Credit Union Expansion and Bifurcation in Local Bank Lending *

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Abstract

Exploiting the 2017 Field of Membership rule change that unleashed the growth of credit unions (CUs) locally, we document how large and small banks respond differently: Smaller banks raise deposit rates, lower loan rates, and experience higher credit risk. Larger banks, in contrast, cut back costly small business lending and keep deposit rates unchanged, leading to deposit outflows and, eventually, market exits. This bifurcation is further illustrated in a theory framework that highlights small banks' advantage in local lending or monitoring costs. Moreover, CUs' expansion improves credit access to customers in low-income and underserved communities usually left out by large banks.

Keywords: Credit unions, Bank competition, Credit supply, Underserved communities, Market segmentation
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1. Introduction

In recent decades, the U.S. credit market, traditionally dominated by banks, has undergone significant changes. Credit unions (CUs), which were traditionally community-focused financial intermediaries, have now expanded their presence and are aggressively competing with banks.[1] From 2000 to 2020, the total assets of credit unions in the U.S. have grown fivefold from $421 billion to $2.06 trillion,[2] and the entire CU system serves more than 132.6 million consumers in the U.S. by the end of 2022.[3] Despite the rapid expansion of CUs, their impact on local banks, businesses, and consumers remains understudied. How do different banks react to the rapid expansion of CUs in the local credit market? What are the credit allocation implications on the rural, low-income, and underserved communities?

We show that as federally chartered credit unions (FCUs) in the U.S. continue to expand membership bases, grow business assets, and acquire market shares with competitive rates, smaller local banks that are dependent on the local market reacted aggressively, while larger banks did not. While exacerbating competition and segmentation in the local bank market, FCUs' expansion does lead to improved credit services and availability without causing credit quality deterioration. In particular, the changes appear to be beneficial for rural, low-income, and underserved communities.

A major challenge in identifying the effects of CU growth on bank lending is that the competitive dynamics may not be randomly assigned. Thus, 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. This paper tackles the challenge by being the first to exploit the field-of-membership (FOM) rule change, implemented by the National Credit Union Administration (NCUA) Board in 2017, that allows FCUs to expand by significantly relaxing their membership constraints.[4]

[1] For example, the Wall Street Journal reported that the CEO from Pentagon Federal Credit Union intended to quadruple the credit union's assets from $18 billion to $75 billion by 2025.

[2] National Credit Union Administration (NCUA) Annual Reports of 2000 and 2020.

[3] Data are from the National Credit Union Administration (NCUA).

[4] A credit union field of membership is a common bond among its members that determines who is eligible to join the credit union. The field of membership is based on a credit union'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

The direct effect of the FOM rule change was that the common bond requirements and geographic boundaries for FCUs to include new members were significantly relaxed, which was consistent with the stated goal of this policy, allowing "more Americans to become eligible for (federal) credit union membership". Following the rule change, FCUs were able to 1) add individuals who were previously ineligible to join their membership base and 2) expand to a bigger area of the local market where they were previously not permitted to operate. Its impact is perceived to be the most significant and comprehensive since the aftermath of the Great Recession.[5]

Critically for our identification strategy, the rule changes allow FCUs to expand mostly in their "local market". Thus, although the rule was implemented nationwide, banks operating in *different* local markets face *different* levels of competitive pressure from FCUs' expansion, depending on the location of banks and FCUs prior to the FOM rule changes.

Equally important, the FOM rule changes only targeted federally chartered credit unions while leaving other types of lenders unaffected (e.g., commercial banks and state-chartered credit unions). 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 not affected by the rule changes, such as state-chartered credit unions (SCUs).

Our empirical strategy builds on the unique features of the rule changes and employs a continuous difference-in-differences approach to identify the effects of the deregulation of FCUs. We quantify the market share of FCUs in a local geographical region *prior to* the introduction of the FOM rule change and use the fraction as a proxy for the local "FCU exposure". The higher the FCU share in a local market, the more competitive pressure other local lenders would face after the FCU liberalization. FCU shares are measured at a time *prior to* the FOM rule change in 2017.[6] The implicit assumption that the short-term number

institutional background with more details about the FOM and CU charters in Section 2.

[5]The perceived impact 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 field-of-membership rule proposed in 2016, ending nearly four years of litigation.

[6]To mitigate endogeneity concerns, including the reverse causality concern and the omitted variable concern, we use the FCU exposure measured in 2015Q4, five quarters prior to 2017Q1, in which the FOM rule change became effective. Furthermore, the credit market conditions have become relatively stable after

of local lenders is inelastic or imperfectly elastic is most likely satisfied.

To guide our empirical analysis, we construct a simple theoretical framework wherein a bank engages in competition with a CU *à la* Bain (1949), Modigliani (1958), and in particular Salop (1979), focusing on loan underwriting between small and large banks, the former are usually more focused on lending locally. The model suggests that the increased competition renders larger banks less inclined to compete by providing favorable loan and deposit rates and more likely to exit the market earlier. The model further implies a potential mechanism for the observed greater loan rate discounts from smaller banks following FCUs' expansion, coupled with a reduced inclination from larger banks to adjust rates for competitive purposes.

We first document some simple, general facts on credit unions and banks' deposit and lending rate patterns (Figure 1). Credit unions generally provide more competitive rates on loans and deposit products than banks. This difference in competitiveness can be attributed to the structural dissimilarities between the two entities, as illustrated in the theory model. Banks focus on generating profits, whereas credit unions, being not-for-profit co-op entities, have greater freedom to offer competitive rates.

Next, we use institution-level data and show that after the FOM rule change, FCUs significantly expanded their branch networks and geographical footprints and experienced growth in membership bases and assets. All these changes are consistent with the stated goal of the FOM rule change. The expansion in the membership base is significant: a 50% increase in the FCU exposure is associated with a 21,500 increase in members, which translates to about 39% of the average member size of our sample FCUs. Critically, we show that state-chartered credit unions, similar in structure but not subject to NCUA's new rule changes, experience declines in assets and the size of membership bases, possibly due to direct competition from FCUs. Using branch-level data, we show that in areas where more FCUs operate, they offer more competitive deposit rates (relative to the Fed funds rate) and home loan rates, suggesting a larger increase in competitive pressure for other lenders. Exploiting the loan-level data from the SBA 7(a) program, we further find that CUs do not significantly change loan pricing or the average loan size of issued loans.

the Great Recession. Our results are not sensitive to other choices of years as we obtain highly identical results across various year-quarter choices.

Looking at banks operating near expanding CUs, we first find that banks contract to lend to small businesses in the same local market after the policy shock. The magnitude is economically meaningful: increasing the FCU exposure in a local market from zero to 50% leads to a reduction of small business lending by about 50% for an average bank in our sample. More importantly, we find stark heterogeneity across bank sizes. Small banks relying on local operations actively compete with expanding FCUs by offering competitive rates and expanding lending to marginal borrowers to defend market share but eventually, experience deteriorated loan quality. In contrast, large and midsize banks, hesitating to engage in costly competition, end up retreating from these markets. Indeed, we show that these large banks reduce operating costs and improve efficiency by cutting ties where they have the least advantage (e.g., small business lending). We find no evidence of large banks adjusting deposit rates to defend deposit market share in FCU-heavy markets. The lack of reaction led to their time deposit outflows in FCU-heavy markets. After controlling for institution-by-time and location-by-time fixed effects, we then confirm this finding using more granular branch-level results. Furthermore, our loan-level data suggest that banks reduce the average loan size and experienced *improved* ex post loan performance, indicating that banks raised lending standards to small business borrowers. Consistent with the baseline institution-level evidence, these loan-level results again provide evidence of the cross-market variation: banks cut down credit supply to small businesses in FCU-dominant markets.

To shed light on the implication for local consumers, we next turn to examine the cross-section of borrowers and study how the loan denial decision varies with borrower characteristics. Exploiting the close-to-universe mortgage application data from the Home Mortgage Disclosure Act (HMDA), we first show that low-income and minority borrowers suffer higher denial rates in general after controlling for a set of borrower and loan characteristics. Then, we show that the rejection rate gap narrows significantly in FCU-dominant markets after the FOM rule change. These results are robust for controlling a comprehensive set of fixed effects and borrower controls. Overall, these results highlight that marginal borrowers have difficulty gaining credit access, but the liberalization of FCUs could mitigate the gap.

Moreover, using small business lending and mortgage lending data, we further document

that large banks withdraw more aggressively from FCU-heavy markets. An analysis looking at the FCU-bank substitution further confirms that changes in CU presence are negatively correlated with changes in bank presence. Our estimates suggest that a one CU per million population increase corresponds to a 0.479 bank per million population decrease. Focusing on the CU-bank competition over products where CU and bank overlap: small business lending and mortgage lending data, we further document that large banks withdraw more aggressively after FCUs are allowed to expand in the local market.

Our study is related to several strands of literature. First, our paper contributes to the strand of literature that examines the effects of bank competition and deregulation. Previous studies that focus on inter-bank competition show that deregulation in the U.S. banking sector in the past three decades contributed to higher level of competition and local economic growth (Jayaratne and Strahan 1996; Guiso et al. 2004; Huang 2008). Notably, many studies use U.S. interstate banking reforms to identify the causality between bank competition and economic growth. In particular, credit competition improves bank services (Dick 2006), improves bank credit rating technology and lending productivity (Dick and Lehnert 2010), expands credit availability and lowers interest rates (Zarutskie 2006; Rice and Strahan 2010), limits access to credit for underperforming firms (Bertrand et al. 2007), and stimulates small business credit supply, entrepreneurship and corporate innovation (Black and Strahan 2002; Amore et al. 2013; Chava et al. 2013; Wang 2019). Moving beyond the realm of inter-bank competition, Gissler et al. (2020) use the lifting of deposit-taking restrictions at CUs and show that banks and nonbanks respond differently to increased competition in consumer credit markets — banks focus more on relationship lending while nonbanks expand credit to riskier borrowers at the extensive margin. Our paper adds to the literature by showing that a deregulated CU system can result in changes in balance sheet structure, geographic footprints, and branch networks for banks and CUs, which leads to a credit market segmentation in the long run.

Our study also contributes to the literature on banks' monopoly rents and consumer welfare. Prior studies have shown that the share of GDP represented by the financial service sector has significantly increased (Greenwood and Scharfstein 2013) but the the period of

growth has come with a puzzling increase in the cost of financial intermediation (Greenwood and Scharfstein 2013; Philippon 2015). As the banking sector provide services that people cannot perform on their own (Greenwood and Scharfstein 2013; Gennaioli et al. 2014), banks have accumulated significant monopoly rents and become more expensive (Philippon 2015). Recent literature has focused on financial technology as a potential solution to lower the costs of using financial services. For example, Philippon (2016), Claessens et al. (2018), and Goldstein et al. (2019) comprehensively study how FinTech can offer a way toward structural change in the financial industry. Extensive literature has examined how banks and FinTech lenders compete (e.g., Navaretti et al. 2018; Thakor 2020) and their competition has had a significant impact on many product markets (e.g., Buchak et al. 2018; Tang 2019; Fuster et al. 2019; Berg et al. 2020). Our paper adds to the literature by showing that the increased competition from CUs can help reduce costs of banking services. Our evidence points to the importance of bringing in an outside competitor to the banking system in increasing consumer welfare.

Finally, our paper is generally related to the studies on the interplay between regulatory changes, finance, and growth. It has long been argued that the development of financial systems contributes to economic growth (Schumpeter 1961; Mckinnon 1973). A large amount of recent research strengthened this view and documents supporting evidence at the country level (King and Levine 1993; Levine and Zervos 1998), as well as at the firm level (Demirgüç-Kunt and Maksimovic 1998; Guiso et al. 2004; Allen et al. 2005). This paper contributes to this literature by highlighting the economic consequences associated with CU expansion, which we argue has brought profound changes to local competitive landscape of credit suppliers.

