of members. In the three quarters running up to 2017:Q1, the coefficient estimate has a small magnitude that is close to zero. We observe a jump of the coefficient estimate immediately in the event quarter, suggesting an expansion in the FCU membership base. The magnitude remains persistent and stably increases in the following quarters and becomes statistically significant in the second quarter and onward. In Panel B, the dependent variable is the log of total assets, and we observe a very similar pattern as in Panel A. The coefficient estimate keeps increasing in the quarters after the policy shock. Importantly, the coefficient magnitude remains stable and close to zero in the pre-event quarters, suggesting against a violation of the parallel trends assumption.

In Figure 6, we plot the dynamics of SCUs during the same time window. Panel A shows that the membership base mildly increases for SCUs after the policy shock, but the coefficient estimate is not statistically significant. Panel B plots the log of assets and exhibits the same insignificant change in the post-shock quarters. Figure 6 helps alleviate the concern that the post-shock expansion for FCUs is due to the rate hikes of the federal funds rate

during 2017 and 2018, because if this alternative explanation is valid, we would expect the same significant growth in SCUs, but we do not see it.

Regarding our lender-level findings that banks experience worse asset quality and reduce lending to small businesses in FCU-heavy areas, a possible concern is that those areas already have a pre-existing trend of shrinking economic activities, and thus our findings are not driven by the policy shock. If valid, we would expect to see a pre-existing trend of deteriorating asset quality and lending decline. To examine this possibility, we plot the dynamics using the sample of banks in Figure 7. Panel A presents the dynamics of nonperforming loans, and we find that in the three quarters running up to the event quarter, the coefficient magnitude is close to zero, suggesting against a violation of the parallel trend. In the event quarter (i.e., quarter 0), we find an immediate and significant increase in the nonperforming-loan measure. Then, the coefficient estimate increases and remains statistically significant in the following four quarters. In Panel B, we plot the dynamics for small business lending. The coefficient estimate remains stable and close to zero in the run-up to the event, consistent with the parallel trends assumption. Following the event, we observe a declining trend of small business lending. Since we focus on a relatively narrow time window around 2017:Q1, banks' immediate response suggests that our baseline findings are largely driven by the FOM rule change and are unlikely to be driven by pre-existing factors.

6. Economic mechanism

In this section, we examine the economic mechanisms through which banks respond to the expansion of FCUs in local lending markets. We explore and examine the price competition channel and the information channel through which lenders determine how to strategically use their information advantages in a local market to compete with each other.

6.1 Price competition: Deposit and loan spreads

In this subsection, we examine the *within-institution* branch-level data to understand how bank branches respond to the FOM policy shock differently when facing different FCU exposures. To identify the channel, we examine changes in time deposits and mortgage loan spreads, since the client base for the former is more financially sophisticated and interest rate sensitive, and the latter is one of the primary businesses of CUs.

Using data from RateWatch, we estimate the following branch-year-quarter-level specification:

$$\begin{aligned} Y_{i,k,c,t} =& \beta_1 FCU\ fraction_c \times Post_t + \beta_2 FCU\ fraction_c + \beta_3 Post_t \\ &+ \gamma X_{c,t} + \delta_{i\times t} + \zeta_{i\times c} + \varepsilon_{i,k,c,t}, \end{aligned} \tag{5}$$

where the dependent variable is either the deposit spread (i.e., deposit rate minus the fed funds rate) for a deposit product or the loan spread (i.e., loan rate minus the fed funds rate) for a loan product for lender i's branch k operating in county c in year-quarter t. *FCU fraction* is the 2015:Q4 measure of the fraction of FCUs over all lenders (i.e., all banks and CUs) in county c. *Post* is an indicator variable that equals 1 if year-quarter t is in or after 2017:Q1. We control for the county-level economic variables, including county per capita income, the income growth, and the log of HPI. To control for any lender-level credit supply factors that vary over time, we include lender-by-time fixed effects in the specification. We also include lender-by-county fixed effects to control for any variation across lender-county pairs, such as soft information a lender has in its headquarter county. We cluster standard errors at the county level.

We report the estimation results in Table 5. In Panel A, we show that banks raise their deposit spreads in areas more exposed to FCUs (columns 1 and 4), but small banks and large banks respond differently. Columns 2 and 5 show that small banks (i.e., less than $100 billion) raise deposit spreads significantly in areas with higher FCU exposures. In column 2,

the coefficient estimate for β_1 suggests that, when FCU fraction increases from 0% to 50%, CUs pay 21.7 basis points higher deposit spreads for 12-month ($10k) CDs after the 2017 policy shock. However, large banks do not respond as significantly as small banks (columns 3 and 6).

In Panel B of Table 5, we examine the effect on loan spreads. In columns 1 and 4, we find that banks lower their loan spreads, measured by loan rates of HELOCs and 15-year mortgage rates, in areas with higher FCU exposures. Similarly, we find that the effect is concentrated among small banks (columns 2 and 5), and large banks do not respond much to the policy shock.[18] This finding is consistent with Prediction 2 of our model, specified in Section 4, which predicts that when increased CU market share due to deregulation leads to a smaller market S for the large and small banks, the large bank reduces its lending rate r_0 at a slower pace than small bank i reduces its lending rate r_i.

6.2 Informed lenders and information competition

Since CUs operate locally and thereby can be viewed as "informed" lenders, large banks and small banks may respond differently to increased competitive pressure from FCUs in a local market due to their difference in informational advantages. We examine the information-based competition channel using loan-level data from the HMDA. In particular, we estimate the following specification:

$$\begin{aligned} GSE_{i,c,b,t} = {} & \beta_1 Small\ bank_{b,t} \times Post_t \times High\ FCU\%_c \\ & + \beta_2 Large\ bank_{b,t} \times Post_t \times High\ FCU\%_c \\ & + Double\ interactions + Stand\text{-}alone\ variables \\ & + Borrower\ characteristic_i \\ & + \delta_t + \zeta_{c\times b} + \eta_{Loan\ amount\ decile} + \theta_{Income\ decile} + \varepsilon_{i,c,b,t}, \end{aligned} \tag{6}$$

[18] We find a similar pattern using GSE-eligible mortgage interest rates in Table A2. Our results show that small banks lower mortgage rates in areas with higher FCU exposure more than large banks.

where i indexes mortgage application, c indexes a borrower's county, b indexes lender, and t indexes year. The dependent variable *GSE* is an indicator that equals 1 if the loan is sold to a GSE and zero otherwise.[19] *High FCU%* is an indicator that equals 1 if the FCU fraction of mortgage applications in a census tract is above the median of the FCU fraction distribution measured in 2015:Q4. *Post* is an indicator variable that equals 1 if the year is in or after 2017.

For this test, we include three types of lenders: large banks (assets greater than $100 billion), small banks (assets less than or equal to $100 billion), and FCUs. In the specification, *Large bank* and *Small bank* are two indicator variables indicating the two types of banks, while FCUs are the omitted benchmark. The control variables include the indicator variables of whether the property is owner occupied, whether the borrower is female or has a co-borrower. In addition, we add lender-by-county fixed effects to control for any time-constant differences across lender-county pairs. We add year fixed effects to control for time-series macroeconomic changes that are common for all lenders and borrowers. We also control for fixed effects for the loan amount decile and applicant income decile. We cluster standard errors at the county level.

Table 6 presents the results. In column 1, we focus on purchase loans, and the coefficient estimate for the triple interaction is positive and significant, suggesting that large banks in high FCU areas are more likely to issue GSE-eligible loans, conditional on acceptance, after the 2017 policy change. In contrast, we do not find such an effect for small banks. Since GSE-eligible loans are less information intense than other types of loans (e.g., Loutskina and Strahan 2009, 2011), this finding is consistent with the view that, facing increased local exposure to FCUs, large banks shift away from information-based lending in the local market. In column 2, we focus on refinance loans and find that the coefficient estimate remains positive and significant, but the magnitude becomes smaller. Given that refinance

[19]The HMDA data only allows a loan to be classified as conforming if it was sold to the GSEs in the same year as the year of loan origination. As a result, the estimate of conforming loans based on HMDA understates the overall market share of conforming loans in the United States.

loans are less information-intensive than purchase loans, our finding is again consistent with large banks shifting away from information-based lending.

In columns 3 to 6, we split loans to lender's headquarter county-issued and nonhead-quarter county-issued, based on the assumption that lenders have better information in their headquarter counties. We find that, facing an increased FCU exposure, large banks are more likely to issue GSE-eligible loans in non-headquarter counties. This finding provides further evidence that large banks shift away from information-based lending in markets where they have less information (such as non-headquarter counties). Overall, Table 6 suggests that large banks shift away from information-based lending after the FCU expansion, whereas small banks exploit their local lending advantages and do not avoid competing with expand-ing FCUs in a local market.

7. Implications of federal credit union expansion

7.1 Low-income borrowers

In this subsection, we examine the differential effects of the FOM policy shock on borrowers from different income groups. We exploit the close-to-universe mortgage application data from the HMDA, and we estimate the following specification:

$$Denied_{i,c,b,t} = \sum_{q=1}^{4} \beta_1 FCU\ fraction_c \times Post_t \times Income\ quartile_q + All\ combos + \gamma Controls_i + \delta_{b\times t} + \zeta_{c\times t} + \eta_{Loan\ amount\ decile} + \theta_{Income\ decile} + \varepsilon_{i,c,b,t}, \quad (7)$$

where i indexes mortgage applications, c indexes a borrower's county, b indexes lender, and t indexes year. The dependent variable *Denied* indicates whether the loan application is denied. *FCU fraction* is the 2015:Q4 measure of the fraction of mortgage volume by FCUs over all lenders at the county level. In alternative specifications, we replace *FCU fraction* with an indicator variable *FCU* that equals one if the lender is an FCU, and zero otherwise. *Post* is an indicator variable that equals 1 if the year is in or after 2017. Loan control

variables include indicators for occupancy, female borrower, and co-borrower status. We also add fixed effects for the loan amount quintile, year, county, and lender. We cluster standard errors at the lender level.

Table 7 presents the results. Columns 1 to 4 (5 to 8) present results for home-purchase (refinance) loans. In columns 1 and 2, we find that FCUs approve 1.5% to 1.7% more loan applications from borrowers in the lowest income quartile after the FOM policy shock. Given that the average denial rate in our sample is about 10% to 11%, this differential effect is not economically trivial. In columns 3 and 4, we replace the FCU indicator with a continuous FCU fraction measure, and we find qualitatively similar results. In columns 5 and 6, we again find a similar lending pattern among refinance loans. Our findings provide evidence that credit access for low-income borrowers improved after the FOM policy shock where the local lending markets are more FCU dominant.

