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The policy impact of new rules for loan participation on credit union returns

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ABSTRACT

In recent years, credit unions have increasingly purchased loan-participation agreements in order to diversify their loan portfolios and manage loan growth. Responding to high charge-off rates for these loans and concern for systemic risk, the National Credit Union Administration imposed in 2013 new rules on federally insured credit unions that limited the purchase of loan participations from a single originator to the greater of $5 million or 100% of net worth. This study uses a difference-in-difference framework to examine the effect the policy had on returns. As a result of the policy change, credit unions with a high share of net worth in loan participations earned, on average, a return on assets 47 basis points less than their counterparts. Further, we find evidence that suggests these lower returns were driven by a decline in participation loans with recourse provisions, liquidity issues, and relatively higher interest expenses.

1. Introduction

Credit unions in the United States are made up of members who share common bonds, which may be based on their occupations, some other association, or the geographic area in which they live.[1] The close ties between credit unions and their memberships may provide insight into lending decisions because of the availability of information that may have otherwise been private (Kane and Hendershott, 1996). These ties significantly limit lending opportunities of credit unions to a relatively homogeneous and narrow market segment. This may result in a lack of diversification among credit union assets. To overcome this, credit unions may use loan-participation agreements to manage their assets and liabilities while increasing revenues.

Loan-participation agreements allow the originator of a loan to transfer ownership to one or more purchasers such that the originator maintains a retained interest in the participated loan. By participating in a loan outside of its trade area, a credit union may be able to diversify its loan portfolio across geographic regions, among types of borrowers, and into loan categories they may not originate. Participation allows credit unions to potentially earn higher interest income and reduce excess liquidity when their own member demand for loans is weak. The sale of loan participations allows originators to make larger loans and strengthens their ability to earn fee income from specializing in the origination of loans.

From a regulatory perspective, the concern with third-party loan agreements such as loan participations, is whether financial institutions will employ the same level of due diligence and monitoring as they would to loans they originated and held in their own portfolios. The issue with loans sold without recourse, as shown by Pennacchi (1988) and Gorton and Pennacchi (1995), is that moral hazard will reduce costly monitoring of loans below the efficient level. Incentives for monitoring may also decline as the ability to sell off loans allows one to transfer risk if necessary (Gande and Saunders 2012; Kamstra et al., 2014; Parlour and Plantin, 2008), such that financial institutions sell loans of lower quality than they retain in their portfolios. These views are consistent with the empirical findings of Li et al. (2015), where borrowers from lenders that are more prone to sell their loans are shown to perform worse and have lower credit quality than borrowers from lenders where relationships are built by holding loans in the portfolio—results they believe are due to resources being used inefficiently to market and distribute tradable loans rather than due to issues with screening and monitoring. Therefore, loans that are originated and held may perform very differently than participation loans. The National Credit Union Administration (NCUA, 2008) warned of this point in

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[1] Credit unions are also unique in they are owned by their members, who are depositors at the credit union. For this reason, various deposit accounts in a credit union are technically referred to as share accounts and interest paid on these accounts is referred to as dividends. We will refer to deposits and interest interchangeably with shares and dividends.

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a supervisory letter, noting the delinquency rate for loan participations among credit unions was 2.27% in 2008, or approximately twice the delinquency rate of the overall credit union loan portfolio at 1.13%.

If only "lemons" were sold, adverse selection could cause the market for loan sales to break down. Gorton and Pennacchi (1995) show sellers are able to overcome the agency issue if they retain a portion of the loan, with the proportion increasing with the level of risk. The loan-participation agreements held by credit unions are unique in that they require the originator to maintain a fixed ownership stake in the underlying loan.[2] Guo and Wu (2014), though, demonstrate in their theoretical model that a flat-rate retention ratio may in fact aggravate the adverse selection problem as purchasers are unable to determine whether the retention ratio was the optimal choice of the seller or the binding regulatory limit. If chosen by the seller, the retention ratio is a noiseless signal of asset quality, which will vary by the asset's riskiness and risk attitudes of market participants for various assets.

Another means of reducing the agency issue is information sharing. Loan-participation agreements require the originator to provide the participants with all financial and nonfinancial credit information relevant to the loan. Despite this requirement, credit unions may participate in loans where they lack origination experience or are in a market outside their trade area, which may limit their ability to use "soft" information (see Coval and Moskowitz, 2001; Berger et al., 2005), independent of the originator. In order to reduce the impact of asymmetric information and improve loan performance, credit union participants typically choose to work with only one or two originators and thus build close relationships.[3] Lenders are quite familiar with the notion that close relationships can lead to higher returns. Of concern to the NCUA is that a high degree of concentration with any originator may create systemic risk among participants.

To mitigate this potential exposure to risk from the continued growth in loan participation, the NCUA instituted new rules in 2013 to limit a participants' concentration with any single originator. This paper's contributions to the literature are to quantify the effect this policy change had on credit union returns in the short run and to identify the channels in which returns were affected. Using a difference-in-difference estimation framework, we find the return on assets was 47 basis points lower as a result of the policy change among credit unions with a high ratio of loan participation to net worth. Returns declined as credit unions with high participation ratios are shown to roll back their previous growth in participation, with agreements having provisions for recourse declining by 1.83 percentage points in 2014 relative to their share of assets in 2010. The direct result of this is a reduction of non-interest income. Following the change in policy, credit unions with high participation ratios are shown to pay higher premiums on both their borrowing and deposits, which we attribute to liquidity issues caused by the policy's constraints. By increasing the duration and premiums of their liabilities, relative to their counterparts over the period, credit unions with high participation ratios are shown to pay higher interest expense, which also contributed to their lower returns.

The rest of this paper is organized as follows. In Section 2 we provide background information on the change in policy toward loan participations. Section 3 examines the empirical effects of the policy on the return on assets and the robustness of our results. In Section 4, we consider the channel to lower returns, and Section 5 concludes.

2. Systemic risk, participation loans, and credit unions

2.1. Systemic risk

During the financial crisis, credit unions were not immune to the disruption of global financial markets, as a heavy concentration in mortgage-backed securities among several corporate credit unions nearly led to their insolvency (NCUA 2010). What prevented this was a large infusion of liquidity from the NCUA, which securitized $50 billion dollars of toxic assets held by the corporate credit unions. If this and other actions had not been taken, the NCUA (2010) estimates that one-third of credit unions' net worth would have been wiped out and at least 800 would have failed. In her 2015 testimony before the House Financial Institutions subcommittee, NCUA Board Chairwoman Debbie Matz noted that in August of 2009 "the credit union system was on the brink of collapse." Despite historic intervention, forty-six credit unions failed in 2008 and 2009, with losses to the National Credit Union Share Insurance Fund of nearly $1 billion.

Over time, credit unions have become more competitive with commercial banks for providing financial services. This was brought upon by regulatory reform, which allowed membership to expand to multiple groups to serve a geographic area. By expanding their membership, credit unions increased their share of national deposits from 4.7% in 1989 to 8.5% in 2009, and with this the industry's importance to the financial system has risen (see Tarullo, 2009). Data from the Federal Reserve's Survey of Consumer Finances further reveals that more than one-third of households have a banking relationship with a credit union. In the wake of the financial crisis, regulators worldwide have taken steps to identify and regulate systemically important financial institutions. Here in the United States, Section 165 of the Dodd–Frank Act requires bank holding companies and nonbank financial companies with more than $50 billion in assets to follow more heightened regulatory standards and those with more than $10 billion in assets to submit to annual stress tests. Only one credit union, Navy Federal Credit Union, with $64 billion in assets in 2014, meets this $50 billion cutoff, while four others had more than $10 billion in assets.[4] Despite few credit unions being systemically important from a size perspective, many are important in the role they play in providing credit in low-income and underserved (e.g., rural) areas, which are additional factors the Financial Stability Oversight Council considers in terms of systemic importance (see 12 C.F.R. § 5330).[5]

Increased competition affects both large and small credit unions' exposure to risk. As credit unions continue their expansion into new markets, the once close ties between credit unions and their members begin to diminish, such that asymmetric information rises. The result of this is an increased need for due diligence, among large credit unions expanding their own origination and small credit unions relying on loan participation and other indirect lending opportunities to grow and compete. It was a failure in due diligence, the NCUA (2010) notes, that led many credit unions with participation loans to near insolvency and others to fail during the crisis.

[2] 12 C.F.R. §701.22 requires federal credit unions retain 10% of the outstanding balance of the loan in loan participations they originate. Other eligible organizations must retain 5%, unless a higher percentage is required by state law.

[3] Credit union leagues from Texas (Yashewski, 2012), Ohio (Kozlowksi, 2012), and Wisconsin (Whiting, 2012) noted in their public comments to the NCUA it was common for their members to work with only one or two originators.

[4] For comparison, thirty-eight commercial banks had more than $50 billion in assets and 104 had assets more than $10 billion as of December 31, 2014 (see http://www.ffiec.gov/nicpubweb/nicweb/HCSGreaterThan10B.aspx).