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 3. Section 4 describes the construction of the sample data and presents the summary statistics. Section 5 outlines the empirical design and presents 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, a federal credit union charter must include a "proposed Field of Membership (FOM), specified in detail." A federal credit union's FOM covers the potential group of members that the credit union may enroll. More specifically, as defined in the National Credit Union Administration (NCUA)'s Chartering Manual, it refers to the "persons and entities eligible for membership." In practice, a federal credit union's FOM is based on a credit union's individual charter, which is defined by the individuals or communities a credit union may serve. The Federal Credit Union Act of 1934 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 federal credit union is chartered to serve one group sharing a common bond of either occupation or association. Within this designation, there are three potential charter types: (i) Single Occupational Common Bond — a Single Occupational Common Bond credit union is one whose FOM is made up of employees from a single occupational sponsor; (ii) TIP Charter — a Trade, Industry, or Profession (TIP) credit union serves an FOM sharing a common bond based on employment in a specific trade, industry, or profession; and (iii) Single Associational Common Bond — a Single Associational Common Bond credit union may serve all members and employees of a single recognized association.

A Multiple Common Bond federal credit union is chartered to serve more than one group, each of which share a distinct, definable single occupational and/or associational common bond. There are two types of Multiple Common Bond charters. The first one is the Select Employee Groups (SEGs). 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 credit union may also add underserved areas to its Field of Membership, provided they meet

the definition of such as established in the Federal Credit Union Act.[7]

A Community Credit Union is chartered to serve members within specific, well-defined geographic boundaries. Under this designation, there are two possibilities for building Field of Membership. 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 credit union may serve all persons and businesses who live in, worship in, attend school in, or work within 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 federal credit unions since 2010. As a result, depending on a federal credit union's specific charter, it became possible and easier for federal credit unions 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 credit unions to serve a well-defined portion of a core-based statistical area or the entirety of a combined statistical area (rather than being limited to a metropolitan statistical area), subject to a 2.5 million population cap;
- Expand opportunities for credit unions to serve underserved areas;
- Provide federal credit unions with community charters more flexibility in electing to serve a portion of a core-based statistical area rather than requiring that their FOM include the most populated county or municipality in that area;

[7] 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 ("CDFI"), and (3) is "underserved by other depository institutions" based on data of the NCUA Board and the federal banking agencies.

- Streamline the process for multiple common-bond credit unions seeking to serve additional groups, such as independent contractors with strong connections to employee groups under their existing FOM;
- Allow rural district credit unions to serve FOMs up to 1 million people; and
- Permit former military members with honorable discharges to join credit unions serving active-duty service personnel.

More generally, the new 2017 rules can be summarized as a fourfold deregulation for federal credit unions: (i) expansion of options for a multiple common bond credit union to add potential members; (ii) expansion of options available to single common bond credit unions based on a trade, industry or profession; (iii) a more streamlined process for applying to expand membership in a federal credit union; and (iv) revised definitions of well-defined local community to include Combined Statistical Areas (CSAs) and portions of a core-based statistical area (CBSA).

3. Theoretical Framework

We commence with a simple incomplete competition model in the spirit of Salop (1979). Through this model, we derive a bank's optimal choice of loan origination rate in the context of competition, and present equilibrium outcomes for the changes amid CU's market expansion. Subsequently, we delve into the testable predictions of our equilibrium results.

3.1 Economy

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

Both small banks and the large bank choose the optimal interest rate r_i to maximize its 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 $\pi_0 = s_0 (r_0 - \kappa_0)$. 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, being an endogenously grown cooperative but subject to size limit, incurs a sufficiently low marginal cost in loan origination such that it takes up size $1 - S$ of the consumers first regardless of the interest rate offering of small banks and the large bank, thus leaving the market sized S to small banks and large bank to 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 borrow from 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.[8] We consider ρ the maximum interest rate the borrower would accept if there is no distance between the borrower and 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 $\rho - r_{i'} - \delta\left(\frac{S}{N} - x_i\right)$. It is easy to see the average distance between a borrower and its nearest small bank is $\frac{S}{4N}$.

When the borrower chooses to borrow from the large bank, he 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.

3.2 Equilibrium

As we focus on the impact 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).

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

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 market share 0.

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

Prediction 1. When CU competition leads to a sufficiently small market for banks to compete, the large bank will exit the lending.

Prediction 2. When CU competition leads to a smaller S, the large bank reduces its lending rate r_0 slower than small bank i reduces its lending rate r_i.

The first prediction follows from the threshold value of $\underline{S}$ in Eq. (1): when competition is strong enough, small banks' advantage in local lending eliminates the large banks' market share. The second prediction follows from $\frac{\partial r_0}{\partial S} > 0$ and $\frac{\partial r_i}{\partial S} > 0$, so a smaller S causes both

small and large banks to lower their lending rate. Moreover, since

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

so

$$\frac{\partial r_0}{\partial S} - \frac{\partial r_i}{\partial S} = \frac{\delta - \delta_0}{6N} < 0,$$

in other words, the large bank reduces its lending rate r_0 slower than the small bank i reduces its lending rate r_i when S goes down. In other words, the competition from CU leaves small banks with a smaller customer base, therefore reducing the monitoring costs or make the bank easier 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.

4. Data and sample construction

4.1 Data sources

Bank and credit union Call Report. To conduct analyses in this study, 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 either the Federal Reserve identification number (RSSD9001).

Quarterly financial and institutional variables for CUs, including the information of credit union branches, are obtained from the Call Report data filed by CUs with the NCUA. The credit union 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 credit union branch data became available after 2010Q3. Key to our study,

we exploit the information on the credit union branch's county location. We use data from January 2012 to December 2020 in our main analysis.

Bank branch data. We collect data on bank branch changes from the National Information Center (NIC) over the period from January 2012 to December 2018. 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 Call Report and deposit data using the Federal Reserve identification number (RSSD9001).

Ratewatch. Data on deposit rates and loan rates are obtained from Ratewatch. 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.

SBA 7(a) loans data. Data on small business loans are obtained from the Small Business Administration's flagship program – the 7(a) Loan Guaranty Program. These loans made by commercial lenders to small businesses are subsidized and guaranteed by the government, i.e., in the case of a loan default, the SBA pays off the guaranteed portion of the remaining loan balance. We use a publicly available loan-level database of all 7(a) loans approved by the SBA from January 2012 to December 2020 across all 50 states. The data contains comprehensive loan information such as the name, street address, and industry of the business, as well as the subprogram, volume, guaranty amount, approval date, interest rate, and the charged off amount of the loan. For lenders, the data contain lender type (i.e., commercial bank or credit union) and lender name if the lender is a commercial bank.

HMDA mortgage application data. Loan-level mortgage lending data are obtained from the Home Mortgage Disclosure Act (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 from 2000 and 1999, respectively. These data sets provide loan interest rates at origination, a rich set of underwriting variables (such as FICO, LTV, and DTI), 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 the Fannie Mae/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 are in both data sets. To ensure matching accuracy, we only keep loans that are uniquely matched between HMDA and the Fannie Mae/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 (BEA), 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 (FHFA) at the state level.

4.2 Sample and summary statistics

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 credit union-year-quarter level for CUs. The average federally chartered credit union exposure (FCU fraction) is 11% in our CU sample. The average number of branches for a CU is 8.55. The average size of a CU is about $720 million. On average, a FCU is smaller than a state chartered CU. Panel B provides the summary statistics at the bank-year-quarter level for banks. The average FCU fraction is 6% and the average capital ratio is 11%.

Table 2 presents the summary statistics of the HMDA data at the loan level. Consistent with our institution-level statistics, the average FCU fraction (in a county) is about 11% for purchase loans and 12% for refinance loans among credit unions. For bank loans, the

average FCU fraction is about 7%, which is also consistent with the institution-level data. For purchase loans, CUs and banks both deny about 10% loan applications, but the average denial rate for refinances is higher for banks. 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.

Table 3 presents the summary statistics of the main variables at the bank-county-year-quarter level (Panel A) and at the county-year-quarter level (Panel B). Panel B shows that a county has an average of two FCUs, three or four CUs, and eight or nine banks.

5. Empirical design and main results

In this section, we first describe the econometric model and then examine the effects of the new FOM rule on (federally chartered) credit unions and banks and credit supply across borrowers. In addition, we address major identification endogeneity concerns and conduct robustness tests.

5.1 Institution-level changes: Credit unions expansion

In this study, we focus on the 2017 NCUA policy change aimed at relaxing the agency's field-of-membership regulations and allowing FCUs to expand their membership bases. Because the policy was approved by the NCUA board at the federal level, local economic conditions or lending environment carry little contribution to the rule change. Therefore, we exploit the change as an instrument to obtain regional variations in the exposure to credit unions' expansion and analyze its effect on banks' responses.

Our empirical strategy exploits the NCUA's 2017 membership rule change as a tool to obtain regional variation in exposure to credit unions. The main variable of interest in our analysis, FCU exposure, is defined as the fraction of the total number of FCUs or credit supply by FCUs in a local market (either a county or a census tract, depending on the test and data availability) over the total number of lenders (i.e., commercial banks and all credit unions) or total credit supply by these lenders. 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 largely orthogonal to the policy change. We calculate the local FCU exposure using the 2015Q4 data, five quarters before the event quarter, 2017Q1, to mitigate the endogeneity concern that the treatment effect on FCU-heavy areas might determine the post-FOM FCU exposure.[9]

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 prior-to-policy FCU exposure, and commercial banks would adjust their lending behavior to maximize their profit. Based on the identifying assumption, we use a difference-in-differences approach based on cross-region differences in the local FCU exposure prior to the FOM rule change.

Our continuous difference-in-differences approach is similar to that of Card (1992) and Lucca et al. (2019).[10] 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 effects of aggregate economic shocks by exploiting cross-sectional variation in the importance of these shocks across geographical regions (e.g., see Goldsmith-Pinkham, Sorkin, and Swift 2020 for a comprehensive analysis).

In this subsection, we examine the operational responses of both federally and state chartered credit unions after the FOM rule became effective in 2017Q1. To examine changes in an institution's balance sheet and operational spectrum, we estimate the following baseline specification

$$Y_{i,t} = \beta_1 FCU\ fraction_i \times Post_t + \beta_2 FCU\ fraction_i + \beta_3 Post_t + \gamma_t + \delta_i + \varepsilon_{i,t}, \quad (2)$$

[9] We also use the 2012Q4 measure instead to get the fraction at the beginning of our sample, which is largely exogenous to what we observe during the entire sample period. We obtain qualitatively similar results.

[10] 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 impact 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.

where the dependent variable is a credit union's balance sheet component or an operation-related variable such as the total number of branches. *FCU fraction* is the 2015Q4 measure of the fraction of federally chartered credit unions over all lenders (i.e., both banks and credit unions) across all counties in which FCU i operates. The fraction is calculated at the census tract level based on the mortgage application volume.[11] *Post* is an indicator variable that equals one if year-quarter t is in or after 2017Q1. We also include the institution fixed effects and year-quarter fixed effects. Because of these fixed effects, the stand-alone variables we include in the specification (*FCU fraction* and *Post*) are absorbed. We cluster standard errors at the lender (institution) level.

We report the results in Table 4. In panel A, we focus on the subsample of FCUs. Columns 1 and 2 report estimates of operational changes of FCUs. In column 1, the coefficient estimate for β_1 is positive and marginally significant, suggesting that FCUs that operate in markets that are more FCU-dominant increase the number of branches. The coefficient estimate suggests that increasing the FCU exposure from zero to 50% for an FCU is associated with 1.17 more branches for the FCU after the FOM rule became effective. Since the average number of branches for an FCU in our sample is 8.55, the magnitude of the branch increase translates to a 13.7% increase. In column 2, we find that FCUs expand their footprint crossing county borders when they operate in more FCU-exposed areas. In columns 3 and 4, we find that FCUs' assets significantly grow after 2017Q1 if they operate in FCU-heavy areas. The magnitude of the coefficient estimate in column 3 suggests that increasing the FCU exposure from zero to 50% for an FCU is associated with a $363 million growth in assets, which is about half of the average asset size of the FCUs in our sample. In columns 5-7, we find that FCUs significantly expand their deposit size and membership base, which is consistent with the goal of the 2017 FOM rule. The expansion in the membership base is significant: a 50% increase in the FCU exposure is associated with a 21,500 increase in members, which is about 39% of the average member size of our sample FCUs. Taken together, these results suggest that FCUs grow mostly organically, through expanding

[11] Prior 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.

deposits and membership base rather than their geographical footprint.