We then examine if FCUs, or other lenders in FCU-heavy markets, expand mortgage credit provision at the expense of lending standards or loan quality. We use loan-level performance data on conforming loans from Fannie Mae and Freddie Mac and examine if lenders change their lending standards as proxied by ex ante or ex post risk measures. Panel A of Table A3 shows that lenders in FCU-dominant areas do not lower lending standards (i.e., proxied by credit scores and LTV ratios) for conforming mortgages. Panel B shows that lenders do not suffer worse loan performance.[20] Taken together, our evidence suggests that the FCU expansion enhances credit access for low-income borrowers and does not necessarily change lenders' risk profiles.

7.2 Credit market segmentation

Given the wave of consolidation that the U.S. banking sector has experienced in the past decades, banks have been aggressive in closing physical branches across the U.S. By contrast, U.S. credit unions have maintained a relatively increasing branch presence in most local

[20] In Table A4, we check and confirm the robustness of our results using an indicator for high-FCU markets—i.e., higher than the median of the variable distribution.

markets (Panel A of Figure 2 and Figure 3). This pattern exhibits a bank-CU bifurcation trend, both in physical branch footprints and in credit lending markets.

In this subsection, we examine how changes in the FCU exposure, and, more specifically, the credit market bifurcation between banks and FCUs, affect mortgage credit supply. We exploit a methodology that mirrors the cross-sectional nature of the bank-CU substitution patterns, which is to estimate the following change-on-change specification in which county-level changes are measured from 2014 to 2019:

$$\Delta Lending_c = \beta \Delta FCU\ presence_c + \gamma X_c + \delta_s + \varepsilon_c, \tag{8}$$

where c indexes county. The dependent variable is the change in county-level mortgage origination, which is measured in various ways, from 2014 to 2019. $\Delta FCU\ presence$ is the change in the number of either FCUs or FCU branches in a county. Control variables include the change in county-level log of total income, change in log of the population, and change in income growth from 2014 to 2019. Since the specification is change on change, it minimizes concerns about any time-invariant factors that might affect lender presence and the local credit demand and supply environment. We include state fixed effects to control for any cross-state differences, such as legal and regulatory environment, or other state-level unobserved factors of changes in the bank-CU substitution trends. Note that our goal with the reduced form of the ordinary least squares specification is to examine the substitution pattern rather than establish causality.

We report the results in Table 8. In columns 1 and 2, we find a strong negative relationship between the change in the FCU exposure and the change in mortgage lending by all banks. When we focus on large banks (i.e., greater than $100 billion in assets) in columns 3 and 4, the coefficient estimate almost doubles, suggesting that large banks reduce mortgage lending more aggressively in areas with higher FCU growth. In columns 5 to 8, we find that FCUs increase mortgage lending in areas with higher FCU growth, but the effect is not significant for SCUs. We also take a step further and examine the changes in

bank branch footprints. Table 9 shows that banks close more branches in a location where FCUs are more dominant and if the lending market is competitive. The results are robust to controlling for county-by-time fixed effects to account for local credit demand changes over time. This finding is consistent with the prediction by our model that when increased CU market share due to deregulation leads to a sufficiently small market over which banks compete, the large bank will exit the market (i.e., $s_0 = 0$).

Our results highlight that the expansion of FCUs, especially that triggered by FCUs following the FOM rule, has exacerbated the bank-FCU substitution patterns in the past decade. As large banks have been leaving rural areas and low-income communities, FCUs have acted as a critical provider of financial services for these underserved and marginalized consumers. While the previous literature on large bank behavior has focused on too-big-to-fail and documented issues such as systemic risk and increasing gaps of credit access, we show that the rise and expansion of FCUs can have far-reaching policy implications. Allowing FCU charters to expand in underserved areas can have a huge effect on credit redistribution and mitigate credit access disparities.

8. Conclusion

The aggregate size and impact of the U.S. credit union system have been strikingly increasing in the past decades. This change has made and will continue to make a profound impact on the U.S. banking system, credit redistribution, and the U.S. economy. Historically, CUs are known for the special focus on benefiting consumers in the local community with a common bond. In this study, we document the effects of the 2017 FOM rule that relaxed the common bond requirement for FCUs and led to expansion of their membership base and geographic footprint.

We provide evidence that FCUs significantly grow in deposits and the size of membership base, and they open more branches and expand to more counties. In response, small banks and large banks behave differently. Small banks directly compete with CUs, raising

deposit rates and lowering loan rates to defend market share, and they use their information advantage and extend credit to marginalized borrowers. Large banks, in contrast, shift away from CU competition: They cut back costly lending such as small business lending and information-intensive mortgages, do not adjust deposit rates so they experience (time) deposits outflows, and eventually withdraw from CU-heavy markets as competition intensifies. Furthermore, this increased competition leads to enhanced credit access to low-income borrowers and underserved markets, and more importantly, FCUs do so without sacrificing their ex ante lending standards.

Taken together, our results highlight that the rise of CUs' overall size and importance has exacerbated the bank-CU substitution patterns, leading to geographically segmented credit markets. While large banks withdraw from rural and low-income areas in order to lower the cost of maintaining the branch networks and lending, CUs expand their footprint in these markets and fill the void in the meantime. With the increasing size and influence of the CU system, these findings may carry policy implications of how policymakers could view the role of the two separate systems (banks versus CUs) in affecting credit allocation efficiency, financial stability, and the welfare of borrowers and communities they serve.

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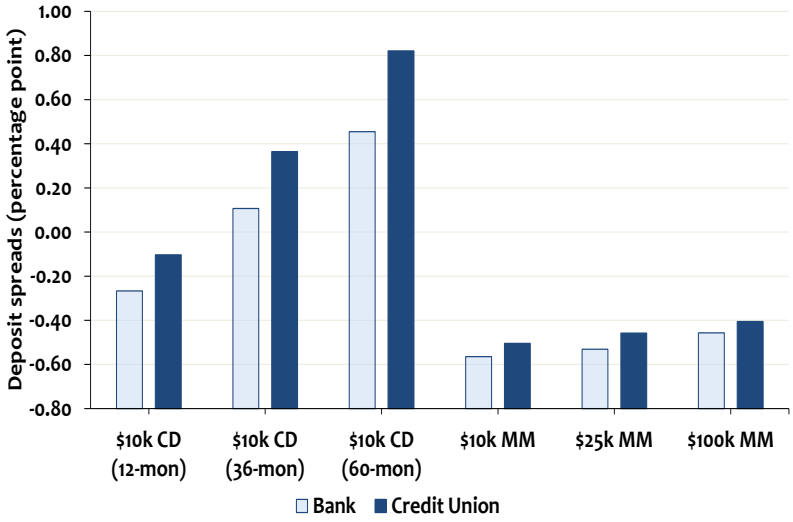
Figure 1: **Deposit spreads and loan spreads (banks vs. credit unions)**

This figure shows the average deposit spreads (i.e., the difference between the average deposit rate and the effective federal funds rate in the concurrent quarter) and the average loan spreads (i.e., the difference between the average loan rate and the effective federal funds rate in the concurrent quarter) for banks and credit unions. The sample period is 2012:Q1-2020:Q1. The data source is the branch-level deposit or loan rates from RateWatch, and we average the rates across all banks or all credit unions across the entire sample period. Panel A plots the deposit spread for accounts of certificate of deposits (CD) and money market (MM); Panel B plots the loan spread across various loan products including auto loans, home equity loans (HELs), home equity line of credit (HELOC), and mortgages.
ALT TEXT: Bar charts showing that credit unions offer higher average deposit rates and lower average loan rates than banks.

Panel A. Deposit spread (percentage point)



Panel B. Loan spread (percentage point)

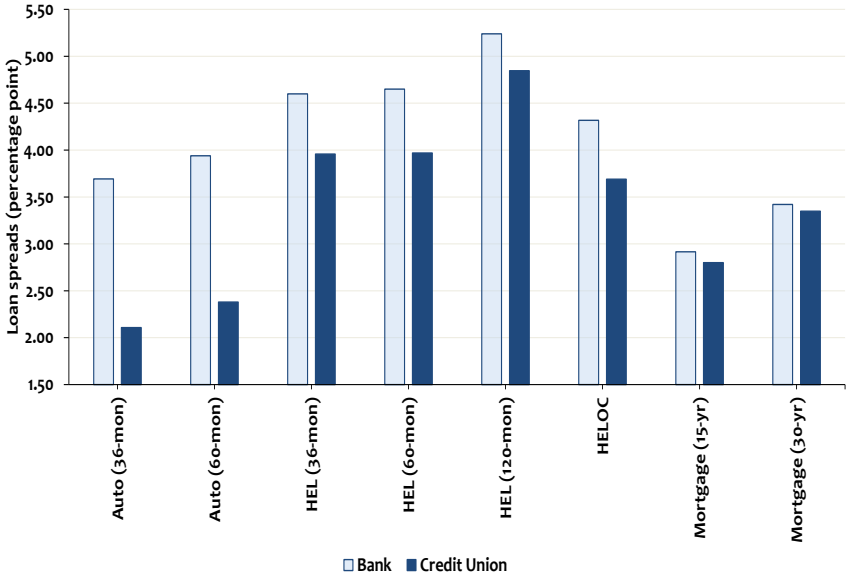
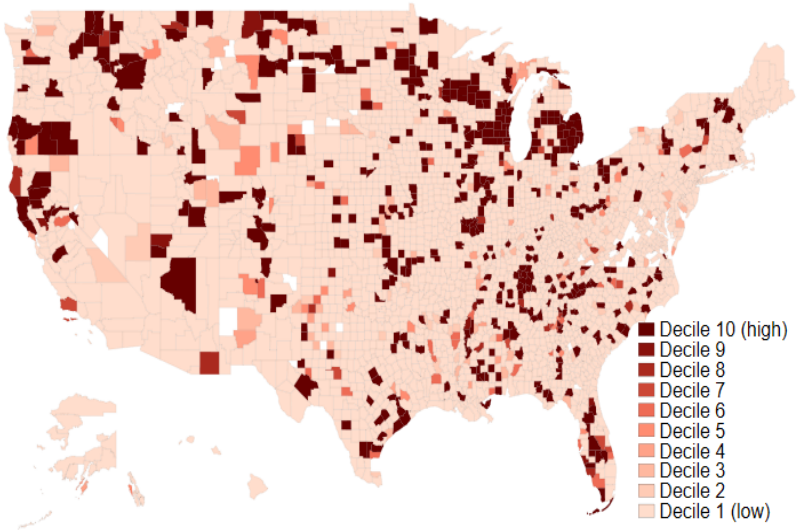


Figure 2: **The FCU-bank bifurcation**

This figure presents the growth of FCUs' footprint from 2014 to 2019 in Panel A. Panel B plots the growth in banks' footprint from 2014 to 2019. The changes in footprint are calculated based on the number of branches per capita (i.e., the number of branches divided by total population in a county), and the county-level changes are sorted into deciles in each panel.

