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Merger reasons and their impact: Evidence from the credit union industry

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Abstract

Using a unique dataset that includes each merger's stated motivation, we explore the impact of credit union mergers of varying motivation and institutional size difference. We show that mergers motivated by financial distress lead to significantly more positive changes in earnings and capital ratios compared to mergers aimed at providing expanded services. We also document that target institution members reap most of the benefits in terms of abnormal savings and loan rate changes, although acquirers also benefit on average in distress driven mergers. Overall, our findings are consistent with the efficient management hypothesis and suggest acquirers subsequently utilize the assets of underperforming institutions more efficiently.

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1 Introduction

Federally insured credit unions continue to serve a growing number of U.S. households despite a steady decline in the number of overall institutions. Over the twenty-five-year period from 1998 to 2023 credit union membership increased 89.4 percent and industry assets grew 480.4 percent, reaching totals of 139.3 million members and \$2.56 trillion, respectively. During this time, however, the number of federally insured credit unions has more than halved, falling from 10,995 to 4,604.[1] Mergers account for the vast majority of this decline, yet the reasons for mergers between cooperative institutions are less well understood (Fried et al. 1999). Using a unique dataset that includes the stated reason for each merger, we explore credit union mergers of varying motivation and institutional size difference to provide key insights on differences in expected merger outcomes.

In contrast to banks, credit unions are not-for-profit financial institutions with each member allotted equal voting rights – regardless of account size. As a result, a credit union's primary objective is to serve the needs of its membership while providing maximum value in the form of higher savings rates and lower borrowing rates (Bauer 2008; Ryder and Chambers 2009). Without a set of residual claimants seeking to maximize profits, however, the primary reason motivating credit union mergers is more varied. Ralston et al. (2001) suggest that smaller institutions may seek merger partners in order to achieve greater economies of scale and remain competitive against increasingly large banking institutions. Wheelock and Wilson (2013) also find that cost productivity has declined more dramatically over time among small credit unions, further motivating consolidation. Mergers between financial institutions may also be driven by the potential for efficiency gains and the ability to attract new loans and deposits (Cornett and Tehranian 1992; Berger et al. 1993). By contrast, relatively large, stable credit unions may acquire financially distressed credit unions as the result of regulatory pressure or to limit their potential liability as a co-insurer (Kane and Hendershott 1996; Bauer et al. 2009). Consequently, the motivation for credit union mergers is varied and the resulting impact on targets, acquirers, and overall industry stability is expected to be a function of the primary reason for the merger.

Unlike prior studies exploring U.S. credit union mergers, we collect merger-motivation data that allows us to examine a key facet potentially explaining significant differences in post-merger performance and stability. In particular, expanded services and financial distress driven mergers offer competing predictions for the expected post-merger changes in member utility as well as institutional safety and soundness which is the chief concern of federal regulators. On the one hand, the *synergy hypothesis* predicts greater improvements in member utility and reduced regulatory risk among mergers aimed at providing expanded services, as they are more likely to generate synergistic benefits in the form of new product offerings,

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[1] Industry statistics are obtained from the National Credit Union Administration's aggregate financial performance reports available at: https://www.ncua.gov/analysis/credit-union-corporate-call-report-data/aggregate-financial-performance-reports.

operational efficiencies, and complementary strengths. On the other hand, the *efficient management hypothesis* predicts that distress driven mergers should yield greater utility improvements and reductions in failure risk, because mergers lead to the replacement of underperforming management teams and a reallocation of assets to more productive uses (Jensen and Ruback 1983).

Prior work has explored the performance impacts of bank mergers (e.g., Akkus et al. 2016; Cornett et al. 2006; Houston et al. 2001; Rhoades 1998) as well as the determinants of bank merger targets (e.g., Prasad and Melnyk 1991; Wheelock and Wilson 2000). For instance, Wheelock and Wilson (2000) find that banks with lower capitalization are more likely to be acquired and that the probability of acquisition declines in a bank's return on assets. This is consistent with most underperforming banks finding suitable merger partners before reaching insolvency as well as the broader literature on the market for corporate control of public firms in which takeovers serve as a governance mechanism that prompts management to maximize shareholder value or risk being replaced (Andrade et al. 2001; Jensen and Ruback 1983). Such work is consistent with the *efficient management hypothesis*, and Cornett et al. (2006) provide evidence of both revenue enhancements and cost reduction activities leading to improved performance following bank mergers.

There is also evidence in the banking literature that suggests strategic mergers combining two healthy institutions can create value. For instance, while Ayadi et al. (2012) do not find evidence of increased productivity as the result of mergers and acquisitions in their sample of European banks, they show that managers take advantage of complementary business lines. Additionally, Filson and Olfati (2014) provide evidence that U.S. bank holding companies that diversified into other areas such investment banking, securities brokerage, and insurance under the Gramm-Leach-Bliley Act of 1999 experienced high combined and acquirer abnormal returns. Such evidence suggests that banks often merge strategically to diversify, expand product lines, or strengthen core competencies as predicted by the *synergy hypothesis*. We explore these competing hypotheses and merger motivations in the context of U.S. credit unions.

Using a novel dataset covering the period from 2008 to 2022 that includes the stated reason for each merger, we evaluate the impact of credit union mergers on targets, acquirers, and regulatory risk. Expanded services is the most frequently reported merger reason during our sample period, while other commonly reported reasons include poor financial condition, lack of sponsor support, declining field of membership, and lack of growth.[2] We classify these performance related concerns into the broader category of financial distress and evaluate differences between expanded services and financial distress driven mergers given their potentially divergent implications for subsequent performance and member welfare. We also

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[2] Although merger reasons are self-reported, two factors limit concerns about the reliability of our analyses. First, the reason is submitted to federal regulators by the continuing credit union, so there is little incentive to conceal performance issues driving the merger. Second, any improper reporting adds noise to the data and should bias us against finding significant differences across merger types. Merger reasons are first available in 2008.

separately consider mergers where the two institutions are in the same versus different asset size peer groups given the impact of institutional size on operating characteristics and economies of scale (Goddard et al. 2002, 2008; Wheelock and Wilson 2013). Our study aims to shed light on whether differences in merger scale and scope influence the effects on each interested stakeholder.

We begin our analyses by examining the impact of mergers on credit union member utility. Smith et al. (1981) and Smith (1984) highlight that a credit union's theoretical objective function is to maximize savings rates and minimize loan rates; therefore, we utilize the event-study methodology proposed by Bauer (2008) to estimate the impact of mergers on abnormal savings and loan rate changes which reflect member welfare. Our results indicate that target institutions reap most of the benefits in terms of abnormal savings and loan rate changes. This result holds across both merger types but is concentrated in instances where the acquirer is in a larger peer group. Thus, a primary driver of target institution rate improvements results from joining a larger institution with more resources and the ability to realize greater economies of scale. In contrast to prior studies that generally find evidence of target credit union gains with an insignificant merger impact on credit union acquirers (Fried et al. 1999; Bauer et al. 2009), we also find some evidence that acquirers are significantly more likely to experience positive than negative abnormal rate changes; however, this effect is concentrated within credit unions that acquire smaller, distressed institutions that may have more inefficiencies that can be addressed. Although we explore abnormal rate changes rather than stock returns given that credit unions are member owned, our finding of acquirer gains is consistent with the results of Leledakis et al. (2021) who provide evidence that banks experience positive abnormal announcement returns when acquiring private banks despite negative abnormal returns when acquiring public banks.[3]

Our second test examines the impact of credit union mergers on regulatory risk by defining one measure for each CAMEL rating component: Capital, Asset quality, Management, Earnings, and Liquidity.[4] Using the event study methodology from Bauer et al. (2009), we assess changes in performance and stability by computing the difference in merging credit unions' CAMEL ratios from one year pre-merger to one year post-merger, with pre-merger ratios computed using pro-forma financial statements. We then measure these CAMEL ratio changes relative to the changes experienced by non-merging credit unions over the same time period to isolate abnormal changes in performance and stability. Consistent with the predictions of the efficient management hypothesis, we find distressed mergers result in significantly greater changes in the earnings and capital ratios relative to expanded services mergers. This suggests that greater benefits to the industry and NCUSIF

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[3] The broader, non-financial literature also providence evidence of a "listing effect" in which only acquirers of private targets experience positive returns (see, e.g., Arikan and Stulz 2016; Chang 1998; Faccio et al. 2006; Netter, 2011).

[4] The NCUA assigns an internal risk rating to each credit union for the five CAMEL components which determine a composite risk rating. Regulatory ratings are assigned on a 1 to 5 scale, with 5 representing the greatest risk. We implement continuous proxies for each CAMEL component which allows for higher power tests.

result when underperforming credit unions are acquired. Distressed credit union acquirers improve earnings beyond the levels of growth experienced by non-merging credit unions, and the performance improvements significantly exceed those found in expanded services mergers. In robustness tests, we address endogeneity concerns by conducting a matched sample analysis in which each distressed credit union merger is matched to an otherwise similar expanded services merger. Despite exhibiting similar asset size, pre-merger trends, and performance ratios, the sample of distressed mergers experience significantly greater post-merger changes in earnings and capital ratios, thereby adding support to our findings. We also conduct an instrumental variables regression in which we instrument for a distressed merger indicator variable using state-level real GDP growth, and we find distressed mergers have significantly higher one-year-ahead net interest margin, a core measure of profitability. Altogether, our analyses of credit union mergers' impact on regulatory risk provide consistent support for the efficient management hypothesis suggesting distressed mergers result in significantly greater risk reductions compared to mergers motivated by expanded services.