We then examine changes of FCUs in their profitability and asset quality. Column 8 of Table 4 suggests that FCUs operating in FCU-heavy markets are more likely to reduce their credit lines; columns 9-10 suggest that these FCUs earn higher interests on loans but a lower net interest income, consistent with them having higher pricing power in local lending markets but suffering higher deposit expense due to a fast-growing deposit base. In columns 11-12, we show that FCUs experience a higher delinquency rate on their loans, suggesting that FCUs start targeting more marginal borrowers, due to deposit inflows and thus a higher pressure of growing loans. Overall, Panel A of Table 4 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 prior to the regulatory change.

Panel B of Table 4 reports a parallel set of results for state-chartered credit unions (SCUs). Contra the operational changes of FCUs, SCUs facing a higher FCU exposure are more likely to reduce the number of branches and the number of counties they operate in, although the reduction is not statistically significant (columns 1-2). These SCUs also reduce their asset size and membership base (columns 3-7), consistent with SCUs losing depositors in the wave of FCU liberalization. In columns 8-12, we do not find significant changes in SCUs' profitability or asset quality. To further address the concern that our FCU exposure measure could be determined by trends or factors during our sample period, we replace the 2015Q4 measure with an earlier measure, 2012Q4, and we obtain robust results (Table A1 in the appendix).

The results in Tables 4 imply opposite effects for FCUs and SCUs. While SCUs experience a reduction in assets and membership base size, FCUs, on the other hand, experience a strong expansion in deposits and membership base. In addition, the growth in FCUs' impact is largely determined by a stark cross-sectional heterogeneity of FCU exposures in local markets.

5.2 Institution-level changes: Banks

In this subsection, we examine how banks respond to the FOM rule change by examining banks' balance sheet components. We estimate Equation (2) and report the results in Table 5 using banks' quarterly Call Report data. In this part of analysis, we still use the same FCU fraction measured in 2015Q4 for a bank, where the FCU fraction is first calculated in a county where bank i operates and then aggregated to the bank level.

We report our estimates using the sample of banks in Table 5. Panel A reports results for all banks in our sample. Column 1 suggests that, after 2017Q1, banks that were more exposed to FCUs grow their assets marginally. For these banks, there is no significant change in capital or the loan ratio, but their cash holding increases significantly (columns 2-4). These banks slightly reduce their real estate lending, although the reduction is not statistically significant (column 5). In columns 6-7, we find that small business lending by these banks decreases significantly, both statistically and economically. In column 7, the coefficient estimate suggests that increasing the FCU exposure from zero to 50% leads to a 0.010 reduction in the small business lending ratio (scaled by total assets), which is about 12% of the average small business lending ratio in our sample.

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. Our theoretical model predicts that, under intensified competition, large banks are more inclined to leave the market as they compete on loan or deposit prices with other institutions with local advantages.

We report results for small and large banks in Panels B and C, respectively. We find that, after FCUs' liberalization, small banks and large banks behaved differently. Our results show that small banks with a higher FCU exposure are associated with a drop in capital ratio, significant cash growth, a smaller reduction in the volume of time deposits, and significantly higher loan charge-offs. This is consistent with the explanation that small banks, directly competing with credit unions for local market and customer base, hoard more cash after the rule change, expand lending to marginal and riskier borrowers to defend market share and

thus suffer worse asset quality.

We find that large banks, on the other hand, significantly reduce lending to small businesses, experience a lower deposit cost which is mostly driven by time deposit outflows, but do not experience changes in size or asset quality. These results suggest that, large banks shifted away from FCU competition: They face relatively higher costs associated with regulatory burdens and information asymmetry, do not defend deposit market share in FCU-heavy areas and they experience large (time) deposit outflows.

As a result of the FCU expansion, the disadvantage of local information collection increases for large banks as credit unions attract more prime borrowers. It then makes economic sense for large banks to completely exit the local market due to higher costs and lower profit.[12]

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 prior to the 2017Q1 FOM rule might have already had consistently experienced bank or bank branch withdrawals before the FOM rule became effective. If valid, our estimate is driven by the pre-existing trend and not the policy change itself. To assess this endogeneity concern, we estimate the following specification:

$$Y_{c,t} = \sum_{k=-4}^{4} \beta^{\tau} FCU\ fraction_c \times Quarter_{t+\tau} + \gamma X_{c,t} + \delta_t + \zeta_c + \varepsilon_{c,t}, \tag{3}$$

where the dependent variable is the total number of CU or bank branches operating in county c in quarter i. $FCU\ fraction_c$ is the 2015Q4 measure of county c's fraction of

[12]In addition, we use alternative thresholds to define small and large banks, such as the bottom and top terciles of the assets distribution, and we obtain qualitatively and quantitatively similar results available upon request.

FCUs. *Quarter* is an indicator variable for each of the quarter during the sample period for this specification, 2016Q1–2018Q1. Quarter $t = -4$ serves as the omitted benchmark. We include time-changing county characteristics, the log of total county income and county income growth, to capture the economic dynamics at the county level. We control for time fixed effects and county fixed effects, and thereby the stand-alone variables (*FCU fraction* and *Quarter*) are absorbed. We cluster standard errors at the lender level.

In Figure 3, we plot the dynamics of bank operations around 2017Q1. Panel A focuses on bank branches and shows an immediate and significant drop in the total number of bank branches in the event quarter. The coefficient estimate remains stable and close to zero in the run-up to the event, consistent with the parallel trend assumption. Panel B exhibits very similar dynamics for total number of banks operating in a local market. Both panels of Figure 3 show a stark heterogeneity of the local FCU exposure and its effects. Banks either reduce their branch network in high-FCU markets or completely withdraw from the markets. Since we focus on a relatively narrow time window around 2017Q1, banks' immediate response suggest that our baseline findings are largely driven by the FOM rule change.

5.4 Deposit and loan spreads

Our baseline institution-level results suggest asymmetric effects on FCUs and banks, such as changes in deposit flows and membership base. To better understand the channels through which federal or state CUs and banks adjust their operations in response to the FOM rule, we examine the *within*-institution cross-branch variation in local FCU exposure to understand how branches respond differently facing increased 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 the one of the primary businesses of credit unions. The theoretical model suggests that small banks are more willing to engage in price competition than larger banks.

Using data from Ratewatch, we estimate the following branch-year-quarter level specifi-

cation:

$$Y_{i,k,c,t} = \beta_1 FCU\ fraction_c \times Post_t + \beta_2 FCU\ fraction_c + \beta_3 Post_t + \gamma X_{c,t} + \delta_{i\times t} + \zeta_{i\times c} + \varepsilon_{i,k,c,t}, \quad (4)$$

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 2015Q4 measure of the fraction of FCUs over all lenders (i.e., both banks and credit unions) in county c. *Post* is an indicator variable that equals one if year-quarter t is in or after 2017Q1. We control for the county-level economic variables including the log of total county 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 lender level.

We report the estimation results in Table 6. In panel A, we show that credit unions and banks raise their deposit spreads for deposit products such as certificates of deposit (CD) in areas more exposed to FCUs. In columns 1-4, we focus on 12-month CDs with an account size of $10,000. In column 1, the coefficient estimate for β_1 suggests that, increasing FCU fraction from zero to 50%, credit unions pay 16.8 bps higher deposit rates for 12-month CDs after the 2017 policy than before. In column 2, we find that banks raise deposit rates in high FCU areas but to a smaller extent. Our estimate suggests that, increasing FCU fraction from zero to 50%, banks pay 3.7 bps higher deposit rates after the 2017 policy than before. The effect is not explained away by credit supply changes at the lender level since we control for lender-by-year-quarter fixed effects in the specification, and therefore our test captures the "within-lender" variation.

We then turn to the cross section of banks and assess how banks differ across sizes. We run the specification in Equation (4) for large and small banks separately. In column 3 of

Panel A, we focus on large banks (i.e., banks assets larger than $100 billion). For these banks, we do not observe significant changes in deposit and loan spreads. The coefficient magnitude is economically and statistically insignificant. This is consistent with the view that large banks, which have sufficient market power and are geographically diverse, do not appear to respond to increased FCU exposure in deposit markets. In contrast, column 4 shows that small banks (i.e., assets $<$ $100 billion) significantly increase their deposit spreads. The magnitude of the coefficient estimate is larger than those obtained using the full sample of banks (column 2). This finding suggests that small banks react more aggressively to FCU expansion in the local market, and they raise deposit rates to defend market share. In columns 5-8, our results remain robust for 36-month CDs. We also find that the effect is again concentrated among small banks.

In Panel B of Table 6, we examine the effect on loan spreads. In columns 1-4, we focus on loans spreads of home equity lines of credit (HELOC). In column 1, we do not find significant change in loan spread by CUs. In column 2, we find that banks lower loan rates in areas more exposed to FCUs after the 2017 FOM rule change. In columns 3-4, we show that this effect is largely concentrated among small banks (column 4).

In columns 5-8 of Panel B, we examine the effect using 30-year mortgage rates. In column 5, the coefficient estimate suggests that a 50% increase in the FCU exposure is associated with a 21.9 bps narrower rate spread for 30-year mortgages. These results imply increased welfare for consumers in high FCU areas in the form of higher deposit rates and lower mortgage loan rates. In column 6, we focus on banks and the coefficient estimate remains negative, although it is less significant statistically and economically. Columns 7 and 8 show that the reduction in mortgage rates is again largely concentrated among small banks. For small banks, the magnitudes suggest that a 50% increase in the FCU exposure is associated with a 29.4 bps lower rate for HELOCs and a 14.5 bps lower rate for 30-year mortgages. Overall, our findings provide suggestive evidence that small banks responded to FCU expansion by raising deposit spreads and lowering loan spreads, but due to regulatory and tax burdens, they did not fully catch up with their CU peers.

6. Economic mechanism

In this section, we examine the economic mechanism through which the expansion of FCUs changes the competitive landscape of banks. Because CUs operate locally and therefore they are "informed" lenders in a local market. We focus on mortgages and small business loans because these loans are credit unions' primary businesses and these loans are economically important for households and the overall economy. In addition, we have loan-level data of mortgages and small businesses to allow us to exploit the richness of cross-sectional variation in the data.

6.1 Small business lending

We obtain loan-level data about SBA's 7(a) loan program from SBA and examine changes in loan pricing and performance for banks. We estimate the following loan-level specification:

$$\begin{aligned} Y_{i,b,c,t} =& \beta_1 FCU\ exposure_c \times Post_t + \beta_2 FCU\ exposure_c + \beta_3 Post_t \\ &+ \gamma_{Loan\ term} + \eta_{Loan\ amount\ decile} + \theta_{Subprogram} + \delta_{Approval\ YQ} + \zeta_{b\times c} + \varepsilon_{i,b,c,t}, \end{aligned} \tag{5}$$

where the dependent variable is either interest rate or performance of loan i issued by lender b in county c in year-quarter t. The sample of lenders are banks only. *FCU exposure* is the 2015Q4 measure of the number of federal credit union headquarters scaled by county population in county c. *Post* is an indicator variable that equals one if year-quarter t is in or after 2017Q1. To capture differences of pricing regimes for loans with different sizes, maturities and the subprogram, we include loan term and loan size decile fixed effects, and subprogram fixed effects.[13] To control for heterogeneity across lender-county pairs, we include lender-by-county fixed effects in the specification. To control for time-series changes that are common for all lenders, we include year-quarter fixed effects at the time of loan

[13] All loans in the 7(a) program are subject to a maximum interest rate cap, with the exception of loans under the Export Working Capital Program. The rate cap is calculated using base rates plus a maximum allowable spread that varies by the loan size, maturity, and the subprogram of the loan. The base rate is usually determined by market rates such as the prime rate or LIBOR. The spread that is negotiated between the lender and borrower.

approval. We cluster standard errors at the county level.