ALT TEXT: Maps showing that the growth of credit unions' footprint is not concentrated in any specific region of the U.S. and does not significantly overlap with the footprint growth of banks.

Panel A. Changes of federal credit unions' footprint



Panel B. Changes of banks' footprint

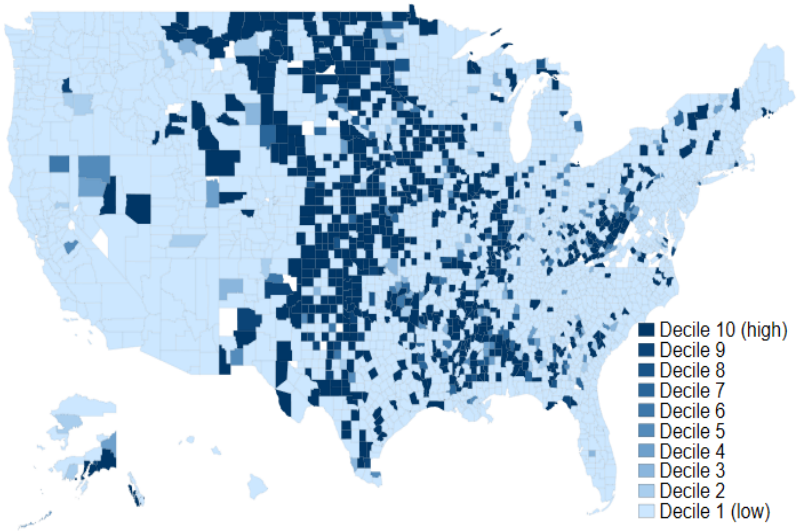


Figure 3: **Change in federal credit union exposure by change in bank exposure**

This figure shows the relationship between change in bank exposure and change in FCU exposure. The figure is constructed in two steps. The first is to sort all counties by change in the number of bank branches from 2014 to 2019, and group counties into quintiles. The second step is to calculate change in FCU branch per million population (from 2014 to 2019) in each quintile.
ALT TEXT: Graph showing that the relationship between change in bank exposure and change in FCU exposure is negative.

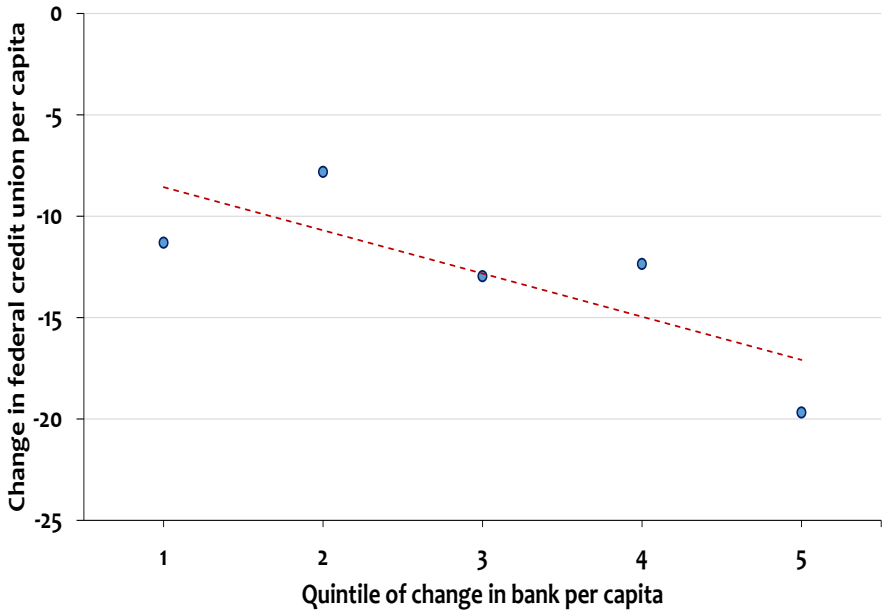


Figure 4: **Borrowers on Salop Circle with perimeter** S

This figure illustrates the model environment. Dashed lines represent Salop circle, whereas its perimeter S represents the size of the market over which the large and small banks compete. N small banks evenly distributed on the Salop circle, whereas borrowers, represented by the dash-dot circle, can gain utility $\rho - r_i - \delta x_i$ by borrowing from adjacent small bank i with lending rate r_i, where x_i is the distance between the borrower and bank i. The borrower can also choose to gain utility $\rho - r_{i'} - \delta(\frac{S}{N} - x_i)$ by borrowing from the other adjacent small bank i' with the lending rate $r_{i'}$, where the distance is $\frac{S}{N} - x_i$. All borrowers can also borrow from the large bank lending at rate r_0 at the center of the circle, gaining utility $\rho - r_i - \delta_0 \frac{S}{4N}$.
ALT TEXT: Figure illustrating our theoretical framework.

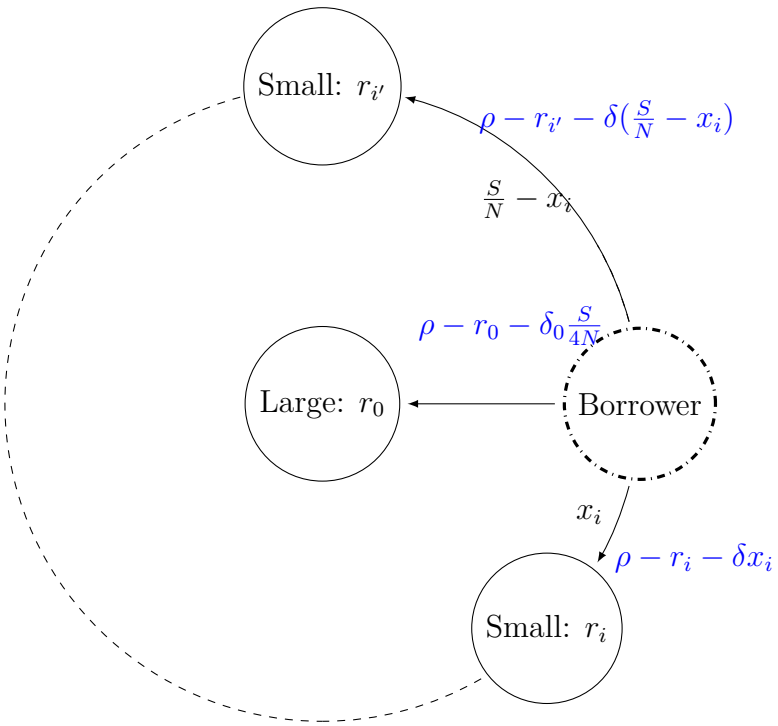
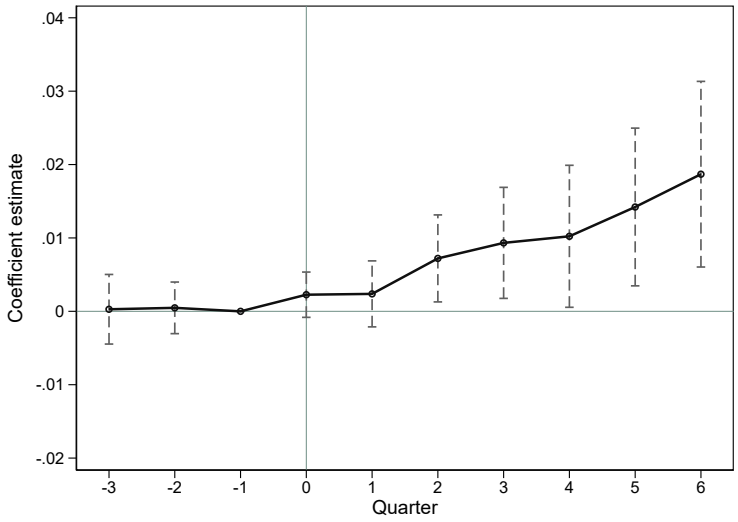


Figure 5: **The dynamics of the federal credit union expansion**

This figure shows the β^τ coefficient estimates of estimating $Y_{i,t} = \sum_{k=-3}^{6} \beta^\tau FCU fraction_i \times Quarter_{t+\tau} + \delta_t + \zeta_i + \varepsilon_{i,t}$, where *FCU fraction* is the local market (county)'s FCU fraction measured in 2015:Q4 using mortgage application volumes, aggregated to the credit union level. The sample includes FCUs only. The dependent variable is the credit union-level balance sheet variables. In Panel A, the dependent variable is log of total number of members; in Panel B, the dependent variable is log of total assets. The sample period is 2016:Q2-2018:Q3. The event quarter (Quarter 0) is 2017:Q1, which was when the NCUA's FOM policy went into effect. These figures present the individual point estimates and their 95% confidence intervals.
ALT TEXT: Graphs showing that FCUs experience growths in size of members and assets after 2017:Q1.

Panel A. Member base expansion



Panel B. Size expansion

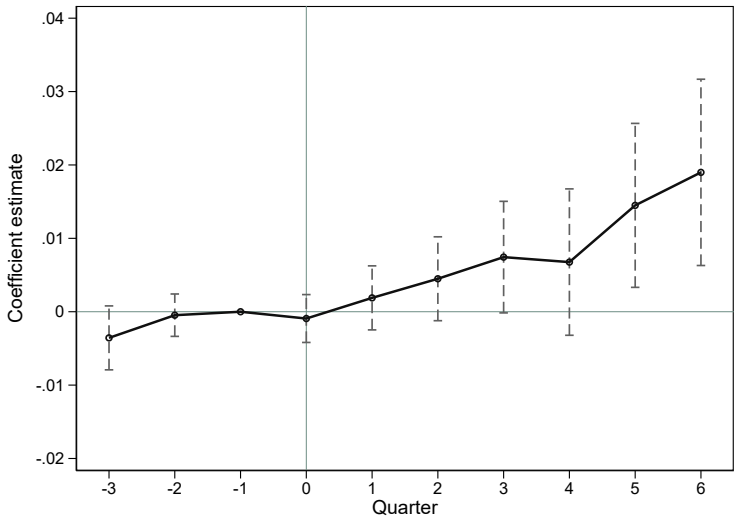
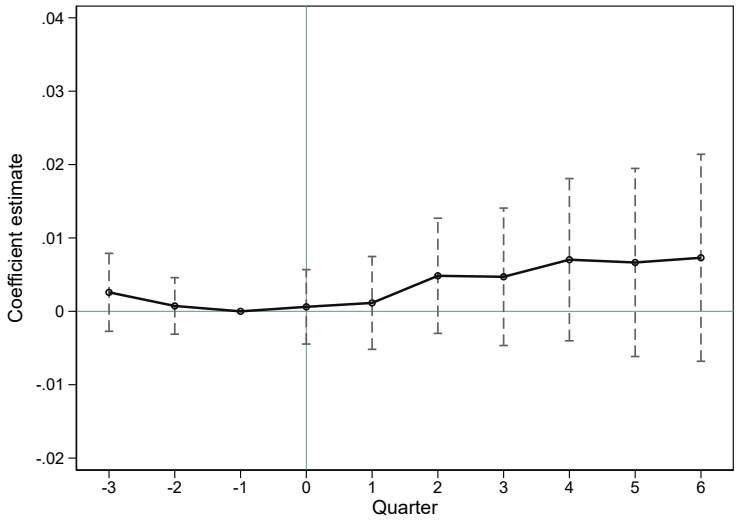


Figure 6: **The dynamics of the state credit union expansion**

This figure shows the β^τ coefficient estimates of estimating $Y_{i,t} = \sum_{k=-3}^{6} \beta^\tau FCU fraction_i \times Quarter_{t+\tau} + \delta_t + \zeta_i + \varepsilon_{i,t}$, where *FCU fraction* is the local market (county)'s FCU fraction measured in 2015:Q4 using mortgage application volumes, aggregated to the credit union level. The sample includes state credit unions only. The dependent variable is the credit union-level balance sheet variables. In Panel A, the dependent variable is log of total number of members; in Panel B, the dependent variable is log of total assets. The sample period is 2016:Q2-2018:Q3. The event quarter (Quarter 0) is 2017:Q1, which was when the NCUA's FOM policy went into effect. These figures present the individual point estimates and their 95% confidence intervals.
ALT TEXT: Graphs showing that the growths in size of members and assets after 2017:Q1 for SCUs are not significant.