While most of the mergers and acquisitions literature focuses on corporations and large banking institutions, our paper is most closely related to prior studies that explore merger activity within the credit union industry. For example, Fried et al. (1999) use data envelopment analysis (DEA) to evaluate the impact of credit union mergers on the members of targets and acquirers over the period from 1988 to 1995. They find target credit union members tend to benefit while there is no discernible impact on acquiring credit unions' members. Ralston et al. (2001) conduct similar analyses using a sample of 31 Australian credit union mergers and note that efficiency declines in as many cases as it improves, thereby casting doubt on the ability of credit union mergers to produce efficiency gains. Bauer et al. (2009) subsequently evaluate the gains to targets, acquirers, and regulators using the event study methodology developed in Bauer (2008). They report evidence of gains to target credit unions and regulators but mixed results for acquirers.[5] Our study examines the aggregate merger effects on credit union targets, acquirers, and regulatory risk; however, our primary focus is on how outcomes vary across different types of mergers given potentially divergent impacts on each interested stakeholder.

Our paper makes three main contributions to the literature. First, we are the first study to use the National Credit Union Administration (NCUA) data on reported merger reason to assess the effect of credit union mergers on each interested stakeholder. We highlight key differences between mergers motivated by financial distress compared to those aimed at providing expanded services. Specifically, in addition to documenting significant variation in pre-merger CAMEL ratio differences between targets and acquirers that contribute to the direct impact on regulatory risk, we find that mergers motivated by financial distress lead to greater changes in performance than expanded services mergers. We also document notable differences for mergers between credit unions of similar asset size compared to mergers where the acquiring

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[5] Specifically, Bauer et al. (2009) provide evidence that credit union acquirers experience unfavorable abnormal savings rate changes but favorable abnormal loan rate changes.

institution is considerably larger, as target credit unions only realize significant utility gains when acquired by a substantially larger institution. Second, we provide a large-scale analysis of mergers within the U.S. credit union industry after the 2008 financial crisis. In contrast to prior studies, our results suggest that the merger effect on acquiring credit unions' member utility is generally positive but only in the case of distressed mergers. Last, we provide an updated overview of merger trends within the credit union industry. While total industry assets continued to grow during our sample period, more than 3,000 credit union mergers occurred between 2008 and 2022 leading to a steady decline in the number of federally insured institutions. Altogether, our paper highlights key differences in expected outcome related to merger scale and scope and should be of practical relevance to both credit union management and federal regulators.

The rest of the paper is organized as follows. Section 2 provides background on credit union mergers, describes our dataset, outlines the main hypotheses, and provides summary statistics. Section 3 details our methodology for estimating abnormal post-merger changes in savings and loan rates as well as changes in institutional performance and stability. Section 4 presents our main empirical results. Section 5 discusses a series of robustness tests, and Sect. 6 concludes.

2 Background and sample properties

2.1 Credit union merger procedures and merger trends

The National Credit Union Administration (NCUA) oversees and regulates all federally insured U.S. credit unions with the official merger policies and procedures detailed in Part 708b of the NCUA's Rules and Regulations.[6] Once a merger plan is approved by the credit unions' board of directors and the institutions ensure the merger is permissible by federal regulation,[7] the continuing credit union is required to submit a merger package for NCUA approval which includes independent and consolidated financial statements, the proposed effective date of the merger, and a detailed explanation of the reason for merging. Subsequently, the target credit union presents the merger proposal to its membership where members vote on whether to approve the deal.

The NCUA maintains a summary of all approved mergers within its *Merger Activity and Insurance Report* identifying the target credit union, acquiring credit union, each institution's total assets at the time of approval, and the stated merger reason.[8] We collect data on each pair of merging institutions and the associated

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[6] A full list of the NCUA's Rules and Regulations can be found at: https://www.ecfr.gov/cgi-bin/text-idx?SID=e021912bbc9ced245472812c0d0309ca&mc=true&tpl=/ecfrbrowse/Title12/12chapterVII.tpl.

[7] The official merger guidelines specify a variety of scenarios that qualify a proposed merger as permissible. For details, see *12 CFR Part 701, Chartering and Field of Membership*.

[8] The Merger Activity and Insurance Report is available on a monthly basis beginning in January 2008. Our sample period start date coincides with the availability of this data. Recent insurance reports are available at: https://www.ncua.gov/analysis/chartering-mergers/merger-activity-insurance-report.

Table 1 Mergers by year

Panel A: Merger activity by year

	All mergers				Final sample			
Year	Number	Volume ($MM)	Expanded Svcs	Distressed	Number	Volume ($MM)	Expanded Svcs	Distressed
2008	240	3,878.9	92	89	139	3,267.3	71	68
2009	214	6,902.9	101	89	128	5,655.5	66	62
2010	165	4,274.8	85	64	96	3,006.7	54	42
2011	206	6,484.0	119	65	114	5,204.9	75	39
2012	262	4,261.0	125	98	149	2,416.0	85	64
2013	251	3,945.8	154	82	149	2,802.0	102	47
2014	254	5,383.1	156	88	136	3,114.2	83	53
2015	236	5,488.6	173	60	133	3,229.5	97	36
2016	221	4,727.8	161	56	120	2,319.1	91	29
2017	201	6,855.6	142	54	111	3,538.3	81	30
2018	186	4,051.4	135	45	112	1,893.0	79	33
2019	140	5,962.0	114	26	77	3,840.1	66	11
2020	132	7,889.0	106	19	70	3,418.8	56	14
2021	153	6,410.3	109	40	93	4,368.3	69	24
2022	175	9,631.8	137	27	112	7,784.6	97	15
Total	3,036	94,285.8	1,909	902	1,739	65,682.7	1,172	567

Table 1 (continued)

Panel B: Relative size of merging CU targets and acquirers

		Acquiring CU Assets						
		≤$10 M	%	$10-100 M	%	≥$100 M	%	Total
Target CU Assets	≤$10 M	65	3.7	517	29.7	532	30.6	1,114
	$10-100 M			150	8.6	400	23.0	550
	≥$100 M					75	4.3	75
	Total	65		667		1,007		1,739

This table summarizes credit union merger activity over the sample period from 2008 to 2022. Panel A reports statistics for all merger activity as well as credit union mergers retained in the final sample after data filters. The annual figures reported include the number of mergers, total dollar volume of mergers (in millions), number of mergers with expanded services listed as the primary merger reason, and number of mergers with financial distress listed as the primary merger reason. Panel B assigns each credit union merger from the final sample into a relative size group based on the most recent year-end total assets reported for each institution in its 5300 Call Report prior to the merger event. For each merger, the target and acquiring credit unions are assigned to one of three size groups: less than or equal to $10 million (≤$10 M), greater than $10 million but less than $100 million ($10-100 M), or greater than or equal to $100 million (≥$100 M). These size groupings utilize the National Credit Union Administration's (NCUA) peer group definitions but consolidate the six peer groups into three. The smallest, middle, and largest size groups reported here correspond to NCUA peer groups 1 and 2, 3 and 4, and 5 and 6, respectively
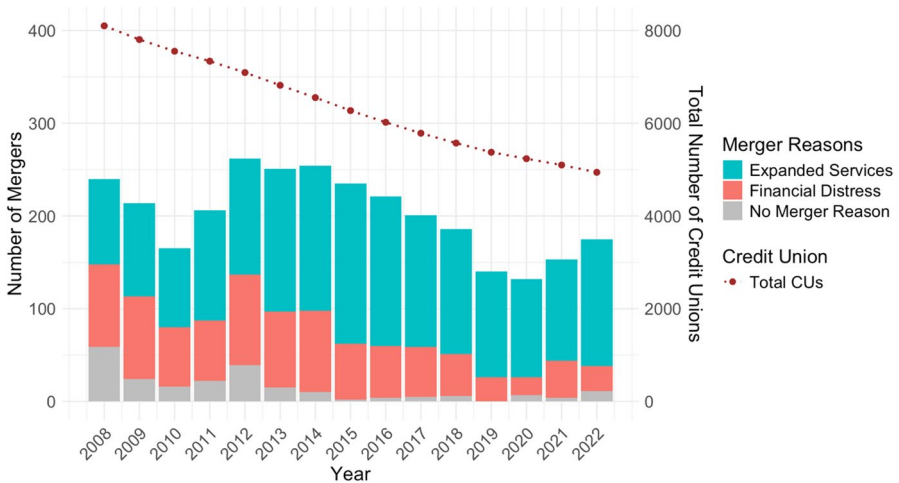
Fig. 1 Total credit unions and credit union mergers by year. This figure displays the total number of credit unions at the beginning of each year and the number of mergers occurring within each year. Each bar indicates the number of mergers per year and is divided into three segments representing the amount with a stated reason of *Expanded Services*, *Financial Distress*, or *Other*, with the latter subsample including mergers with no stated reason as well as those aimed at changing from a federal to state charter or vice versa. The sample period is from 2008 to 2022

merger reason. We then combine the merger data with financial information from the 5300 Call Reports for all federally insured credit unions and the complete list of chartering events over our sample period.[9] Table 1 displays credit union merger statistics during our sample period spanning from 2008 to 2022, with 2008 representing the first year when merger reason data is available. In Panel A, we report annual data on the total number of mergers, dollar volume of target assets, number of mergers aimed at providing expanded services, and number of mergers driven by financial distress. We report these figures separately for the overall dataset as well as for mergers retained in our final sample that excludes instances where a credit union is involved in multiple mergers within the same year or consecutive years in order to prevent the contamination of each merger event's measured effect (Bauer 2008; Bauer et al. 2009). The total figures include all mergers from NCUA's complete list of chartering events. Some mergers do not have a classified merger reason either because there was no recorded reason, the reason was recorded as "no response", or the reason is stated as a conversion to or merger with a federal credit union (FCU) or federally insured state-chartered credit union (FISCU). In the latter instance, there is no clear merger objective other than changing from a federal to state charter or vice versa.

The two most commonly stated merger reasons are "expanded services" and "poor financial condition". In addition to poor financial condition, we also classify less commonly provided reasons related to long-term viability or performance-related

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[9] Call report data is obtained from: https://www.ncua.gov/analysis.

issues into the financial distress category. These merger motivations include declining field of membership, lack of growth, poor management, lack of sponsor support, and inability to obtain officials. Overall, the sample period includes 3,036 merger events totaling $94.29 billion in acquired assets with 1,909 of those mergers motivated by expanded services and 902 classified as being driven by financial distress. After excluding credit unions involved in multiple mergers in the same or consecutive years as well as credit unions without a listed merger reason, our final sample contains 1,739 mergers totaling $65.68 billion in acquired assets with 1,172 expanded services mergers and 567 distressed mergers. Figure 1 illustrates industry trends in merger activity as well as the number of federally insured credit unions. The total number of mergers per year has declined somewhat over the sample period after reaching a peak in 2012, in part due to a smaller number of remaining credit unions. This trend in merger activity is driven primarily by a decline in the number of distressed driven mergers, particularly as the U.S. economy became further removed from the 2008 financial crisis. By contrast, the number of expanded services mergers has remaining relatively stable. Figure 1 also highlights that the total number of federally insured U.S. credit unions declined each year of the sample period from a high of 8,101 at the start of 2008 to 4,942 at the start of 2022 with the annual changes closely tied to the number of mergers occurring each year.

Table 1, Panel B shows the relative size difference between credit union targets and acquirers for mergers in our final sample. Similar to Bauer et al. (2009), we reclassify NCUA's designated target and acquiring credit unions in cases where the listed target credit union has greater total assets. Although the combined institution may use the charter from the smaller institution, the post-merger upper management is typically from the larger institution. We then assign the institutions from each merger pair to one of three size categories based on their reported total assets as of the beginning of the merger event year. We use total asset peer groups of less than $10 million, between $10 million and $100 million, and $100 million or greater. These correspond to NCUA's six official peer groups where each set of two groups is combined into one to ensure each group is well populated when considering only merging institutions.[10] The most common mergers in terms of institution size involve a mid-sized credit union acquiring a small credit union (29.7%), a large credit union acquiring a small credit union (30.6%), and a large credit union acquiring a mid-sized credit union (23.0%). Mergers between two large credit unions (4.3%), two mid-sized credit unions (8.6%), or two small credit unions (3.7%) are far less common and jointly account for 16.7% of mergers in our sample. We subsequently refer to these mergers between two credit unions from the same total asset size peer group as same size group mergers.

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[10] NCUA's peer group definitions are as follows: (1) $2 million or less; (2) $2 million to less than $10 million; (3) $10 million to less than $50 million; (4) $50 million to less than $100 million; (5) $100 million to less than $500 million; (6) $500 million or more.

2.2 Hypotheses

Our tests focus on measuring the abnormal changes in member utility to target and acquiring credit union members as well as abnormal changes in credit union CAMEL ratios used to capture overall performance and risk to the NCUSIF as assessed by federal regulators. In addition to measuring the average impact on each interested stakeholder across the full sample, we examine variation in outcomes conditional on merger scale and scope. In particular, we evaluate whether distressed or expanded services mergers lead to greater improvements in member utility and reductions in regulatory risk, as the differing merger motives lead to competing hypotheses. On the one hand, acquirers may be able to substantially improve the operations of struggling credit unions even more so than well-managed target institutions. Along with realizing greater economies of scale, acquirers can replace underperforming management teams, find more productive uses for excess cash, and ensure efficient collection practices for nonperforming loans. As a result, the efficient management hypothesis predicts that distress driven mergers will lead to greater member utility gains and institutional risk reductions.

Hypothesis 1A: Efficient Management Hypothesis. Mergers motivated by financial distress lead to greater improvements in member utility and reductions in regulatory risk.

Conversely, the synergy hypothesis predicts that greater improvements will result from mergers focused on providing expanded services, as such mergers can be expected to benefit from new product offerings that were previously unavailable to target members, greater operational efficiencies, and increased member participation. Expanded services mergers are also more likely to result from a willing and strategic matching of institutions that capitalize on existing opportunities rather than pressure from federal regulators.

Hypothesis 1B: Synergy Hypothesis. Mergers aimed at providing expanded services lead to greater improvements in member utility and reductions in regulatory risk.

The efficient management hypothesis predicts greater member utility gains in distress driven mergers than expanded services mergers due to opportunities to replace inefficient management teams and better utilize underperforming assets. Conversely, the synergy hypothesis predicts greater gains in expanded services mergers given the ability to take advantage of new product and service opportunities as well as strategic partnerships. For both merger types, such gains may not be shared equally between merging institutions. In particular, acquirers may feel pressure to merge in distressed mergers – either from the direct influence of federal regulators or the incentive to prevent failures within the industry – thereby yielding greater gains to target institutions. Similarly, the benefits of expanded product and service offerings are more likely to accrue to target institution members, as acquirers are likely to already possess robust offerings and more sophisticated management teams. As a

result, we predict target credit union members will experience greater utility gains with a smaller effect on acquirers.

> **Hypothesis 2**. Greater utility gains will be realized by target credit union members with acquiring credit union members experiencing either no change or small gains.

2.3 Credit union variables

We first compute measures of average savings and loan rates, and we also define a set of variables that control for differences in expected savings and loan rates with variable definitions reported in Appendix Table A.1. Specifically, we define *Savings* as the sum of dividends on shares and interest on deposits divided by average shares and deposits (expressed in percent). *Loan* is measured as the interest income on loans less interest refunded scaled by average loans (expressed in percent).[11] *Reserves* is computed as total assets less the sum of shares and deposits, accounts payable and other liabilities, accrued dividends and interest payable, and total borrowings, all scaled by average total assets. We measure asset growth (*Agrowth*) as the annual percentage change in total assets. *Size* is computed as the log of total assets. We also define an indicator variable, *Federal*, which is equal to one for federally chartered credit unions and zero for state-chartered credit unions.

We additionally construct variables for each of the CAMEL rating components that measure performance and stability which are used by federal regulators to assess the risk each credit union poses to the NCUSIF. We construct *Capital* as undivided earnings plus regular reserves divided by total assets. *Asset Quality* is defined as the total amount of delinquent loans divided by total loans and leases. *Management* is total loans and leases divided by total shares and deposits. *Earnings* is the ratio of net income to total assets, and *Liquidity* is computed as the sum of cash on hand, cash on deposit in other financial institutions, and cash equivalents, all scaled by total assets. In each instance, a higher ratio indicates a lower degree of risk except for the *Asset Quality* variable where a higher value signals greater loan performance issues. Following prior studies, we report the negative of the change in *Asset Quality* throughout the event study analysis so that positive values indicate performance improvements for all five CAMEL variables.

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[11] Our measure for *Savings* and *Loan* rates are the same as those used in Bauer (2008) and Bauer et al. (2009). To the extent that long-term fixed rate loans do not re-price for several years, our estimated change in loan rate should be downward biased rather to the change in marginal loan rate. Our non-parametric tests, however, are independent of magnitude and only evaluate the frequencies of abnormal positive versus negative rate changes.

Table 2 Summary statistics

Panel A: All non-merging CU-year observations

	Mean	Median	Stdev	P1	P5	P95	P99
Savings	0.922	0.594	0.903	0.000	0.091	2.811	3.689
Loan	6.420	6.162	1.936	3.490	4.065	9.898	12.956
Reserves	0.138	0.121	0.064	0.060	0.075	0.260	0.376
Agrowth	0.045	0.038	0.080	-0.146	-0.071	0.188	0.330
Size	17.026	17.014	1.995	12.144	13.640	20.457	21.696
Federal	0.637	1.000	0.481	0.000	0.000	1.000	1.000
Capital	0.130	0.114	0.061	0.026	0.066	0.254	0.370
Asset quality	0.017	0.009	0.027	0.000	0.000	0.061	0.162
Management	0.639	0.649	0.222	0.106	0.254	0.982	1.128
Earnings	0.003	0.004	0.008	-0.031	-0.011	0.014	0.024
Liquidity	0.131	0.096	0.113	0.011	0.025	0.361	0.608

Panel B: Acquirers

	Mean	Median	Stdev	P1	P5	P95	P99
Savings	0.928	0.616	0.821	0.073	0.157	2.766	3.557
Loan	5.835	5.733	1.333	3.544	3.979	8.158	9.719
Reserves	0.118	0.110	0.037	0.067	0.077	0.191	0.249
Agrowth	0.062	0.052	0.071	-0.088	-0.030	0.198	0.304
Size	18.764	18.770	1.547	14.642	16.279	21.344	21.696
Federal	0.546	1.000	0.498	0.000	0.000	1.000	1.000
Capital	0.110	0.103	0.039	0.023	0.061	0.181	0.248
Asset quality	0.011	0.008	0.011	0.000	0.001	0.029	0.051
Management	0.714	0.724	0.189	0.255	0.390	1.008	1.130
Earnings	0.005	0.006	0.006	-0.013	-0.004	0.014	0.020
Liquidity	0.095	0.076	0.074	0.010	0.022	0.236	0.370