We report the estimates of Equation (5) in Table 7. In column 1, the coefficient estimate is positive and significant, suggesting that banks charge a 1.65 percentage points higher interest rate with a 50% higher FCU exposure. In columns 2-3, we find that the increase in the interest rate is concentrated among non-headquarter areas, suggesting that banks reduce credit supply in areas where they have less information. In columns 4-5, we find that the effect is almost entirely concentrated among large banks.

We next turn to examine small business loans' ex post performance to shed light on how lenders rely on information when making lending decisions. In columns 6-10, we examine loan performance using an indicator variable that equals one if the loan has been charged off. In column 6, we show that the likelihood of a loan being charged off increased for banks facing higher FCU exposures. The coefficient estimate is positive and marginally significant at the 10% level. In columns 7-8, we find that the increase of charge-offs is concentrated among non-headquarter markets, consistent with the view that banks have information advantages in areas where they are headquartered. In addition, we find that the deterioration of loan quality is concentrated among small banks, suggesting that small banks extend credit to riskier borrowers when they are more exposed to FCU expansion.

Put together, our small business results provide evidence of the cross-market variation: large banks withdraw from small business lending when facing FCU expansion, while small banks extend credit to riskier borrowers and then suffer worse asset quality. Since a large portion of the SBA loans in our sample are sponsored by the SBA, our estimates are likely to be the lower bound of the true effect at the extensive and intensive margins.[14]

6.2 Identification strategy: branch-level evidence

The previous 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 CUs have a direct causal effect on bank exits, we need to rule out alternative explanations and confirm that our estimates are not driven by

[14]The maximum fraction guaranteed by the SBA is 85% for loans up to $150,000 and 75% for loans greater than $150,000.

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 lending opportunities.

One 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.

Another important alternative explanation is that branch exits in a county could be driven by banks' lending opportunities. In particular, the exit of a bank branch in a county could be driven by omitted factors related to the asset side of the banks' balance sheets. The identification challenge comes from the fact that we cannot directly observe or control for lending opportunities that vary across banks. To mitigate this concern, we exploit the cross section at the bank-county level and conduct a within-bank test by adding bank-by-year-quarter fixed effects to control for any factors that vary over time at the bank level, such as the lending opportunities the bank has or any economic shocks to the bank through its branch operations. Controlling for the bank-by-year-quarter fixed effects, we can directly compare the FCU exposure across branches within the same bank to examine whether branches operating in a more FCU-dominated county are more likely to exit after the FOM policy was approved than branches operating in a less FCU-dominated county.

In particular, we estimate the following specification:

$$\begin{aligned} Y_{i,c,t} =& \beta_1 County\ FCU\%_c \times Bank\ FCU\%_i \times Post_t \\ &+ \beta_2 County\ FCU\%_c \times Post_t \\ &+ \beta_3 Bank\ FCU\%_i \times Post_t \\ &+ \beta_4 County\ FCU\%_c \times Bank\ FCU\%_i \\ &+ \beta_5 Post_t + \gamma_{i\times t} + \delta_{c\times t} + \varepsilon_{i,c,t}, \end{aligned} \tag{6}$$

where the dependent variable is the number of bank branch exits of bank i in county c in year-quarter t. *County FCU%* is the 2015 measure of the fraction of credit unions over all lenders (i.e., both banks and credit unions) in county c. *Bank FCU%* is the 2015Q4 measure of bank i's fraction of credit unions over all lenders (i.e., both banks and credit unions). *Post* is an indicator variable that equals one if year-quarter t is in or after 2017Q1. Important for our identification strategy, we control for county-by-time fixed effects and bank-by-time fixed effects. Using the interaction term of the bank- and county-FCU exposure of a given bank-county pair, we can isolate the added effect of banks with a high FCU exposure operating in a FCU-dominated market, after controlling for local economic conditions.

We report the results in Table 9. The coefficient estimate in column 1 is positive, suggesting that a bank is more likely to close its branches in a more FCU-dominated county after the FOM policy is approved, and the effect is more pronounced if the bank has a higher overall FCU exposure. Interestingly, the estimated magnitude increases almost monotonically with the length of the time window. For example, the coefficient estimate for a six-quarter window (column 5) has a magnitude that is more than six times that over a one-quarter window (column 1).

7. Implications of FCU expansion

7.1 Heterogeneity of mortgage borrowers

Our baseline results show that the 2017 FOM rule affects the extensive margin of credit provision across lenders and markets. These findings highlight that the FOM rule leads to credit redistribution through a cross-sectional variation in the FCU exposure. An important further question is which demographic groups are most affected by the liberalization of CUs. In this subsection, we examine the effects of the FOM rule on marginal borrowers, those who are more likely to be denied by consumer credit markets: low-income borrowers, borrowers belonging to racial minorities, and female borrowers. As we mentioned previously, the connection between the FOM rule and credit access for marginal borrowers is particularly relevant as one of the primary goals of the FOM rule and the overall CU system is to expand access to financial services for underserved populations.

We study how the loan denial decision varies with borrower characteristics. We exploit the close-to-universe mortgage application data from the Home Mortgage Disclosure Act (HMDA) data, which contains both loan applications and their denial decisions. As detailed below, we firstly find that marginal borrowers suffer higher denial rates, after controlling for a set of borrower and loan characteristics. We then examine how the local FCU exposure affects credit access across borrower groups after the FOM rule became effective. We find that the effect is particularly strong for borrowers belonging to racial minorities and low-income borrowers. Our OLS specification is as follows:

$$\begin{aligned} Denied_{i,c,b,t} =& \beta_1 FCU\ fraction_c \times Post_t \times Borrower\ characteristic_i \\ &+ \beta_2 FCU\ fraction_c \times Borrower\ characteristic_i \\ &+ \beta_3 Post_t \times Borrower\ characteristic_i \\ &+ Borrower\ characteristic_i \\ &+ \gamma Controls_i + \delta_{b\times t} + \zeta_{c\times t} + \eta_{Loan\ amount\ decile} + \theta_{Income\ decile} + \varepsilon_{i,c,b,t}, \end{aligned} \tag{7}$$

where i indexes mortgage applications, c indexes a borrower's county, b indexes lender, and

t indexes year. The dependent variable Denied equals one if the loan application is denied, and zero otherwise. For the borrower characteristic, we use one of the three variables. The first one is the low-income indicator variable that equals one is the applicant's income falls into the bottom quintile of the income distribution in a year, and zero otherwise. The second one is a minority indicator that equals one if the applicant is not non-Hispanic white, and zero otherwise. The third one is a female indicator for an applicant's gender. *FCU fraction* is the 2015Q4 measure of the fraction of mortgage volume by FCUs over all lenders at the county level. *Post* is an indicator variable that equals one if the year is in or after 2017. 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-year fixed effects to control for any time-varying changes in differential pricing by the lender. We also add county-by-year fixed effects to control for local credit demand changes. We also control for fixed effects for the loan amount decile and applicant income decile. We cluster standard errors at the lender level.

Table 8 presents the results. Columns 1-3 (4-6) present results for home purchase (refinance) loans. We observe that the coefficient estimate on the stand-alone low-income and minority indicators are positive and significant based on our specification and risk controls. For home purchase loans, the denial rate differential for low-income borrowers is 8.2% and for minority borrowers is 7.1%. Both differentials are higher for refinance loans.

When we triple-interact the borrower characteristic with the FCU fraction and the post dummy, the coefficient estimate for β_1 shows that the denial rate differential for low-income borrowers declines by 1.8 percentage points, or by about 22% in a relative sense, moving the FCU exposure from a zero to one after 2017. Similarly, the denial differential for minority borrowers declines by 1.5 percentage points, or by about 21% relatively. These findings are statistically significant and remains strong for refinance loans. We find weak evidence that high-FCU markets after 2017 favor female borrowers, and the result is marginally strong for refinance loans (column 6). Our findings provides evidence that, while low-income and minority borrowers are rejected more on average, the rejection rate gap narrows significantly after the FOM rule became effective and if local lending markets are more FCU-dominant.

Combined, these results highlight that marginal borrowers have difficulty gaining credit access and credit unions can help mitigate the gap.[15]

7.2 Credit market segmentation

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 aggressive in closing physical branch locations in the last decade. The impact of these closures was unevenly distributed across the U.S., with rural, low-income, and minority communities suffering the worst effects. The massive and systematic change in U.S. banks' physical branching footprint has led to an increasing gap across geographical areas and consumers, creating "banking deserts" for rural and underserved communities. More broadly, this credit redistribution can have implications of credit provision, local business dynamics, and the cost of access to financial services (Philippon 2015). On the other hand, the U.S. credit unions have maintained a relatively stable footprint or even increased their branch presence in most local markets.[16]

These observations raise an important implication of our study – the role CUs play in the bank-CU substitution patterns. Did the CU liberalization exacerbate the substitution between banks and CUs? As banks have been leaving rural areas and unserved communities, did CUs fill the void in credit provision? The previous findings in our study provide implications to answer this question, as we find that CUs expand their branch networks and reduce the credit access gap for low-income and minority consumers. In this section, we specifically examine the credit substitution dimension between banks and CUs. To the best of our knowledge, our study is among the first to shed light on how CUs can and have

[15]We then examine if CUs expand mortgage credit provision at the expense of loan quality. We use data on conforming loans sponsored by Fannie Mae and Freddie Mac from the two entities and examine if lenders change their lending standards as proxied by an ante or ex post risk measures. Panel A of Table A3 shows that CUs do not lower lending standards for conforming mortgages.

[16]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 credit unions maintained or grew their branch presence.

contributed to the credit substitution patterns beyond the traditional banking system.

Our methodology mirrors the cross-sectional nature of the bank-CU substitution patterns. Figure 4 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 2012 to 2020), 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 move to estimate the following change-on-change specification in which county-level changes are measured from 2012 to 2020:

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

where c indexes county. The dependent variable is a measure of bank presence such as bank or bank branch per million population. Similarly, *CU presence* is a measured by either CUs or CU branches per million population in a county. Control variables include change in county-level log of total income, change in log of the population, and change in income growth from 2012 to 2020. Since the specification is change on change, it minimizes concerns about any time-invariant factors that might affect lender presence and 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 treads. Note that our goal with the reduced form of OLS specification is to examine the substitution pattern rather than establish causality.

We report the results in Table 10. In columns 1-2, the dependent variable is the change in total bank branches per million population. We find that the coefficient estimate on the change in CU presence is negative and statistically significant, consistent with a bank-CU substitution pattern. The estimate is robust if we use either CUs or CU branches to measure the CU presence. In columns 3-4, we replace the dependent variable with the change in bank per capita and confirm our results. The magnitude of our estimates is economically significant: a one CU per million population increase corresponds to 0.479 bank per million population decrease.

We next examine how changes in the FCU exposure affect bank credit supply across counties. We first examine changes in mortgage credit provision by estimating the same specification as in Equation (8) but replace the dependent variable with various bank lending measures. We report the results in Table 11. To be consistent with our context of examining the effects of the FOM rule on FCUs, the independent variable is the change in the number of FCUs in a county from 2012 to 2020. In column 1, the dependent variable is the change in log of mortgage originations for all banks in a county. We find a strong negative relationship between the change in the FCU exposure and the change in bank mortgage lending. To examine the cross section of banks, columns 2-3 show that the effect is mostly concentrated among large banks (i.e., bank assets greater than $50 billion), consistent with our baseline finding that large banks withdraw more aggressively from FCU-heavy markets. We then examine changes in small business lending by estimating the same specification. In columns 4-5, we find strong evidence that an increase in FCU exposure in a county corresponds to a decrease in banks' credit supply to small business borrowers. The results are robust if we use the total loan amount or the loan amount that the lender has the liability on.

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

8. Conclusion

The aggregate size and impact of the U.S. credit union system has been strikingly increasing in the past decade. 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, credit

unions are known for the special focus on benefiting consumers in the local community with a common bond. In this study, we examine the effects of the 2017 Field of Membership (FOM) rule that relaxed the common bond requirement for federally chartered credit unions and led to expansion of their membership base and geographical footprint.