Panel A. Member base expansion



Panel B. Size expansion

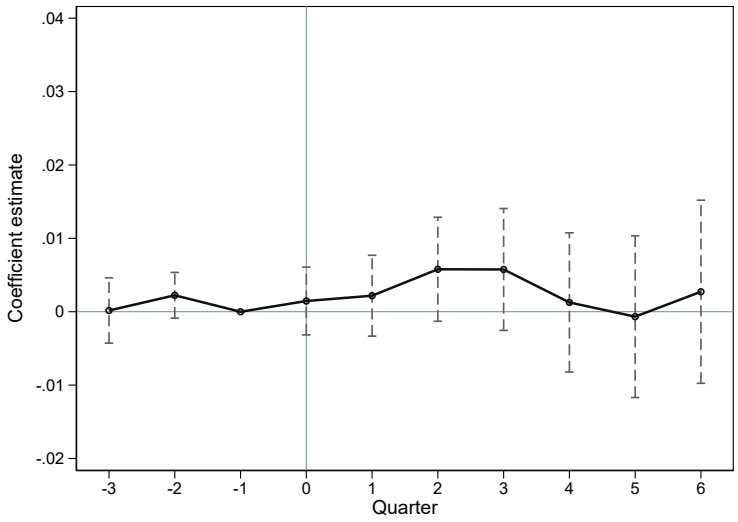
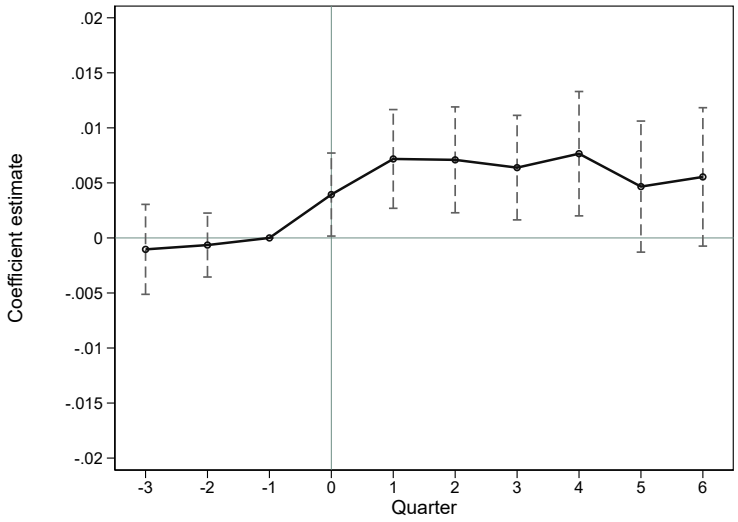


Figure 7: **The dynamics of bank balance sheet**

This figure shows the β^τ coefficient estimates of estimating $Y_{i,t} = \sum_{k=-3}^{6} \beta^\tau FCU fraction_i \times Quarter_{t+\tau} + \delta_t + \zeta_i + \varepsilon_{i,t}$, where *FCU fraction* is the local market (county)'s FCU fraction measured in 2015:Q4 using mortgage application volumes, aggregated to the bank level. The sample includes banks only. In Panel A, the dependent variable is the nonperforming loan ratio (90-Day past due + non-accruals/total loans); in Panel B, the dependent variable is the small business loan ratio (small business loans<$1m/total assets). The sample period is 2016:Q2-2018:Q3. The event quarter (Quarter 0) is 2017:Q1, which was when the NCUA's FOM policy went into effect. These figures present the individual point estimates and their 95% confidence intervals.
ALT TEXT: Graphs showing that banks experience an increase in nonperforming loans and reduce small business lending after 2017:Q1.

Panel A. Nonperforming loans



Panel B. Small business loans

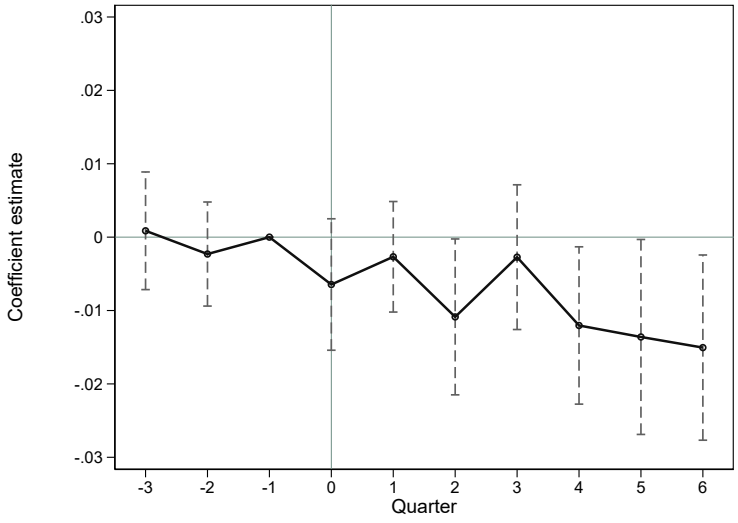


Table 1: **Summary statistics of institutions**

This table presents summary statistics of our main variables used in empirical analyses at the institution level. Panel A presents the statistics for the institution-year-quarter level data for credit unions, FCUs, and SCUs; Panel B presents the statistics for the institution-year-quarter level data for banks, small banks (assets<$100B), and large banks (assets>=$100B). The sample period is 2014-2019. Statistics include the number of observations (N), mean, and the standard deviation (S.D.).

Panel A. CU-year-quarter level

	All credit unions			Federal credit unions			State credit unions		
Variable	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.
FCU fraction	37639	0.108	0.095	19831	0.152	0.099	17808	0.058	0.060
Branches total	36785	8.754	13.649	19557	8.128	14.179	17228	9.466	12.986
Counties total	36775	3.334	5.066	19550	3.140	5.426	17225	3.553	4.615
Members ('000)	37639	57	207	19831	56	262	17808	59	117
Log(Members)	37639	10.137	1.140	19831	10.005	1.130	17808	10.284	1.132
Assets ($million)	37639	727	2643	19831	698	3215	17808	760	1805
Log(Assets)	37639	19.453	1.215	19831	19.321	1.200	17808	19.601	1.214
Log(Shares)	37639	19.310	1.203	19831	19.182	1.186	17808	19.452	1.206
Loans/Assets	37639	0.637	0.160	19831	0.613	0.166	17808	0.663	0.149
Interest income/Assets	37639	0.034	0.007	19831	0.034	0.007	17808	0.035	0.007
Interest expense/Assets	37639	0.004	0.003	19831	0.004	0.003	17808	0.004	0.002
Net interest income/Assets	37639	0.027	0.006	19831	0.027	0.006	17808	0.027	0.006
Delinquent loans(2-6m)/Loans	37639	0.005	0.005	19831	0.005	0.005	17808	0.005	0.005
Delinquent credit cards/Loans	37639	0.000	0.001	19831	0.000	0.001	17808	0.000	0.000

Panel B. Bank-year-quarter level

	All banks			Small banks (Assets<$100B)			Large banks (Assets>=$100B)		
Variable	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.
FCU fraction	63623	0.055	0.060	63115	0.055	0.060	508	0.052	0.020
Log(Assets ('000))	63623	12.988	1.443	63115	12.936	1.327	508	19.384	0.981
Capital ratio	63575	0.112	0.032	63067	0.112	0.032	508	0.117	0.023
Loans/Assets	63623	0.643	0.154	63115	0.646	0.151	508	0.332	0.135
Small loans (<250k)/Assets	57451	0.021	0.016	56957	0.021	0.016	494	0.001	0.002
Small loans (<1m)/Assets	57451	0.083	0.054	56957	0.083	0.054	494	0.008	0.008
Savings deposits/Assets	63612	0.440	0.142	63104	0.439	0.141	508	0.543	0.169
Time deposits/Assets	63612	0.253	0.122	63104	0.255	0.121	508	0.079	0.074
NPL/Loans	63611	0.012	0.018	63103	0.012	0.018	508	0.018	0.011
Mortgage NPL/Loans	63572	0.012	0.020	63064	0.012	0.020	508	0.022	0.018
Mortgage charge-offs/Loans	63572	0.001	0.006	63064	0.001	0.006	508	0.003	0.003

Table 2: **Summary statistics of the HMDA mortgage sample**

This table presents summary statistics of our HMDA mortgage application sample at the loan level. Panel A presents the statistics of the loan-level mortgage application data for credit unions, including home purchase loans and refinance loans; Panel B presents the statistics of the loan-level mortgage application data for banks, including home purchase loans and refinance loans. The sample period is 2014-2019. Statistics include the number of observations (N), mean, median, and the standard deviation (S.D.).