Panel C: Targets

	Mean	Median	Stdev	P1	P5	P95	P99
Savings	0.852	0.367	2.461	0.000	0.023	2.657	6.035
Loan	6.831	6.509	2.258	3.377	4.172	10.708	13.827
Reserves	0.130	0.109	0.082	0.004	0.040	0.279	0.424
Agrowth	-0.017	-0.014	0.089	-0.186	-0.186	0.125	0.234
Size	15.533	15.500	1.683	11.901	12.674	18.293	19.651
Federal	0.633	1.000	0.482	0.000	0.000	1.000	1.000
Capital	0.129	0.107	0.077	0.023	0.038	0.281	0.377
Asset quality	0.032	0.013	0.046	0.000	0.000	0.142	0.196
Management	0.561	0.551	0.234	0.099	0.187	0.952	1.151
Earnings	-0.009	-0.004	0.015	-0.040	-0.040	0.009	0.018
Liquidity	0.201	0.153	0.159	0.012	0.030	0.560	0.662

This table presents credit union (CU) summary statistics over the sample period from 2008 to 2022. Panel A reports values for all 87,734 non-merging CU-year observations. Panels B and C report values for the 1,739 CUs that become acquirers or targets in the following year, respectively. The variables reported include savings rate (*Savings*), loan rate (*Loan*), equity reserves (*Reserves*), asset growth (*Agrowth*), log total assets (*Size*), an indicator variable equal to one if the CU is federally chartered (*Federal*), and CAMEL ratios variables for *Capital*, *Asset quality*, *Management*, *Earnings*, and *Liquidity*. For each variable, the statistics reported include the mean, median, standard deviation, 1st percentile, 5th percentile, 95th percentile, and 99th percentile

3 Summary statistics

Table 2 provides summary statistics for our key variables separately for all non-merging, acquirer, and target credit-union-year (CU-year) observations. For targets and acquirers, summary statistics are computed for all variables based on the year-end financials reported prior to the merger event. Our final sample includes 87,734 non-merging CU-year observations along with 1,739 merger observations over the period from 2008 to 2022. Panel A presents summary statistics for non-merging CU-year observations. The average savings and loan rates during our sample period are 0.922% and 6.420%, respectively, which is reflective of the low interest rate environment in the U.S. following the 2008 financial crisis. Additionally, the average non-merging CU-year had values of 13.0%, 1.7%, 63.9%, 0.3%, and 13.1% for the *Capital*, *Asset Quality*, *Management*, *Earnings*, and *Liquidity* ratios, respectively. The 13.0% average capital ratio is nearly double the NCUA's requirement of 7% to be considered well-capitalized suggesting most credit unions maintain a sizable capital cushion.[12]

Panels B and C report summary statistics separately for acquirer and target credit unions with a number of notable differences. First, average asset growth (*Agrowth*) for acquirers is 6.2% relative to -1.7% for targets. This suggests the inability to retain existing members and expand operations may contribute to the decision to merge and is consistent with the evidence from Goddard et al. (2002) that slower growth among small credit unions is often driven by institutional inefficiencies. Despite their lack of growth, we find that target institutions have higher capital ratios than acquirers on average at 12.9% compared to 11.0%, suggesting most targets in our sample far exceed the 7% capital requirement to be considered well capitalized and do not face immediate insolvency concerns. However, target credit unions have worse average values for *Asset Quality*, *Management*, and *Earnings*, with a -0.9% average value for *Earnings* implying that the average target credit union in our sample is unprofitable. We also observe an average *Liquidity* ratio for targets that far exceeds that of acquirers with an average value of 20.1% compared to just 9.5%. While such a large cash position reduces the risk of short-term cash flow problems it is also indicative of challenges in making new loans and finding productive uses for available funds.

4 Methodology

4.1 Detecting abnormal savings and loan rate changes

To measure the impact of credit union mergers on their respective memberships, we use an approach similar to the event study methodology developed in Bauer

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[12] The official net worth categories are: "well capitalized" = over 7%, "adequately capitalized" = 6% to 7%, "undercapitalized" = 4% to 6%, "significantly undercapitalized" = 2% to 4%, and "critically undercapitalized" = less than 2%. Credit unions must also satisfy additional risk-based net worth requirements.

Table 3 Expected savings and loan rate regressions

Dependent Variable:	$Savings_{i,t+1}$	$Loan_{i,t+1}$
$Savings_{i,t-1}$	0.553***	-0.047*
	(6.11)	(-1.82)
$Loan_{i,t-1}$	-0.069***	0.717***
	(-2.82)	(6.20)
$Reserves_{i,t-1}$	10.213***	-4.263*
	(3.31)	(-1.72)
$AGrowth_{i,t+1}$	3.399***	1.232
	(3.36)	(0.84)
$Size_{i,t-1}$	0.129***	-0.279***
	(3.63)	(-3.38)
$Federal_{i,t-1}$	1.845	-3.466***
	(1.33)	(-3.44)
Year Controls	YES	YES

This table reports dynamic panel estimation results that are used to generate post-event expected savings and loan rates. The dependent variables are the one-year-ahead savings and loan rates, and the independent variables include the once lagged savings and loan rates, reserve ratio as a percentage of assets, log size, and a federal charter dummy variable. We also include the contemporaneous asset growth following Bauer (2008) as well as year controls. Coefficients are estimated using generalized method of moments (GMM) estimation for linear dynamic panel models which uses lagged values of the independent variables as instruments. t-statistics are reported in parentheses, and ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively

(2008). Specifically, we first estimate expected future savings and loan rates, which are then compared against the actual savings and loan rates realized post-event. Our set of predictor variables includes the pre-event savings and loan rates, *Savings* and *Loan*, as well as the pre-event values for *Reserves*, *Size*, and *Federal*. Similar to Bauer (2008) and Bauer et al. (2009), we also control for contemporaneous asset growth. The inclusion of pre-event savings and loan rates controls for institutional preferences, as some credit unions may favor higher savings rates while others prefer the benefit of lower loan rates. Additionally, because the focus is on credit unions that merge in year *t*, pre-event predictor variables are measured in *t-1* with post-event rates measured in year *t + 1* following prior studies.

We use a generalized method of moments (GMM) dynamic panel estimation to generate values for expected savings rates and loan rates. This technique allows for unbiased estimation with the inclusion of a lagged dependent variable in the set of predictors and uses lags of the independent variables as instruments for their current values. We also explore the use of both full panel estimation as well as a series of cross-sectional estimations and find qualitatively similar results. The results from our full-sample pooled dynamic panel GMM estimation are presented in Table 3 with cross-sectional estimations available upon request.

As expected, lagged savings rates are the strongest predictor of one-year-ahead savings rates (*Savings*) and lagged loan rates are the strongest predictor of one-year-ahead loan rates (*Loan*).

The fitted values from our GMM estimations generate a set of expected future savings and loan rates for each credit union. We then construct the abnormal net gain vector ($\alpha_{i,t+1}$) used to measure the unexpected changes as the result of the merger,

$$\alpha_{i,t+1} = \left\{ Savings_{i,t+1} - E\left[Savings_{i,t+1}\right], E\left[Loan_{i,t+1}\right] - Loan_{i,t+1} \right\}, \qquad (1)$$

where the abnormal net gains for each credit union reflect the differences between the realized post-event savings rate and the expected savings rate as well as between the expected loan rate and the realized post-event loan rate. If the observed savings rate is higher than expected and the observed loan rate is lower than expected, both differences will be positive suggesting the credit union's members are better off as a result of the merger.

After computing the abnormal rate changes, we apply two tests to evaluate member utility gains across groups of institutions. The first is a parametric test that evaluates whether the abnormal return vector is significantly different from the zero vector and in the first quadrant – reflecting positive abnormal savings and loan rates. The test statistic is computed as follows,

$$\eta = n\left(\overline{\alpha} - 0\right)S^{-1}\left(\overline{\alpha}\prime - 0\right) = n\overline{\alpha}S^{-1}\overline{\alpha}\prime, \qquad (2)$$

where $\overline{\alpha}$ denotes the average abnormal savings and loan rates (i.e. $\overline{\alpha} = \frac{1}{n}\sum_{i=1}^{n}\alpha_i$), 0 is a 1×2 zero vector reflecting the null hypothesis of zero abnormal net change, and S^{-1} is the inverse of the abnormal rate variance–covariance matrix. The value of η follows a χ^2 with 2 degrees of freedom.[13]

The second method uses a non-parametric test to evaluate the number of credit unions that realize both positive abnormal savings and loan rate changes following the event. Under the null hypothesis that mergers have no effect on the utility credit unions deliver to their memberships, we would expect the percentage of merging and non-merging credit unions with abnormal return vectors falling in the first quadrant to be similar. Since the probability of an observation being in the first quadrant is binomially distributed, we use the abnormal savings and loan rates for all credit unions to compute the likelihood that the sample of merging credit unions (or a sub-sample of merging credit unions) is drawn from the same population as non-merging credit unions. We compute this cumulative binomial probability as follows,

$$\pi = 1 - b(n, p, k) = 1 - \sum_{i=0}^{k} \binom{n}{i} p^i (1-p)^{n-i}, \qquad (3)$$

where π is the test statistic computed as one minus $b(n,p,k)$ and b is the cumulative binomial probability under the null hypothesis of observing fewer test observations in the first quadrant than the realized amount. This cumulative probability is

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[13] See Bauer (2008) for additional details.

computed as a function of the number of merging institutions in the test group (n), the proportion of non-merging institutions that fall in the first quadrant (p), and the number of merging institutions that fall in the first quadrant (x, where $k=x-1$). A value of π below the test's significance level suggests significantly more merging institutions realized positive abnormal savings and loan rate gains than would be expected had they not merged.

4.2 Measuring changes in performance, institutional stability, and regulatory risk

To examine how credit union mergers impact performance and the risk posed to the NCUSIF, we explore unexpected changes in credit union CAMEL ratios using our measures for *Capital*, *Asset Quality*, *Management*, *Earnings*, and *Liquidity*. Prior to evaluating whether mergers result in performance improvements, however, we first assess whether mergers (or subsamples of mergers) tend to yield stronger combined CAMEL ratios relative to those of target institutions. Specifically, we evaluate pre-merger performance differences by calculating each CAMEL ratio for target institutions at the end of the year prior to the merger event (i.e. year t-1) as well as the ratios for the combined institutions computed on a pro-forma basis. We then compute pre-merger improvements as the combined institution's ratio less the target's ratio. Following prior literature, we take the negative of the difference of *Asset Quality* given that higher values reflect higher risk, so a positive change reflects an improvement for each of the five CAMEL variables. The mean difference for each CAMEL ratio is then evaluated, with significant positive values indicating a stronger financial position for the combined institution relative to the target. In other words, positive values suggest that even in the absence of a merger effect on performance, the target institution will be more financially sound after being acquired. We also employ a sign test to ensure robustness against the impact of outliers which evaluates whether a significantly higher percentage of merging institutions realize positive changes for each variable. Last, we conduct difference-in-means tests across merger subsamples to evaluate whether greater pre-merger differences in performance and stability exist for distress driven mergers relative to expanded services mergers as well as for different size group mergers relative to same size group mergers.

We subsequently attempt to determine if merged institutions display evidence of improved financial stability post-merger compared to pre-merger with differences evaluated for the overall sample of credit union mergers as well as separately by merger reason. We measure changes in performance by subtracting each combined pre-merger CAMEL ratio (measured on a pro-forma basis) from the ratio realized one-year post-merger. To control for average changes during the event period, we subtract the mean (median) CAMEL ratio changes of non-merging credit unions over the corresponding year in our parametric (non-parametric) tests.

We use a series of *t*-tests to evaluate whether each group of merging institutions displayed evidence of significant changes in performance relative to the control group of non-merging institutions, with performance measured by the set of the CAMEL ratio variables. We also conduct non-parametric tests that calculate

Table 4 Abnormal savings and loan rate gains

		Parametric test			*Non-parametric test*	
	Obs	$\alpha_{savings}$	α_{loan}	χ^2	# Improved	# Worsened
Panel A: All mergers						
Targets	1,739	0.21	0.89	33.11^^^	580+++	278---
Acquirers	1,739	0.07	-0.02	4.96	449+	382---
Panel B: By merger reason						
Targets – Distressed	567	0.11	0.99	28.66^^^	180+++	92---
Acquirers – Distressed	567	0.07	0.10	2.78	172+++	116--
Targets – Expanded Svcs	1,172	0.25	0.84	35.99^^^	400+++	186---
Acquirers – Expanded Svcs	1,172	0.07	-0.09	5.66	277	266
Panel C: By CU size difference						
Targets – Different size group	1,449	0.19	1.08	28.57^^^	506+++	217---
Acquirers – Different size group	1,449	0.05	0.03	3.21	383++	306---
Targets – Same size group	290	0.29	-0.09	7.68	74	61-
Acquirers – Same size group	290	0.12	-0.21	5.02	66	76

This table reports abnormal changes in savings and loan rates experienced by merging credit unions with values reported separately for target and acquirers. Panel A displays abnormal savings ($\alpha_{savings}$) and loan (α_{loan}) rates across all mergers during the sample period from 2008 to 2022. Panel B and C partition the sample by primary stated merger reason and whether the target and acquirer are in different size categories, respectively. The three credit union size groups are as follows: Category 1 = Assets < $10 million, Category 2 = $10 million ≤ Assets < $100 million, Category 3 = Assets ≥ $ 100 million. The $\alpha_{savings}$ and α_{loan} columns report the mean abnormal savings and loan rates, and the χ^2 column reports the associated chi-square statistic based on the abnormal savings and loan vectors. ^^^, ^^, and ^ indicate a result significantly different from zero and in the 1st quadrant at the 1%, 5% and 10% levels, respectively. ˅˅˅, ˅˅, and ˅ denote a significant result in the 3rd quadrant. The # Improved (# Worsened) column reports the number of observations with both improved (worsened) savings and loan rates, with +++, ++, and + used to indicate a significantly higher proportion and ---, --, and - used to indicate a significantly lower proportion relative to all non-merging credit unions at the 1%, 5% and 10% levels

the number of merging credit unions with positive abnormal CAMEL ratio changes relative to non-merging institutions. Specifically, following Bauer (2008) and Bauer et al. (2009), we compute the cumulative binomial probability of observing up to the observed number of positive abnormal changes given an expected positive rate of 50% under the null hypothesis of no merger impact.[14] Given that the pre-to-post event year CAMEL ratio changes are reduced by the median change of non-merging institutions, an abnormally high frequency of positive values is consistent with a

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[14] The sample median ratio change is an unbiased estimate of the population median ratio change. This results in a 50% chance of observing a positive value for each observation under the null hypothesis of no merger impact. We use the cross-sectional mean (median) as a control in our parametric (non-parametric) tests since changes may be cross-sectionally correlated.

positive merger impact. If the probability of observing the realized number of positive changes or more (i.e. one minus the cumulative binomial probability) is less than the test's significance level, we reject the null of no merger impact on financial performance. For robustness, we also utilize one-to-one nearest neighbor matching and instrumental variables regression to help address endogeneity concerns.

5 Empirical results

5.1 Abnormal savings and loan rates for merging credit unions

Table 4, Panel A reports institutional utility gains or losses for the full sample. The parametric test results suggest that, overall, mergers tend to benefit target credit union members with mixed results for acquirers. In particular, the parametric test results show that target credit union members experience positive abnormal savings and loan rate changes with the non-parametric results indicating an abnormally high number of targets with positive abnormal rate changes and an abnormally low percentage of targets with negative abnormal rate changes (580 vs. 278). By contrast, acquirers show positive average abnormal savings rate gains with negative abnormal loan rate changes. Despite the lack of significance for acquirers in the parametric tests, the non-parametric test results provide evidence of more improved acquiring institutions than expected (i.e. positive abnormal savings and loan rates) and significantly fewer worsened institutions (i.e. negative abnormal savings and loan rates). Given our sample of member-owned credit unions, this result is consistent with the findings of Leledakis et al. (2021) which shows that although banks lose when they acquire public firms, they gain when acquiring private firms. Similar positive acquirer effects for private firms are also documented in the literature on non-financial firms (see e.g., Arikan and Stulz 2016; Chang 1998; Netter, 2011). Thus, in contrast to prior studies that generally find target credit union members benefit with no discernible impact on acquiring credit union members, we provide some evidence that acquirers are more likely to experience gains than losses although target credit union members reap the greatest benefits.

Panel B evaluates the results separately for distressed and expanded services mergers given our two competing hypotheses regarding the expected utility gains. In both subsamples, we find that credit union targets benefit most, with significant savings and loan rate improvements indicated by both the parametric and non-parametric tests. Consistent with the efficient management hypothesis, the non-parametric tests indicate that a significantly greater number of acquirers in distressed mergers experience favorable abnormal rate changes than unfavorable rate changes (180 vs. 92), whereas the results are not statistically significant for acquirers in expanded services mergers with a comparable number of favorable and unfavorable changes (277 vs. 266). Such evidence is consistent with acquirers improving the operations of distressed credit unions and creating sufficient efficiency gains to benefit members of both merging institutions.

Panel C subsequently explores subsamples formed by dividing all mergers into instances where the two institutions are in the same or different asset size peer

groups. The parametric tests reveal the strongest benefit to targets in different size group mergers, providing evidence of significant utility gains when acquired by a larger credit union. By contrast, the parametric tests yield insignificant utility changes among targets when acquired by a same size group credit union as well as insignificant results for acquirers within both subgroups. The non-parametric tests, however, indicate significantly higher than expected improvements and lower than expected declines among both targets and acquirers in different size group mergers. Altogether, our results indicate that target institution members experience the greatest savings and loan rate improvements relative to the rates expected had they not merged, whereas the effect on acquiring institutions is smaller. Acquirers may be significantly more likely than non-merging credit unions to experience positive abnormal rate changes, but this effect is concentrated within distressed mergers and mergers where the acquirer is significantly larger than the target.

5.2 Target versus combined credit union pre-merger performance and financial stability

We next examine pre-merger differences in credit union performance and risk to the NCUSIF between targets and the pro-forma combined institutions. Specifically, we compute CAMEL ratios using the year-end financial statements prior to the merger event for both the target and combined institution. This test effectively evaluates the health of targets relative to the resulting institutions prior to the merger event and any subsequent performance changes. While this analysis does not assess the merger's impact on subsequent operational efficiency and performance, it provides an assessment of the merger's immediate impact on failure risk due to combining operations.

Table 5, Panel A reports the full sample results. We find significant differences across all CAMEL ratios with the combined institutions exhibiting significantly lower *Capital* and *Liquidity* ratios but significantly better *Asset Quality*, *Management*, and *Earnings* ratios. This suggests that the average target credit union is very well capitalized with excess liquidity but has more problem loans, a lower ratio of loans-to-shares, and lower profitability than the average acquiring credit union.

Panels B and C explore differences across merger subsamples. Our difference-in-means tests indicate that relative to mergers driven by expanded services, the CAMEL ratio changes for distress driven mergers are significantly positive for *Capital*, *Asset Quality*, and *Earnings* but significantly negative for *Liquidity* and marginally significant and negative for *Management*. One of the most notable differences is in *Asset Quality* with distress driven mergers exhibiting an average combined-minus-target delinquency ratio difference of 3.7 percentage points relative to 1.1 percentage points in expanded services mergers. The net difference of 2.6% is highly significant ($t = 12.29$) and economically large, especially when compared to the average *Asset Quality* ratio of 1.7% among non-merging credit unions over the full sample period. Thus, a primary benefit of distress driven mergers appears to be alleviating loan portfolio performance issues by transferring credit risk to healthier institutions that can better absorb potential defaults. When focusing on Panel C comparing different

Table 5 Pre-merger CAMEL ratio differences between target CU and combined institution

Panel A: All credit union mergers

	Full sample (n = 1,739)			
	Mean	t-stat	# Pos	% Pos
Capital	-0.019***	-10.29	832	47.8
Asset quality	0.020***	18.99	1,071***	61.6
Management	0.143***	23.24	1,254***	72.1
Earnings	0.014***	37.76	1,507***	86.7
Liquidity	-0.102***	-27.20	434	25.0

Panel B: By merger reason

	Financial Distress (n = 567)				Expanded Services (n = 1,172)				Difference-in-means	
	Mean	t-stat	# Pos	% Pos	Mean	t-stat	# Pos	% Pos	Diff	t-stat
Capital	-0.010***	-2.59	332***	58.6	-0.024***	-11.36	500	42.7	0.014***	3.58
Asset quality	0.037***	15.58	408***	72.1	0.011***	12.20	663***	56.6	0.026***	12.29
Management	0.126***	10.45	375***	66.1	0.151***	21.56	879***	75.0	-0.025*	-1.92
Earnings	0.018***	25.70	497***	87.7	0.011***	28.90	1,010***	86.2	0.007***	9.28
Liquidity	-0.123***	-16.61	138	24.3	-0.092***	-21.73	296	25.3	-0.031***	-3.95

Panel C: By CU size difference

	Different Size Group (n = 1,449)				Same Size Group (n = 290)				Difference-in-means	
	Mean	t-stat	# Pos	% Pos	Mean	t-stat	# Pos	% Pos	Diff	t-stat
Capital	-0.023***	-10.98	677	46.7	0.001	0.36	155	53.4	-0.024***	-4.93
Asset quality	0.022***	18.55	909***	62.8	0.008***	4.71	162**	55.9	0.014***	4.92
Management	0.158***	22.65	1,061***	73.2	0.069***	6.11	193***	66.6	0.089***	5.43
Earnings	0.015***	37.09	1,275***	88.0	0.007***	10.64	232***	80.0	0.008***	8.74
Liquidity	-0.115***	-27.22	326	22.5	-0.034***	-5.66	108	37.2	-0.081***	-8.25

This table tests for significant pre-merger CAMEL ratio differences between target credit unions and the combined institutions, where combined institution ratios are computed on a pro-forma basis. The mean change for each CAMEL ratio is defined as the combined institution's ratio minus the target's ratio except for the *Asset quality* tests where changes are defined as the target's minus the combined institution's ratio. We report *t*-tests that evaluate whether the mean differences are significantly different from zero. We also employ a non-parametric test following Bauer et al. (2009) that tests whether CAMEL ratio differences are more likely to be positive or negative. The final two columns test whether the first subsample mean value in each row differs significantly from the second subsample mean. ***, **, and * indicate that the mean (number of positive values) is significantly different from zero (the expected value) for the parametric (non-parametric) tests at the 1%, 5% and 10% levels, respectively

Table 6 Abnormal CAMEL ratio differences between post-merger CU and pre-merger combined institution

Panel A: All credit union mergers

Full sample (n=1,739)

	Mean	t-stat	# Pos	% Pos
Capital	-0.004***	-10.91	691	39.7
Asset quality	0.000	0.11	894	51.5
Management	0.010***	5.25	936***	53.8
Earnings	0.001***	4.58	973***	56.0
Liquidity	-0.003**	-2.49	795	45.7

Panel B: By merger reason

	Financial Distress (n=567)				Expanded Services (n=1,172)				Difference-in-means	
	Mean	t-stat	# Pos	% Pos	Mean	t-stat	# Pos	% Pos	Diff	t-stat
Capital	-0.002***	-2.65	266	46.9	-0.005***	-11.38	425	36.3	0.004***	4.55
Asset quality	0.000	0.34	293	51.8	-0.000	-0.25	601	51.3	0.000	0.49
Management	0.010***	2.99	302*	53.3	0.010***	4.31	634***	54.1	-0.001	-0.14
Earnings	0.001***	4.25	321***	56.6	0.000**	2.40	652***	55.6	0.001***	2.68
Liquidity	-0.003	-1.31	266	46.9	-0.003**	-2.12	529	45.1	0.000	0.10

Panel C: By CU size difference

	Different Size Group (n=1,449)				Same Size Group (n=290)				Difference-in-means	
	Mean	t-stat	# Pos	% Pos	Mean	t-stat	# Pos	% Pos	Diff	t-stat
Capital	-0.002***	-6.46	623	43.0	-0.014***	-10.14	68	23.4	0.012***	11.62
Asset quality	-0.000	-0.34	742	51.3	0.001	0.55	152	52.4	-0.001	-0.92
Management	0.012***	5.58	786***	54.2	0.002	0.43	150	51.7	0.010*	1.86
Earnings	0.001***	3.20	790***	54.5	0.002***	3.69	183***	63.1	-0.001***	-2.71
Liquidity	-0.003**	-2.28	676	46.7	-0.004	-1.04	119	41.0	0.001	0.34

This table evaluates changes in credit union CAMEL ratios from pre-merger to post-merger. We compute mean values by first taking the difference between each ratio's value at the end of the post-merger period and the pre-merger period (using pro-forma ratios for the combined institution). In the case of *Asset quality*, we use the negative of the change, so that positive values indicate an improvement. Each difference is reduced by the mean (median) change for all non-merging credit unions over the same period for our parametric (non-parametric) test. The non-parametric test examines whether CAMEL ratio changes are more likely to be positive or negative. The final two columns test whether the first subsample mean value differs significantly from the second subsample mean. ***, **, and * indicate that the mean (number of positive values) is significantly different from zero (the expected value) for the parametric (non-parametric) tests at the 1%, 5% and 10% levels, respectively

size group to same size group mergers, we find positive differences for *Asset Quality*, *Management*, and *Earnings*, but negative differences for *Capital* and *Liquidity*.

5.3 Changes in performance and financial stability from pre- to post-merger

Table 6 evaluates CAMEL ratio changes from pre- to post-merger for the combined credit unions relative to changes for non-merging institutions over the same period. Across the sample of all credit union mergers presented in Panel A, we find significantly positive values for *Management* and *Earnings* but significantly negative values for *Capital* and *Liquidity*. When considered jointly, a significant decline in *Liquidity* coupled with a corresponding increase in *Management* is consistent with greater lending activity, as the *Management* ratio measures total loans as a percentage of shares and deposits. Our summary statistics previously indicated that target institutions have higher average cash holdings, which these merger effect results suggest are subsequently utilized by acquirers to take advantage of lending opportunities that targets were previously unable to leading to a decline in cash balances but an increase in outstanding loans.

Panel B explores differences in mergers motivated by financial distress compared to expanded services mergers. We find that distress driven mergers result in significantly greater increases in *Earnings* and significantly smaller *Capital* ratio declines as evidenced by the positive difference-in-means values for each variable. This implies that distressed mergers tend to result in greater improvements in profitability relative to expanded services mergers as well as non-merging credit unions. Such evidence is consistent with the efficient management hypothesis and suggests that acquiring credit unions are able to improve the existing operations of struggling credit unions.

Panel C subsequently compares mergers between credit unions in different versus same size peer groups. Focusing again on the difference-in-means tests, we find that different size group mergers lead to a significantly positive difference in *Capital* ($t = 11.62$) but a significantly negative difference in *Earnings* ($t = -2.71$). Thus, mergers between institutions of comparable size appear to generate greater improvements in profitability as well as stronger asset growth that drives their capital ratio declines relative to both different size group mergers as well as non-merging credit unions.

Appendix Table A.2 repeats these analyses with mergers divided simultaneously along merger motivation and asset size peer group, and the results are largely consistent. Of particular note is that distress driven mergers generate significantly positive differences in *Capital* and *Earnings* ratios relative to mergers driven by expanded services, and the results hold across both same size and different size mergers. Altogether, our results in this section provide support for the efficient management hypothesis, highlighting the regulatory benefits of distress driven mergers. We further document several significant differences in outcomes related to merger scale.

6 Robustness tests

Many early studies in the merger's literature do not address potential endogeneity biases that arise from the merger decision. While our main tests document the average changes in performance variables from pre- to post-merger and control for broad industry effects by subtracting the average or median changes of other credit unions over the same time period, it is possible that merging credit unions differ significantly from the broader sample and would have experienced different future changes in performance even in the absence of a merger event. Even when comparing different merger types, which is our primary focus, it is possible that the types of credit unions in distressed mergers differ from those in expanded services mergers. Our prior tests confirm that that average changes in performance differ between the different merger types along both scale and scope, but to provide stronger evidence of a causal effect we conduct both matched sample analysis and instrumental variables regression.