We provide evidence that FCUs significantly grew in deposits and the size of membership base, and they opened more branches and expanded to more counties. In the cross section, we show that FCUs expand credit supply to low-income and minority borrowers. Facing an increase in the FCU exposure in a local market, small banks and large banks behaved differently. Small banks that directly compete with CUs raise deposit rates and lower loan rates to defend market share, and they extend lending to marginal borrower and consequently suffer higher default risk. Large banks, in contrast, shifted away from CU competition: they reduced costly lending such as small business lending, did not adjust deposit rates so they experienced (time) deposits outflows, and eventually they withdrew from CU-heavy markets.

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 withdrawing 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 market and fill the void in the meanwhile. With the increasing size and influence of the CU system, these findings carry policy implications of how regulators should examine the role of the two separate systems (banks vs. CUs) in affecting credit allocation efficiency, financial stability, and the welfare of borrowers and communities they serve.

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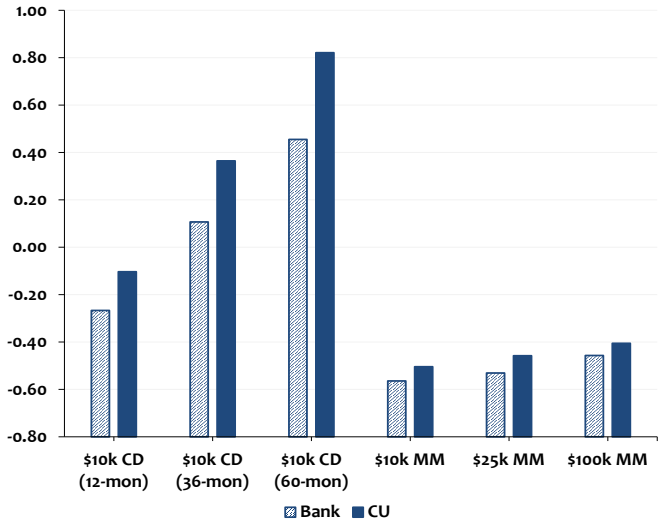
Figure 1: **Deposit spreads and loan spreads (banks vs. credit unions)**

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 2012Q1-2020Q1. 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.

Panel A. Deposit spread (percentage point)



Panel B. Loan spread (percentage point)

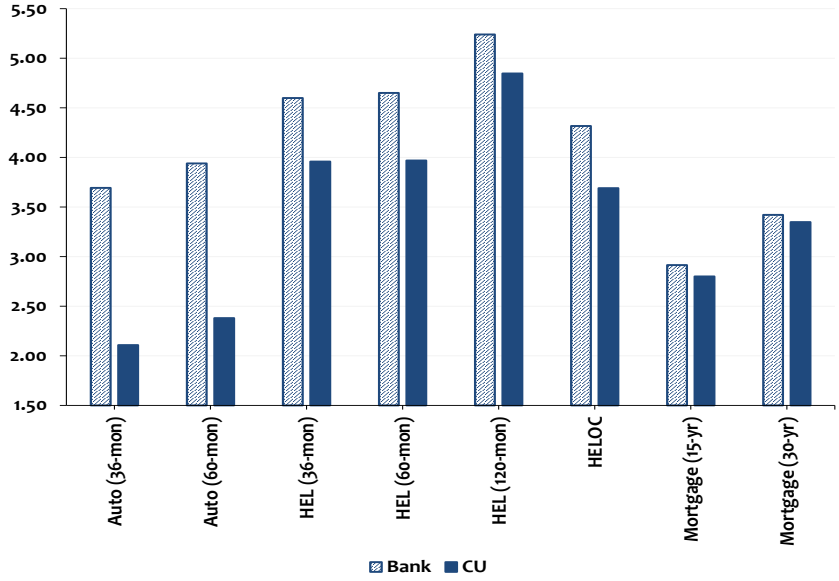
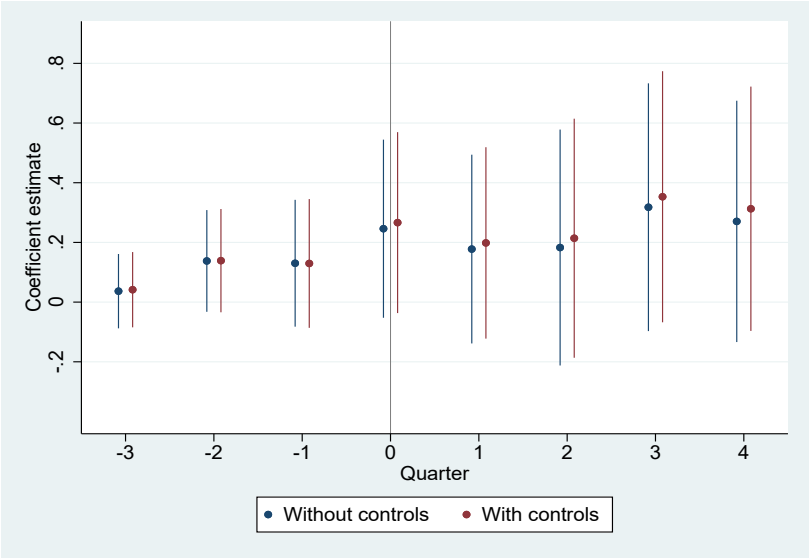


Figure 2: **The dynamics of the NCUA FOM policy for credit union branches**

This figure shows the β^{τ} coefficient estimates of estimating $Y_{i,t} = \sum_{k=-4}^{4} \beta^{\tau} FCU\,fraction_c \times Quarter_{t+\tau} + \gamma X_{i,t} + \delta_t + \zeta_c + \varepsilon_{i,t}$, where *FCU fraction* is the county c's federal credit union (FCU) fraction measured in year 2015 using mortgage application volumes. The dependent variable is the total number of branches of either federal credit unions or state credit unions. The sample period is 2016Q1-2018Q1. The event quarter (Quarter 0) is 2017Q1, which was when the NCUA's FOM policy went into effect. Controls (X) include log of total county income and county income annual growth. Both panels plot the individual point estimates (dots) and their 95% confidence intervals (lines) with or without controls.

Panel A. Federal CU branch changes



Panel B. State CU branch changes

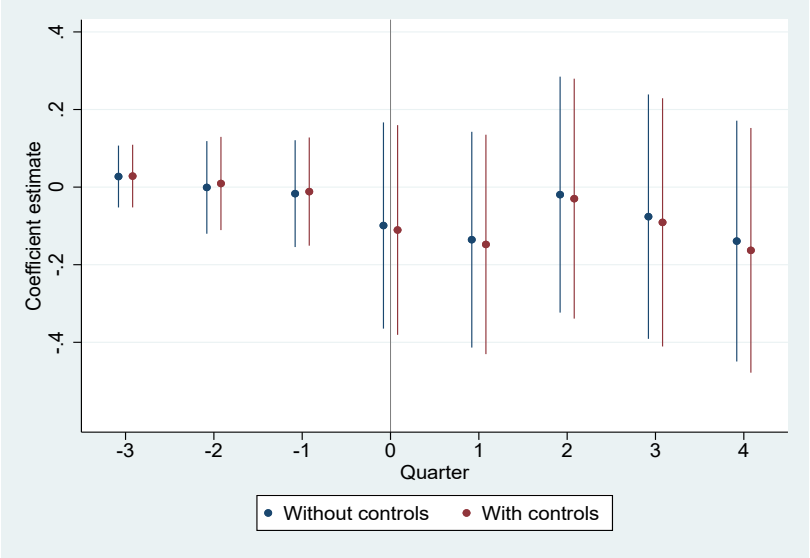
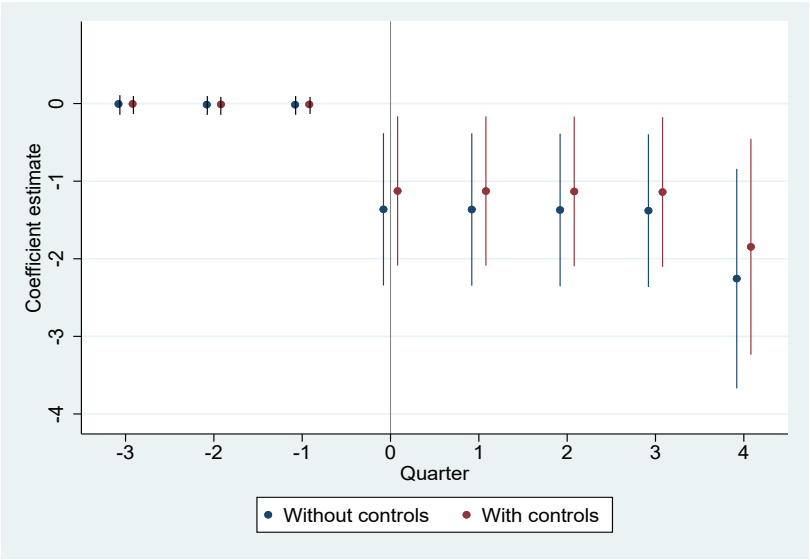


Figure 3: **The dynamics of the NCUA FOM policy for bank branches**

This figure shows the β^{τ} coefficient estimates of estimating $Y_{i,t} = \sum_{k=-4}^{4} \beta^{\tau} FCU fraction_c \times Quarter_{t+\tau} + \gamma X_{i,t} + \delta_t + \zeta_c + \varepsilon_{i,t}$, where *FCU fraction* is the county c's federal credit union (FCU) fraction measured in year 2015 using mortgage application volumes. The dependent variable is the total number of bank branches or banks operating in a county. The sample period is 2016Q1-2018Q1. The event quarter (Quarter 0) is 2017Q1, which was when the NCUA's FOM policy went into effect. Controls (X) include log of total county income and county income annual growth. Both panels plot the individual point estimates (dots) and their 95% confidence intervals (lines) with or without controls.

Panel A. Bank branch changes



Panel B. Number of banks changes

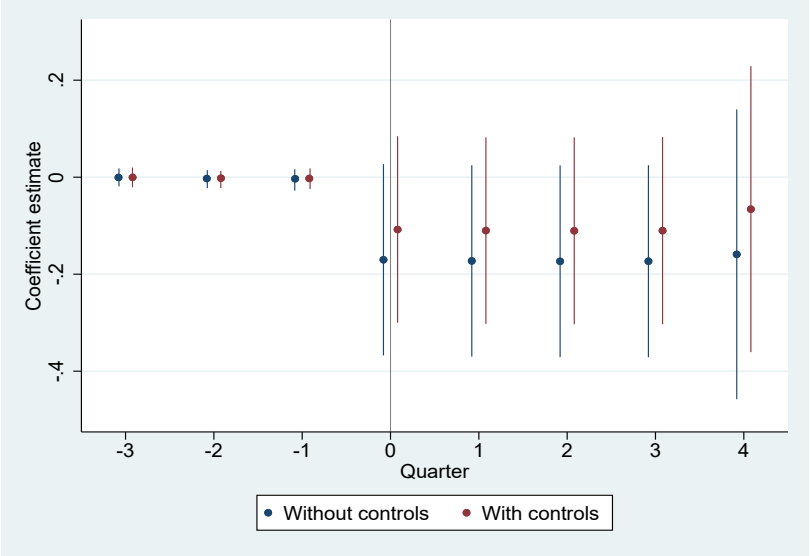


Figure 4: **Change in federal credit union exposure by change in bank exposure**

This figure shows the relationship between change in bank exposure and change in federal credit union exposure. The figure is constructed in two steps. The first is to sort all counties by change in the number of bank branches from 2012 to 2020, and group counties into quintiles. The second step is to calculate change in federal credit union branch per million population (from 2012 to 2020) in each quintile.