Panel A. Loan applications of credit unions

	Purchase loans				Refinance loans			
Variable	N	Mean	Median	S.D.	N	Mean	Median	S.D.
FCU fraction	1456583	0.108	0.057	0.136	1757630	0.120	0.066	0.144
Federal CU indicator	1456821	0.452	0.000	0.498	1757949	0.464	0.000	0.499
Denied	1456821	0.112	0.000	0.316	1757949	0.209	0.000	0.406
Loan amount	1456821	220.095	176.000	631.629	1757949	193.962	150.000	871.280
Applicant income	1456821	102.799	81.000	381.518	1757949	100.647	80.000	628.885
Occupancy	1456821	0.915	1.000	0.279	1757949	0.942	1.000	0.234
Female applicant	1456821	0.334	0.000	0.472	1757949	0.350	0.000	0.477
Co-borrower	1456821	0.489	0.000	0.500	1757949	0.521	1.000	0.500

Panel B. Loan applications of banks

	Purchase loans				Refinance loans			
Variable	N	Mean	Median	S.D.	N	Mean	Median	S.D.
FCU fraction	7462120	0.066	0.037	0.088	7333225	0.067	0.037	0.089
Denied	7463527	0.103	0.000	0.305	7334503	0.238	0.000	0.426
Loan amount	7463527	303.644	220.000	323.003	7334503	265.626	184.000	334.975
Applicant income	7463527	146.903	100.000	231.653	7334503	131.941	90.000	216.077
Occupancy	7463527	0.848	1.000	0.359	7334503	0.886	1.000	0.318
Female applicant	7463527	0.278	0.000	0.448	7334503	0.276	0.000	0.447
Co-borrower	7463527	0.498	0.000	0.500	7334503	0.507	1.000	0.500

Table 3: **Credit union balance sheet components and operations**

This table presents the results of the effect of the NCUA's FOM policy on credit unions' balance sheet components and operations. The sample period is from 2014 to 2019. *FCU fraction* is the 2015:Q4 county-level FCU's fraction of mortgage applications. *Post* is a dummy variable that equals 1 if the quarter is or after 2017:Q1. *FCU* is a dummy variable that equals 1 if the lender is an FCU, and zero if the lender is a state credit union. The dependent variable is indicated in each column head. Fixed effects are indicated at the column bottom. Standard errors in parentheses are clustered at the credit union level. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Dep. Var.	Sum of branches	Sum of counties operating	Log Members	Log Assets	Log Shares	Total loans /Assets	Interest income /Assets	Interest expense /Assets	Net interest income /Loans	Delinquent 2-6 mon /Loans	Delinquent credit card /Loans
FCU × FCU fraction × Post	2.705**	0.806*	0.232***	0.241***	0.235***	-0.018	0.001	0.002***	-0.001	0.002	0.000
	(1.329)	(0.436)	(0.074)	(0.068)	(0.068)	(0.047)	(0.002)	(0.001)	(0.002)	(0.002)	(0.000)
FCU fraction × Post	-0.928	-0.366	-0.106*	-0.084	-0.084	0.008	-0.002	-0.002**	-0.002	-0.001	-0.000
	(0.897)	(0.348)	(0.064)	(0.058)	(0.059)	(0.042)	(0.002)	(0.001)	(0.002)	(0.002)	(0.000)
FCU × FCU fraction	-0.702	-0.320	0.500	0.026	0.034	0.319***	0.000	-0.004***	-0.001	0.005*	0.001
	(2.485)	(0.983)	(0.332)	(0.288)	(0.280)	(0.108)	(0.005)	(0.002)	(0.005)	(0.003)	(0.001)
FCU × Post	-0.651***	-0.208***	-0.052***	-0.066***	-0.065***	0.004	0.000	-0.000***	0.001***	-0.000	-0.000
	(0.183)	(0.072)	(0.009)	(0.009)	(0.009)	(0.005)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FCU	-0.043	-0.028	-0.070*	0.010	0.008	-0.051***	-0.001	0.001**	-0.001	-0.000	-0.000
	(0.362)	(0.211)	(0.036)	(0.038)	(0.040)	(0.018)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)
Observations	36,785	36,775	37,639	37,639	37,639	37,639	37,639	37,639	37,639	37,639	37,639
Adj. R2	0.987	0.986	0.996	0.997	0.997	0.932	0.920	0.885	0.748	0.568	0.732
CU FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 4: **Bank balance sheet components and operations**

This table presents the results of the effect of the NCUA's FOM policy on banks' balance sheet components and operations. The sample period is from 2014 to 2019. Panel A includes small banks (assets<$100 billion); Panel B includes large banks (assets>=$100 billion). *FCU fraction* is the 2015:Q4 county-level FCU's fraction of mortgage applications. *Post* is a dummy variable that equals 1 if the quarter is or after 2017:Q1. The dependent variable is indicated in each column head. Fixed effects are indicated at the column bottom. Standard errors in parentheses are clustered at the bank level. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dep. Var.	Log Assets	Capital /Assets	Loans /Assets	Small loans <=$250k /Assets	Small loans <=$1mil /Assets	Savings deposits /Assets	Time deposits /Assets	NPL /Loans	Mortgage NPL /Loans	Mortgage charge-offs /Loans
Panel A. Small banks										
FCU fraction × Post	0.089*	-0.003	-0.019	-0.005***	-0.017***	0.007	-0.019*	0.007***	0.006***	0.002**
	(0.052)	(0.004)	(0.015)	(0.002)	(0.005)	(0.016)	(0.012)	(0.003)	(0.002)	(0.001)
Observations	63,114	63,066	63,114	56,946	56,946	63,102	63,102	63,101	63,063	63,063
Adj. R2	0.992	0.899	0.939	0.936	0.939	0.936	0.946	0.745	0.758	0.216
Panel B. Large banks										
FCU fraction × Post	-1.562	0.128	-0.098	-0.011*	-0.037*	0.053	-0.298	-0.086	-0.080	0.044
	(1.212)	(0.116)	(0.552)	(0.005)	(0.021)	(0.390)	(0.275)	(0.086)	(0.125)	(0.049)
Observations	508	508	508	494	494	508	508	508	508	508
Adj. R2	0.994	0.908	0.920	0.949	0.968	0.985	0.952	0.675	0.778	0.366
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 5: **Deposit and loan spreads**

This table presents the branch-year-quarter level results of the effect of the NCUA's FOM policy on changes in deposit or loan spreads. The sample period is from 2014 to 2019. In Panel A, the dependent variable is the difference between the deposit rate and the federal funds rate for 12-month or 36-month certificates of deposit with an account size of $10,000; In Panel B, the dependent variable is the difference between the loan rate and the federal funds rate for home equity lines of credit (HELOC) or 15-year mortgages. *FCU fraction* is the 2015:Q4 fraction of the number of FCUs over total lenders for a lender across all its branches. *Post* is a dummy variable that equals 1 if the quarter is or after 2017:Q1. The county-time control variables include county income per capita, income growth, and the log of HPI. Fixed effects are indicated at the column bottom. Standard errors in parentheses are clustered by county. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

Panel A. Deposits	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	Deposit rate spread (=deposit rate - FF rate)					
Product	CD $10k (12-month)			CD $10k (36-month)		
Lenders	Banks			Banks		
	All	Small <$100B	Large >=$100B	All	Small <$100B	Large >=$100B
FCU fraction × Post	0.241***	0.433***	0.079*	0.160**	0.385**	-0.024
	(0.073)	(0.159)	(0.045)	(0.078)	(0.172)	(0.043)
Observations	56,190	38,584	17,562	53,935	36,361	17,530
Adj. R2	0.973	0.959	0.987	0.969	0.955	0.979
Lender × Year-quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Lender × County FE	Yes	Yes	Yes	Yes	Yes	Yes

Panel B. Loans	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	Loan rate spread (=loan rate - FF rate)					
Product	HELOC			Mortgage (15-year)		
Lenders	Banks			Banks		
	All	Small <$100B	Large >=$100B	All	Small <$100B	Large >=$100B
FCU fraction × Post	-0.614*	-2.362**	-0.327	-0.319*	-1.345*	-0.138
	(0.361)	(0.938)	(0.391)	(0.176)	(0.784)	(0.146)
Observations	8,189	3,225	4,945	3,508	1,410	2,089
Adj. R2	0.952	0.861	0.957	0.885	0.861	0.894
Lender × Year-quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Lender × County FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 6: **Likelihood of mortgage securitization**

This table presents the results of the effect of the NCUA's FOM policy on GSE mortgage lending using loan-level observations from HMDA. The sample period is from 2014 to 2019. The dependent variable is an indicator variable that equals 1 if the loan is sold to a government sponsored entity (GSE), conditional on acceptance. In columns 1, 3, and 4 (2, 5, and 6), mortgages are home-purchase (refinance) loans. In columns 3 and 5 (4 and 6), properties associated with the mortgages are (not) located in the lender's headquarter county. *High FCU%* is an indicator that equals 1 if the fraction of loan application volume of FCUs over all lenders in a census tract is above the median of the fraction distribution, which is measured using the HMDA 2015 data. *Post* is an indicator that equals 1 if the year is or after 2017. *Small bank* is an indicator that equals 1 if the bank's asset is smaller than $100 billion in a given year. *Large bank* is an indicator that equals 1 if the bank's asset is greater than $100 billion in a given year. Loan control variables include indicators for occupancy, female borrower, and co-borrower status. Fixed effects are included and indicated in the column bottom. Standard errors in parentheses are clustered by county. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.			GSE indicator			
Loan sample	Purchase	Refinance	Purchase		Refinance	
Region			HQ county		HQ county	
			Yes	No	Yes	No
Small bank × Post × High FCU%	0.010	0.009	-0.022	0.006	-0.029*	0.015**
	(0.007)	(0.008)	(0.018)	(0.006)	(0.017)	(0.007)
Large bank × Post × High FCU%	0.030***	0.019**	-0.020	0.024***	-0.045	0.021***
	(0.008)	(0.007)	(0.035)	(0.007)	(0.074)	(0.007)
Federal CU (Omitted benchmark)						
Observations	10,488,412	15,205,164	1,465,911	9,022,476	1,841,383	13,363,755
Adj. R2	0.416	0.399	0.431	0.409	0.444	0.384
Loan size decile FE	Yes	Yes	Yes	Yes	Yes	Yes
Income decile FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Lender × County FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 7: **Heterogeneity of mortgage borrowers**