[5] The FSOC was established in the Dodd–Frank Act to provide oversight of U.S. financial stability. The chairman of the NCUA serves as one of ten voting members on the council.

2.2. A change in policy on loan participation rules

On December 22, 2011, the NCUA proposed (Federal Register, 2011) several new rules for federally insured credit unions (FICUs), which would impose concentration limits on the purchase of loan participations. Under the proposed rules, each FICU would be limited to the purchase of loan participations from a single originator of up to 25% of the FICU's net worth. The FICU also would be limited in its purchase of loan participations from a single borrower, or a group of associated borrowers of up to 15% of net worth, which is similar to policy that already existed (12 C.F.R. §723.8) regarding federal credit unions' origination of member business loans. The NCUA's perception is that while loan participation benefits the credit union industry, a high share of total assets from participation, along with concentration in a few originators, leads to systemic risk from the shared exposure.

The ability to buy and sell loans via participation allows credit unions to better manage their liquidity and credit risk while potentially increasing returns. Cebenoyan and Strahan (2004) empirical findings support these notions as banks engaged in buying and selling loans have, on average, a return on their assets 10 basis points higher than their counterparts that do neither activity, and they tend to have lower risk as indicated by variation in these returns. Examining the transfer of credit risk more generally, Bedendo and Bruno (2012) find medium-size banks prior to the financial crisis were subject to more variation in their returns on assets the more dependent they were on combined loan sales and securitization for risk transfer. During the crisis, there was no effect on the variation of returns, though bank loan portfolios performed worse the more involved banks were with the sale and securitization of loans not tied to residential mortgages. Further empirical evidence (Keys et al., 2010; Purnanandam, 2011) suggests loan sales and securitization led to less screening during the financial crisis, which resulted in origination of lower-quality mortgage loans that exhibited higher default. Even if bank-level risk does not rise from the use of loan sales, systemic risk may still rise as banks eliminate idiosyncratic exposure by diversifying, while creating similarity across balance sheets that exposes the system to shared shocks (De Vries, 2005; Nijskens and Wagner, 2011). Nijskens and Wagner find this to be the case for banks using collateralized loan obligations and credit default swaps during the crisis. The increase in risk among banks using these financial instruments, they find, is due to higher correlation of returns between banks (systemic risk) rather than the volatility of individual bank returns (bank-level risk).

Credit unions, not surprisingly, largely opposed the proposed rule changes, which was reflected in the majority of the 215 comments the NCUA received during the proposal's public comment period that ran through February 21, 2012.[6] Opponents (e.g., Grinnick, 2012; Freeborn, 2012) argued a concentration limit of 25% of net worth for a single originator was too low and noted that this limit ironically could increase systemic risk by forcing credit unions to work with inexperienced and untested partners. Prudent participants, the industry noted, work with a small number of originators to improve information sharing and to develop an understanding of how a particular originator's loan products will be affected over time by changes in the business cycle and interest rates, which improves due diligence and monitoring. By adding originators, the concentration limit may result in an increase in systemic risk if information asymmetry also increases. Credit unions, though, were primarily concerned a concentration limit would reduce their net income. Judith Sparrow (2012), chairwoman of Chartway Financial FCU, indicated to the NCUA a 25% concentration limit would reduce her credit union's interest income by $14 million over five years, presumably from interest lost on not being able to extend profitable participations with existing originators.[7] Other credit union CEOs, such as Dubie (2012), believed non-interest expense would likely rise as credit unions added staff and information technology to increase self-origination and monitoring. In each case, lower returns are posited to be a direct result of the concentration limit being a binding constraint on credit union activities.

It is possible the policy had a more general effect on credit unions with exposure to participation loans. By limiting the ability to buy and sell participations, the change in policy reduces the liquidity of loan participations as an asset. Pyles and Mullineax (2008) find this to be empirically the case for syndicated loans, where constrained loans are less liquid and shown to have higher spreads. Reducing the liquidity of credit union assets would increase exposure to liquidity risk, making it more difficult to meet borrower demands and potential outflows from creditors and depositors. Compounding the liquidity issue is the fact that lenders use loan sales to manage the effects of liquidity shocks (Irani and Meisenzahl, 2015). Bank lenders can improve their ability to bear systemic liquidity risk by adding transactions deposits (Gatev et al., 2009). Attracting additional deposits, or in the case of credit unions, share accounts, comes with higher interest expenses. Credit union's may also stabilize their sources of funding by replacing more volatile wholesale funds and short-term debt with long-term debt, which needs to be rolled over less often and is subject to less risk with refinancing. Faced with higher liquidity risk, any additional borrowing by affected credit unions in the wholesale or debt market is likely to come with a higher premium and additional interest expense. Interest expenses may rise and returns may fall if liquidity is negatively affected by the policy change.

The final rules regarding participation limits were announced in the Federal Register on June 25, 2013, and were to become effective a month later on July 25, 2013. What is noteworthy about the difference between the proposed and actual rules is the NCUA increased the single originator concentration limit to the greater of $5 million or 100% of net worth. The $5 million limit was added to lessen the burden of the policy change on small credit unions, and the higher net-worth limit, the NCUA (Federal Register, 2013) noted, was to reduce the number of credit unions potentially impacted by the policy. As of fourth quarter 2012 call reports, the NCUA indicated that only seventy-nine credit unions held loan participations greater than their net worth under the assumption of a single originator.[8] If participations were purchased equally from two originators, the number impacted fell to seventeen credit unions, which fell further to five credit unions when the $5 million limit was applied (Federal Register, 2013). Despite the NCUA's expectation that few credit unions would be impacted by the change in policy, implementation was delayed to September 23, 2013, as a result of what the NCUA (2013) noted were difficulties by some FICUs to come into compliance. While the nature of the difficulties and number of credit unions impacted by the change in policy is unclear, it is evident from the NCUA's press release there was an effect. Below we examine whether the policy change had an effect on credit unions' returns on assets, as feared by the industry.

[6] Individual comments received by the NCUA regarding proposed regulations are available for review at http://www.ncua.gov/Legal/Regs/Pages/PropRegs.aspx.

[7] In the proposed rules, existing participations above the concentration limits would be grandfathered in at the time the final rule became effective.

[8] Call report data do not provide a breakdown of the amount of loan participations by originator.

3. The effects of regulation on the return on assets

In our empirical analysis, we examine the effect the change in policy toward the purchase of loan participations had on the return on assets of Federal Credit Unions (FCU) and Federally Insured State Credit Unions (FISCU). We focus our analysis on the sample of credit unions that held positions in purchased loan participations on their balance sheet in 2012, the year prior to the change in policy. The dependent variable used in the analysis, the annual return on assets, is equal to net income earned during the year divided by the value of total assets at year end. The financial data drawn throughout the analysis comes from end-of-year call report data reported to the NCUA and is adjusted for changes in the price level and mergers over time. Mergers can significantly impact financial statement items. Therefore, similar to previous studies (DeYoung and Roland, 2001; Esho et al., 2005), we combine financial data from credit unions that subsequently merged within our period of analysis. That is to say, two credit unions that merge in 2014 would have a single combined return on assets for 2013 and prior years, which would equal their combined net incomes for the year divided by their combined total assets. We test this aggregation for robustness using a sample of observations that do not include mergers.

Our sample of observations is also adjusted to exclude very small credit unions. Similar to Ely (2014), we eliminate from our sample credit unions with either 100 or fewer members or with assets of $2 million or less in year 2000 dollars. These small credit unions, which are often run by volunteers, are potentially outliers. For our sample of credit unions with participation loans, this assumption has little effect, affecting only thirty-nine observations.

3.1. Identification and estimation strategy

To estimate the impact of the policy change, we need to be able to identify what would have happened to credit unions' returns if the intervention had never occurred—the true counterfactual. Lacking data from a randomly controlled trial in which the policy were randomly applied, we instead rely on a difference-in-difference approach for purposes of estimation. This approach compares the effects on returns before and after the policy changes for both treatment and control groups, where the treatment group is assumed to be impacted by the policy intervention and the control group is not. In this case, the difference in returns over time for the control group represents what would have happened to the treatment group's returns over the intervention period if the policy were not implemented. By comparing the difference in the difference in returns one is able to identify the effect of the policy change.

The control group we use throughout consists of FICUs whose purchased loan participations were positive yet less than 25% of their net worth in 2012. These 825 credit unions were each below the proposed single originator concentration limit put forward by the NCUA and were thus less likely to be impacted during the discussion period of the policy and after it went into effect. We believe it is important to exclude credit unions from the control group that do not hold loan participations, as they may differ fundamentally from our treatment group on the basis of unobservable factors, which influence the decision to hold participation loans. In our baseline model, the treatment group consists of credit unions with loan participations greater than 100% of their net worth at year end 2012. The sixty-six credit unions that meet this criteria were not necessarily constrained by implementation of the policy, as it is unknown whether they worked with more than one originator. If this were the case, the estimate of the policy effect may be mitigated by the presence of these credit unions in the treatment group. We believe, though, that the policy could affect credit unions with high participation ratios more generally by affecting their liquidity.