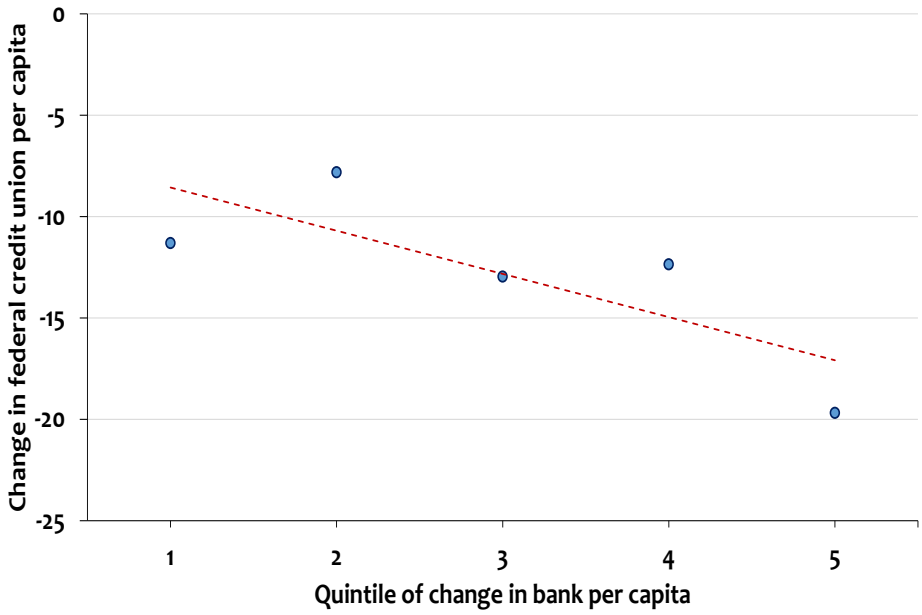


Table 1: **Summary statistics of institutions**

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, federally chartered credit unions, and state chartered credit unions; 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 2012-2020. 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	56101	0.11	0.10	29627	0.15	0.10	26474	0.06	0.06
Branches total	51965	8.55	13.34	28354	8.08	13.86	23611	9.12	12.66
Counties total	51940	3.26	5.00	28340	3.12	5.36	23600	3.43	4.52
Assets ($million)	56101	720	2666	29627	692	3248	26474	751	1804
Log(Assets)	56101	19.44	1.22	29627	19.31	1.20	26474	19.58	1.22
Log(Deposits)	56101	19.30	1.21	29627	19.17	1.19	26474	19.43	1.21
Members ('000)	56101	56.44	203.32	29627	54.91	257.43	26474	58.16	115.91
Log(Members)	56101	10.13	1.13	29627	10.01	1.12	26474	10.27	1.12
Credit lines/Assets	56101	0.14	0.39	29627	0.13	0.51	26474	0.15	0.15
Interest on loans/Assets	56101	0.05	0.01	29627	0.05	0.01	26474	0.05	0.01
Net int income/Assets	56101	0.03	0.01	29627	0.03	0.01	26474	0.03	0.01
Delinquent loans(6-12m)/Loans	56101	0.00	0.00	29627	0.00	0.00	26474	0.00	0.00
Delinquent credit cards/Loans	56101	0.00	0.00	29627	0.00	0.00	26474	0.00	0.00

Panel B. Bank-year-quarter level

	All banks			Small banks (<$100b)			Large banks (>=$100b)		
Variable	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.
FCU fraction	95150	0.06	0.06	94416	0.06	0.06	734	0.05	0.02
Log(Assets ('000))	95150	12.95	1.44	94416	12.90	1.33	734	19.41	0.99
Capital ratio	95073	0.11	0.03	94339	0.11	0.03	734	0.12	0.02
Cash/Assets	71163	0.08	0.07	70429	0.08	0.07	734	0.10	0.09
Loans/Assets	95150	0.63	0.15	94416	0.63	0.15	734	0.34	0.14
RE loans/Assets	95150	0.51	0.16	94416	0.52	0.15	734	0.23	0.12
Small loans (<250k)/Assets	87269	0.02	0.02	86552	0.02	0.02	717	0.00	0.00
Small loans (<1m)/Assets	87269	0.08	0.06	86552	0.09	0.06	717	0.01	0.01
Deposit cost	95072	0.01	0.00	94338	0.01	0.00	734	0.00	0.00
Savings deposits/Assets	95139	0.43	0.14	94405	0.43	0.14	734	0.54	0.17
Time deposits/Assets	95139	0.27	0.13	94405	0.27	0.13	734	0.08	0.07
Interest income/Loans	95072	0.06	0.03	94338	0.06	0.03	734	0.10	0.05
Net charge-offs/Loans	95072	0.00	0.01	94338	0.00	0.01	734	0.01	0.01

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 2012-2020. 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	1999219	0.11	0.06	0.14	3365681	0.12	0.06	0.14
Denied	1999219	0.10	0.00	0.30	3365681	0.15	0.00	0.36
Loan amount	1999219	219.42	175.00	551.25	3365681	193.56	155.00	639.55
Applicant income	1999219	103.23	81.00	343.48	3365681	104.35	84.00	1112.41
Occupancy	1999219	0.91	1.00	0.28	3365681	0.95	1.00	0.23
Female applicant	1999219	0.33	0.00	0.47	3365681	0.34	0.00	0.47
Co-borrower	1999219	0.49	0.00	0.50	3365681	0.55	1.00	0.50

Panel B. Loan applications of banks

	Purchase loans				Refinance loans			
Variable	N	Mean	Median	S.D.	N	Mean	Median	S.D.
FCU fraction	10851915	0.07	0.04	0.09	17442373	0.07	0.04	0.09
Denied	10851915	0.10	0.00	0.29	17442373	0.20	0.00	0.40
Loan amount	10851915	297.07	215.00	315.14	17442373	243.60	176.00	277.20
Applicant income	10851915	147.30	99.00	415.93	17442373	130.04	91.00	254.92
Occupancy	10851915	0.84	1.00	0.37	17442373	0.88	1.00	0.32
Female applicant	10851915	0.28	0.00	0.45	17442373	0.27	0.00	0.44
Co-borrower	10851915	0.50	1.00	0.50	17442373	0.54	1.00	0.50

Table 3: **Summary statistics of local markets**

This table presents summary statistics of our main variables at the bank-county-year-quarter level (Panel A) and at the county-year-quarter level (Panel B). Panel A presents the statistics of the credit union fraction and bank branch changes; Panel B presents the statistics of the number of institutions and branches, and economic conditions, all of which are at the county level. The sample period is 2012-2020. Statistics include the number of observations (N), mean, median, standard deviation (S.D.), the 25th percentile, and the 75th percentile.

Panel A. Bank-county-year-quarter level

Variable	N	Mean	S.D.	P25	P50	P75
CU fraction (bank)	640707	0.06	0.04	0.04	0.05	0.07
CU fraction (county)	640707	0.07	0.08	0.02	0.04	0.08
Branch exits sum	640707	0.03	0.23	0.00	0.00	0.00
Branch exits sum (t+1)	623668	0.06	0.33	0.00	0.00	0.00
Branch exits sum (t+2)	606614	0.08	0.42	0.00	0.00	0.00
Branch exits sum (t+4)	572507	0.13	0.57	0.00	0.00	0.00
Branch exits sum (t+6)	537912	0.18	0.71	0.00	0.00	0.00

Panel B. County-year-quarter level

Variable	N	Mean	SD	p25	p50	p75
FCU sum	82854	2.04	5.28	0	0	2
FCU branch sum	82854	3.86	11.56	0	0	3
FCU HQ sum	82854	1.26	4.11	0	0	1
CU sum	82854	3.58	7.72	0	1	3
CU branch sum	82854	7.08	18.37	0	2	5
CU HQ sum	82854	2.04	5.86	0	0	2
Bank sum	82854	8.55	8.85	4	6	10
Bank branch sum	82854	28.88	74.26	5	10	22
Bank HQ sum	82854	2.15	4.94	0	1	3
FCU fraction (by mortgage application)	82770	0.06	0.09	0.01	0.03	0.07
FCU fraction (by lender count)	82770	0.10	0.08	0.05	0.10	0.14
County income	82854	40739	11748	33498	38482	45069
Log(County income)	82854	10.58	0.24	10.42	10.56	10.72
County income growth	82854	0.03	0.05	0.01	0.03	0.05
HPI growth	82854	1.41	3.92	0.00	0.04	0.07
County population	82854	104634	334427	11219	26218	68982

Table 4: **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 2012 to 2020. *FCU fraction* is the 2015Q4 county-level federal credit union's fraction of mortgage applications. *Post* is a dummy variable that equals one if the quarter is or after 2017Q1. 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)	(12)
Dep. Var.	Sum of branches	Sum of counties operating	Assets ($mil)	Log Assets	Log Shares	Members ('000)	Log Members	Credit lines/ Assets	Interest on loans/ Loans	Net interest income/ Assets	Delinquent 6-12 mon/ Loans	Delinquent credit card/ Loans
Panel A. Federal CUs												
FCU fraction × Post	2.347*	0.707**	726.135***	0.249***	0.240***	43.191**	0.202***	-0.048*	0.003**	-0.003***	0.001**	0.000*
	(1.202)	(0.345)	(277.483)	(0.050)	(0.049)	(19.915)	(0.056)	(0.029)	(0.001)	(0.001)	(0.001)	(0.000)
Observations	28,352	28,338	29,626	29,626	29,626	29,626	29,626	29,626	29,626	29,626	29,626	29,626
Adj. R2	0.972	0.978	0.919	0.996	0.996	0.931	0.993	0.0480	0.882	0.735	0.367	0.663
Panel B. State CUs												
FCU fraction × Post	-1.123	-0.485	-396.912*	-0.193**	-0.196**	-17.260	-0.203**	0.025	-0.002	-0.001	-0.000	-0.000
	(1.134)	(0.434)	(238.111)	(0.077)	(0.078)	(11.688)	(0.083)	(0.042)	(0.002)	(0.002)	(0.001)	(0.000)
Observations	23,611	23,600	26,472	26,472	26,472	26,472	26,472	26,472	26,472	26,472	26,472	26,472
Adj. R2	0.981	0.978	0.954	0.993	0.993	0.975	0.990	0.436	0.867	0.645	0.300	0.655
CU FE	Yes	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	Yes

Table 5: **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 2012 to 2020. Panel A includes all banks; Panel B includes small banks (assets<$100 billion); Panel C includes large banks (assets>=$100 billion). *FCU fraction* is the 2015Q4 county-level federal credit union's fraction of mortgage applications. *Post* is a dummy variable that equals one if the quarter is or after 2017Q1. 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)	(11)	(12)
Dep. Var.	Log Assets	Capital/ Assets	Cash/ Assets	Loans/ Assets	RE loans/ Assets	Small loans <=$250k/ Assets	Small loans <=$1mil/ Assets	Deposit cost	Savings deposits/ Assets	Time deposits/ Assets	Interest income/ Loans	Net charge-offs/ Loans
Panel A. All banks												
FCU fraction × Post	0.140*	-0.007	0.029**	-0.027	-0.029	-0.007***	-0.021***	-0.002**	0.000	-0.024	-0.002	0.003***
	(0.076)	(0.004)	(0.012)	(0.019)	(0.019)	(0.002)	(0.007)	(0.001)	(0.020)	(0.015)	(0.003)	(0.001)
Observations	95,150	95,073	71,133	95,150	95,150	87,258	87,258	95,072	95,139	95,139	95,072	95,072
Adj. R2	0.988	0.857	0.786	0.905	0.923	0.912	0.915	0.756	0.907	0.926	0.784	0.338
Panel B. Small banks												
FCU fraction × Post	0.142*	-0.008*	0.025**	-0.028	-0.030	-0.007***	-0.021***	-0.002**	-0.001	-0.022	0.000	0.003***
	(0.076)	(0.004)	(0.012)	(0.019)	(0.019)	(0.002)	(0.007)	(0.001)	(0.020)	(0.015)	(0.002)	(0.001)
Observations	94,416	94,339	70,399	94,416	94,416	86,541	86,541	94,338	94,405	94,405	94,338	94,338
Adj. R2	0.986	0.857	0.785	0.905	0.921	0.911	0.913	0.756	0.908	0.926	0.791	0.329
Panel C. Large banks												
FCU fraction × Post	-1.065	0.161	1.211	-0.585	-0.867**	-0.021**	-0.079**	-0.082***	0.447	-0.786**	-0.980*	-0.036
	(1.778)	(0.177)	(0.741)	(0.823)	(0.334)	(0.009)	(0.036)	(0.028)	(0.512)	(0.374)	(0.546)	(0.071)
Observations	733	733	733	733	733	716	716	733	733	733	733	733
Adj. R2	0.989	0.837	0.843	0.900	0.973	0.895	0.929	0.843	0.861	0.909	0.760	0.824
Bank FE	Yes	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	Yes