This table presents the results of the effect of the NCUA's FOM policy on mortgage denial rate using loan-level observations from HMDA. The sample period is from 2014 to 2019. The loan sample is a 30% random sample of the universal data obtained from HMDA. Columns 1 to 4 include home purchase loans; columns 5 to 8 include refinance loans. The dependent variable is a dummy variable that equals 1 if the application is denied, and zero otherwise. *FCU* is an indicator variable that equals 1 if the lender of the loan application is a federally chartered credit union, and zero otherwise. *Post* is an indicator variable that equals 1 if the year is or after 2017. *Income quartile 1-4* is an indicator variable for the quartile of the applicant's income distribution in a given year. *FCU fraction* is the 2015:Q4 county-level FCU's fraction of mortgage applications. Loan control variables include indicators for occupancy, female borrower, and the co-borrower status. Fixed effects are included and indicated in the column bottom. Standard errors in parentheses are clustered by lender. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var.	Denied							
Loan sample	Purchase				Refinance			
FCU × Post × Income quartile 1 (Lowest)	-0.015**	-0.017***			-0.013**	-0.024***		
	(0.006)	(0.006)			(0.006)	(0.005)		
FCU × Post × Income quartile 2	-0.002	-0.006			-0.004	-0.014***		
	(0.005)	(0.004)			(0.006)	(0.005)		
FCU × Post × Income quartile 3	0.004	0.002			-0.009*	-0.014***		
	(0.004)	(0.004)			(0.005)	(0.005)		
FCU × Post × Income quartile 4 (Omitted baseline)								
FCU fraction × Post × Income quartile 1 (Lowest)			-0.044**	-0.029*			0.011	0.011
			(0.017)	(0.017)			(0.018)	(0.019)
FCU fraction × Post × Income quartile 2			-0.010	-0.006			0.017	0.009
			(0.013)	(0.012)			(0.018)	(0.019)
FCU fraction × Post × Income quartile 3			-0.004	-0.002			0.027*	0.022
			(0.011)	(0.011)			(0.015)	(0.015)
FCU fraction × Post × Income quartile 4 (Omitted baseline)								
Observations	2,676,043	2,675,805	2,675,553	2,675,315	2,728,236	2,728,008	2,727,758	2,727,529
Adj. R2	0.0363	0.0704	0.0360	0.0704	0.0506	0.102	0.0507	0.102
Borrower controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan amount quintile FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lender FE		Yes		Yes		Yes		Yes

Table 8: **Federal credit union exposure and bank lending**

This table presents OLS estimates from the regressions of county-level change in FCU exposure from 2014 to 2019 on the change in county-level mortgage lending during this period. The dependent variables are the change in log of county-level mortgage origination volume. Columns 1 and 2 focus on all banks; columns 3 and 4 focus on large banks (assets > $100 billion); columns 5 and 6 focus on FCUs; columns 7 and 8 focus on state credit unions. Control variables include change in county-level log of total income, change in log of the population, and change in income growth from 2014-2019. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var.	ΔLog of mortgage originations							
Lender sample:	All banks		Large banks (Assets > $100B)		FCU		State CU	
ΔFCU branches	-0.003***		-0.007***		0.008**		0.004	
	(0.001)		(0.002)		(0.003)		(0.004)	
ΔFCU		-0.011***		-0.020***		0.019***		0.013
		(0.002)		(0.004)		(0.006)		(0.008)
ΔLog(Income)	0.693***	0.674**	0.128	0.095	0.002	0.027	1.216***	1.239***
	(0.267)	(0.268)	(0.444)	(0.445)	(0.450)	(0.453)	(0.453)	(0.455)
ΔLog(Population)	4.198***	4.203***	3.723***	3.733***	2.998***	2.987***	2.528***	2.522***
	(0.365)	(0.365)	(0.505)	(0.505)	(0.793)	(0.793)	(0.759)	(0.759)
ΔIncome growth	-0.733	-0.710	-0.414	-0.376	0.698	0.666	1.843**	1.817**
	(0.592)	(0.594)	(0.779)	(0.780)	(0.682)	(0.684)	(0.731)	(0.732)
Observations	3,060	3,060	3,060	3,060	3,060	3,060	3,060	3,060
Adj. R2	0.0932	0.0939	0.0244	0.0253	0.00358	0.00374	0.00752	0.00764

Table 9: **Bank branch exits: identification strategy**

This table presents the bank-county-year-quarter level results of the effect of the NCUA's FOM policy on the branch exit for banks. The sample period is from 2014 to 2019. The dependent variable is the total number of branch exits of a bank in a county over various quarters. *FCU fraction* is the 2015:Q4 measure of the FCU fraction for a bank across all its branches, where the FCU fraction is firstly calculated for counties and then aggregated to the bank level, using mortgage application volumes. *County HHI* is the county-year Herfindahl-Hirschman index (HHI) in a given county in a given year. The county-year HHI is calculated by summing up the squared deposit-market shares of all bank branches in the given county in the given year. *Post* is a dummy variable that equals 1 if the quarter is or after 2017:Q1. Bank controls include the log of assets, capital ratio, return on assets, deposit ratio, and loan ratio. Fixed effects are indicated in the bottom column. Standard errors in parentheses are clustered by county. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var.	Total number of branch exits							
Time window	t		[t,t+1]		[t,t+2]		[t,t+4]	
FCU fraction × County HHI × Post	-0.351**	-0.427***	-0.777***	-0.907***	-1.043***	-1.201***	-1.376**	-1.541***
	(0.142)	(0.150)	(0.281)	(0.293)	(0.378)	(0.375)	(0.604)	(0.559)
FCU fraction	0.086	2.005*	-2.148	1.038	-6.488*	-2.388	-15.762**	-6.737*
	(0.992)	(1.172)	(2.318)	(2.205)	(3.713)	(3.922)	(6.786)	(3.901)
FCU fraction × County HHI	0.109	0.116	0.257	0.237	0.369	0.247	0.467	-0.401
	(0.115)	(0.327)	(0.223)	(0.664)	(0.345)	(1.020)	(0.611)	(1.667)
FCU fraction × Post	0.088**	0.109***	0.202***	0.241***	0.281***	0.332***	0.383**	0.448***
	(0.039)	(0.041)	(0.077)	(0.079)	(0.109)	(0.110)	(0.177)	(0.172)
Observations	447,393	447,387	444,505	444,505	441,600	441,455	435,933	435,932
R-squared	0.104	0.186	0.134	0.285	0.159	0.367	0.200	0.496
County-Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes		Yes		Yes		Yes	
Bank-County FE		Yes		Yes		Yes		Yes

A. Internal Appendix

A.1 Proof of Propositions

Proposition 1. *If the market size S for small and large banks is greater than the threshold*

$$\underline{S} = \frac{4N\left(\kappa_0 - \kappa\right)}{4\delta - \delta_0}, \tag{1}$$

then each small bank i's market share is

$$s_i = \frac{S}{6N\delta}\left(\delta + 2\delta_0\right) + \frac{2}{3\delta}\left(\kappa_0\text{-}\kappa\right),$$

whereas the large bank's market share is

$$s_0 = S - Ns_i = S - \frac{S}{6\delta}\left(\delta + 2\delta_0\right) - \frac{2N}{3\delta}\left(\kappa_0\text{-}\kappa\right).$$

Moreover, small banks charge interest rate

$$r_i = \frac{\kappa_0 + 2\kappa}{3} + \frac{S\delta}{6N} + \frac{S\delta_0}{12N},$$

whereas for the large bank

$$r_0 = \frac{2\kappa_0 + \kappa}{3} + \frac{S\delta}{3N} - \frac{S\delta_0}{12N}.$$

Otherwise, each small bank obtains a market share of $\frac{S}{N}$ and charges interest rate $r_i = \kappa + \frac{S\delta}{N}$, whereas the large bank has a market share of 0.

Proof. First, we consider a borrower's choice between two adjacent small banks i and i'. In order to have the borrower choose to deal with the small bank i instead of i', we need to have

$$\rho - r_i - \delta x_i \geq \rho - r_{i'} - \delta\left(\frac{S}{N} - x_i\right)$$

or

$$x_i \leq \frac{S}{2N} - \frac{r_{i'} - r_i}{2\delta}$$

and in addition, to have the borrower choose to deal with the small bank i instead of the large bank, we need

$$\rho - r_i - \delta x_i \geq \rho - r_0 - \delta_0 \frac{S}{4N}$$

or

$$x_i \leq \frac{S\delta_0}{4N\delta} + \frac{r_0 - r_i}{\delta}.$$

Now consider the bank i, which adjacents to bank i' and i''. It is easy to see that bank i will attract $\frac{S}{N} + \frac{r_{i'}+r_{i''}-2r_i}{2\delta}$ amount of borrowers if the large bank does not present, or $2\left(\frac{S\delta_0}{4N\delta} + \frac{r_0-r_i}{\delta}\right)$ if small banks do not present. Therefore, the small bank i's market share would be

$$\min\left(\frac{S}{N} + \frac{r_{i'} + r_{i''} - 2r_i}{2\delta}, \frac{S\delta_0}{2N\delta} + 2\left(\frac{r_0 - r_i}{\delta}\right)\right).$$

Given the symmetric setting among small banks, the optimal interest rate set by small banks would be the same. Therefore, the small bank market share above gives us two scenarios about the small bank i's market share. Either the large bank participates in competition, in which case $s_i = \frac{S\delta_0}{2N\delta} + 2\left(\frac{r_0-r_i}{\delta}\right)$, or the large bank does not participate in competition, in which case $s_i = \frac{S}{N} + \frac{r_{i'}+r_{i''}-2r_i}{2\delta}$.

Scenario 1: When the large bank participates in competition, we have each small bank i's market share to be $s_i = \frac{S\delta_0}{2N\delta} + 2\left(\frac{r_0-r_i}{\delta}\right)$, and the large bank's market share is $s_0 = S - \frac{S\delta_0}{2\delta} - 2N\left(\frac{r_0-r_i}{\delta}\right)$.

From the small bank i, we have $\frac{\partial s_i}{\partial r_i} = -\frac{2}{\delta}$. So the FOC is

$$0 = \frac{\partial \pi_i}{\partial r_i} = \frac{\partial s_i}{\partial r_i}(r_i - \kappa) + s_i = -\frac{2}{\delta}(r_i - \kappa) + \frac{S\delta_0}{2N\delta} + 2\left(\frac{r_0 - r_i}{\delta}\right),$$

or $2r_0 - 4r_i = -\frac{S\delta_0}{2N} - 2\kappa$.

On the other hand, for the large bank, we have $\frac{\partial s_0}{\partial r_0} = -\frac{2N}{\delta}$. So the FOC is

$$0 = \frac{\partial \pi_0}{\partial r_0} = \frac{\partial s_0}{\partial r_0}(r_0 - \kappa_0) + s_0 = -\frac{2N}{\delta}(r_0 - \kappa_0) + S - \frac{S\delta_0}{2\delta} - 2N\left(\frac{r_0 - r_i}{\delta}\right),$$

or $2r_0 - r_i = \kappa_0 + \frac{\delta S}{2N} - \frac{S\delta_0}{4N}$.

Therefore we can solve for $r_i = \frac{\kappa_0 + 2\kappa}{3} + \frac{S\delta}{6N} + \frac{S\delta_0}{12N}$ and $r_0 = \frac{2\kappa_0 + \kappa}{3} + \frac{S\delta}{3N} - \frac{S\delta_0}{12N}$.

Moreover, given

$$2\left(\frac{r_0 - r_i}{\delta}\right) = 2\frac{\kappa_0\text{-}\kappa}{3\delta} + \frac{1}{6N\delta}(\delta - \delta_0)S,$$

so

$$s_i = \frac{S\delta_0}{2N\delta} + 2\left(\frac{r_0 - r_i}{\delta}\right) = \frac{S}{6N\delta}(\delta + 2\delta_0) + \frac{2}{3\delta}(\kappa_0\text{-}\kappa)$$

$$s_0 = S - Ns_i = S - \frac{S}{6\delta}(\delta + 2\delta_0) - \frac{2N}{3\delta}(\kappa_0\text{-}\kappa).$$

Scenario 2: When the large bank does not participate in competition, it is easy to see that the large bank's participation in competition should also satisfy the large bank's IR condition $\pi_0 \geq 0$, which translates into both $s_0 \geq 0$, and $r_0 \geq \kappa_0$. Given the equation of r_0, r_1, and s_0 we have derived above, we obtain the conditions as

$$0 \leq s_0 = S - \frac{S\delta_0}{2\delta} - 2N\left(\frac{r_0 - r_i}{\delta}\right) = S - \frac{S\delta_0}{2\delta} - \frac{2N}{\delta}\left(\frac{\kappa_0 - \kappa}{3} + \frac{1}{6N}(\delta - \delta_0)S\right)$$

and

$$\frac{2\kappa_0 + \kappa}{3} + \frac{S\delta}{3N} - \frac{S\delta_0}{12N} \geq \kappa_0$$

Simplify both conditions we get the same criteria as

$$S \geq \frac{4N(\kappa_0 - \kappa)}{4\delta - \delta_0}$$

which translate into a minimum size of S that satisfies both conditions. In other words, when CUs taking up too much market and leave the small banks and large bank competiting for too small of a market, the large bank will exit the market altogether.

Finally, for the small bank i, we have $s_i = \frac{S}{N} + \frac{r_{i'} + r_{i''} - 2r_i}{2\delta}$, so $\frac{\partial s_i}{\partial r_i} = -\frac{1}{\delta}$. So the FOC is

$$0 = \frac{\partial \pi_i}{\partial r_i} = \frac{\partial s_i}{\partial r_i}(r_i - \kappa) + s_i = -\frac{1}{\delta}(r_i - \kappa) + \frac{S}{N} + \frac{r_{i'} + r_{i''} - 2r_i}{2\delta}$$

Given the symmetric equilibrium, we have $r_{i'} = r_{i''} = r_i$, so $r_i = \kappa + \frac{S\delta}{N}$.

A.2 Variable definitions

Variable	Description	Data source
Panel A. CU-year-quarter level		
FCU fraction	The institution-level measure of the fraction of FCUs over all lenders (i.e., both banks and CUs) across all counties in which the institution operates. The fraction is calculated at the census tract level based on the mortgage application volume in 2015:Q4, then aggregated to the institution level.	HMDA
Post	An indicator variable that equals 1 if the quarter is or after 2017:Q1, and zero otherwise.	NCUA Call Report
Sum of branches	The total number of branches of a credit union in a year-quarter.	NCUA Call Report
Sum of counties operating	The total number of counties where a credit union operates in a year-quarter.	NCUA Call Report
Assets ($million)	Total assets of a credit union (in $million).	NCUA Call Report
Log(Assets)	Log of total assets of a credit union.	NCUA Call Report
Log(Shares)	Log of total deposits (shares) of a credit union.	NCUA Call Report
Members ('000)	Total members of a credit union (in thousands).	NCUA Call Report
Log(Members)	Log of total members of a credit union.	NCUA Call Report
Interest income/Assets	Total interest income/total assets.	NCUA Call Report
Interest expense/Assets	Total interest expense/total assets.	NCUA Call Report
Net interest income/Assets	(Total interest income - interest expense - loan loss provisions)/total assets.	NCUA Call Report
Delinquent loans(2-6m)/Loans	The volume of loans 6-12 months overdue/total loans and leases.	NCUA Call Report
Delinquent credit cards/Loans	Total delinquent credit cards/total loans and leases.	NCUA Call Report
Panel B. Bank-year-quarter level		
FCU fraction	The institution-level measure of the fraction of FCUs over all lenders (i.e., both banks and CUs) across all counties in which the institution operates. The fraction is calculated at the census tract level based on the mortgage application volume in 2015:Q4, then aggregated to the institution level.	HMDA
Post	An indicator variable that equals 1 if the quarter is or after 2017:Q1, and zero otherwise.	Call Report
Log(Assets)	Log of bank's total assets.	Call Report
Capital ratio	Bank capital/total assets.	Call Report
Loans/Assets	Total loans/total assets.	Call Report
Small loans (<250k)/Assets	Total loans (<$250k)/total assets.	Call Report
Small loans (<1M)/Assets	Total loans (<$1 million)/total assets.	Call Report
Savings deposits/Assets	Total savings deposits/total assets.	Call Report
Time deposits/Assets	Total time deposits/total assets.	Call Report
NPL/Loans	Non-performing loans that are 90-Day past due + non-accruals/total loans.	Call Report
Mortgage NPL/Loans	1-4 Family mortgage loans 90-Day past due + Non-accruals/total 1-4 family mortgage loans.	Call Report
Mortgage charge-offs/Loans	1-4 Family mortgage charge-offs/total 1-4 family mortgage loans.	Call Report

Variable	Description	Data source
Panel C. Branch-level		
Deposit spread on CD	Deposit rate (on CD with a certain amount and certain maturity) - Federal funds rate.	RateWatch & FRED
Loan spread	Loan rate (on a certain loan product) - Federal funds rate.	RateWatch & FRED
Federal funds rate	Monthly effective Federal funds rate.	FRED
Panel D. Mortgage lending: Loan-level		
Denied	An indicator variable that equals 1 if the application is denied.	HMDA
FCU	An indicator variable that equals 1 if the lender of the loan application is an FCU, and zero otherwise.	HMDA
Post	An indicator variable that equals 1 if the year is or after 2017.	HMDA
Income quartile 1-4	An indicator variable for the quartile of the applicant's income distribution in a given year.	HMDA
Female	An indicator variable that equals 1 if the applicant is female.	HMDA
Occupancy	An indicator variable that equals 1 if the loan is for an owner-occupied property.	HMDA
Coborrower	An indicator variable that equals 1 if the applicant has a co-borrower.	HMDA
Panel E. Bank-county-year-quarter level		
FCU fraction	A 2015:Q4 measure of the FCU fraction for a bank across all its branches, where the FCU fraction is firstly calculated for counties and then aggregated to the bank level, using mortgage application volumes.	NCUA Call Report & FDIC SOD
FCU fraction high	An indicator variable that equals 1 if the 2015:Q4 measure of the FCU fraction for a bank across all its branches is above the median value of the 2015 distribution, where the FCU fraction is firstly calculated for counties then aggregated to the bank level, using mortgage application volumes.	NCUA Call Report & FDIC SOD
County HHI	The county-year Herfindahl-Hirschman index (HHI) in a given county in a given year. The county-year HHI is calculated by summing up the squared deposit-market shares of all bank branches in the given county in the given year.	FDIC SOD
Post	An indicator variable that equals 1 if the year is or after 2017.	HMDA
Total number of branch exits	The sum of bank branch exits (through closure or sale) of a bank in a county in the concurrent quarter.	NIC
Panel F. Cross-sectional county level		
ΔBank p.c.	The change in county-level banks (per million population) from 2014-2019.	NIC & BEA
ΔFCU branches	The change in county-level FCU branches from 2014-2019.	NCUA Call Report & BEA
ΔFCU	The change in county-level FCUs from 2014-2019.	NCUA Call Report & BEA
ΔLog(Income)	The change in county-level log of total income from 2014-2019.	BEA
ΔLog(Population)	The change in county-level log of total population from 2014-2019.	BEA
ΔIncome growth	The change in county-level income growth from 2014-2019.	BEA
ΔLog of mortgage originations	The change in log of county-level mortgage originations from 2014-2019.	HMDA

Online Appendix

A supplementary section that is only published online

A. Supplementary results

Table A1: **Federal credit union-bank competition**

This table presents OLS estimates from the regressions of county-level change in FCU exposure from 2014 to 2019 on the county-level bank exposure during this period. The dependent variable is the change in county-level banks (per million population) from 2014 to 2019. $\Delta FCU\ branches$ is the change in the number of county-level FCU branches from 2014 to 2019. ΔFCU is the change in the number of county-level FCUs from 2014 to 2019. Control variables include change in county-level log of total income, change in log of the population, and change in income growth from 2014-2019. All columns include state fixed effects. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
Dep. Var.		ΔBank p.c.		
ΔFCU branches	-0.281***	-0.113**		
	(0.058)	(0.054)		
ΔFCU			-0.669***	-0.400***
			(0.142)	(0.131)
ΔLog(Income)	-31.240*	-10.991	-32.101*	-11.344
	(18.820)	(22.165)	(18.900)	(22.176)
ΔLog(Population)	-219.913***	-222.935***	-219.533***	-223.481***
	(21.852)	(25.396)	(21.872)	(25.410)
ΔIncome growth	-9.207	-13.614	-8.123	-13.175
	(29.814)	(28.343)	(29.861)	(28.362)
Observations	3,060	3,059	3,060	3,059
Adj. R2	0.042	0.050	0.042	0.050
State FE		Yes		Yes

Table A2: **Changes in mortgage interest rates: Indicator variable**

This table presents the results of the effect of the NCUA's FOM policy on changes in mortgage interest rates using loan-level HMDA-FNM/FDM merged data. The sample period is from 2014 to 2019, and the sample includes loans sold to government-sponsored enterprises (GSEs) only. The dependent variable is the contractual interest rate at origination. *FCU fraction high* is an indicator variable that equals 1 if the census-tract-level fraction of loan application volume of FCUs over all mortgage applications in 2015 is above its median value, and zero otherwise. *Post* is a dummy variable that equals 1 if the month is or after February 2017, when the FOM policy change became effective. Loan control variables include indicator variables for occupancy, female borrower, and co-borrower status. Fixed effects are included and indicated in the column bottom. Standard errors in parentheses are clustered by lender. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lender sample:	All	FCU	SCU	All banks	Bank assets			
					<$10B	>=$10B	<$100B	>=$100B
Dep. Var.	Interest rate							
FCU fraction high × Post	-0.006***	-0.033**	-0.007	-0.007***	-0.012***	0.001	-0.011***	0.005**
	(0.002)	(0.013)	(0.009)	(0.002)	(0.004)	(0.002)	(0.003)	(0.003)
Observations	943,879	38,550	50,214	851,020	297,570	553,233	460,021	390,801
Adj. R2	0.718	0.769	0.774	0.712	0.767	0.685	0.751	0.675
Refinance FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cashout FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan term FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan size quintile FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Income quintile FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lender FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table A3: **Mortgage ex ante and ex post risks**