Our main finding is captured in Fig. 1, where we compare the average return on assets and average ratios of loan participation to net worth for both our treated (constrained) and control groups over time.[9] Examining the return on assets, highlights the divergence in returns between the two groups in the year (2014) following when the policy went into effect. Whereas returns of treated credit unions decreased by 47 basis points in 2014 from the previous year, they increased by 4 basis points for our control group. As evident from the second panel, treated credit unions began to decrease, in absolute and relative terms, their share of loan participations in the year the policy went into effect (2013), and this in magnitude further increased in 2014. Our treated group appears to be constrained following the change in policy, which in part reduced returns.

A concern one may have is whether the control group used is adequately similar to the treatment group. If the two groups were to differ substantially, then there is a greater potential for the returns of both groups to be affected differently due to unobserved differences (e.g., sensitivity to macroeconomic conditions) at the same time as our policy change, which would challenge our identification strategy. To ensure comparability of treated and control observations, we balance the covariates between groups by using the propensity score to both trim and match observations from both groups.[10] The propensity score is the estimated probability of being in the treatment group conditioning on observed covariates and represents a low dimension (Dehejia and Wahba, 2002) way of matching treated observations with similar control observations.[11] Overlap in our covariate distributions between the groups is accomplished using two methods. The first method uses the propensity score to identify the common support between observations and eliminates treated and control observations with little or no overlap in their distributions. Credit unions with a propensity score of less than the first percentile of scores among the treated group are trimmed, as are observations with propensity scores above the 99th percentile of the control group. This reduces the number of credit unions in the treatment group to fifty-five with 735 in the control group. For an additional robustness check, we also use the propensity score and apply nearest neighbor matching on the set of observations on common support to identify a sample of credit unions in our control group that most closely resemble our treated group. The matching algorithm used here matches with replacement treated observations with the four closest control observations.[12] The matched sample consists of the fifty-five treated observations and 170 control observations that were matched.

Balance between our treated and control groups is evaluated by comparing the normalized difference in mean covariates based on treatment status (Imbens, 2015) for our observations with common support and where matching is used. Imbens (2015, p. 385) finds a

[9] The results discussed here are from the "trimmed" sample, which is explained later on.

[10] The normalized differences of our unbalanced sample were larger than 0.25 standard deviations for asset growth (0.29), net worth to total assets (0.37), and size (0.39).

[11] There is no causal interpretation of the model used to estimate the propensity score (Dehejia and Wahba, 2002). Therefore, we use stepwise regression (Imbens, 2015) to select a subset of our controls for the specification. Backward elimination with various cutoffs (0.1, 0.15) are used without any impact on the results. Data for 2012, prior to the policy change, is used in the estimation of the probit model. These estimates are available upon request.

[12] Matching is based on the standardized Euclidian distance. Dehejia and Wahba (2002) note most matching algorithms will be similar when there is significant overlap of the propensity scores between treated and control groups, which is why we impose matching after trimming. In terms of minimal bias and root mean square error, Abadie and Imbens (2011) show in their simulations that four matches work well.

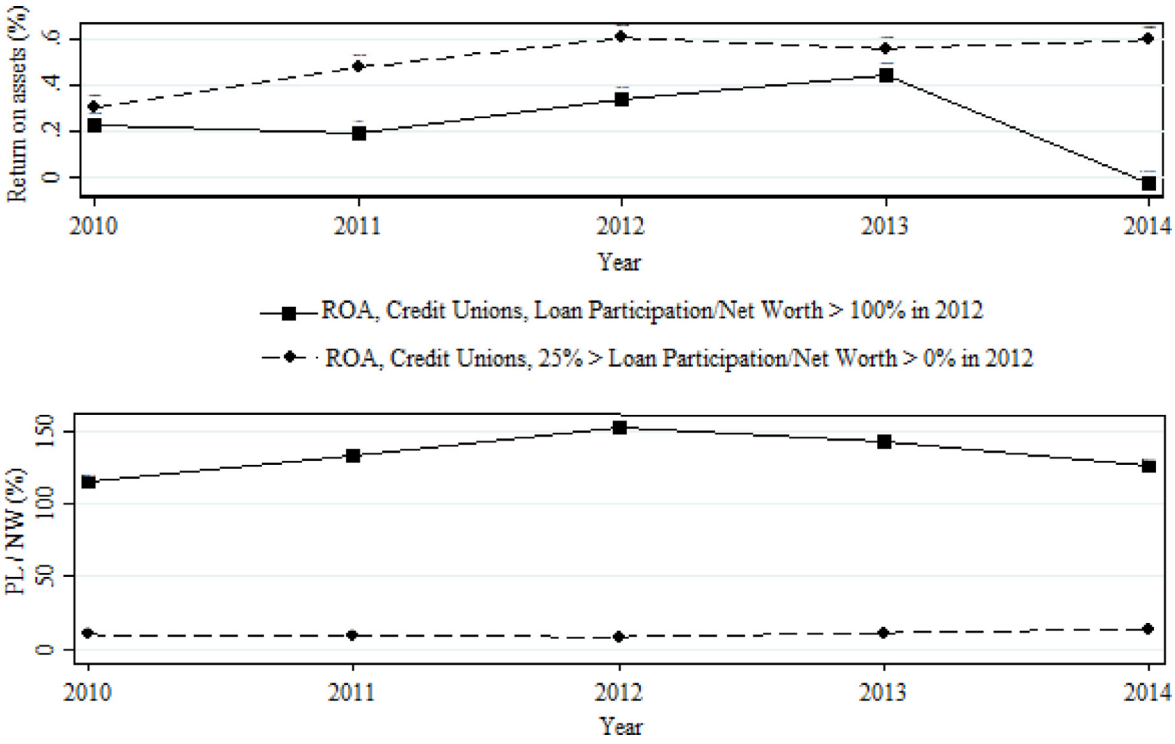

Fig. 1. Return on Assets and participation Loan to Net Worth Ratio.

normalized difference is a more useful method of evaluating covariate balance between treated and control groups than the t-statistic, which is sensitive to sample size.[13] A difference greater than 0.25, or 25% of a standard deviation in absolute value has been suggested by Imbens and Rubin (2015) to be an indication estimates from linear regression may be sensitive to model specification. Table 1 presents means and normalized differences for the covariates of both groups, under each balancing procedure. Under the trimmed sample the largest normalized difference is 0.31 for credit union size, which is modest yet above the 0.25 cutoff. For this reason, we examined the robustness of our findings to using a matched sample. With nearest neighbor matching we are able to lower the normalized difference in credit union size to 0.22 standard deviations in the sample.

The divergence in returns on assets displayed in Fig. 1 in 2014 could be potentially explained by differences in observed time-varying conditions that affect credit union purchases of loan participations and their returns. It is possible that shocks, along with differences in financial conditions (size, asset and liability management, solvency, productivity), contributed to the change in returns. Unobserved heterogeneity may also play a role, as unobserved factors (e.g., management quality and preferences toward risk aversion) may be correlated with the purchase of loan participations and returns, which would confound identification of the policy effect. These unobserved differences are likely to be credit union specific, and as such do not vary over short periods of time. This suggests use of a fixed effects model to control for time-invariant credit union specific factors with covariates added to control for differences in time-varying observed factors.

The linear regression framework for this approach is specified in Eq. (1) by a two-way fixed effects model

$$y_{it} = \sum_{j=2}^{T} \alpha_j T_{j,it} + \beta x_{it} + \delta_t + \theta_i + \varepsilon_{it}, \quad (1)$$

where x_{it} represents a matrix of covariates that vary by credit union i =1:N and time t =1:T, with time and credit union fixed effects given by δ_t and θ_i, respectively. The time period covered by the model includes years 2010–2014, which allows us to evaluate whether there were any differences in pre-treatment trends between the control and treatment groups prior to and during the discussion periods of the policy change. The $T-1$ indicator variables $T_{j,it}$ are equal to 1 if credit union i is in the treatment group and the year t= j, and is 0 otherwise. Our estimates of the treatment effects, α_j, capture the average difference in the return on assets between the treatment and control groups for year j minus the difference between the two groups for the baseline year 2010. Therefore, the coefficient for the treatment effect coinciding with 2011 provides us a means to formally test whether the pre-treatment trends of the control and treatment groups were the same prior to the policy being discussed by testing whether the coefficient was significantly different from 0. Similarity in trends is crucial for identification of the policy effect, as this is what allows us to determine what would have happened to returns for the treatment group if the policy had not been implemented. It is possible trends may have been different during the discussion period if credit unions responded preemptively to the proposed change in policy. Our primary interest, though, is in the coefficient for the treatment effect in 2014 as it captures the impact of the policy change in the first full year it was in effect. The coefficient for 2013 reflects income earned over nine months prior to and three months following the change, therefore we are less likely to see as large an effect in this earlier period or during the year the policy was discussed.The idiosyncratic error term ε_{it} is assumed to meet strict exogeneity, such that the error has mean 0 conditional on past, current, and future values of the regressors

[13] The normalized difference for covariate Xk is equal to $\Delta_{X,k} = \frac{\bar{X}_{t,k} - \bar{X}_{c,k}}{\sqrt{(S^2_{X,t,k} + S^2_{X,c,k})/2}}$ where we have the difference in the mean of covariate Xk between the treatment and control groups in the numerator and their standard deviations in the denominator.

and fixed effects. It is likely though that the error term is not necessarily independently and identically distributed, therefore we adjust our standard errors to control for the possible presence of heteroskedasticity and correlation of errors over time for credit unions within the same state. Cameron and Miller (2015, p. 330) note that panel-robust or cluster-robust standard errors are important even in specifications that include fixed effects, as errors for a given individual (cluster) may be correlated over time "due to unobserved factors that evolve progressively over time." Failure to account for these features can result in standard errors that are significantly lower than their robust counterparts, an issue that was shown by Bertrand, Duflo, and Mullainathan (2004) to be particularly relevant for interpreting the statistical significance of policy effects in difference-in-difference settings.

Table 1
Covariate summary statistics, 2012.

	Trimmed sample			Matched sample		
	Mean control	Mean treatment	Normalized difference	Mean control	Mean treatment	Normalized difference
SIRRT ratio	2.44	2.48	0.02	2.55	2.48	−0.03
Fixed assets/total assets (%)	2.88	2.50	−0.15	2.65	2.50	−0.07
Asset growth (%)	3.96	2.40	−0.20	3.04	2.40	−0.09
Net worth/total assets (%)	10.37	9.55	−0.25	9.82	9.55	−0.09
Loans/total assets (%)	58.96	59.79	0.04	59.81	59.79	0.00
Member percent	0.20	0.17	−0.08	0.18	0.17	−0.01
Cash & short term investments/total assets (%)	17.97	20.53	0.19	18.44	20.53	0.17
Size	18.97	18.25	−0.31	18.74	18.25	−0.22
Credit card loan share (%)	5.13	5.70	0.08	5.55	5.70	0.02
Auto loan share (%)	31.91	27.82	−0.16	29.60	27.82	−0.08
Net long term assets/total assets (%)	31.51	30.01	−0.08	30.81	30.01	−0.04
Loans/deposits (%)	67.45	66.91	−0.02	67.56	66.91	−0.03
Unemployment (%)	7.65	7.97	0.11	7.57	7.88	0.12
Observations	738	55		170	55	

Notes: The control group consists of credit unions with a loan participation to net worth ratio greater than 0 and less than or equal to 25%. The treatment group consists of credit unions with a loan participation to net worth ratio greater than 100%.

3.2. Specification of return on assets

A credit union's return on its assets is in large part influenced by management of its assets and liabilities along with the economic environment they operate within. One would expect, ceteris paribus, holding assets associated with higher risk to offer higher returns. For example, a credit union receives, on average, a higher interest rate on unsecured credit (e.g., a credit card) than on a loan supported by collateral (e.g., an auto or mortgage loan) in order to be compensated for additional credit risk. Whether the credit union actually earns a higher return on credit card debt than on a car loan depends on realized outcomes. If default on credit card debt is more likely or costly than expected, then the premium may not have been sufficient to compensate for risk, in which case returns are lower despite higher risk. Therefore, concentration in a particular asset class may have a different impact on returns in one period relative to another, and returns may not be associated with risk. This is evident in Ely's (2014) analysis of the return on credit union assets, as he finds the share of loans among credit cards and other unsecured credit to have no effect on returns for the period 2004–2007 relative to the share of real estate loans. Similarly, the share of auto loans has no effect for the same period. Yet for the period 2008–2011, the effect differs across loan type, with the share of unsecured loans contributing to lower returns than the share of real estate loans, and the share of auto loans contributing to higher returns.

Returns are also influenced by the mix of assets and movements in interest rates. When interest rates rise (decline), the value of long-term fixed-rate assets decline (rise) by more than short term assets. Credit unions with a larger asset share among long-term assets are exposed to additional interest rate risk. Depending on the size and direction of interest rate movements, credit unions may either earn higher returns, as Ely (2014) finds for the period 2008–2011, or lower returns (2004–2007) from having a higher share of net long-term assets. The liquidity of the mix of assets may also impact returns. Loans typically offer higher returns and are less liquid than other assets, whereas securities and cash may offer little to no return, but are highly liquid. The consequence of holding relatively more liquid assets is generally lower returns, but during economic downturns, more liquid and lower-risk assets may outperform their counterparts. Thus variation in macroeconomic conditions will play a role in the performance of existing assets and in determining lending opportunities. How well credit unions make use of their opportunities as measured by their productivity will influence returns.

Our model specification of the return on assets includes several measures to control for differences in asset mix, credit union productivity, and the economic environment, which vary by credit union and time. Most of our measures are drawn from financial ratios used in the NCUA's Financial Performance Reports (FPR) to

evaluate credit unions.[14] The share of net long-term assets to total assets is included to control for exposure to interest rate risk, as is the supervisory interest rate risk threshold (SIRRT).[15] Variation in liquidity across the mix of assets is controlled here using both the share of assets in cash and securities, along with the share of assets held in loans, with the share of investments omitted to avoid multi-collinearity. A measure of liquidity and liability management is included, which is the loan-to-deposits ratio. The more loans are supported by relatively low cost core deposits, the stronger earnings are likely to be. We control for variation in credit risk across the mix of loans, similar to Ely (2014), using both the share of loans held in unsecured credit and the share in autos, with the share of real estate loans omitted to avoid multi-collinearity.

Two measures are used to generically capture differences in productivity. The natural logarithm of total assets is included to control for the size of credit unions. Larger credit unions are able to take advantage of economies of scale by offering more banking services at lower costs, and are better able to diversify. For performance comparisons, the NCUA determines a credit union's peers on the basis of their size. Credit union productivity though is also potentially impacted by the local environment. The FPR ratio of current members to total potential members in the credit union is a measure of the scope in which expansion is possible (Glass and McKillop, 2006). Glass and McKillop find that higher penetration of members within the credit union's common bonds results in lower costs, which they believe may be due to informational advantages associated with higher membership penetration.

The specification includes three variables that capture credit union risk management practices more generally. Goddard et al. (2008) suggest a credit union's ratio of net worth to total assets may be an indication of management's preferences toward risk and return, as a highly solvent credit union may be choosing to forgo return-generating opportunities in exchange for lower risk. Greater solvency, though, they note, may reduce insurance costs, which would increase returns. Analyzing the mean return on assets from 1993–2004 with a cross section of credit unions, Goddard et al. find more solvent credit unions earn higher returns. They also find credit unions with faster asset growth earn higher returns. Asset growth is included as it reflects both internal and external factors that influence the credit union and may play a role in the purchase of loan participations. A measure of fixed assets (including foreclosures) to net worth is included to capture exposure on the balance sheet to illiquid and non-revenue-generating assets. The NCUA (2015) notes a high concentration of non-earning fixed assets constrains a credit union's ability to adjust to macroeconomic shocks.

Differences in local economic conditions are captured here using the unemployment rate where the credit union is headquartered. The unemployment rate is measured using Bureau of Labor Statistics data at the Metropolitan Statistical Area (MSA) or county level, depending on whether the credit union is within a MSA.[16] The inclusion of time-fixed effects captures the impact of varying macroeconomic conditions at the national level, whereas fixed effects for each credit union capture the effect of any time invariant measures, such as charter type, region of operation, and type of common bond.

3.3. Results and discussion

Interpretation of our difference-in-difference estimates as a policy effect depends on the assertion that trends in returns are the same for the treatment and control groups before and after the policy change. We test this assertion, in part, by evaluating whether the difference in returns between the treatment and control groups in 2011 was different from the difference in returns for 2010, keeping in mind that both years' returns were prior to the rule being proposed. The estimate for this effect from the trimmed sample is given by α_2 (2011) found in column 1 of Table 2. The coefficient of this is not statistically significant at the 10% level, indicating our pre-treatment trends are the same for both groups. The estimates of the other years' treatment effects also indicate that there is no difference in returns relative to the baseline year 2010, between the two groups during the policy discussion and partial implementation stages of 2012 and 2013. Turning attention to the key policy effect α_5 (2014), the results indicate in the first full year the policy was in effect that returns on assets were lower by 47 basis points (0.47 percentage points), a result statistically significant at the 1% level. For a robustness check, we estimate the model using observations from the matched sample. Similar to before, there is no evidence (Table 2, column 2) to suggest a difference in returns prior to 2014. In 2014, the effect of the policy is to reduce returns by 0.35%, a slightly smaller yet still statistically significant effect. Given that the mean level of returns in 2014 was 0.57%, both estimates of the policy effect are substantial in magnitude.[17]

One of the things we do to further test the sensitivity of our difference-in-difference estimates is to use a falsification test with a fake treatment group—we identify a group of different credit unions we know were not affected by the policy change and pretend they are the treatment group. If the estimated treatment effect is non-zero for the fake group, then our previous difference-in-difference estimates are likely biased as unobserved factors are influencing returns of our control group at the time of change and not the change in policy. For our falsification test, we use a matched sample of credit unions that had not purchased loan participations as our fake treatment group, and the same control group as before.[18] The estimates in column 3 of Table 2 indicate that the coefficient for α_5 (2014) is not statistically significant, which means we do not observe a difference in returns between our fake treatment and control group in 2014 or years prior. Failing to reject the null hypothesis of our falsification test adds further confidence in the parallel trends assumption.

The estimates of our covariates found in columns 1 and 2 are consistent with expectations. Credit unions with higher net worth are shown for both samples to have higher returns on assets, a result similar to Goddard et al. (2008). We also find the share of fixed (non-earning) assets has a negative effect on returns in both samples. For the trimmed sample, a few additional covariates had a statistically significant effect. Credit unions with a higher concentration of interest rate risk as measured by the SIRRT ratio earned lower returns. A positive and statistically significant coefficient for the loan-to-deposit ratio, indicates credit unions with less liquidity

[14] Each of the financial ratios is based on the NCUA's formula used in their Financial Performance Report (FPR) along with merger adjusted data in 2014 dollars.

[15] SIRRT is ratio of total first mortgages held plus total investments with maturities greater than five years. The NCUA identified the SIRRT ratio to a reliable indicator of interest rate risk concentration (Federal Register, 2012)

[16] We examined whether the level of local banking competition had an impact on performance and found that inclusion of a Herfindahl–Hirschman Index of deposit concentration (Ely, 2014) was not significant.

[17] During the period examined, the NCUA operated a stabilization fund, the primary purpose of which was to assist with the resolution of five insolvent corporate credit unions. To pay for the expenses of the fund the NCUA assessed additional premiums on all federally insured credit unions proportional to their deposits, which were reported as a special expense on their call reports. While this assessment had an impact on reducing returns, it did not impact estimates of the treatment effect, given that the treated and control groups were similarly affected. Estimates of the models that appear in Table 2 using the return on assets, excluding NCUSIF stabilization expenses, are available upon request.

[18] We matched each control observation with a single observation with the fake treatment due to the larger sample size. Normalized differences were all less than 0.25, other than for size which was 0.256.

Table 2
Policy impact of participation rules on the return on assets.

	(1)	(2)	(3)
α_2 Treatment effect (2011)	−0.1972	−0.1757	−0.0181
	(0.1214)	(0.1381)	(0.0354)
α_3 Treatment effect (2012)	−0.1697	−0.1544	−0.0166
	(0.1188)	(0.1382)	(0.0364)
α_4 Treatment effect (2013)	−0.0518	0.0010	−0.0100
	(0.1616)	(0.1892)	(0.0276)
α_5 Treatment effect (2014)	−0.4745***	−0.3540***	−0.0322
	(0.1366)	(0.1151)	(0.0282)
SIRRT ratio	−0.0835**	−0.0261	−0.0012
	(0.0384)	(0.0587)	(0.0319)
Fixed assets/total assets (%)	−0.0962***	−0.1168**	−0.0971***
	(0.0182)	(0.0462)	(0.0143)
Asset growth (%)	0.0040	0.0055**	0.0060***
	(0.0024)	(0.0027)	(0.0019)
Net worth/total assets (%)	0.2192***	0.3771***	0.1887***
	(0.0333)	(0.0841)	(0.0182)
Loans/total assets (%)	−0.0148*	0.0055	0.0030
	(0.0083)	(0.0239)	(0.0083)
Member percent	0.0000	0.0955	0.0001
	(0.0001)	(0.1744)	(0.0001)
Cash and S.T. investments/total assets (%)	−0.0046	0.0002	−0.0051*
	(0.0032)	(0.0058)	(0.0027)
Size	−0.1318	0.7469	−0.1644
	(0.1962)	(0.5484)	(0.1641)
Credit card loan share (%)	−0.0094	−0.0105	−0.0076
	(0.0104)	(0.0167)	(0.0068)
Auto loan share (%)	−0.0056*	−0.0059	−0.0022
	(0.0033)	(0.0058)	(0.0034)
Net long term assets/total assets (%)	−0.0009	−0.0017	−0.0024
	(0.0030)	(0.0048)	(0.0022)
Loans/Deposits (%)	0.0170**	0.0017	0.0001
	(0.0070)	(0.0179)	(0.0068)
Unemployment rate (%)	−0.0299*	−0.0137	−0.0360***
	(0.0153)	(0.0224)	(0.0123)
Constant	1.3666	−16.9698	2.0500
	(3.8803)	(10.9057)	(3.0992)
Observations	3959	1124	7029
Adjusted R^2	0.472	.540	.513

Notes:> The dependent variable in each column is the annual return on assets. In columns (1) and (2) the treatment group consists of credit unions with a loan participation to net worth ratio greater than 100%. Column (3) uses a fake treatment group consisting of credit unions that do not hold loan participations. Column (1) uses a trimmed sample, whereas columns (2) and (3) use matched samples. Each specification includes time and credit union level fixed effects. Standard errors clustered at the state level appear in parentheses. *, **, *** Statistically different from 0 at the 10%, 5%, and 1% level.

earned higher returns, while credit unions with a higher asset concentration in loans earned lower returns. A higher concentration in auto loans was found to reduce returns as did a higher unemployment rate in the trimmed sample. For the matched sample, asset growth had a positive effect on returns.

3.4. Additional robustness checks

As a robustness check on the effect on returns, we consider the impact of mergers and our use of merger-adjusted data by eliminating observations from the trimmed and matched samples if a credit union was part of a merger during the sample period. Columns 1–3 of Table 3 represent the estimates from our trimmed, matched, and falsification sub-samples. The magnitude of the effect of the policy change is slightly stronger among credit unions without a merger. In 2014 returns are lower by 53 basis points in the trimmed sample and 36 basis points lower in the matched sample. Results from the falsification test again indicate there to be no significant differences in returns between our fake treatment and control groups.

In another robustness check, we consider the sensitivity of our estimates to our model's dynamic specification, which includes year-specific treatment effects. Rather than allow the effect to vary by year, we constrain the effect to be the same in each year for the pre and post periods of interest. Given that we believe there is no effect on returns prior to 2014, then constraining the treatment effect to be the same for the two years 2010–2011, prior to the policy's discussion, and after (2012–2013), we should find there to be no difference in effects. The estimates in column 1 of Table 4 confirm this is the case. We then constrained the treatment effect to be the same in the years 2010–2013 and examined the effect on returns in 2014. With this constraint imposed, returns on assets are found to be 37 basis points lower among credit unions with high loan participation ratios in the full year following implementation. This is a result smaller in magnitude than without the constraint, but still a large effect.

Credit unions with loan participation ratios greater than 100% faced a potentially binding constraint when the policy went into effect in late 2013, and as seen from our results, this negatively affected their returns. We believe, though, that the policy could, more generally, affect credit unions with participation ratios near the constraint by affecting their liquidity. To explore this notion and the robustness of our baseline model's results, we consider an alternative treatment group consisting of the 131 credit unions with loan participations more than 75% of their net worth at year end 2012. Similar to before, we created trimmed and matched

Table 3
Robustness checks.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
α_2 Treatment effect (2011)	−0.2373	−0.2356	0.0176	−0.0875	−0.0875	−0.1237	−0.1501
	(0.1481)	(0.1626)	(0.0363)	(0.0681)	(0.0765)	(0.0805)	(0.0919)
α_3 Treatment effect (2012)	−0.1646	−0.1300	0.0486	−0.0341	−0.0694	−0.0484	−0.1019
	(0.1495)	(0.1605)	(0.0479)	(0.0794)	(0.0916)	(0.1043)	(0.1096)
α_4 Treatment effect (2013)	−0.0646	−0.0016	0.0331	0.0911	0.0813	0.0338	0.0381
	(0.1989)	(0.2217)	(0.0332)	(0.1010)	(0.1180)	(0.1160)	(0.1359)
α_5 Treatment effect (2014)	−0.5321***	−0.3635**	0.0250	−0.1742**	−0.1635**	−0.2072**	−0.1768**
	(0.1567)	(0.1437)	(0.0359)	(0.0696)	(0.0792)	(0.0815)	(0.0872)
Merger obs. included	No	No	No	Yes	Yes	No	No
Sample type	Trimmed	Matched	False	Trimmed	Matched	Trimmed	Matched
Observations	2854	884	5141	4478	2108	3184	1554
Adjusted R^2	0.458	0.537	0.518	0.481	0.543	0.475	0.540

Notes: The dependent variable in each column is the annual return on assets. The sample used in columns (1)–(3) exclude credit unions that underwent a merger during 2010–2014. In columns (1) and (2) the treatment group consists of credit unions with a loan participation to net worth ratio greater than 100%, whereas column (3) uses the fake treatment group for the falsification test. Columns (4)–(7) use an alternative treatment group, where the loan participation ratio is greater than 75%. Columns (4) and (5) use the sample with mergers and columns (6) and (7) exclude credit unions with mergers. The specifications all include time and credit union level fixed effects, along with the same covariates used in Table 2. Coefficient estimates of covariate and fixed effects are omitted here to save space. Standard errors clustered at the state level appear in parentheses. *, **, *** Statistically different from 0 at the 10%, 5%, and 1% level.

Table 4
Robustness of dynamic specification.

	(1)	(2)
Pre/Post treatment effect	0.0134	−0.3695**
	(0.0976)	(0.1499)
Observations	3170	3959
Adjusted R^2	0.511	0.471

Notes: The dependent variable in each column is the annual return on assets. The sample used in column 1 includes the years 2010–2013. The treatment effect measures the difference of returns in (2010–2011) relative to (2012–2013). Column 2 uses the years 2010–2014 and constrains the year effects to be the same in the period 2010–2013, relative to 2014. Each uses the trimmed sample. The specifications all include time and credit union level fixed effects, along with the same covariates used in Table 2. Standard errors clustered at the state level appear in parentheses. *, **, *** Statistically different from 0 at the 10%, 5%, and 1% level.

samples that include and exclude observations with mergers. These results appear in columns 4–7 of Table 3. Including observations with mergers, returns for our treated group are found to be 17 basis points lower than the control group in 2014 for our trimmed sample and are 16 points lower for the matched sample. The estimates are quite similar when mergers are excluded. For the trimmed sample, returns are lower by 21 basis points and for the matched sample they are lower by 18 basis points. While the magnitude of the treatment effect is reduced for our alternative group as one would expect due to weaker constraints, it appears the policy negatively affected a larger number of credit unions than those in our baseline, albeit with less of an effect.

4. Channels

4.1. Direct effects of loan participation policy

The results in Section 3 indicate credit unions with a high ratio of loan-participation agreements to net worth had their return on assets negatively impacted by the change in policy. In this section, we consider the mechanism whereby returns were lowered in the short run. The direct effect of the policy change is that credit unions with high loan participation ratios will find it more difficult in the short run to use participation agreements to manage their assets. Therefore, we would expect constrained credit unions to respond with a decline in their loan participations purchased as a share of total assets relative to our unaffected control group. Loan participation plays an important role in supporting loan growth for many credit unions, such that the policy is likely to reduce loan growth among constrained credit unions. With slower loan growth and access to fewer lending opportunities, interest income of constrained credit unions may decrease, thus negatively influencing their returns.

The data reveals that the share of loan participations to total assets grew for our treatment group relative to that of our control group prior to the implementation of the policy. The difference-in-difference in this share grew by 1.9 percentage points in 2011 and by 3.5 percentage points in 2012 relative to the difference in 2010. This difference then declined from the year prior in the partial year of implementation (2013) to 2.6 percentage points and continued to decline to only a 1 percentage point difference in 2014, which was not statistically different from zero. These treatment effect estimates appears in column 1 of Table 5. Prior to the change in policy, there was an increasing divergence in the share of loan participations to total assets; following the change, this difference was eliminated, an indication the policy influenced constrained credit unions' use of loan participations. Loan growth was also influenced by the policy change. Prior to implementation of the policy, the difference in loan growth was stable; after the change, loan growth declined in 2013 and 2014 for our constrained credit unions relative to their counterparts. In 2014, loan growth for our constrained credit unions was 5.3 percentage points lower than for our control group due to the change in policy (see column 2).

Despite there being fewer loan participations and slower loan growth, we could not find any evidence to suggest the change in policy had an impact on interest income. The coefficients for the treatment effects on the share of interest income to total assets were not statistically different from zero (column 3, Table 5). An explanation for the lack of an effect of the policy on interest income is that much of the decline in loan participations was driven by a decrease in participation with recourse. As a share of total assets, the difference in loan participation with recourse decreased by 0.74 percentage points in 2013 and 1.83 percentage points in 2014 for constrained credit unions relative to the control in 2010 (column 4, Table 5). This distinction is important because interest earned on participations with significant recourse is accounted for in other operating income, a component of non-interest income,

Table 5
Pathways to lower returns — direct effects.

	(1)	(2)	(3)	(4)	(5)	(6)
α_2 Treatment effect (2011)	1.8588***	0.4857	0.0091	−0.0502	−0.0087	−0.0528
	(0.4407)	(1.4174)	(0.0354)	(0.3193)	(0.0120)	(0.0438)
α_3 Treatment effect (2012)	3.4651***	0.9006	−0.0119	−0.1430	−0.0327**	−0.1355**
	(0.9142)	(2.2509)	(0.0618)	(0.2871)	(0.0144)	(0.0570)
α_4 Treatment effect (2013)	2.5714***	−3.7806	0.0323	−0.7440***	−0.0413**	−0.1332**
	(0.8410)	(2.4942)	(0.0585)	(0.2731)	(0.0197)	(0.0517)
α_5 Treatment effect (2014)	1.0208	−5.2651**	0.0392	−1.8311**	−0.0490*	−0.0473
	(1.2128)	(2.4474)	(0.0443)	(0.7990)	(0.0288)	(0.0750)
Observations	3959	3959	3959	3959	3959	3959
Adjusted R^2	0.836	0.625	0.934	0.783	0.847	0.924

Notes: The dependent variable in column (1) is the ratio of loan participation to total assets, (2) is the rate of loan growth, (3) is the ratio of interest income to total assets, (4) is the ratio of participations with recourse to total assets, (5) is the ratio of other operating income to total assets, and (6) is the ratio of non-interest expense to total assets. Each is measured as a percentage. The specifications all include time and credit union level fixed effects, along with the same covariates used Table 2. Column (5) adds to the specification, the share of loan sales to total assets and share of loans serviced to total assets. Coefficient estimates of covariate and fixed effects are omitted here to save space. Each uses the trimmed sample. Standard errors clustered at the state level appear in parentheses. *, **, *** Statistically different from 0 at the 10%, 5%, and 1% level.

rather than in interest income. Analyzing the effect of the policy is somewhat muddled by the fact that other operating income includes income from a number of sources, including income from interchange income (e.g., use of debit and credit cards), profits on loan sales, and servicing income. Controlling for the shares of loan sales and servicing, we find evidence indicating other operating income began to decline for our constrained credit unions in 2012 and continued through 2014, relative to their counterparts. In 2014, other operating income as a share of assets was 4.9 basis points lower as a result of the policy—a magnitude one need interpret with caution, given our inability to control for factors such as interchange use, which may be affecting the result.

Another explanation for why there might not have been an effect on interest income from fewer participations is that constrained credit unions may have offset lost outside lending opportunities by generating more of their own loan origination. If this were the case, we would expect to see an increase in non-interest expense from the additional employees, technology, and fixed assets needed to increase origination of loans. Our estimates (Table 5, column 6) indicate non-interest expenses were lower for our treatment group in 2012 and 2013 relative to our control group. This finding is consistent with our treatment group achieving loan growth prior to the change in policy largely via loan participations, whereas after the policy they devoted more resources to originating and servicing their own loans. Finding the effect to be statistically insignificant in 2014, though, fails to explain the decrease in the return on assets caused by the policy, given that the treatment effect measures differences-in-differences relative to 2010.

4.2. Indirect effects of loan participation policy

Under reasonable assumptions, very few credit unions were faced with a binding constraint from the concentration limit, therefore it appears the policy had more of an indirect effect on credit unions with high exposure to participation. Our belief is the added restrictions on participations reduced their liquidity as an asset, which made liquidity management more challenging for credit unions the more participations they held. The results in column 1 of Table 6 indicate liquidity of constrained credit unions fell following the change in policy. For 2013, the ratio of cash and securities to total assets was 1.6 percentage points lower for our constrained group as a result of the change in policy, and it was 2.1 percentage points lower in 2014. In response to declining liquidity, affected credit unions turned toward managing their liabilities to ensure stable sources of funds. These efforts, though, came with additional reliance on long-term borrowing (maturities more than three years) and higher interest premiums to fund their assets. The change in policy did not affect total borrowing, as evident in the estimates found in column 2 of Table 6, but it did affect the maturity of borrowing. In columns 3–5 of Table 6, the dependent variables are the share of short-term (less than one year), intermediate-term (1–3 years), and long-term (more than 3 years) borrowing to total assets. In 2014, we see that constrained credit unions moved away from intermediate-term debt and added long-term debt relative to the control group. While controlling for the share borrowing by maturity, we find interest expense on borrowing increases due to the policy. Borrowing premiums rose due to the change in policy, which lowered returns by 1.1 basis points in 2013 and 1.3 basis points in 2014, with each statistically significant at the 5% level (column 7, Table 6).