Table 6: **Deposit and loan spreads: Credit unions vs. banks**

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 2012 to 2020. 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 30-year mortgages. *FCU fraction* is the 2015Q4 fraction of the number of federal credit union over total lenders for a lender across all its branches. *Post* is a dummy variable that equals one if the quarter is or after 2017Q1. 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)	(7)	(8)
Dep. Var.	Deposit rate spread (=deposit rate - FF rate)							
Product	CD $10k (12-month)				CD $10k (36-month)			
Lenders	Credit unions	Banks			Credit unions	Banks		
		All	Large >=$100b	Small <$100b		All	Large >=$100b	Small <$100b
FCU fraction × Post	0.336**	0.074***	0.024	0.135***	0.355*	0.046*	-0.011	0.113**
	(0.156)	(0.026)	(0.015)	(0.052)	(0.186)	(0.025)	(0.015)	(0.052)
Observations	16,210	76,665	22,483	54,116	12,694	73,305	22,442	50,797
Adj. R2	0.890	0.975	0.989	0.963	0.850	0.972	0.982	0.959
Lender × Year-quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lender × County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B. Loans	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var.	Loan rate spread (=loan rate - FF rate)							
Product	HELOC				Mortgage (30-year)			
Lenders	Credit unions	Banks			Credit unions	Banks		
		All	Large >=$100b	Small <$100b		All	Large >=$100b	Small <$100b
FCU fraction × Post	0.450	-0.235*	-0.177	-0.588*	-0.438**	-0.096*	-0.054	-0.290*
	(0.433)	(0.126)	(0.150)	(0.346)	(0.218)	(0.052)	(0.053)	(0.157)
Observations	2,548	11,525	6,865	4,647	774	4,777	2,727	2,048
Adj. R2	0.660	0.952	0.954	0.908	0.833	0.967	0.976	0.949
Lender × Year-quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lender × County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 7: **Small business lending: Loan-level evidence**

This table presents loan-level results of the effect of the NCUA's FOM policy on small business lending. The data is obtained from Small Business Administration, and the sample period is from 2012 to 2020. The sample of lenders include banks only. The dependent variable is loan interest rate in columns (1)-(5), and the charged-off indicator (i.e., an indicator that equals one if the loans is charged off) in columns (6) and (10). Columns (3) and (8) ((2) and (7)) focus on loans issued in a three-digit Zip code where is (not) the lender's headquarter located. Columns (4) and (9) ((5) and (10)) focus on banks with assets size smaller (larger) than $100 billion. *FCU exposure* is the number of federal credit union headquarters per capita in a county measured in 2015. *Post* is a dummy variable that equals one if the quarter is or after 2017Q1. 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.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dep. Var.	Interest rate					Charged-off indicator				
		HQ Zip-3		Bank assets			HQ Zip-3		Bank assets	
		No	Yes	<=$100b	>$100b		No	Yes	<=$100b	>$100b
FCU exposure × Post	3.317***	3.664***	1.958	-0.362	11.916***	0.106*	0.160***	-0.177	0.006	0.735***
	(0.819)	(0.858)	(2.491)	(1.012)	(2.022)	(0.056)	(0.057)	(0.123)	(0.074)	(0.152)
Post	0.057**	0.065***	0.006	0.073**	1.211***	0.007*	0.008*	0.009	0.012**	-0.020
	(0.023)	(0.024)	(0.059)	(0.029)	(0.123)	(0.004)	(0.005)	(0.010)	(0.005)	(0.029)
Income growth	0.165	0.049	0.808	0.108	-0.263	-0.020	-0.028	0.006	-0.010	-0.034
	(0.179)	(0.136)	(0.816)	(0.264)	(0.282)	(0.017)	(0.018)	(0.043)	(0.024)	(0.037)
Observations	439,430	391,978	46,954	214,768	145,337	439,430	391,978	46,954	214,768	145,337
Adj. R2	0.609	0.616	0.515	0.505	0.646	0.129	0.135	0.0848	0.113	0.174
Loan term decile FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan size decile FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subprogram FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Approval YQ FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lender × County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 8: **Heterogeneity of borrowers: Evidence from HMDA**

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 2012 to 2020. The dependent variable is a dummy variable that equals one if the application is denied, and zero otherwise. *FCU* is a dummy variable that equals one if the lender of the loan application is a federally chartered credit union, and zero otherwise. *Post* is a dummy variable that equals one if the year is or after 2017. *Low income* is a dummy variable that equals one if the applicant's income falls into the bottom quintile of the income distribution in a given year. *Minority* is a dummy variable that equals one if the applicant is a minority applicant. *Female* is a dummy variable that equals one if the applicant is female. 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)
Dep. Var.	Denied					
Loan sample	Purchase			Refinance		
Low income	0.082***			0.117***		
	(0.004)			(0.010)		
FCU × Low income	0.021**			0.034***		
	(0.008)			(0.012)		
Post × Low income	-0.054***			-0.052***		
	(0.002)			(0.009)		
FCU × Post × Low income	-0.018***			-0.030***		
	(0.006)			(0.010)		
Minority		0.071***			0.095***	
		(0.003)			(0.010)	
FCU × Minority		0.024***			0.040***	
		(0.007)			(0.015)	
Post × Minority		-0.049***			-0.050***	
		(0.003)			(0.008)	
FCU × Post × Minority		-0.015**			-0.032***	
		(0.007)			(0.010)	
FCU × Female			0.002			0.013***
			(0.002)			(0.005)
Post × Female			-0.007***			-0.006**
			(0.001)			(0.003)
FCU × Post × Female			0.001			-0.007*
			(0.002)			(0.004)
Observations	12,856,906	11,630,778	12,856,906	20,814,726	18,493,398	20,814,726
Adj. R2	0.108	0.111	0.111	0.132	0.140	0.138
Loan controls	Yes	Yes	Yes	Yes	Yes	Yes
Lender × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
County × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Loan amount decile FE	Yes	Yes	Yes	Yes	Yes	Yes
Borrower income decile FE	Yes	Yes	Yes	Yes	Yes	Yes

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 2012 to 2020. *County FCU%* is the 2015 measure of the federal credit union's fraction over banks in a county. *Bank FCU%* is the 2015Q4 measure of the federal credit union fraction for a bank across all its branches. *Post* is a dummy variable that equals one if the quarter is or after 2017Q1. The dependent variable is the total number of branch exits of a bank in a county over various quarters. Fixed effects are indicated at the column bottom. Standard errors in parentheses are double clustered at the county and bank level. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

Dep. Var.	(1)	(2)	(3)	(4)	(5)
	Total number of branch exits				
	t	[t,t+1]	[t,t+2]	[t,t+4]	[t,t+6]
County FCU% × Bank FCU% × Post	0.369*	0.677*	1.005*	2.016**	2.672**
	(0.210)	(0.395)	(0.587)	(0.931)	(1.255)
County FCU% × Bank FCU%	0.086	0.242	0.364	0.422	0.631
	(0.111)	(0.206)	(0.310)	(0.503)	(0.714)
Observations	640,707	623,465	606,209	571,697	536,717
Adj. R2	-0.0513	-0.0392	-0.0232	0.00445	0.0262
County × Year-Quarter FE	Yes	Yes	Yes	Yes	Yes
Bank × Year-Quarter FE	Yes	Yes	Yes	Yes	Yes

Table 10: **Cross-Sectional Heterogeneity in bank vs. credit union exposure**

This table presents OLS estimates from the regressions of county-level change in credit union exposure from 2012-2020 on the county-level bank exposure during this time period. The dependent variables are the change in county-level bank branches or banks (per million population) from 2012-2020. Control variables include change in county-level log of total income, change in log of the population, and change in income growth from 2012-2020. All columns include state fixed effects. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
Dep. Var.	ΔBank branch p.c.		ΔBank p.c.	
ΔCU branch p.c.	-0.252**		-0.243**	
	(0.117)		(0.118)	
ΔCU p.c.		-0.439***		-0.479***
		(0.155)		(0.153)
ΔLog(Income)	7.899	7.924	-6.692	-6.414
	(34.350)	(34.320)	(31.512)	(31.417)
ΔLog(Population)	-259.679***	-262.367***	-164.589***	-168.715***
	(34.007)	(33.915)	(27.610)	(27.434)
ΔIncome growth	-9.042	0.688	-16.492	-5.776
	(68.108)	(68.343)	(45.615)	(45.666)
Observations	3,055	3,055	3,055	3,055
Adj. R2	0.0919	0.0998	0.0447	0.0629
State FE	Yes	Yes	Yes	Yes

Table 11: **Credit union exposure and bank lending**

This table presents OLS estimates from the regressions of county-level change in federal credit union exposure from 2012-2020 on the change in county-level bank lending during this time period. Large banks includes banks with assets more than $50 billion; small banks includes banks with assets less than $10 billion. The dependent variables are the change in log of county-level mortgage originations (columns (1)-(3)) and change in total small-business loan amount (column (4)) or the change in total small-business loan amount borne by lenders (column (5)) from 2012-2020. Control variables include change in county-level log of total income, change in log of the population, and change in income growth from 2012-2020. All columns include state fixed effects. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)
Lenders	All banks	Large banks	Small banks	All banks	
Dep. Var.	ΔLog of mortgage originations			ΔLoan amount	ΔLender amount
ΔFederal CU	-0.006***	-0.009***	-0.005*	-1.328***	-0.306***
	(0.002)	(0.002)	(0.003)	(0.286)	(0.069)
ΔLog(Income)	-0.253	0.399	-0.137	3.450*	0.842*
	(0.319)	(0.453)	(0.353)	(2.023)	(0.501)
ΔLog(Population)	2.366***	2.645***	3.079***	20.027***	5.021***
	(0.268)	(0.362)	(0.311)	(2.567)	(0.623)
ΔIncome growth	-0.360	-0.166	-0.538	-3.404	-0.771
	(0.423)	(0.552)	(0.474)	(2.101)	(0.535)
Observations	3,055	3,055	3,055	3,055	3,055
Adj. R2	0.135	0.0906	0.173	0.246	0.227
State FE	Yes	Yes	Yes	Yes	Yes

A. 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 market share 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

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

so

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

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

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

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

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

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

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

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

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

A.2 Additional tables

Table A0: **Variable definitions**

Variable	Description	Data source
Panel A. CU-year-quarter level		
FCU fraction	The institution-level measure of the fraction of federally chartered credit unions over all lenders (i.e., both banks and credit unions) across all counties in which the institution operates. The fraction is calculated at the census tract level based on the mortgage application volume in 2015Q4, then aggregated to the institution level.	HMDA
Post	An indicator variable that equals one if the quarter is or after 2017Q1, 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(Deposits)	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
Credit lines/Assets	Total credit lines/total assets.	NCUA Call Report
Interest on loans/Assets	Total interest on loans/total assets.	NCUA Call Report
Net int income/Assets	(Total interest income - interest expense - loan loss provisions)/total assets.	NCUA Call Report
Delinqunt loans(6-12m)/Loans	The volume of loans 6-12 months overdue/total loans and leases.	NCUA Call Report
Delinqunt 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 federally chartered credit unions over all lenders (i.e., both banks and credit unions) across all counties in which the institution operates. The fraction is calculated at the census tract level based on the mortgage application volume in 2015Q4, then aggregated to the institution level.	HMDA
Post	An indicator variable that equals one if the quarter is or after 2017Q1, and zero otherwise.	Call Report
Log(Assets)	Log of bank's total assets.	Call Report
Capital ratio	Bank capital/total assets.	Call Report
Cash/Assets	Total cash/total assets.	Call Report
Loans/Assets	Total loans/total assets.	Call Report
RE loans/Assets	Real estate 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
Deposit cost	Interest expense on deposits/total (domestic) deposits.	Call Report
Savings deposits/Assets	Total savings deposits/total assets.	Call Report
Time deposits/Assets	Total time deposits/total assets.	Call Report
Interest income/Loans	Interest income/total loans.	Call Report
Net charge-offs/Loans	(Charge-offs - recoveries)/total loans.	Call Report