This table presents the results of the effect of the NCUA's FOM policy on changes in mortgage risks using loan-level HMDA-FNM/FDM merged data. The sample period is from 2014 to 2019, and the sample includes loans sold to government-sponsored enterprises (GSEs) only. The dependent variable is indicated at the column head. In Panel A, the dependent variables are the credit scores and the loan-to-value ratio (LTV). In Panel B, the dependent variables are the 60-day delinquency and foreclosure indicators, where *Delinquency (60+ days)* is an indicator variable that equals 1 if the loan is 60-day past due after it was issued, and *Foreclosure* is an indicator variable that equals 1 if the property is foreclosed after it was issued. *FCU fraction* is the census-tract-level fraction of loan application volume of FCUs over all mortgage applications in 2015. *Post* is a dummy variable that equals 1 if the month is or after February 2017, when the FOM policy change became effective. Loan control variables include indicator variables for occupancy, female borrower, and co-borrower status. Fixed effects are included and indicated in the column bottom. Standard errors in parentheses are clustered by county. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

Panel A. Ex ante risk	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lender sample:	FCU	All banks	Bank assets		FCU	All banks	Bank assets	
			<$100B	>=$100B			<$100B	>=$100B
Dep. Var.	FICO				LTV			
FCU fraction × Post	1.859	0.286	1.013	-0.177	-0.318	0.835	0.871	0.951
	(3.325)	(1.231)	(1.709)	(1.745)	(1.084)	(0.517)	(0.651)	(0.606)
Observations	38,550	851,020	460,021	390,801	38,550	851,020	460,021	390,801
Adj. R2	0.0637	0.0655	0.0657	0.0672	0.449	0.397	0.371	0.417

Panel B. Ex post risk	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lender sample:	FCU	All banks	Bank assets		FCU	All banks	Bank assets	
			<$100B	>=$100B			<$100B	>=$100B
Dep. Var.	Delinquency (60+ days)				Foreclosure			
FCU fraction × Post	-0.003	0.009	0.009	0.003	0.004	0.002	0.005	0.000
	(0.014)	(0.006)	(0.007)	(0.009)	(0.006)	(0.003)	(0.004)	(0.004)
Observations	38,550	851,020	460,021	390,801	38,550	851,020	460,021	390,801
Adj. R2	0.0208	0.0212	0.0200	0.0230	0.0177	0.00682	0.00645	0.00816
Refinance FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cashout FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan term FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan size quintile FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Income quintile FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lender FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table A4: **Mortgage ex ante and ex post risks: Indicator variable**

This table presents the results of the effect of the NCUA's FOM policy on changes in mortgage risks using loan-level HMDA-FNM/FDM merged data. The sample period is from 2014 to 2019, and the sample includes loans sold to government-sponsored enterprises (GSEs) only. The dependent variable is indicated at the column head. In Panel A, the dependent variables are the credit scores and the loan-to-value ratio (LTV). In Panel B, the dependent variables are the 60-day delinquency and foreclosure indicators, where *Delinquency (60+ days)* is an indicator variable that equals 1 if the loan is 60-day past due after it was issued, and *Foreclosure* is an indicator variable that equals 1 if the property is foreclosed after it was issued. *FCU fraction high* is an indicator variable that equals 1 if the census-tract-level fraction of loan application volume of FCUs over all mortgage applications in 2015 is above its median value, and zero otherwise. *Post* is a dummy variable that equals 1 if the month is or after February 2017, when the FOM policy change became effective. Loan control variables include indicator variables for occupancy, female borrower, and co-borrower status. Fixed effects are included and indicated in the column bottom. Standard errors in parentheses are clustered by county. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

Panel A. Ex ante risk	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lender sample:	FCU	All banks	Bank assets		FCU	All banks	Bank assets	
			<$100B	>=$100B			<$100B	>=$100B
Dep. Var.	FICO				LTV			
FCU fraction high × Post	0.248	0.037	0.128	0.047	-0.119	-0.115	0.006	-0.219*
	(1.673)	(0.225)	(0.320)	(0.320)	(0.550)	(0.084)	(0.107)	(0.113)
Observations	38,550	851,020	460,021	390,801	38,550	851,020	460,021	390,801
Adj. R2	0.0637	0.0654	0.0657	0.0671	0.448	0.397	0.371	0.416
Panel B. Ex post risk	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lender sample:	FCU	All banks	Bank assets		FCU	All banks	Bank assets	
			<$100B	>=$100B			<$100B	>=$100B
Dep. Var.	Delinquency (60+ days)				Foreclosure			
FCU fraction high × Post	-0.001	0.001	0.002	-0.001	0.002	0.001*	0.001	0.000
	(0.007)	(0.001)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)
Observations	38,550	851,020	460,021	390,801	38,550	851,020	460,021	390,801
Adj. R2	0.0208	0.0212	0.0200	0.0230	0.0176	0.00683	0.00646	0.00816
Refinance FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cashout FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan term FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan size quintile FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Income quintile FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lender FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

B. Changes in bank branch footprints

Our county-level evidence shows that an increase in the FCU fraction is associated with a higher probability of bank branch exits after the FOM rule became effective. However, to show that the expansion policy of FCUs has a direct *causal* effect on bank exits, we need to rule out alternative explanations and confirm that our estimates are not driven by omitted variables, in particular, local economic conditions and lending opportunities. In this subsection, we exploit a more granular cross section at the bank-county-year-quarter level to control for local economic conditions and changes in credit demand.

An important alternative explanation is that branch exits in a county could be driven by local economic forces in that county. In other words, it is possible that areas with a higher FCU fraction are more sensitive to changes in FCU dominance due to some omitted factors. For instance, if credit demand in markets with a higher FCU dominance is more sensitive to an increase in FCU expansion, we may observe that more branches would be closed in those areas due to a larger decline in credit demand. Therefore, to identify the causal effect of FCU expansion on bank branch exits, we need to control for county-level demand-related factors that may vary over time. A valid test requires variation in banks' FCU exposure in a given county that is independent of the local economic conditions in that county. We therefore exploit variation in the FCU exposure at the bank level and control for county-by-year-quarter fixed effects. The county-by-year-quarter fixed effects control for any time-varying factors at the county level, such as shocks to a county that can affect the branch reallocation decision. The test, which is "within-county" in nature, allows us to directly compare different bank branches operating in the same county in the same year-quarter.

In particular, we estimate the following specification:

$$\begin{aligned} Y_{i,c,t} = {} & \beta_1 FCU\ fraction_i \times County\ HHI_c \times Post_t \\ & + \beta_2 FCU\ fraction_i \times Post_t + \beta_3 County\ HHI_c \times Post_t \\ & + \beta_4 FCU\ fraction_i \times County\ HHI_c \\ & + \beta_5 FCU\ fraction_i + \beta_6 County\ HHI_c + \beta_7 Post_t + \delta_{c\times t} + \eta_{i\times c} + \varepsilon_{i,c,t}, \end{aligned} \tag{9}$$

where the dependent variable is the number of bank branch exits of bank i in county c in year-quarter t. *FCU fraction* is the 2015:Q4 measure of the FCU fraction for a bank across all its branches, where the FCU fraction is firstly calculated for counties then aggregated to the bank level, using mortgage application volumes. *County HHI* is the county-year Herfindahl-Hirschman index (HHI) in a given county in a given year. The county-year HHI is calculated by summing up the squared deposit-market shares of all bank branches in the given county in the given year. *Post* is a dummy variable that equals 1 if the quarter is or after 2017:Q1. Bank controls include log of assets, capital ratio, return on assets, deposit ratio, and loan ratio. Important for our identification strategy, we control for county-by-year-quarter fixed effects to control for any time-varying local economic conditions such as credit demand changes. In a more restrictive specification, we also include county-by-bank fixed effects to control for any time-constant heterogeneity of bank-county pairs, such as the informational advantage a bank has in a county. We cluster standard errors by county.

We report the results in Table 9. The coefficient estimate on β_1 across all columns is negative and significant, suggesting that banks operating in areas with higher FCU exposures shut down more branches after the FOM policy shock, and this effect is more pronounced if the local lending market is more competitive. In column 1, we control for the bank fixed effects, and in column 2, we find that the coefficient estimate becomes economically larger and more statistically significant after we control for county-by-bank fixed effects. Moving from columns 1-2 to columns 7-8, we increase the time window length to examine the effect

on the branch exits in a longer run. The estimated coefficient magnitude increases almost monotonically with the length of the time window. For example, the coefficient estimate for a two-quarter window (column 6) has a magnitude that is around two to three times that over the concurrent quarter (column 2). To mitigate the effect of possible outliers and distribution issues regarding the *FCU fraction* measure, we replace the continuous variable with an indicator variable, and we find qualitatively robust results in Table B1.

Table B1: **Bank branch exits: Indicator variables**

This table presents the bank-county-year-quarter level results of the effect of the NCUA's FOM policy on the branch exit for banks. The sample period is from 2014 to 2019. The dependent variable is the total number of branch exits of a bank in a county over various quarters. *FCU fraction high* is an indicator variable that equals 1 if the 2015:Q4 measure of the FCU fraction for a bank across all its branches is above the median value of the 2015 distribution, where the FCU fraction is firstly calculated for counties then aggregated to the bank level, using mortgage application volumes. *County HHI low* is an indicator variable that equals 1 if the county-year Herfindahl-Hirschman index (HHI) in a given county in a given year is below the median value of the distribution in a given year. The county-year HHI is calculated by summing up the squared deposit-market shares of all bank branches in the given county in the given year. *Post* is a dummy variable that equals 1 if the quarter is or after 2017:Q1. Bank controls include the log of assets, capital ratio, return on assets, deposit ratio, and loan ratio. Fixed effects are indicated in the bottom column. Standard errors in parentheses are clustered by county. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var.	Total number of branch exits							
Time window	t		[t,t+1]		[t,t+2]		[t,t+4]	
FCU fraction high × County HHI low × Post	0.009***	0.012***	0.018***	0.023***	0.026***	0.033***	0.035**	0.044***
	(0.004)	(0.004)	(0.007)	(0.007)	(0.010)	(0.010)	(0.016)	(0.016)
FCU fraction high × County HHI low	-0.002	-0.008	-0.003	-0.010	-0.003	-0.012	0.002	0.013
	(0.003)	(0.007)	(0.005)	(0.014)	(0.008)	(0.019)	(0.014)	(0.034)
FCU fraction high × Post	0.002	0.000	0.005	0.002	0.007	0.001	0.007	-0.000
	(0.003)	(0.003)	(0.005)	(0.005)	(0.007)	(0.007)	(0.011)	(0.011)
Observations	447,393	447,387	444,505	444,505	441,600	441,455	435,933	435,932
R-squared	0.105	0.187	0.134	0.285	0.160	0.367	0.200	0.496
County-Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes		Yes		Yes		Yes	
Bank-County FE		Yes		Yes		Yes		Yes