6.1 Matched sample analysis

To focus on the difference between distressed and expanded services mergers, we conduct a matched sample analysis to account for potential pre-merger differences that could affect post-merger trajectories. Specifically, we use one-to-one nearest neighbor matching to pair each merging distressed credit union observation ($FMERGE = 1$) with the closest expanded services merger observation within the same year based on the mahalanobis distance.[15] The mahalanobis distance between two N-dimensional points, X_i and X_j, with covariance matrix Σ can be expressed as,

$$D(X_i, X_j) = \{(X_i - X_j)^T \Sigma^{-1} (X_i - X_j)\} \tag{4}$$

so that the distance equals zero if all covariates have the same values, and the distance increases as covariates become further apart. We match on characteristics for *Size*, *Capital*, *Asset Quality*, *Management*, *Earnings*, *Liquidity*, *Asset Growth (Agrowth)*, and *EarningsDecline*. We define the *EarningsDecline* variable as an indicator equal to one if a credit union's *Earnings* ratio is worse than the previous year. The *EarningsDecline* and *Agrowth* variables are used to help ensure that credit unions in the distressed mergers sample have similar pre-merger trends to their matched counterparts, and the remaining variables ensure similar institutional size and performance levels. We also implement a caliper of 3.0 to exclude observations for which there exists no suitable match.[16] Similar to our prior analyses, we avoid any mechanical changes in performance ratios by computing pre-merger characteristics using pro-forma financial statements.[17] We then evaluate the changes in each of

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[15] Propensity score matching achieves a similar result, but we achieve better characteristic balancing in our tests using mahalanobis distance.

[16] The results are robust to using other similar caliper values. As the allowable distance is reduced, the number of successful matches declines by construction.

[17] In other words, our test compares the financials of the pre-merger combined institution to the post-merger combined institution.

the five CAMEL ratio measures from year t-1 to $t+1$ for credit unions in distressed mergers compared to their matched counterparts.

Table 7, Panel A highlights that credit unions in distressed mergers (*FMERGE*) differ significantly from the full sample of credit unions in expanded services mergers (*Control*). The distressed merger institutions, measured on a pre-merger combined basis, exhibit significant differences in *Size*, *Asset Quality*, *Earnings*, *Agrowth*, and *EarningsDecline*. As expected, the distressed merger observations have lower

Table 7 Matched sample analysis

Panel A: Unmatched sample characteristics				
Variable	Mean(*FMERGE*)	Mean(Control)	Diff	*p*-value
$Size_{i,t-1}$	18.665	16.999	-0.334***	0.000
$Capital_{i,t-1}$	0.111	0.109	0.002	0.292
$Asset\ quality_{i,t-1}$	0.014	0.011	0.003***	0.000
$Management_{i,t-1}$	0.697	0.707	-0.010	0.325
$Earnings_{i,t-1}$	0.003	0.005	-0.002***	0.000
$Liquidity_{i,t-1}$	0.101	0.099	0.002	0.564
$Agrowth_{i,t-1}$	0.053	0.060	-0.007**	0.030
$EarningsDecline_{i,t-1}$	0.579	0.520	0.059**	0.021
Panel B: Matched sample characteristics				
Variable	Mean(*FMERGE*)	Mean(Control)	Diff	*p*-value
$Size_{i,t-1}$	18.779	18.917	-0.138	0.103
$Capital_{i,t-1}$	0.108	0.108	0.003	0.904
$Asset\ quality_{i,t-1}$	0.012	0.011	0.001**	0.035
$Management_{i,t-1}$	0.707	0.718	-0.011	0.291
$Earnings_{i,t-1}$	0.004	0.004	-0.000	0.223
$Liquidity_{i,t-1}$	0.095	0.090	0.005	0.118
$Agrowth_{i,t-1}$	0.055	0.056	-0.002	0.638
$EarningsDecline_{i,t-1}$	0.573	0.573	0.000	1.000
Panel C: Average merger effect (ATET)				
Variable	ATET	Std. Error	*t*-stat	*p*-value
$\Delta Capital_{i,t+1}$	0.0025***	0.0008	3.006***	0.003
$\Delta Asset\ quality_{i,t+1}$	-0.0004	0.0006	-0.662	0.508
$\Delta Management_{i,t+1}$	0.0019	0.0045	0.425	0.671
$\Delta Earnings_{i,t+1}$	0.0007**	0.0003	2.573**	0.010
$\Delta Liquidity_{i,t+1}$	-0.0002	0.0028	-0.081	0.936

This table presents the results of a matched sample analysis used to evaluate the impact of distressed versus expanded services mergers. Using one-to-one nearest neighbor matching, we match each distressed merger (*FMERGE*) to an otherwise similar expanded services merger credit union (*Control*) from the same year based on the mahalanobis distance computed from pre-merger credit union characteristics. Year *t-1* characteristic values are computed using pro-forma combined financial statements to avoid any mechanical effect on the performance outcomes. Panel A reports average pre-merger characteristic values for the subsamples, the difference in sample means, and *p*-values computed using two-sample *t*-tests for differences in means. Panel B repeats this analysis; however, the control group includes only those credit unions selected by the matching procedure, and only 520 out of 567 distressed mergers have a match within the caliper. Panel C reports the average treatment effect of distressed mergers where the outcome variables considered are the changes in each CAMEL ratio variable from year *t-1* to year *t+1*

average values for *Agrowth* and higher average values for *EarningsDecline*, highlighting their adverse trends.[18]

Out of the 567 distressed merger observations, 520 are successfully matched to an expanded services merger observation. Panel B reveals that the matching procedure is effective at minimizing the characteristic differences. All characteristic differences become statistically insignificant after matching except for *Asset Quality* which remains significant but with an economically small difference (i.e. 0.012 vs. 0.011). Panel C then evaluates changes in each of the CAMEL ratio variables for the matched samples. Overall, the results add support to our prior findings, as credit unions engaged in distressed mergers exhibit significantly greater changes in *Capital* and *Earnings* compared to credit unions in expanded services mergers. Such evidence is consistent with our prior results and confirms that distressed mergers result in greater performance improvements and institutional risk reductions as predicted by the efficient management hypothesis.

6.2 Instrumental variables regression

To further explore the merger effects, we also use an instrumental variables approach. Specifically, we use the state-level real GDP growth (*StateGDP*) of where the credit union is headquartered plus a set of control variables to predict distressed merger (*FMERGE*). The appeal of using *StateGDP* as an instrument is that it should be correlated with local area macroeconomic conditions that contribute to economic distress but should not be directly related to future performance except through its impact on the likelihood of distressed merger. We then regress the one-year-ahead net interest margin (*NIM*) on the fitted value of *FMERGE* and the full set of controls in the second stage, as shown below in Eq. (5).

$$
\begin{aligned}
NIM_{i,t+1} = {} & \beta_0 + \beta_1 \widehat{FMERGE}_{i,t} + \beta_2 Log(Size)_{i,t-1} + \beta_3 Capital_{i,t-1} \\
& + \beta_4 AssetQuality_{i,t-1} + \beta_5 Management_{i,t-1} + \beta_6 Earnings_{i,t-1} \\
& + \beta_7 Liquidity_{i,t-1} + \beta_8 Investment_{i,t-1} + \beta_9 NCO_{i,t-1} \\
& + \beta_{10} Federal_{i,t-1} + \epsilon_{i,t+1}
\end{aligned}
\tag{5}
$$

Table 8 presents our results. *StateGDP* enters the first-stage regression with a significant negative coefficient. This is consistent with better (worse) local area economic conditions being associated with a lower (greater) chance of distressed merger. In the second-stage equation, *FMERGE* enters with a positive and significant coefficient consistent with credit unions in distressed mergers better utilizing distressed assets to generate greater interest income and improve overall profitability.

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[18] Matching is conducted on pre-merger pro-forma combined financial statements. Our goal is to ensure the combined pre-merger financials are similar; however, we do not require the target and acquirer to have similar weights. Distressed merger acquirers represent a higher share of combined assets on average than expanded service merger acquirers (i.e. 93% vs. 90%).

7 Conclusions

This study uses a unique and previously unexplored U.S. credit union dataset that includes the primary reason for each merger to evaluate differences in the impact on interested stakeholders including target credit unions, acquiring credit unions, and the National Credit Union Share Insurance Fund (NCUSIF). We focus primarily on differences between distress driven mergers compared to mergers aimed at providing expanded services given potentially divergent predictions in their expected impact. In particular, the synergy hypothesis predicts that expanded services mergers will generate larger utility gains for credit union members and greater improvements in institutional performance and stability because such mergers are more likely to be focused on matching complementary strengths, creating operational efficiencies, and providing new product offerings. Alternatively, the efficient management hypothesis predicts that distress driven mergers will result in greater utility gains and performance improvements, because distressed mergers allow underperforming management teams to be replaced and inefficiently utilized assets to be put to more productive uses.

Our evidence provides support for the efficient management hypothesis, as mergers driven by financial distress generate significantly larger increases in earnings relative to both non-merging credit unions as well as expanded services mergers. The results hold separately for mergers between credit unions in the same size peer group as well as different size peer groups. To mitigate endogeneity concerns, we conduct a matched sample analysis with each distressed merger matched to an otherwise similar expanded services merger which provides consistent evidence of significantly positive differences in the capital and earnings ratio changes. Thus, distressed mergers seem to provide greater opportunities for profitability enhancement. The results from our instrumental variables regression further corroborate these findings, thus, reinforcing the efficient management hypothesis. Our utility tests also reveal that target credit union members enjoy positive abnormal savings and loan rate changes when acquired by a larger institution. The savings and loan rate changes for acquirers is less pronounced, but we provide evidence of a significantly greater than expected number of positive changes for acquirers in distressed mergers, particularly when absorbing smaller target institutions. Thus, our evidence suggests that credit union size also plays an important role in determining the impact on credit union member utility.

While our main tests focus primarily on the post-event effects of credit union mergers, significant pre-merger differences in stability between the target and acquiring institution also contribute to a merger's impact on regulatory risk. We highlight significant differences in pre-merger characteristics between targets and the resulting combined institutions, and these differences vary in magnitude across mergers of different motivation. Most notably, target credit unions in distressed mergers have pre-merger loan delinquency rates that exceed those of the pro-forma combined institution by 3.7 percentage points on average compared to an average difference of 1.1 percentage points in expanded services mergers. As a result, an additional benefit of distressed mergers is the transfer of credit risk to healthier institutions that are more able to absorb potential loan defaults. Altogether, our evidence suggests mergers motivated by financial distress contribute to greater reductions in failure risk

Table 8 Two-stage instrumental variables regression

Dependent Variable:	$FMERGE_{i,t}$	$NIM_{i,t+1}$
$StateGDP_{i,t}$	-0.021**	
	(-2.12)	
$\widehat{FMERGE}_{i,t}$		0.556**
		(2.02)
$Log(Size)_{i,t}$	0.003***	0.002**
	(14.31)	(2.45)
$Capital_{i,t}$	0.006	-0.044***
	(0.90)	(-9.50)
$Asset\ Quality_{i,t}$	0.034***	-0.066***
	(5.18)	(-6.08)
$Management_{i,t}$	0.001	0.028***
	(0.09)	(6.28)
$Earnings_{i,t}$	-0.108***	-0.231***
	(-3.77)	(-6.36)
$Liquidity_{i,t}$	0.002	-0.003
	(0.20)	(-0.53)
$Investment_{i,t}$	-0.002	0.020***
	(-0.26)	(3.78)
$NCO_{i,t}$	0.076	-1.355***
	(1.22)	(-30.15)
$Federal_{i,t}$	0.001*	-0.002***
	(1.81)	(-3.64)
$Constant$	-0.044***	0.101***
	(-4.52)	(-7.70)

This table reports the second-stage results from instrumental variables regression to evaluate the impact of mergers motivated by financial distress (*FMERGE*). The first-stage predicts *FMERGE* using annual state-level real GDP growth rate as an instrument plus the full set of controls. The second-stage then regresses the one-year-ahead net interest margin (*NIM*) on the fitted value of *FMERGE* and the same set of controls. t-statistics are reported in parentheses, and ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively

based both on pre-merger CAMEL ratio differences as well as post-merger changes in performance. These findings contribute to a better understanding of the expected impact of credit union mergers and may be of interest to cooperative institutions more broadly. Our results are also of practical relevance to credit union management and federal regulators, as the primary reason for merging appears to explain key differences in the resulting merger outcome. Regulators may enact policies and provide additional resources that promote mergers with struggling institutions. Additionally, senior leadership of credit unions with viability concerns can benefit both their membership and industry stability by identifying a suitable merger partner.

Appendix A

Table 9 A.1 Variable definitions

Name	Description
Savings	Dividends on shares (Acct 380) plus interest on deposits (Acct 381) divided by average total shares and deposits (Acct 018)
Loan	Interest on loans (Acct 110) minus interest refunded (Acct 119) divided by average loans (Acct 025B plus Acct 003)
Reserves	Total assets (Acct 010) minus the sum of total shares and deposits (Acct 018), accounts payable and other liabilities (Acct 825), accrued dividends and interest payable (Acct 820A), and total borrowings (Acct 860C), with the result scaled by average total assets
Agrowth	Percentage growth in total assets (Acct 010)
Size	Log of total assets (Acct 010)
Federal	Indicator equal to one when charter number is between 60000 and 69999 and zero otherwise
E[Savings]	Value of *Savings* predicted in year $t+1$ using bivariate regressions
E[Loan]	Value of *Loan* predicted in year $t+1$ using bivariate regressions
Capital	Undivided earnings (Acct 940) plus regular reserves (Acct 931) divided by total assets (Acct 010)
Asset Quality	Total amount of delinquent loans (Acct 041B) divided by total loans and leases (Acct 025B)
Management	Total loans and leases (Acct 025B) divided total shares and deposits (Acct 018)
Earnings	Net income (Acct 661A) divided by total assets (Acct 010)
Liquidity	The sum of cash on hand (Acct 730A), total cash on deposit in corporate credit unions or other financial institutions (Acct 730B), and cash equivalents (Acct 730C) divided by total assets (Acct 010)
Earnings_Decline	An indicator variable equal to one if the current period *Earnings* variable is lower than the prior year and zero otherwise
Investment	Total investments (Acct 799I) divided by total assets (Acct 010)
NCO	Gross charge-offs (Acct 550) minus recoveries (Acct 551) divided by total assets (Acct 010)

Table 10 A.2 Abnormal gains and CAMEL ratio changes by merger reason and credit union size difference

Panel A: Abnormal savings and loan rate changes

	$\alpha_{savings}$	α_{loan}	χ^2	Improved	Worse
Different Size, Financial Distress (n=493)					
Targets	0.07	1.14	29.62^^^	163+++	80---
Acquirers	0.07	0.12	3.51	153+++	98---
Different Size, Expanded Services (n=956)					
Targets	0.25	1.05	29.87^^^	343+++	137---
Acquirers	0.05	-0.04	1.96	230	208--
Same Size, Financial Distress (n=74)					
Targets	0.35	-0.05	1.46	17	12--
Acquirers	0.06	-0.02	0.05	19	18
Same Size, Expanded Services (n=216)					
Targets	0.26	-0.10	7.22	57	49
Acquirers	0.14	-0.28	6.59	47	58

Panel B: Pre-merger CAMEL ratio differences between target and combined CU

	Different Size, Financial Distress (n=493)				Different Size, Expanded Services (n=956)			
	Mean	t-stat	# Pos	%Pos	Mean	t-stat	# Pos	% Pos
Capital	-0.012***	-2.94	289***	58.6	-0.029***	-11.99	388	40.6
Asset quality	0.041***	15.36	366***	74.4	0.012***	11.86	543***	56.9
Management	0.135***	10.20	327***	66.3	0.169***	21.11	734***	76.8
Earnings	0.019***	25.32	437***	88.6	0.013***	28.25	838***	87.7
Liquidity	-0.137***	-16.87	106	21.5	-0.104***	-21.54	220	23.0

	Same Size, Financial Distress (n=74)				Same Size, Expanded Services (n=216)			
	Mean	t-stat	# Pos	%Pos	Mean	t-stat	# Pos	%Pos
Capital	0.005	0.56	43*	58.1	-0.000	-0.04	112	51.9
Asset quality	0.016***	3.47	42*	56.8	0.006***	3.28	120**	55.6
Management	0.066**	2.48	48***	64.9	0.070***	5.76	145***	67.1
Earnings	0.010***	6.57	60***	81.1	0.006***	8.60	172***	79.6
Liquidity	-0.031**	-2.36	32	43.2	-0.035***	-5.22	76	35.2

Panel C: Combined CAMEL ratio changes from pre- to post-merger

	Different Size, Financial Distress (n=493)		Different Size, Expanded Services (n=956)	
	Difference-in-means		Difference-in-means	
	Diff	t-stat	Diff	t-stat
Capital	0.005	0.68	0.017***	3.9
Asset quality	0.010**	2.42	0.028***	11.78
Management	-0.004	-0.17	-0.034**	-2.35
Earnings	0.005***	3.27	0.007***	8.24
Liquidity	0.004	0.29	-0.032***	-3.64

Table 10 (continued)

	Mean	t-stat	# Pos	%Pos	Mean	t-stat	# Pos	% Pos	Diff	t-stat
Capital	-0.001*	-1.66	237	48.1	-0.003***	-6.61	386	40.4	0.002***	2.78
Asset quality	0.000	0.25	251	51.0	-0.000	-0.66	491	51.4	0.000	0.59
Management	0.012**	3.35	266**	54.0	0.012***	4.47	520***	54.4	-0.000	-0.07
Earnings	0.001***	3.32	273***	55.4	0.000	1.41	517***	54.1	0.001**	2.18
Liquidity	-0.002	-0.93	232	47.1	-0.004**	-2.11	444	46.4	-0.002	0.57

Same Size, Financial Distress (n=74)					Same Size, Expanded Services (n=216)				Difference-in-means	
	Mean	t-stat	# Pos	%Pos	Mean	t-stat	# Pos	% Pos	Diff	t-stat
Capital	-0.007**	-2.14	29	39.2	-0.016***	-11.32	39	18.1	0.009***	3.02
Asset quality	0.001	0.23	42	56.8	0.001	0.86	110	50.9	0.000	0.17
Management	-0.002	-0.21	36	48.6	0.004	0.63	114	52.8	-0.006	0.50
Earnings	0.003***	2.78	48***	64.9	0.001**	2.48	135***	62.5	0.002**	2.12
Liquidity	-0.010	-0.95	34	45.9	-0.002	-0.54	85	39.4	-0.008	-0.84

Abnormal gains and CAMEL ratio changes by merger reason and credit union size difference. This table repeats the analyses from Tables 4, 5, and 6 for subsamples formed by dividing all mergers by stated merger reason and whether the merging institutions are in the same or different size peer groups. The four subsamples include: 1) Different Size, Financial Distress; 2) Different Size, Expanded Services; 3) Same Size, Financial Distress; and 4) Same Size, Expanded Services. Panel A reports abnormal changes in savings and loan rates experienced by merging credit unions with mean values reported separately for targets and acquirers. Panel B evaluates the difference in pre-merger CAMEL ratios for the combined institutions (measured on a pro-forma basis) and the target credit union. Panel C reports tests of the difference in CAMEL ratios for the combined institutions from pre- to post-merger

Declarations

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