Another component of interest expense is interest paid on deposit accounts. Deposits as a share of total assets were relatively stable between the two groups during the period. In 2012, we find the difference in shares increases by nearly one-half a percentage point relative to 2010 for our group with a high participation ratio, and in other years no significant differences. This result appears in column 7 of Table 6. While there was little change in the relative level of deposits over the period, there was a change in duration. Columns 8–10 of Table 6 represent estimates of the effect on short-term, intermediate-term, and long-term deposits as a share of total assets. Short-term deposits decline in 2013 and 2014 following implementation of the policy, while intermediate-term and long-term deposits both increase. The increase in deposit duration is similar to the increase we saw for borrowing. Next, we examine the policy effect on interest expense of deposits. Our estimates (column 11) indicate the coefficients for the treatment effect to be positive, increasing by year, and statistically significantly different from 0 before and after the change in policy. Additional tests of statistical significance reveal the treatment effect observed in 2011 of 4.6 basis points, while different from that observed in 2010, is also significantly (statistically) different from that found in 2012–2014 (7.1–7.9 basis points). This suggests there was an increase in interest expenses on deposits for credit unions with high loan participation ratios relative to the control beginning in the year the policy was discussed. Given the specification includes controls for deposit shares by maturity, this result highlights the premium on deposits rose for credit unions with high participation ratios, which similar to the effect of borrowing premiums, reduced their returns.

Table 6
Pathways to lower returns — indirect effects.

Borrowing expenses	(1)	(2)	(3)	(4)	(5)	(6)
α_2 Treatment effect (2011)	−1.2692	−0.0123	0.1216	−0.0824	−0.0515	0.0026
	(0.8033)	(0.0756)	(0.0822)	(0.0568)	(0.0543)	(0.0031)
α_3 Treatment Effect (2012)	−1.2052	0.0730	0.1003	0.0026	−0.0298	0.0048
	(1.0503)	(0.0562)	(0.0810)	(0.0757)	(0.0399)	(0.0032)
α_4 Treatment effect (2013)	−1.6325**	0.0657	0.1813**	−0.1106	−0.0050	0.0114***
	(0.7623)	(0.0724)	(0.0895)	(0.0951)	(0.0570)	(0.0040)
α_5 Treatment effect (2014)	−2.1501**	0.0786	0.2012	−0.2587**	0.1361**	0.0130**
	(0.8694)	(0.1522)	(0.1976)	(0.0998)	(0.0525)	(0.0053)
Observations	3959	3959	3959	3959	3959	3959
Adjusted R^2	0.838	0.971	0.705	0.680	0.861	0.893
Deposit expenses	(7)	(8)	(9)	(10)	(11)	
α_2 Treatment effect (2011)	0.3255	−0.6629	0.7293*	0.2591	0.0461***	
	(0.2337)	(0.4424)	(0.3705)	(0.2157)	(0.0132)	
α_3 Treatment effect (2012)	0.4389**	−0.5857	0.5981	0.4265*	0.0707***	
	(0.1927)	(0.6387)	(0.4536)	(0.2329)	(0.0192)	
α_4 Treatment effect (2013)	0.2984	−1.5840***	1.3176***	0.5649**	0.0757***	
	(0.2085)	(0.5100)	(0.4872)	(0.2346)	(0.0219)	
α_5 Treatment effect (2014)	−0.0005	−1.9474***	1.1990***	0.7479***	0.0788***	
	(0.3102)	(0.6371)	(0.4070)	(0.2598)	(0.0234)	
Observations	3959	3959	3959	3959	3959	
Adjusted R^2	0.952	0.884	0.768	0.772	0.925	

Notes: The dependent variable in column (1) is the ratio of cash and short term securities to total assets, (2) is the ratio of total borrowing to total assets, (3)–(5) is the ratio of short-term, intermediate-term, and long-term borrowing to total assets, and column (6) is the ratio of borrowing expense to total assets. For column (7) the dependent variable is the ratio of deposits to total assets, (8)–(10) represents the ratio of short-term, intermediate-term, and long-term deposits to total assets, and column (11) is the ratio of interest income on deposits to total assets. Each is measured as a percentage. The specifications all include time and credit union level fixed effects, along with the same covariates used Table 2. Column (6) includes in the specification the separate ratios of short-term, intermediate-term, and long-term borrowing. Column (11) includes the separate ratios of short-term, intermediate-term, and long-term deposits. Coefficient estimates of covariate and fixed effects are omitted here to save space. Each uses the trimmed sample. Standard errors clustered at the state level appear in parentheses. *, **, *** Statistically different from 0 at the 10%, 5%, and 1% level.

It may seem counter intuitive that the treatment effect indicates interest expenses on deposit accounts increased following discussion of the policy despite interest rates declining throughout the entire period examined. One must note that while interest rates declined on average for both the control and treatment groups between 2010 and 2014, there were two other factors at play. Credit unions with high participation ratios are shown to become relatively more dependent on more costly sources of deposits than their counterparts over the period. Their deposits in IRA shares and share certificates increased over the period, as shown in Table 7, but decreased for money market accounts, share drafts, and regular shares relative to the control group.[19] IRA shares and share certificates, as evident from the table, pay the highest interest rates of deposit accounts, averaging 78 and 58 basis points, respectively, for our treatment group in 2014. Despite interest rates falling, it is evident from the table that rates for IRA shares, regular shares, and share draft accounts fell by less for credit unions with high participation ratios than for their counterparts. Together these three components make up a majority of credit union deposits, accounting for 64% of deposits in 2014. Credit unions with high participation ratios became more reliant on more expensive types of deposits and were unable to reduce the interest they paid on the majority of their deposits relative to their counterparts over the period.

5. Summary and conclusion

As a result of the NCUA's policy to impose concentration limits on the purchase of loan participations, credit unions with loan participation ratios greater than 100% of their net worth, were shown to earn significantly—in terms of magnitude and statistical significance—lower returns on their assets in the year following the policy change. Our estimates reveal returns were reduced, depending on model specification, by between 35 and 53 basis points relative to those of our control group. Part of the reduction in returns for these constrained credit unions was brought upon by the substantial reduction in participation with recourse, which led to lower other operating income. We also found evidence the policy reduced loan growth, but there was no evidence to suggest this had an impact on interest income earned. It is possible the effects of slower loan growth on interest income may only be seen in the long run, if constrained credit unions dependent on participation for growth are unable to replace existing participation agreements with those of other originators at similar terms.

Another striking effect of the policy is our finding that constrained credit unions paid a higher interest premium on both their borrowing and deposits after the change. We believe the policy change may have been interpreted by credit markets as a signal from regulators of higher risk and a need for greater regulatory oversight among this subset of credit unions, which contributed to their higher premiums. The policy change may, in addition, have had an effect on reducing the liquidity of loan participations as an asset. Credit-constrained credit unions primarily reduced their exposure to participation loans with recourse, which would seemingly be more liquid, given their guarantees. While unable to test this assertion, we did find evidence of a decline in liquidity of assets following the change in policy. In response to liquidity pressure, credit unions with a high concentration in participation loans responded by not reducing interest rates on their deposit accounts by as much as their counterparts in order to ensure a stable source of funds as the policy went into effect. Increasing the duration of both borrowing and deposits further compliments this strategy by

[19] The discussion here is meant to be descriptive. Call report data provide the most common deposit rate by type of deposit and are not broken down by maturity.

Table 7
Difference-in-difference mean interest rates and deposit concentration.

Interest on deposits				Deposit concentration			
a. IRA Shares							
	Treatment	Control	DID		Treatment	Control	DID
2014	78.0	64.6		2014	6.37%	7.10%	
2010	133.4	123.7		2010	7.29%	8.52%	
Difference	−55.4	−59.1	3.7	Difference	−0.92%	−1.41%	0.49%
b. Share drafts							
	Treatment	Control	DID		Treatment	Control	DID
2014	12.0	14.4		2014	15.52%	16.19%	
2010	17.4	23.4		2010	12.97%	13.36%	
Difference	−5.4	−9.0	3.6	Difference	2.55%	2.83%	−0.28%
c. Money market							
	Treatment	Control	DID		Treatment	Control	DID
2014	22.5	25.5		2014	16.50%	18.64%	
2010	56.0	56.2		2010	16.43%	18.38%	
Difference	−33.5	−30.6	−2.8	Difference	0.07%	0.26%	−0.19%
d. Share certificates							
	Treatment	Control	DID		Treatment	Control	DID
2014	57.6	67.9		2014	17.84%	18.88%	
2010	113.3	119.5		2010	26.21%	27.56%	
Difference	−55.7	−51.6	−4.1	Difference	−8.37%	−8.67%	0.30%
e. Regular shares							
	Treatment	Control	DID		Treatment	Control	DID
2014	13.8	13.5		2014	41.16%	38.23%	
2010	27.1	29.7		2010	34.61%	31.20%	
Difference	−13.3	−16.2	2.9	Difference	6.55%	7.03%	−0.47%

Reported by deposit type are the average interest rates in basis points and concentration within a type, prior to and after the change in policy. The treatment group includes credit unions with a loan participation ratio greater than 100%. The third row in each set of results, indicates the "difference" in mean dividend rates before and after the change in policy for each group. The figure in the third column represents the difference-in-difference (DID) across the treatment and control groups.

providing an additional source of stable funding to counter declining liquid assets.

One of the matters left unresolved for now is the effect of the policy on risk to credit unions and the system. Following the change in policy, variability of constrained credit unions' returns was evident, yet this may be only a temporary response. It will take several years' worth of data, spanning the business cycle, before we are able to assess the long-run effects on risk. Also remaining to be seen is whether credit unions dependent on loan participation will be able to monitor and provide the due diligence necessary from working with additional partners. If these costs prove to be prohibitive and returns remain significantly lower, then we may find in the long run these constrained credit unions no longer in operation.

From a system perspective, the credit unions impacted by the change appeared to pose very little threat. Credit unions with participation ratios greater than 100% of net worth averaged a mere $359 million in size in 2014, with their combined assets accounting for 1.7% of system assets. Our more broadly affected set of credit unions accounted for 3.3% of system assets. Contrast this to the ten largest credit unions, which averaged $17.4 billion in size and accounted for 15% of system assets and the fifty largest that accounted for 30%. For these systemically important credit unions, loan participations play only a negligible role in asset management, averaging 6.7% and 14.5% of net worth for the ten and fifty largest credit unions, respectively. Therefore, it is unlikely the NCUA's rules limiting the purchase of participations has significantly reduced systemic risk as was the policy's intention. The results though here indicate that the rule may have inadvertently increased risk for those affected by the policy. Our results indicate much of the decline in participation loans caused by the policy change have been in loans with recourse. These loans not only offer additional protection from credit risk due to their recourse provisions, but are more likely of higher quality given the additional signal the seller provides in offering recourse. Thus by reducing ties to other credit unions, affected credit unions may have increased their own risk.

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References

Abadie, A., Imbens, G.W., 2011. Bias-Corrected matching estimators for average treatment effects. J. Bus. Econ. Stat. 29, 1–11.
Bedendo, M., Bruno, B., 2012. Credit risk transfer in U.S. commercial banks: what changed during the 2007–2009 Crisis? J. Bank. Finance 36, 3260–3273.
Berger, A.N., Miller, N.H., Petersen, M.A., Rajan, R.G., Stein, J.C., 2005. Does function follow organizational Form? Evidence from the lending practices of large and small banks. J. Financ. Econ. 76, 237–269.
Bertrand, M., Duflo, E., Mullainathan, S., 2004. How much should we trust differences-in-differences estimates? Q. J. Econ. 119, 249–275.
Cameron, A.C., Miller, D.L., 2015. A practitioner's guide to cluster-robust inference. J. Hum. Resour. 50, 317–372.
Cebenoyan, A.S., Strahan, P.E., 2004. Risk Management, capital structure and lending at banks. J. Bank. Finance 28, 19–43.
Coval, J.D., Moskowitz, T.J., 2001. The geography of Investment: informed trading and asset prices. J. Polit. Econ. 109, 811–841.
De Vries, C.G., 2005. The simple economics of bank fragility. J. Bank. Finance 29, 803–825.
Dehejia, R.H., Wahba, S., 2002. Propensity score-matching methods for nonexperimental causal studies. Rev. Econ. Stat. 84, 151–161.
DeYoung, R., Roland, K.P., 2001. Product mix and earnings volatility at commercial banks: evidence from a degree of total leverage model. J. Financ. Intermed. 10, 54–84.
Dubie, Ann. Letter to mary Rupp. 17 feb TS (accessed 16.09.15).
Ely, D., 2014. Credit unions and risk. J. Regul. Econ. 46, 80–111.
Esho, N., Kofman, P., Sharpe, I.G., 2005. Diversification, fee income, and credit union risk. J. Financ. Serv. Res. 27, 259–281.
Freeborn, Terresa. Letter to mary Rupp. 22 Feb. TS (accessed 16.09.15).
Gande, A., Saunders, A., 2012. Are banks still special when there is a secondary market for Loans? J. Finance 67, 1649–1684.

Gatev, E., Strahan, P.E., 2009. Liquidity risk and syndicate structure. J. Financ. Econ. 93, 490–504.
Glass, J.C., McKillop, D.G., 2006. The impact of differing operating environments on US credit union performance, 1993–2001. Appl. Financ. Econ. 16, 1285–1300.
Goddard, J., Mckillop, D., Wilson, J.O.S., 2008. The diversification and financial performance of US credit unions. J. Bank. Finance 32, 1836–1849.
Gorton, G.B., Pennacchi, G.G., 1995. Banks and loan sales: marketing nonmarketable assets. J. Monetary Econ. 35, 389–411.
Grinnick, Wayne. Letter to mary Rupp. 24 jan TS (accessed 16.09.15).
Guo, G., Wu, H., 2014. A study on risk retention regulation in asset securitization process. J. Bank. Finance 45, 61–71.
Imbens, G.W., 2015. Matching methods in practice: three examples. J. Hum. Resour. 50, 373–419.
Imbens, G.W., Rubin, D.B., 2015. Causal Inference for Statistics, Social, and Biomedical Sciences: An Introduction. Cambridge University Press, Cambridge and New York.
Interest Rate Risk Policy and Program, 77 Federal register 22 (final rule september 30, 2012) (amending 12 C.F.R. pt. 741), pp. 5155–5162.
Irani, R.M., Meisenzahl, R.R., 2015. Loan Sales and Bank Liquidity Risk Management: Evidence from a U.S. Credit Register. Board of Governors of the Federal Reserve System (U.S.). Finance and Economics Discussion Series, pp. 2011–2015. 68 pp., 68.
Kamstra, M.J., Roberts, G.S., Shao, P., 2014. Does the secondary loan market reduce borrowing Costs? Rev. Finance 18, 1139–1181.
Kane, E.J., Hendershott, R., 1996. The federal deposit insurance fund that didn't put a bite on U.S. taxpayers. J. Bank. Finance 20, 1305–1327.
Keys, B.J., Mukherjee, T., Seru, A., Vig, V., 2010. Did securitization lead to lax Screening? Evidence from subprime loans. Q. J. Econ. 125, 307–362.
Kozlowski, John. Letter to mary Rupp. 21 feb TS (accessed 16.09.15).
Li, Y., Saunders, A., Shao, P., 2015. The monitoring incentive of transactional and relationship Lenders: evidence from the syndicated loan market. J. Money, Credit, Bank. 47, 701–735.
Loan Participations; Purchase, sale and pledge of eligible Obligations; purchase of assets and assumption of Liabilities, 77 federal register 246 (proposed december 22, 2011) (amending 12 C.F.R. pts. 701 and pt. 741), pp. 79548–79553.
Loan Participations; Purchase, sale and pledge of eligible Obligations; purchase of assets and assumption of Liabilities, 78 federal register 122 (final rule june 25, 2013) (amending 12 C.F.R. pts. 701 and pt. 741), pp. 37946–37958.
NCUA, 2008. Evaluating loan participation programs, letters to credit unions, number 08-CU-26, november.
NCUA. NCUA 2008–2009 annual Report Retrieved from https://www.ncua.gov/regulation-supervision/Documents/2008-2009AR.pdf.
NCUA. NCUA board revises effective date for loan participation Rule. Retrieved from http://www.ncua.gov/News/Pages/NW20130703Loans.aspx.
NCUA, 2015. Fixed asset management, supervisory Letter, number 15-03, October.
Nijskens, R., Wagner, W., 2011. Credit risk transfer activities and systemic Risk: how banks became less risky individually but posed greater risks to the financial system at the same time. J. Bank. Finance 35, 1391–1398.
Parlour, C.A., Plantin, G., 2008. Loan sales and relationship banking. J. Finance 63, 1291–1314.
Pennacchi, G.G., 1988. Loan sales and the cost of bank capital. J. Finance 43, 375–396.
Purnanandam, A., 2011. Originate-to-distribute model and the subprime mortgage crisis. Rev. Financ. Stud. 24, 1881–1915.
Pyles, M.K., Mullineax, D.J., 2008. Constraints on loan sales and the price of liquidity. J. Financ. Serv. Res. 33, 21–36.
Sparrow, Judith. Letter to mary Rupp. 26 jan TS http://www.ncua.gov/Legal/Regs/Pages/PropRegs.aspx (accessed 16.09.15).
Tarullo, DanielK., 2009. Large banks and small banks in an era of systemic risk regulation. North Carolina Bankers Association Annual Convention. North Carolina, Chapel Hill. 2016, *Federal Reserve Board of Governors*. Web. 05 May.
United States. Cong, 2015. House financial institutions and consumer credit subcommittee. Hearing on National Credit Union Administration Operations and Budget July 23, *2015*. 114th Cong. 1st sess. statement of Debbie Matz, Chairman, National Credit Union Administration), Washington: GPO.
Whiting, Joanne. Letter to mary Rupp. 21 feb TS http://www.ncua.gov/Legal/Regs/Pages/PropRegs.aspx (accessed 16.09.15).
Yashewski, Suzanne. Letter to mary Rupp. 21 feb TS http://www.ncua.gov/Legal/Regs/Pages/PropRegs.aspx (accessed 16.09.15).