Table A0: **Variable definitions (continue)**

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. Small business lending: Loan-level		
Interest rate	Initial interest rate - total interest rate (base rate plus spread) at time loan was approved.	SBA
Log loan amount	Log of total loan amount.	SBA
Charge-offs	Total loan balance charged off (includes guaranteed and non-guaranteed portion of loan).	SBA
Panel E. Mortgage lending: Loan-level		
Denied	An indicator variable that equals one if the application is denied.	HMDA
FCU	An indicator variable that equals one if the lender of the loan application is a federally chartered credit union, and zero otherwise.	HMDA
Post	An indicator variable that equals one if the year is or after 2017.	HMDA
Low income	An indicator variable that equals one if the applicant's income falls into the bottom quintile of the income distribution in a given year.	HMDA
Minority	An indicator variable that equals one if the applicant is a non-white applicant.	HMDA
Female	An indicator variable that equals one if the applicant is female.	HMDA
Occupancy	An indicator variable that equals one if the loan is for an owner-occupied property.	HMDA
Coborrower	An indicator variable that equals one if the applicant has a co-borrower.	HMDA
Panel F. Bank-county-year-quarter level		
CU fraction (bank)	A 2015Q4 measure of the federal credit union fraction for a bank across all its branches.	NCUA Call Report & FDIC SOD
CU fraction (county)	A 2015 measure of the federal credit union's fraction over banks in a county.	NCUA Call Report & FDIC SOD
Branch exits sum	The sum of bank branch exits (through closure or sale) of a bank in a county in the concurrent quarter.	NIC
Branch exits sum (t+τ)	The sum of bank branch exits (through closure or sale) of a bank in a county over the following τ quarters.	NIC
Panel G. Cross-sectional county level		
ΔBank branch p.c.	The change in county-level bank branches (per million population) from 2012-2020.	NIC & BEA
ΔBank p.c.	The change in county-level banks (per million population) from 2012-2020.	NIC & BEA
ΔCU branch p.c.	The change in county-level credit union branches (per million population) from 2012-2020.	NCUA Call Report & BEA
ΔCU p.c.	The change in county-level credit unions (per million population) from 2012-2020.	NCUA Call Report & BEA
ΔLog(Income)	The change in county-level log of total income from 2012-2020.	BEA
ΔLog(Population)	The change in county-level log of total population from 2012-2020.	BEA
ΔIncome growth	The change in county-level income growth from 2012-2020.	BEA
ΔLog of mortgage originations	The change in log of county-level mortgage originations from 2012-2020.	HMDA
ΔLoan amount	The change in total small-business loan amount from 2012-2020.	SBA
ΔLender amount	The change in total small-business loan amount borne by lenders from 2012-2020.	SBA

Table A1: **Credit union balance sheet: Robustness check**

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 2012 to 2020. *FCU fraction* is the 2012Q4 county-level federal credit union's fraction of mortgage applications. *Post* is a dummy variable that equals one if the quarter is or after 2017Q1. 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)	(12)
Dep. Var.	Sum of branches	Sum of counties operating	Assets ($mil)	Log Assets	Log Shares	Members ('000)	Log Members	Credit lines/ Assets	Interest on loans/ Loans	Net interest income/ Assets	Delinquent 6-12 mon/ Loans	Delinquent credit card/ Loans
Panel A. Federal CUs												
FCU fraction × Post	3.110**	0.998***	774.958**	0.225***	0.215***	42.657**	0.212***	-0.055*	0.005***	-0.004***	0.001*	0.000
	(1.330)	(0.379)	(312.239)	(0.056)	(0.054)	(21.273)	(0.062)	(0.032)	(0.002)	(0.001)	(0.001)	(0.000)
Observations	28,162	28,155	29,392	29,392	29,392	29,392	29,392	29,392	29,392	29,392	29,392	29,392
Adj. R2	0.971	0.978	0.919	0.996	0.996	0.931	0.993	0.0471	0.887	0.731	0.341	0.691
Panel B. State CUs												
FCU fraction × Post	0.338	0.360	-502.292	-0.204**	-0.211**	-23.884	-0.102	0.074	-0.001	-0.003	0.001	0.000
	(1.478)	(0.592)	(306.982)	(0.096)	(0.097)	(16.336)	(0.106)	(0.058)	(0.003)	(0.003)	(0.001)	(0.000)
Observations	23,556	23,545	26,360	26,360	26,360	26,360	26,360	26,360	26,360	26,360	26,360	26,360
Adj. R2	0.981	0.978	0.954	0.993	0.993	0.975	0.990	0.434	0.867	0.646	0.306	0.660
CU FE	Yes	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	Yes

Table A2: **Bank balance sheet: Robustness check**

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 2012 to 2020. Panel A includes all banks; Panel B includes small banks (bottom tercile); Panel C includes large banks (top tercile). *FCU fraction* is the 2015Q4 county-level federal credit union's fraction of mortgage applications. *Post* is a dummy variable that equals one if the quarter is or after 2017Q1. 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)	(11)	(12)
Dep. Var.	Log Assets	Capital/ Assets	Cash/ Assets	Loans/ Assets	RE loans/ Assets	Small loans <=$250k/ Assets	Small loans <=$1mil/ Assets	Deposit cost	Savings deposits/ Assets	Time deposits/ Assets	Interest income/ Loans	Net charge-offs/ Loans
Panel A. All banks												
FCU fraction × Post	0.140*	-0.007	0.029**	-0.027	-0.029	-0.007***	-0.021***	-0.002**	0.000	-0.024	-0.002	0.003***
	(0.076)	(0.004)	(0.012)	(0.019)	(0.019)	(0.002)	(0.007)	(0.001)	(0.020)	(0.015)	(0.003)	(0.001)
Observations	95,150	95,073	71,133	95,150	95,150	87,258	87,258	95,072	95,139	95,139	95,072	95,072
Adj. R2	0.988	0.857	0.786	0.905	0.923	0.912	0.915	0.756	0.907	0.926	0.784	0.338
Panel B. Small banks												
FCU fraction × Post	0.278**	-0.013*	0.289**	-0.099**	-0.105**	-0.014*	-0.033*	-0.000	-0.032	-0.014	0.012**	0.004***
	(0.136)	(0.008)	(0.137)	(0.039)	(0.041)	(0.008)	(0.019)	(0.002)	(0.034)	(0.026)	(0.005)	(0.002)
Observations	30,818	30,798	15,298	30,818	30,818	25,905	25,905	30,797	30,807	30,807	30,797	30,797
Adj. R2	0.951	0.895	0.824	0.914	0.927	0.883	0.914	0.705	0.908	0.933	0.753	0.225
Panel C. Large banks												
FCU fraction × Post	-0.231	-0.004	0.018	0.007	0.022	-0.010***	-0.021***	-0.004***	0.056	-0.072***	-0.017**	0.003
	(0.147)	(0.008)	(0.015)	(0.031)	(0.029)	(0.002)	(0.008)	(0.001)	(0.040)	(0.024)	(0.007)	(0.002)
Observations	31,846	31,789	31,446	31,846	31,846	31,244	31,244	31,789	31,846	31,846	31,789	31,789
Adj. R2	0.986	0.849	0.730	0.906	0.935	0.941	0.933	0.872	0.900	0.928	0.748	0.480
Bank FE	Yes	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	Yes

Table A3: **Changes in conforming loans' ex ante and ex post risks**

This table presents the results of the effect of the NCUA's FOM policy on changes in conforming loans' ex ante and ex post risk measures using loan-level HMDA-FNM/FDM merged data. The sample period is from 2012 to 2020. The dependent variable is indicated in the column head. *Dlq 60+* is a dummy variable that equals one if the loan is 60-day past due after it was issued. *Foreclosure* is a dummy variable that equals one if the property is foreclosed after it was issued. *FCU fraction* in a census tract measures the fraction of loan application volume of federal credit unions over all lenders using the HMDA 2015 data. *Post* is a dummy variable that equals one if the month is or after 2016 Nov when the policy was approved by the NCUA board. Loan control variables include indicator variables 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.

Table A3: **Changes in conforming loans' ex ante and ex post risks (Cont.)**

Panel A. Credit unions	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var.	FICO	LTV	Dlq 60+	Foreclosure	FICO	LTV	Dlq 60+	Foreclosure
Loan sample	Purchase				Refinance			
FCU fraction × Post	-0.343	-2.420	-0.058**	-0.013	3.219	-1.657	-0.033	-0.008
	(6.193)	(2.286)	(0.024)	(0.013)	(7.825)	(1.934)	(0.025)	(0.013)
FCU fraction	-1.750	5.169***	0.003	-0.003	-7.046*	12.137***	0.011	-0.001
	(3.625)	(1.365)	(0.011)	(0.004)	(3.822)	(1.588)	(0.009)	(0.005)
Post	3.217	-1.396**	0.010	0.003	-4.185*	0.834	-0.003	-0.002
	(2.346)	(0.637)	(0.009)	(0.003)	(2.367)	(0.671)	(0.009)	(0.004)
Occupancy	-19.239***	2.033***	0.007***	0.002*	-6.981***	-2.847***	-0.004*	-0.003***
	(0.757)	(0.283)	(0.002)	(0.001)	(0.732)	(0.300)	(0.002)	(0.001)
Female	0.400	-0.199	0.001	-0.001	-0.623	-0.070	-0.002	-0.001
	(0.436)	(0.124)	(0.002)	(0.001)	(0.412)	(0.157)	(0.001)	(0.001)
Coborrower	2.920***	-1.642***	-0.010***	-0.003***	6.126***	-2.457***	-0.010***	-0.002***
	(0.852)	(0.141)	(0.002)	(0.001)	(0.743)	(0.150)	(0.002)	(0.001)
Observations	65,501	65,501	65,501	65,501	61,081	61,081	61,081	61,081
Adj. R2	0.0733	0.265	0.0226	0.0170	0.0825	0.412	0.0202	0.00746
Cashout × Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan size decile FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Income decile FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan term FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B. Banks	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var.	FICO	LTV	Dlq 60+	Foreclosure	FICO	LTV	Dlq 60+	Foreclosure
Loan sample	Purchase				Refinance			
FCU fraction × Post	1.061	0.310	-0.017	-0.008**	-10.795***	3.475***	-0.012	-0.001
	(2.205)	(0.658)	(0.010)	(0.004)	(2.462)	(0.952)	(0.008)	(0.006)
FCU fraction	-6.415***	9.663***	0.008*	0.003*	-7.636***	13.890***	0.006**	0.001
	(1.129)	(0.468)	(0.004)	(0.002)	(0.909)	(0.510)	(0.003)	(0.002)
Post	-0.972	-0.480	0.003	0.003	-3.824***	-0.231	0.003	0.002
	(0.739)	(0.369)	(0.003)	(0.002)	(0.662)	(0.233)	(0.004)	(0.002)
Occupancy	-17.758***	2.829***	0.007***	0.002***	-7.602***	-1.650***	0.001**	0.000
	(0.220)	(0.141)	(0.001)	(0.000)	(0.305)	(0.172)	(0.001)	(0.000)
Female	0.087	-0.180***	-0.003***	-0.001***	-0.738***	-0.119***	-0.002***	-0.001***
	(0.198)	(0.050)	(0.001)	(0.000)	(0.139)	(0.042)	(0.000)	(0.000)
Coborrower	1.442***	-1.895***	-0.015***	-0.004***	2.886***	-2.033***	-0.013***	-0.003***
	(0.505)	(0.052)	(0.001)	(0.000)	(0.397)	(0.062)	(0.000)	(0.000)
Observations	662,980	662,980	662,980	662,980	684,611	684,611	684,611	684,611
Adj. R2	0.0629	0.222	0.0258	0.00974	0.0901	0.316	0.0287	0.0129
Cashout × Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan size decile FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Income decile FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan term FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes