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March 1, 2013

Did Residential Mortgages Help Banks and Hurt Credit Unions During the Financial Crisis?

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I would like to thank Luis Dopico for assistance and suggestions and the NCUA and CUNA for their assistance in our collecting data. I also thank the Fisher Center for Real Estate and Urban Economics for financial support. An earlier version of this paper was titled, "Determinants of Credit Union and of Commercial Bank Failures: Similarities and Differences, 1981-2011." All errors are solely my responsibility.

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Abstract

We estimated and compared models that predict failures of credit unions with models for commercial banks. Not surprisingly, our estimates bore many similarities to prior estimates of bank failure prediction models. Our estimated models of future failures of credit unions also bore many similarities to those that we estimated for banks. Both types of lenders had higher failure probabilities when more of their assets were in commercial mortgages.

But, the differences were perhaps more interesting and informative than the similarities. We found that the estimated sizes and significance of many of the determinants of failures differed importantly between credit unions and banks.

Unlike banks, for example, credit unions that had more residential mortgages and consumer loans had higher probabilities of future failure. Indeed, the larger banks were, the stronger was the evidence that residential mortgages reduced their probabilities of failure. Conversely, unlike credit unions, banks that had more non-real-estate business loans were estimated to have higher probabilities of future failure.

Introduction

Failures of credit unions have been relatively rare. Even rarer have been systematic analyses of the causes of failures of credit unions. During the quiescent period of the "Great Moderation" of the macroeconomy that ended with the recent financial crisis and recession, failure rates of credit union and of banks sank to historic lows. During and after the crisis, the numbers of failures of credit unions and even more of banks rebounded. In the years 2008-2011, upwards of 100 credit unions and over 350 banks failed.

The evolving size and devolving regulation of credit unions relative to smaller banks spur us to analyze and compare the failures of credit unions to those of banks. The analysis may be useful to those who may be affected by actual or prospective failures: uninsured creditors (such as some depositors and debt holders), firms that rate the creditworthiness of financial institutions, deposit insurers (the National Credit Union Administration (NCUA) and the Federal Deposit Insurance Corporation (FDIC)), and taxpayers. The volume of studies of failures of banks tends to rise and fall soon after the numbers of failures rise and fall. Our analysis is an example. In addition to systematically analyzing bank failures through 2011, we try to identify the similarities and differences in failures of credit unions and of banks. These patterns may provide insight into the risks of each category of financial institution that would not have emerged so clearly without having analyzed both categories.

Ours is the first, large-scale, long-term, study of failures of credit unions that is based on the statistical methods that have long been the standard for studies of failures of

banks.[1] In addition to bearing directly on the determinants of failures, our results may also have implications for the effects of credit unions' mutual, as opposed to banks' stock, ownership of depositories on efficiency, pricing, portfolios, and activities.

Factors that have long been associated with failures of banks are also often associated with failures of credit unions. Both credit unions and banks that had more commercial mortgages (i.e., business loans backed by real estate) and delinquent loans were more likely to fail the following year. Both credit unions and banks that had lower capital and earnings (ROA) tended to fail more.

However, we also found some substantial differences between credit unions and banks in the estimated models of their failures. Compared with those for banks, the factors that affected the failures of credit unions sometimes differed in size or in statistical significance. Even within credit unions or banks, the size and significance of the factors also sometimes differed by institutions' asset sizes and by subperiods. Having more consumer loans, residential mortgages, or noninterest expense implied greater likelihood of failure of credit unions, but not of commercial banks.[2] Conversely, having more commercial and industrial (C&I) loans implied greater likelihood of failure of banks, but not of credit unions.[3] These findings may suggest how loan portfolios could be shifted to reduce failure risk. Though other considerations would also be relevant, the estimates suggest that replacing some consumer loans or residential mortgages with C&I loans could reduce failures of credit unions. Similarly, replacing some holdings of C&I loans with consumer loans might reduce failures of commercial banks.

[1] For expository convenience, we include both commercial banks and thrifts in the term "banks.".
[2] Consumer loans exclude any loans backed by real estate and consist mostly of auto and credit card loans.
[3] C&I loans are business loans that are not collateralized by real estate.

Failures of both credit unions and of banks rose from the earlier, quiescent subperiod (1994-2007) to the financial crisis subperiod (2008-2011). The increase in the (average, annual) failure rate of credit unions was much smaller (from 0.18 to 0.26%) than the increase for commercial banks (from 0.05 to 1.28%). We looked to see whether the relative increase in the failure rate of banks could be accounted for by the relative deterioration of banks, as indicated by changes in the measured factors that were included in the failure equations. To do so, we used size-specific estimates of failure-prediction equations for credit unions and for banks to calculate for each depository its one-year-ahead probability of failure (EPF). We then tabulated the numbers of credit unions and of banks that had EPFs greater than a threshold value of 0.1% (10 basis points). We regarded 10 basis points as a Basel-like threshold above which a bank could be considered "high risk." We calculated EPFs for three years 1990, 2000, and 2010. Because we used the same estimated failure equation for each of the three years, we attribute these calculated changes in EPFs solely to changes in each depository's conditions, as measured by the factors or explanatory variables in the failure-prediction equations.

Credit unions had far larger declines on average in calculated EPFs from the first, troubled subperiod (1987-1993) to the subsequent, quiescent subperiod (1994-2007) than banks did. From the first to the subsequent subperiod, the share of small credit unions (i.e., those with assets between $10 million and $100 million) that were high risk, for example, fell from 37% to 7%, while the high-risk share of small banks fell from 35% to 15%. More interestingly, from the quiescent subperiod to the crisis subperiod, we tabulated fewer credit unions than banks that became high risk. The share of medium

(sized) credit unions (i.e., those with assets between $100 million and $1 billion) that were high risk rose from 8% to 10%, while the high-risk share of medium banks rose from 22% to 43%. These calculations suggest that the relative rise in the failure rate of banks might be importantly attributed to the relatively more severe deterioration of banks' conditions.

Our analysis proceeds as follows. Section I reviews the literature on failures of commercial banks, mutual and stock thrifts, and credit unions. Section II compares failure rates of credit unions to those of banks. Section III discusses the statistical methods that we used to predict failures of credit unions and of banks. Section IV presents estimated logit models for failures of credit unions and failures of banks, by asset sizes and for subperiods of our entire 1981-2011 sample. Section V shows summary statistics for the variables that were included in logits. It also shows distributions of estimated probabilities of failure of credit unions and of banks, by asset sizes and for subperiods. Section VI briefly concludes.

I. Literature review

The flow of studies that focus on failures of depositories ebbs and flows with the volume of failures and losses they impose. In the decade before the recent financial crisis, both failures and studies of failures were rare. On the heels of the literally thousands of failures of depositories, mostly thrifts, from the early 1980s through the middle of the 1990s, much attention was devoted to uncovering the determinants of future failures of depositories. Banks were the depositories that were first to be analyzed econometrically. Failures of banks also garnered by far the most academic interest. Banks' supervisory

agencies have long used econometric models akin to those found in academic studies. Both failures and attention to failures of thrifts exploded during the latter 1980s. Many studies of thrifts in general, and of failures of thrifts in particular, considered whether mutual (as opposed to stock) ownership affected whether thrifts failed. Because credit unions are mutually owned and commercial banks are shareholder, or stock, owner, studies of ownership effects may highlight possible differences between credit unions and banks that are germane to their likelihoods of failure. Compared with banks and thrifts, failures of credit union failures have been studied only sporadically and rarely econometrically. We have not found direct comparisons of the systematic aspects of failures of banks with those of credit unions.

A. Empirical methods and findings

Seminal studies by Beaver (1966) and Altman (1968) produced econometric models using financial ratios that could predict the bankruptcy (i.e., failure) of business firms. Many similar papers followed focusing on depository institutions. Among the earliest studies of failures in depository institutions using econometric models are Meyer and Pifer (1970) focusing on commercial banks, Altman (1977) focusing on thrifts, and Kharadia and Collins (1981) focusing on credit unions.

The increased availability of computer power has made possible testing an increasing variety of statistical techniques with large databases of individual depository institutions. The techniques employed range among others from ordinary least squares (OLS) (Meyer and Pifer 1970) to discriminant analysis (Sinkey 1975), probit (Hanweck 1977), binomial logit (Martin 1977), factor analysis (West 1985), difference of means

tests (Rudolph and Hamdan 1988), proportional hazards (Whalen 1991), trait recognition (Kolari et al. 2001), Markov models (Glennon and Golan 2003), and multinomial logit (Oshlinsky and Olin 2005). Demirguc-Kunt (1989), Altman and Saunders (1998) and King et al. (2006) provide reviews of the literature on attempts by econometric models to predict failures of depository institutions.

While every statistical technique is likely to have some advantages and shortcomings, the logistical specification (logit) has long been the standard in failure studies (King et al. 2006, 59). Martin (1977), for instance, argues that logit is preferable to discriminant analysis since logit does not require the sample sizes of the two categories to be compared to be matched, obviating restricting one's samples. Logit's staying power is perhaps best attested to by proponents of other techniques who routinely compare their techniques to logit.

Aside from pioneering the use of logit, Martin (1977) set the standard for studies of failure in depository institutions in several ways. He experimented with a variety of financial ratios, settling on measures of capital adequacy, asset quality, earnings, and liquidity as the most significant determinants of failure. The main bank rating system used by US supervisory agencies, the Uniform Financial Rating System or CAMELS, reflects the importance of largely the same set of variables in predicting failure. Adopted in 1979, the rating system included capital adequacy (C), asset quality (A), management competence (M), earnings performance (E), and liquidity risk (L). Sensitivity to market risk (S) was added in 1997. Most failure studies have routinely used similar lists of variables, largely drawn from Call Report data, and largely continue to find them to be significant (King et al. 2006, 59).

Supervisory banking agencies have long validated the emphasis of the academic literature on financial ratios and their formal statistical analysis in the development of Early Warning Systems (EWS) that use data updated quarterly to predict the failure of depository institutions. Supervisors use these off-site systems to supplement the information they receive in onsite examinations, seeking to prevent some failures or to reduce the costs of those failures (Kolari et al. 2001 and Jordan and Rosengren 2002, 5).

King et al. (2006) review in detail the evolution of off-site surveillance models used by supervisory agencies. The earliest formal step in this direction was the National Bank Surveillance System (NBSS), adopted by the OCC in 1975. Constrained by computational costs, the NBSS simply allowed supervisors to rank banks according to financial ratios to detect outliers within peer groups. In 1977, the Federal Reserve launched the Minimum Bank Surveillance System (MBSS). Weighing seven financial ratios by z-scores, this system was the first surveillance model used by a supervisory agency that used econometric techniques (Korobow, Stuhr, and Martin 1977). After experimenting with a variety of models, the Federal Reserve has since 1993 used logit in its System to Estimate Examination Ratings (SEER) to predict probabilities of failure (King et al. 2006, 63).

Martin (1977) also deviated from earlier studies that focused on small samples of banks over short time spans. His study used all Fed-supervised institutions over a period of 7 years during the 1970s, yielding over 30,000 observations. Several other studies employing econometric models have also investigated failures over long time spans. Harrison and Ragas (1995) and Fuller and Kohers (1994) study thrift failures respectively

in 1980-89 and 1983-91. Jordan and Rosengren (2002) investigate commercial bank failures in 1985-2001. Oshinsky and Olin (2004) studied troubled banks in 1990-2002.

As failures have now been studied using econometric models for several decades, a number of studies document the large variation in the experience of failures and insurance losses from commercial banks and the variations in the coefficients and statistical significance of explanatory variables over time, under different macroeconomic, regulatory, or industry conditions. Hanc (1998) studies in detail the evolution of the number of failures in commercial banks during the 1980s and early 1990s and reviews the likely causes. Kaufman (2004) documents the sizable differences in the number of commercial bank failures, losses to the FDIC from those failures, and losses per assets in failing institutions for two extended periods before and after the Federal Deposit Insurance Corporation Improvement Act (FDICIA) (in his study 1980-92 and 1993-2002).

Fuller and Kohers (1994), Harrison and Ragas (1995), and Helwege (1996) compare the estimates from models predicting thrift failures across different time periods. King et al. (2006) compare the characteristics of failing and surviving commercial banks in 1984-94 and 1995-2003. Each of these studies found that the lists of variables likely to be significant in explaining failure have been roughly similar across periods, but that the size of coefficients (and thus their economic significance) could vary greatly across periods. For instance, King et al. (2006, 70-71) report that during their earlier period failing commercial banks were larger than average, held more commercial mortgages, and did not experience climbing cash levels before failure. During the latter period, each of those warning signs was reversed or was no longer predictive. Using a multinomial

logit technique, Oshinsky and Olin (2004, 12) similarly find changes in the patterns of bank problems and failures. They report that in the early 1990s most banks classified as troubled remained troubled 6-24 months later. By the late 1990s, however, most banks classified as troubled would recover within 6-24 months.

Availability (and unavailability) of different types of data and of populations sufficiently large to permit meaningful statistical analysis have determined the shape of many avenues in the research of failures. Since commercial bank failures have grown increasingly more rare in recent years, the paucity of data makes it more difficult to update models meaningfully to reflect the characteristics that are likely to be associated with failures in the future. Thus, several authors note that whereas supervisory off-site models are used to produce new estimates of likely failures based on new data quarterly, the variables used and their coefficients are based on the failure experience of 1985-92 and had not changed since (Jordan and Rosengren 2002, 6 and King et al. 2006, 63).

The characteristics and mechanics (e.g., too big to fail policies) of failures for institutions of different sizes have long been suspected to be different. For instance, Kaufman (2004) contrasts failures, losses, and loss to asset ratios in commercial banks of different asset sizes. King et al. (2006) find that failing banks on average were larger than surviving ones in 1984-94 but were smaller in 1995-2003. However, the small number of large banks failing has limited the ability to study large bank failures separately from smaller institutions. Demirguc-Kunt (1989) and Kolari et al. (2001) are among the few studies to model the characteristics of failing commercial banks segregated by assets. Even in those studies, the paucity of data forces the time span covered to be short (e.g., 1989-92 in Kolari et al. 2001) limiting its predictive capacity for other periods.

Many studies of failures (e.g., Glennon and Golan 2003) have used as explanatory variables both financial data for individual institutions and different measures of state macroeconomic performance. For instance, DeYoung (1999) finds that banks are more prone to fail during recessions and are very unlikely to fail during expansions. Similarly, Jordan and Rosengren (2002) find that macroeconomic forecasts provide little additional information over bank-specific financial data in predicting failures during prosperous times, but are relevant during troubled periods. However, much the literature on the use of state macro variables in failure models is mixed. For example, Nuxoll (2003) reports that models that include macroeconomic variables do not perform significantly better than models that do not include them.

B. Rationales and incentives

Interest in thrift failures rose with thrift failure rates during the 1980s and early 1990s. Since the end of the thrift crisis in the mid 1990s, thrift failures and studies about them have both been rare.

Many studies of thrifts consider the potential impact of organizational form (mutual vs. stock) on efficiency, asset mix, and failures. These studies may serve to highlight some of the possible differences between commercial banks and credit unions. Agency theories posit that different agents (customers, managers, stockholders, debtholders, etc.) within firms may have conflicting interests. Different forms of organization (e.g., mutual vs. stock) may be better or worse attuned to solving some of these conflicts. Wilcox (2006) describes how mutuals are typically thought as better than stock companies at solving customer-owner conflicts (essentially by merging the two),

but worse at solving manager-owner conflicts. Having members as their sole constituency, mutuals might provide products and services to their members at a lower cost. The Credit Union National Association (CUNA 2006) routinely reports that on average customers pay lower loan rates and receive higher deposit rates on most individual products at credit unions than they do at commercial banks.

In contrast, Rasmusen (1988), among others, argues that mutuals typically have weak governance structures. Absent transparent means to measure how much value members receive from their mutual and absent effective means for individual concerned members to remove management, managers are largely self-controlled. Lacking a clear means to link managerial performance and compensation, better managers will be underpaid and worse managers will be overpaid. Thus, rather than maximizing value for members, managers might grant themselves extensive non-monetary perks or reduce the risks to their future position by incurring less risk (and thus returns) than their members might prefer. Similarly Harris and Raviv (1991) describe a possible asset substitution conflict between stockholders and debtholders in stock firms, where stockholders would prefer banks to engage in riskier activities (such as commercial mortgages) more than debtholders.

Whereas the broad implications of theories on the impacts of organizational form are largely settled, evidence on the performance and efficiency of mutual vs. stock thrifts is mixed. Using different sample periods, Vergrubbe and Jahera (1981), Akella and Greenbaum (1988), and Sfiridis and Daniels (2004) find mutual thrifts to be less efficient than stock thrifts. In contrast, Cebenoyan et al. (1993b) did not find efficiency to be significantly related to organizational form. Searching for an explanation to the

conflicting evidence, Hermalin and Wallace (1994) investigate the impact of asset mix on efficiency. They report that ignoring asset mix, stock thrifts appear on average less efficient than mutual thrifts. Holding constant for asset mix, they found that stock thrifts engaging in similar activities operated more efficiently than mutual thrifts.

From these findings, Hermalin and Wallace conclude that stock thrifts were better at resolving agency conflicts between owners and managers (i.e., they could operate at a lower cost for a given set of business lines), but worse at resolving the asset-substitution conflict between shareholders and debtholders (i.e., they held riskier assets). Similarly Esty (1997) found stock thrifts to exhibit greater profit variability and thrifts that converted from the mutual to the stock form to increase their investments in risky assets and profit variability. Gropper and Hudson (2003) found that, as standard theory might predict, increased competition during the 1980s removed most evidence of a difference in efficiency between mutual and stock thrifts.

Evidence on failures and failure costs in mutual vs. stock thrifts is also mixed. Some results are straightforward and consistent across studies: Cebenoyan et al. (1993a) and Hermalin and Wallace (1994) find measures of inefficiency to be significant predictors of failures in both mutual and stock thrifts. Other results are more complex or disputed. Benston (1985) and Harrison and Ragas (1995) include a mutual vs. stock variable in their failure models and do not find organizational form to be a significant predictor of failure. In contrast, Chou and Cebula (1996) find that states with a higher proportion of stock thrifts experienced more thrift failures.

Hermalin and Wallace (1994) also find asset mix pivotal in explaining failures in mutual vs. stock thrifts. Ignoring asset mix, they found stock thrifts to fail more often

than mutual thrifts. Holding constant for asset mix, stock thrifts engaging in similar activities were less likely to fail than mutual thrifts. Whereas these findings might imply that the stock form might otherwise be less prone to failure, they also imply that the activities that stock thrifts tend to engage in will make them more prone to failure. Similarly, Barth et al. (1990) find organizational form not to be significant in predicting failure costs, but speculate that the effects typically associated with the stock form would likely have been already captured elsewhere in their model.

The links between organizational form, efficiency, and failure might also have been obscured by the difference between sudden regulatory failure and slow growth and shrinking market share. Rasmusen (1988) argues that, absent deposit insurance, mutual and stock depositories could readily coexist in the marketplace. Stock depositories would specialize in providing some savers (depositors), managers, and investors (stockholders) with high-risk, high-return saving, compensation, and investment options backed by higher-risk loans. In contrast, mutual depositories would specialize in providing other savers and managers with low-risk, low-return options backed by lower-risk loans. Thus Rasmusen finds that from the nineteenth century through the Great Depression, mutual depositories failed less often than stock depositories.

Rasmusen's theory implies that unless other countervailing government assistance (such as tax exemptions) were provided to mutuals, providing federal deposit insurance to stock depositories would make deposits in mutual and stock depositories similarly risky and remove a key incentive for depositors to use mutuals. This could explain why as mutual thrifts progressively lost their income tax exemptions between 1952 and 1996, their number of institutions and their market share plummeted from 4,148 and 26.4% in

1965 to 979 and 2.9% in 1996, and to 600 and 1.3% in 2005.[4] Having lost a key advantage and faced with greater difficulty in controlling costs, mutual thrifts would have dwindled not as much through outright failures, but through lower growth (and conversions, see Wilcox 2006). During the same period, credit unions (i.e., also a type of mutual depository, but one that did not lose its tax exemption) have continued to thrive, with market shares growing from 1.9% in 1965 to 5.7% in 1996 and 6.5% in 2011.

C. Studies of failures of credit unions

The historical evolution of failures at credit unions has been described in several studies. Croteau (1952) and Kelly and Karofsky (1999) present the evolution of the number of failures of federal credit unions (i.e., excluding state-chartered credit unions) for respectively 1935-51 and 1935-1970. Examining data for individual credit union failures without using econometric models, Gordon et al. (1987), Gordon (1991), and Shafroth (1997) identify a number of variables as likely to play a role in credit union failures and losses (respectively for 1981-85, 1986-91, and 1995-96). Some of these variables are akin to those found in studies of commercial bank and thrift failures: riskier assets (residential mortgages and business loans) and high noninterest expenses. These authors also suggest some additional issues that are more idiosyncratic to credit unions, and particularly to the smallest of credit unions: small size, youth (i.e., a recent chartering), sponsor failures, poor record keeping, weak lending and collection practices, and refinancing delinquent loans.

[4] The number of mutual institutions reported includes those insured by the Federal Savings and Loan Insurance Corporation (FSLIC 1934-1989) and the both the Bank Insurance Fund (BIF) and the Savings Association Insurance Fund (SAIF) of the FDIC. Market share is expressed as a percent of assets in the total of commercial banks, mutual and stock thrifts, and credit unions (see Wilcox 2006).

Wilcox (2005) presents the most comprehensive recent study of the evolution of failures and insurance losses for federally-insured credit unions (i.e., excluding the greatly reduced number of uninsured, state-insured, and privately-insured credit unions). Wilcox contrasts the evolution of failures and insurance losses at credit unions and commercial banks and the characteristics of failing and surviving credit unions, for institutions of different sizes and for different time subperiods within 1971-2004 (i.e., since the inception of federal insurance for deposits[5] in credit unions). Credit union failures and insurance losses generally compare favorably to the experience of commercial banks (see Figures 1, 2, and 3 below). Among credit unions, smaller asset size, lower capital, higher loan to asset ratios, higher noninterest expenses, and more delinquent loans were associated with lower failure rates.

However, studies applying econometric models to credit union failures have been relatively rare. For instance, Kharadia and Collins (1981) used OLS to model failures of federal credit unions in 1960-71. Kane and Hendeshott (1996) used logit to model failures of federally-insured credit unions in 1987-1990. Wilcox (2007) presented an earlier version of this study for 1981-2005, thus not including data for the most recent period of high failure rates and/or insurance losses among depository institutions.

II. Data for Failures and Insurance Losses

We obtained aggregate and individual data for failures of natural person federally-insured credit unions and commercial banks for 1971-2011 from the NCUA and the

[5] In credit unions, the analogs to deposits in banks are often called “shares” or “savings”. We use the term “deposits” to refer to credit union shares and shares.

FDIC (2011).[6] We obtained call report data for individual credit unions and commercial banks for 1980-2011 from the NCUA (2012), CUNA, and the Federal Reserve Bank of Chicago (FRBC 2012). Table 1 presents annual failure rates and the number of failures in credit unions and commercial banks for several time periods and asset size ranges.[7] We include two subperiods (1981-1993 and 2008-2011) during which failure rates were higher and a "quiescent" subperiod (1994-2007) during which failure rates were lower.[8] To calculate average failure rates for each subperiod, we first compute annual failure rates (i.e., the number of failures during one year relative to the number of institutions on the previous December 31) and then average those annual failure rates across the years included in a subperiod. For each variable in the table, we present values for all credit unions and commercial banks, and for institutions under $10M in assets (i.e., tiny), with between $10M and $100M (i.e., small), with between $100M and $1B (i.e., medium), and over with over $1B (i.e., large), with all boundaries between asset sizes adjusted for inflation expressed in 2011 dollars.[9] Table 1 also includes the number of institutions on several dates (i.e., those at the boundaries of the subperiods that we use throughout) to highlight the evolution of the various asset size groups. For instance, large credit unions were rather rare until relatively recently, and tiny banks have long been relatively rare.

[6] We use the term "credit union" to refer exclusively to federally-insured credit unions. We excluded credit unions that were either uninsured or insured by non-federal entities from our analysis. Thus, our data, including counts of credit unions and asset totals, include only federally-insured credit unions. In 1971, federal deposit insurance for credit unions was launched (Wilcox 2005). We also include only natural person credit unions, which serve individuals, and exclude corporate credit unions, which serve other credit unions.

[7] Because we report failure rates by assets in Table 1, we used financial data for individual institutions experiencing failure and could not include data prior to 1980.

[8] We further subdivide the period 1981-1993 into sub-periods, 1981-1986 and 1987-1993. Credit unions and commercial banks reported data for many more variables that we include in most of our models for the latter sub-period (Tables 2-5) than for the earlier sub-period (Table 6).

[9] These boundaries reflect (1) the absence of failures among larger credit unions, (2) their relative rarity among what would be considered fairly small banks (i.e., our medium category), and (3) the concentration of credit union failures among their smallest institutions. Wilcox (2005) presents results for credit unions across smaller asset size ranges including under $1M and $1-10M in assets.

Table 1 shows that failure patterns have differed substantially between credit unions and commercial banks. Failure rates fell substantially from their earlier high levels during a subperiod (1987-1993) associated with the thrift crisis to the following quiescent period (1994-2007) for both credit unions (from 0.79% to 0.18%) and commercial banks (from 1.07% to 0.05%). However, failure rates have increased far less during the financial crisis for credit unions (from 0.18% to 0.26%) than for commercial banks (from 0.05% to 1.28%). Moreover, commercial bank failure rates during this crisis are substantially higher than during the earlier, albeit longer, subperiod with many failures (1.28% vs. 1.07%). Averaged over extended period of 1981-2011, credit unions' failure rates were somewhat lower (0.44%) than commercial banks' (0.52%).

Smaller institutions used to fail consistently more often than larger ones. This pattern was clearest among credit unions, where tiny, small, medium, and large institutions had failure rates of 0.87, 0.20, 0.09, and 0.00 during the earliest subperiod and of 0.31, 0.05, 0.02, and 0.00 during the quiescent subperiod. The pattern was less pronounced among commercial banks, with failure rates of 0.97, 0.61, 0.25, and 0.13 during the earliest subperiod, but of 1.10, 1.23, 0.83, and 0.88 during the second subperiod. However, the link between smaller size and more failures has broken down during the most recent subperiod, with credit union asset size groups experiencing failure rates of 0.35, 0.14, 0.36, and 0.16, and commercial banks experiencing higher failure rates among larger asset size groups, respectively at 0.00, 0.58, 1.56, and 2.53.

Comparing across institutions in the same asset size range, credit unions broadly display lower failure rates than commercial banks, i.e., 0.18 vs. 0.50 for small institutions, 0.11 vs. 0.45 for medium institutions, and 0.02 vs. 0.57 for large institutions.

The one partial exception involves tiny institutions (0.58 vs. 0.47) that historically included the bulk of credit unions (half of them as late as 2000) and of their failures (1,594 out of 1,817). However, tiny commercial banks have become so rare that their failure rates are not readily comparable. For instance, the failure of a single tiny commercial bank would imply a 2% annual failure rate for that asset size group.[10]

Figures 1-3 further elaborate on the differences between credit union and commercial bank failures and insurance losses. Figure 1 presents annual failure rates of credit unions and commercial banks during 1971-2011.[11] Annual failure rates have often been higher for credit unions than for commercial banks. Annual credit union failure rates averaged 0.59% (during 1971-2011) and peaked at 2.01% in 1981. Annual commercial bank failure rates averaged 0.41% during the same period and peaked at 1.91% in 2010. Like Table 1, Figure 1 highlights that failure rates can exhibit alternating periods of high and low values that only partially overlap for credit unions and commercial banks.

Failure rates computed across all credit unions vs. all commercial banks disguise the fact that failure rates are typically lower among credit unions than among commercial banks in similar asset size ranges. While institutions with under $100M in assets dominate the number of credit unions (at 99% in 1980 and 81% in 2010), they account for a far smaller proportion of credit union assets (at 65% in 1980 and 13% in 2010). Thus Figure 2 presents the annual evolution in 1981-2011 of a version of the failure rate weighted by assets, or of assets in institutions that fail during one year divided by assets

[10] The "exception" disappears further if one separates institutions into those with under $1 million in assets and those with $1-10 million. While commercial banks with under $1 million in assets were extremely rare during this period, there continue to be many such credit unions, and they exhibit far larger failure rates than those with $1-10 million in assets.

[11] Because this figure does not disaggregate failure rates by assets, we report data that starts in 1971 instead of in 1981.

in all institutions on the previous December 31 for both credit unions and commercial banks.[12]

Correcting for the large number of smaller credit unions that hold a small proportion of assets (and their higher failure rates), Figure 2 displays size-adjusted failure rates for credit unions that are either similar or far lower than those for commercial banks in most years during this period. The annual failure rate of credit unions, when weighted by each credit union's assets, averaged 0.11% and peaked at 0.41% in 1991. In contrast, the annual commercial bank failure rate weighted by assets averaged 0.37% and peaked at 2.86% in 2008.

Figure 3 presents insurance losses per insured deposits during 1971-2011 for both the federal insurer for credit unions, the National Credit Union Share Insurance Fund (NCUSIF), and the federal insurer for commercial banks (and now thrifts). Consistent with the findings of Table 1 and Figure 2, insurance losses have been much larger at the FDIC than at the NCUSIF both in absolute terms and per insured deposits.[13] From 1971 to 2011, the FDIC reported total insurance losses of $119B ($149B in 2011 dollars). During this period, FDIC annual insurance losses per insured deposits averaged 0.08% and peaked at 0.68% in 2009. In contrast, NCUSIF insurance losses totaled $1.7B ($2.5B in 2011 dollars). NCUSIF annual insurance losses per insured deposits averaged 0.02% and peaked at 0.08% in 1982. Thus, the peak for NCUSIF insurance losses is about the same as the mean for FDIC insurance losses.

III. Methodology

[12] These failure rates are based on data for individual institutions, which are available beginning in 1981.
[13] Wilcox (2005) found that various measures of insurance losses per assets in failed institutions were quite similar, both for credit unions and for commercial banks

Thrift charters provide a natural experiment to test for the effects of the mutual vs. stock form of organization on issues such as efficiency, asset mix, and failure rates since (federal) mutual and stock thrifts have largely the same powers. Here we attempt to extend this type of analysis to other mutual[14] and stock financial institutions. However comparing failures of credit unions and commercial banks is more complex than comparing mutual and stock thrifts. Unlike among thrifts, the mix of assets and activities at credit unions may differ from those at commercial banks both (1) because their mutual structure affects their expense or asset preferences and (2) because legislation and regulation place more restrictive caps on credit union activities.[15] Thus we compare failures at credit unions and commercial banks while attempting to hold constant for different measures of their activities.

Since our dependent variable is binary in nature (survival or failure), and following the practice of much of the earlier literature, we used the logistic specification (logit) in our regressions.[16] Our dependent variable takes values of one for institutions failing and zero for institutions surviving within one calendar year. We pooled data across years in different periods for several reasons: (1) we are interested in fairly long-lived patterns and not one-off effects; (2) failures are relatively rare events and are absent in some individual years for many of our chosen subsamples; and (3) many earlier studies

[14] Credit union practitioners do not typically refer to their institutions as mutuals, preferring instead the term "cooperative." Wilcox (2006) describes how the corporate governance differences between federal "mutual" thrifts and "cooperative" credit unions are, in practice, small.

[15] Wilcox (2006) summarizes credit union lending and investment restrictions such as caps on business lending to members and how credit unions may not lend to corporations or hold corporate bonds. Of course, activity restrictions may not necessarily limit the ability of managers to seek higher-return riskier lending. For instance, some types of subprime, unsecured consumer lending permitted for credit unions could well involve higher interest rates and be riskier than many commercial loans permitted for commercial banks.

[16] We also estimated our models with OLS and reached similar conclusions. In our OLS specifications, we included state and year dummies, but including them did not much change the coefficients or significance of the other variables.

(e.g., Oshinsky and Olin 2004 and King et al. 2006) pool data across shorter and longer subperiods to explore the stability of coefficients. In particular, we compare three subperiods with high failures (failures in 1981-1986, 1987-1993, and 2008-2011) and a more quiescent subperiod with fewer failures (those in 1994-2007). Following Kolari et al. (2001) and Kaufman (2004), we also explore the stability of coefficients across institutions with different asset sizes: tiny (with under $10M in assets), small ($10M-100M), medium ($100M-$1B), and large (over $1B), with all boundaries between asset sizes adjusted for inflation expressed in 2011 dollars.

We regressed whether an institution failed (=1) or survived (=0) during one calendar year (e.g., 2011) on financial data for each individual institution as of December 31 of the previous year (e.g., 2010).[17] Our choice of independent variables was dictated by (1) our literature review, (2) having to use variables reported somewhat consistently by both credit unions and commercial banks, and (3) the earliest dates on which those variables were available for both credit unions and commercial banks. We settled on an extended model with a longer list of variables that covers a shorter time period (i.e., failures in 1987-2011) and a basic model with a shorter list of the variables that were all available for an extended period of time (i.e., failures in 1981-2011).

In the basic model, we included the following independent variables: (1) asset size (expressed in 2011 dollars and logged) to control for possible effects of size on failure, (2) securities (and for credit unions other non-cash investments such as deposits

[17] Rather than drop extreme outliers that might otherwise bias results, we used histograms for each variable in our models to guide our winsorizing our data. Thus, we turned extreme observations (e.g., ROAs below -15% or above 15%) into merely ones at the tail end of the relevant distribution.

in corporate credit unions),[18] (3) residential mortgages,[19] as a measure of exposure to an asset often reported as linked to failures in credit unions, (4) loans other than residential mortgages, (5) all assets (e.g., branches, goodwill, etc.) other than securities, residential mortgages, loans other than residential mortgages, and cash, i.e., we leave cash out as a common omitted variable against which other asset levels are compared, (6) provisions for loans losses, as an *ex post* measure of asset quality or risk, (7) capital per assets (net worth for credit unions and equity for commercial banks), (8) net income or return on assets (ROA), and (9) the unemployment rate in the previous year in the state in which the institution is headquartered, as a measure of macroeconomic conditions.[20]

In the extended model, we dropped the variable "loans other than residential mortgages" and added instead (10) non-mortgage consumer loans,[21] (11) commercial and industrial (C&I) loans, (12) commercial mortgages,[22,23] and (13) noninterest expense, as a rough measure of efficiency. In the extended model, we also used (14) delinquent

[18] Smaller commercial banks begin to report both Treasurys and other securities in 1983. We estimated their total securities for 1980-1982 based on their holdings of Treasurys and the relative weight of the two types of securities, nationally, in 1983.

[19] Credit unions begin to report residential real estate loans other than first mortgages in 1986. We estimated the total of residential mortgages (i.e., firsts plus others) before then based on the relative weight of the two types, nationally, in 1986.

[20] Like Nuxoll (2003), we found our results to be broadly robust across models including and excluding the state unemployment rate. Since we used state unemployment rates in some of our models, we included throughout only credit unions and commercial banks headquartered in the fifty states and the District of Columbia, and not those in other US territories.

[21] Commercial banks begin to report consumer loans in 1984. Credit unions begin to report consumer loans in 1986. For credit unions, these include largely short-term unsecured consumer loans, credit card loans, and auto loans.

[22] Credit unions begin to report business loans in 1986. For credit unions, data distinguishing C&I from commercial mortgages begins in 2004. For earlier years, we allocated credit union business loans as either C&I or commercial mortgages based on their relative weight, nationally, in 2004. Due to data limitations, we include agricultural loans not backed by real estate or land as C&I loans, and agricultural loans backed by real estate or land as commercial mortgages.

[23] The variable all other assets differs slightly across the basic and extended models. In the basic model, all other assets include no loans. In the extended model, "all other assets" includes those (few) loans not included elsewhere.

loans[24] instead of provisions for loan losses since the latter variable is likely more subject to managerial discretion (Wilcox and Stever 2007). Most of these variables (i.e., 2-8, 10-14) were expressed as a percent of assets.

We performed our regressions for samples with only credit unions, with only commercial banks, and with both credit unions and commercial banks. We performed Chow tests to determine whether the same coefficients applied to both credit unions and commercial banks. If the Chow tests were not passed, we included data both for credit unions and for commercial banks and adding interaction terms (i.e., including additional variables that are the product of each of the original variables and a credit union dummy variable). Regressions with these interaction variables allow us to estimate which variables affect failures of credit unions and of commercial banks similarly and differently (statistically).

Once we have obtained estimates of coefficients (the betas), we do not only consider their sign, size, and statistical significance but also how the average characteristics (the X's) of credit unions and commercial banks differ. This would allow us, for instance, not only to know the impact of an additional percent of C&I loans on the likelihood of failure, but also how much of that type of risk each type of institution has accumulated on average. Lastly, we compare the distributions of estimated probabilities of failure implied by these betas and X's across different samples of credit unions and commercial banks. This approach allows us to consider succinctly not just how many institutions of each type actually failed, but also how much, according to our model, different types of institutions were at risk of failure.

[24] Delinquent loans and noninterest expense were first reported by commercial banks in 1984.

IV. Results: Failures, by Asset Size and by Sub-period

Tables 2-6 present results of logit regressions of failure on measures of the financial conditions for individual institutions and macroeconomic conditions. Table 2 presents results for extended models using a longer list of variables (e.g., ones that begin to be reported at a later date such as C&I loans and noninterest expenses), but for a shorter time period (failures in 1987-2011). Column 1 presents the results for a pooled sample of both credit unions and commercial banks, forcing a single set of coefficients for both types of institutions. The results are largely consistent with the earlier literature. Thus, the following are associated, all at the 1% level, with more failures: fewer securities, more consumer loans, more C&I loans, more commercial mortgages, smaller asset size, more noninterest expense (i.e., lower efficiency), more delinquent loans, lower capital, lower ROA, and higher unemployment rates. The only variable that was not statistically associated with failure was residential mortgages.

However, Chow test rejected the hypothesis that the same coefficients applied to both credit unions and commercial banks. Thus, we performed regressions for separate samples of only credit unions (column 2) and only commercial banks (column 3). We also performed a regression (column 4) with interaction-terms (i.e., variables obtained multiplying each original variable by a "dummy variable" that contains values of 1 for credit unions and values of 0 for commercial banks). The full set of results would involve twice as many coefficients and t-values, with half being identical to those for commercial banks in column 3, and another half referring to the interaction terms and reflecting the

difference between the coefficients for credit unions and commercial banks and whether that difference is statistically significant. For simplicity, in column 4 we report only the coefficients and t's for these differences.

While the same set of coefficients may not apply to both credit unions and commercial banks, many of the results were similar in that many variables had the same signs (i.e., positive or negative) and were significant for both types of institutions. For instance, the following were associated, all at the 1% level, with more failures: more commercial mortgages, smaller asset size, more delinquent loans, lower capital, and lower ROAs.

However, as the Chow test implied, not all results were consistent. For instance, more consumer loans and residential mortgages were associated with more failures of credit unions, but not of commercial banks. In contrast, fewer securities and more C&I loans were associated with more failures of commercial banks, but not of credit unions. These results might point to the benefits of shifting assets to diversify each type of lender. Thus shifting credit unions' assets away from their higher concentrations in consumer loans and toward C&I loans might reduce their failures; and the converse shift from C&I loans to consumer loans might reduce failures in commercial banks.

Another difference is that higher noninterest expense (lower efficiency) is associated with more failures of credit unions, but not of commercial banks. Also, our indicator of macroeconomic conditions (the state-level unemployment rate) was significant for commercial banks, but not for credit unions.

The results in column 4 also highlight that while most coefficients have the same sign for credit unions and commercial banks, few of those coefficients have similar sizes.

For instance, commercial banks' coefficient on commercial mortgages is three times as large as that for credit unions, and credit unions' coefficient for capital is three times as large as that for commercial banks. Overall, only four of thirteen coefficients had a statistically similar size. And even among those with statistically similar coefficients, in only two cases (asset size and ROA) were the variables significant for both credit unions and commercial banks.

Comparing the R^2's for credit unions and commercial banks, we find that our models explain far larger proportions of the variation for commercial banks than for credit unions. This is consistent with the findings of Gordon et al. (1987) and Shafroth (1997) that many failures in credit unions take place for largely idiosyncratic reasons (such as sponsor failures, poor record keeping, etc.) that are unrelated to the historical financial conditions of the individual institutions.

Thus, while models of institutional failure in credit unions and commercial banks may be broadly similar, there are substantial differences that require findings and conclusions drawn from one type of institution to be applied only with caution to the other type of institution.

Table 3 explores whether the pattern of coefficient signs and significance levels varies substantially across asset size ranges. In particular, we examined tiny institutions (with under $10M in assets), small ones ($10M-$100M), medium ones ($100M-$1B), and large ones (over $1B), with all boundaries between asset sizes adjusted for inflation expressed in 2011 dollars. We chose our asset size boundaries largely to be able to focus on two roughly-comparable asset size groups common to both credit unions and commercial banks. Thus, the tiny group separates many credit unions, and their failures,

into a group that is largely irrelevant for commercial banks. Similarly, the large group separates many commercial banks, and their failures, into a group that is only relatively new for credit unions, and for which there has been only one failure of a large credit union in three decades.[25]

A few results were broadly consistent. For instance, more failures were associated with more delinquent loans and lower capital for all asset sizes and types of institutions. Other results largely mimicked those from Table 2. Thus, credit union failures across all sizes were associated with more residential mortgages, but not with C&I loans. In general, however, we find that as the divide our sample into smaller groups, fewer variables tend to be significant. Also while some of the patterns appeared to be related with size, others were not obviously so. For instance, noninterest expenses vary widely among smaller credit unions and tend to be more uniformly lower among larger credit unions. Thus, higher noninterest expense was associated with more failures among tiny and small credit unions, but not among medium ones. Among commercial banks, the coefficients for several loan types varied substantially across sizes (in each case ignoring those for the rare cases of tiny institutions). For instance, more failures were associated with more consumer loans or C&I loans for small commercial banks, the relationship was statistically insignificant for medium commercial banks, and more failures were associated with fewer of those loans for large commercial banks. Similarly, more failures were not associated with residential mortgages for small commercial banks, but were associated with fewer of those loans for medium and large commercial banks.

[25] Only one, large, natural person credit union failed during 1981-2011, so we did not estimate models for large credit unions.

Table 4 explores whether the pattern of coefficient signs and significance levels vary substantially across subperiods. In particular, we examined an early subperiod with many failures (1987-1993) associated with the thrift crisis, a quiescent subperiod with relatively few failures (1994-2007), and the recent subperiod with many failures (2008-2011) associated with the financial crisis.

Some results are broadly consistent across time periods and types of institutions. For instance, more failures were associated, always at the 1% level, with more delinquent loans, less capital, and lower ROA for all time periods and types of institutions. However, we found several substantial differences both across subperiods and types of institution. For instance, the patterns of the percentage of variation explained (R^2) were rather different across types of institutions. In general, R^2's were substantially lower across all subperiods for credit unions (0.12, 0.15, and 0.09) than commercial banks' (0.37, 0.10, and 0.48), likely highlighting that credit union failures tend to be more idiosyncratic, or harder to predict. Moreover, credit union R^2's were even lower when failure rates were higher, while commercial bank models explained a larger fraction of the variation during the high-failure periods. Similarly, many variables that have significant coefficients during the high failure periods do not have significant coefficients during the low failure period: namely C&I loans, commercial mortgages, and the unemployment rate (as well as the "other assets" variable).

Some results highlight changes in our financial industry, while others may simply highlight the difficulties of statistical prediction during unusual times, such as the financial crisis. For instance, more consumer loans, residential mortgages, and commercial mortgages used to be associated with more failures of credit unions during

earlier subperiods, but were not during the financial crisis. Similarly, more commercial banks' securities were associated with fewer failures during earlier subperiods, but were not during the financial crisis. This change might reflect either or both changes in the composition of their holdings of securities (e.g., shifting from Treasurys to mortgage-backed securities, MBS) or simply changes in their performance (i.e., MBS performing more poorly during the crisis than during earlier periods).

One striking result appears to surface across both types of institutions. While more failures were once associated with smaller asset sizes for both types of institutions, size appears to longer be statistically associated with failures of credit unions. For commercial banks, during the financial crisis, more failures were actually associated with large asset sizes.

Table 5 dissects our results further by moving beyond breaking down our subsamples by either of asset size or by subperiod. Instead, we provide an example of results broken down by subperiods for one asset size group (small institutions). We do not show results by subperiod for all asset size groups since dissecting further and further, one quickly encounters detailed subsamples with too few failures to meaningfully perform regressions. For instance, there were only three failures of medium credit unions during 1994-2007. Briefly, many of the results in Table 5 largely confirm those from other subsamples. For instance, more failures are most often associated with, as usual, more delinquent loans, less capital, and less ROA. Also bank R^2's are commonly higher than credit unions' and bank R^2's are higher during high-failure periods.

Table 6 presents results for basic models using the smaller set of variables for which all data was available for an extended period of time (failures in 1981-2011).

Columns 1 and 5 present results for credit unions and commercial banks. Columns 2-3 and 6-7 reproduce the same model for the earlier additional years (1981-1986) and for the same period as in Table 2 (1987-2011). For ease of comparison, columns 4 and 8 replicate the extended models using the larger set of variables already presented in Table 2.

While the pattern of coefficients and levels of significance is not identical across the basic and extended models, much of the overall pattern is largely consistent. One example of a difference is that more failures of commercial banks were associated with more securities during the earlier periods of 1981-1986, perhaps highlighting the losses resulting from the massive increases in interest rates (and associated capital losses) during the early 1980s. Examples of consistent results include, as usual, that more failures are associated with smaller size, more delinquencies (or provisions for loan losses), less capital, and lower ROA.

V. Data for Determinants of Failure and Estimated Probabilities of Failure (EPFs)

Tables 2-6 presented the coefficients (the betas) for variables in regressions modeling failures of credit unions and commercial banks. Table 7 presents averages of the values in those variables (the X's). Columns 1 and 6 present averages for credit unions and commercial banks. Columns 2-5 and 7-10 present average for tiny (under $10M in assets), small ($10M-$100M), medium ($100M-$1B), and large (over $1B) institutions, with all boundaries between asset sizes adjusted for inflation expressed in

2011 dollars. For ease of exposition, rows 1-5 replicate part of Table 1, presenting the number of institutions across asset sizes on several representative years.

The numbers of both credit unions and commercial banks have shrunk massively during this period, but the pattern of those changes differs markedly across type of institution. Among credit unions, the bulk of the reduction has taken place among tiny institutions whose numbers have fallen from 14,626 to, a still rather large number of, 2,739. In contrast, the numbers of both medium and of large credit unions have increased markedly, respectively from 249 to 1,220 and from 3 to 172. The number of small credit unions has largely been stable, in large part as many tiny credit unions grew, or merged, into small institutions. In contrast, among commercial banks, the number of tiny institutions was never large, falling from 320 to 59, and the bulk of the reduction took place among small institutions, whose numbers fell from 9,193 to 2,255. Unlike among credit unions, the numbers of both medium and large commercial banks have been roughly stable during this period.

Rows 6-10 present the equivalent data for assets and rows 11-15 present the percent of assets in each asset size group in each year. The data presented highlights that credit unions are a far smaller, but growing, segment of the U.S. depository industry, with total assets in credit unions growing from 3% of those in commercial banks in 1980 to 8% in 2010. The shifts in the distributions of assets across asset sizes also differ markedly between credit unions and commercial banks. Among credit unions, tiny and small institutions once held sizable shares of assets (20% and 45% in 1980) and large ones held very few (3%). Over time, tiny and small credit unions have come to hold far smaller fractions (1% and 12% in 2010) and large ones hold almost half of credit union assets

(47%). In contrast, large banks (i.e., using our credit union-centric definition of over $1B of assets) have simply increased their share from very large (69% in 1980) to very, very large (90% in 2010).

In rows 11-61, variables are presented as a percent of assets. For each variable, we present averages for several subperiods. When all the data was available for both types of institutions, we included the subperiod of failures in 1981-1986 (i.e., data for December 31 of each of 1980-1985). For all variables, we include the subperiod of 1987-1993 that had many failures and was associated with the thrift crisis, the quiescent subperiod of 1994-2007 that had relatively few failures, and the subperiod of 2008-2011 that also had more failures and was associated with the recent financial crisis. Subperiod averages were computed as follows: First we computed annual averages (weighted by assets). Next we computed and report simple arithmetic averages across the annual values included in each subperiod.

Tables 2-6 and Table 7 together highlight the difficulties in trying to assess whether one type of institution is inherently riskier than the other. Our results point out what types of activities could make either credit unions or commercial banks more prone to failure, but they do not point to either institution being more or less at risk for all combinations of activities. For instance, comparing a credit union A and a commercial bank B with identical characteristics and both with many residential mortgages, one might conclude the credit union was more likely to fail. Comparing a separate pair of credit union C and commercial bank D, again identical to each other, and both with many C&I loans, one might conclude the commercial bank was more likely to fail. Thus our findings provide guidance on how individual institutions might reduce their risk of

failure, but do not help to answer whether either type of institution is inherently more or less prone to failure. Rather each individual institution can change its risk level by tailoring its portfolio of activities.

Table 7 shows that the levels of commercial mortgages, C&I loans, provisions for loan losses, and capital at commercial banks would imply that on average they have a riskier profile than credit unions. Commercial mortgage and C&I loans, variables often identified in our models and in the literature as particularly risk-prone, appear as the clearest difference between credit unions and commercial banks. Commercial mortgages and C&I loans are almost a footnote, even if a growing one, for credit unions (at 2.99% and 0.87% of assets) but are substantial portions, even if somewhat shrinking ones, of the portfolios of commercial banks (at 14.01% and 11.18%).

Over extended periods of time, credit unions have reported substantially lower provisions for loan losses than commercial banks (0.39% vs. 0.63%). Whereas provisions for loan losses may be manipulated by management in the short-term (Wilcox and Stever 2007), it is unlikely that this manipulation can hide differences in asset risk over the long term. Thus, credit union loans would have been less risky that commercial bank loans. (Examining delinquent loans yields broadly similar results.)

In contrast, the levels of other variables such as consumer loans, residential mortgages, and asset size would imply that on average credit unions have riskier profiles than commercial banks. Credit unions have traditionally been and remain far smaller than commercial banks and, thus, on average often reflect the traditionally higher failure rates of smaller institutions.

Combining the coefficients from the models for small and medium credit unions and commercial banks for 1987-2011 (models 2-3 and 6-7 in Table 3) and data for individual institutions, we may generate the estimated probability of failure (EPF) for individual institutions and graph EPF distributions. Table 8 and Figures 4-6 present these distributions for three representative years: 1990 (during the subperiod with many failures associated with the thrift crisis), 2000 (during the subperiod with relatively few failures) and 2010 (during the period with many failures associated with the financial crisis). We computed the distribution of estimated probabilities of failure for each year (e.g., 2010) using data for institutions as of December 31 on the previous year (i.e., 2009). These distributions allow us to consider not only how many institutions of each type actually failed, but also how much, according to our model, different types of institutions were at risk of failure.

In Table 8, the cells in each row present the percent of institutions with a given EPF (and thus total 100 per row). The four left-most columns present EPFs that are less than 0.1% and thus might not be considered "high risk" by Basel standards. The three right-most columns present EPFs that are greater than 0.1%, which is a threshold that we use to designate institutions as being "high risk." To highlight the distinction, a solid vertical line separates high risk from other institutions. The rows present EPFs for 1990, 2000, and 2010 for credit unions that were tiny (rows 1-3), small (4-6), and medium (7-9), and commercial banks that were tiny (10-12), small (13-15), medium (16-18), and large (19-21).

Figure 4 and Table 8 compare the full EPF distributions of small credit unions (from row 6) and of small commercial banks in 2010 (from row 15). These distributions

provide one example of how, according to our models, for most time periods and most asset sizes, credit unions seem to be less likely to fail (or less risky) than similarly-sized commercial banks. In particular, the figure shows that fewer small credit unions (14%) have EPFs that identify them as risky (i.e., larger than 0.1%) than small commercial banks (33%).

Figure 5 and Table 8 focus on narrower fractions of these distributions (i.e., the rightmost tails of risky institutions) for a larger number of time periods (1990, 2000, and 2010) for both credit unions and commercial banks. The figure highlights that the fraction of risky institutions (i.e., with high EPFs) were unsurprisingly larger during periods with more failures and smaller during periods with fewer failures. However, we also find that while the share fell markedly from 1990 to 2000 for both small and medium credit unions and commercial banks, the increases from 2000 to 2010 were much smaller among credit unions than among banks. For instance, the fraction of risky medium credit unions only increased from 8% in 2000 to 10% in 2010, while for medium commercial banks it increased from 22% to 43%.

We constructed these EPFs using common sets of coefficients across all time periods so that we could clearly identify shifts in EPFs as resulting from changes in institutions' financial characteristics and in macroeconomic conditions. In section III, we observed that the increase in credit unions failure rates from the quiescent period to the financial crisis (from 0.18% to 0.26%) was much smaller than that for commercial banks (from 0.05% to 1.28%). Our EPFs, then, would seem to indicate that the smaller increase in credit union failures is largely explained by a smaller degree of change (i.e., deterioration) in their financial characteristics.

Finally Figure 6 and Table 8 provide some evidence that during this crisis, among credit unions, failures (and in particular the risk of failure) may continue to be strikingly inversely related with asset size. Thus, over half (53%) of tiny credit unions have EPFs above 0.1% and are risky. Among small credit unions, risks of failure are substantially lower with about half (44%) of institutions having EPFs in the 0.01-0.1% range, that is on the safer side of the 0.1% boundary. Among medium credit unions, risks of failure are generally very low with almost over one fifth of institutions in each of the four safest EPF ranges (totaling 90% of institutions).

VI. Summary and implications

We conducted the first, large-scale, long-term econometric analysis of failures of credit unions. We also compared the estimated effects and significance of various factors on failures of credit unions and on banks. Among the similarities were that many variables that have long been used to predict failures of banks also help predict failures of credit unions. Not surprisingly, both credit unions and banks were more likely to fail when they had more commercial mortgages, fewer assets, more delinquent loans, less capital, or lower ROAs.

There were also differences. Having more consumer loans, residential mortgages, or noninterest expense signaled more failures of credit unions, but not of banks. Conversely, having more commercial and industrial loans or local unemployment signaled more failures of banks, but not of credit unions.

Since the onset of the financial crisis, failure rates rose more for banks than for credit unions. Conditions at both credit unions and banks deteriorated enough that our

estimates imply significant increases in the numbers of institutions that could have been considered “high risk” and more likely to fail. Based on our failure equation estimated, changes in banks’ conditions were such that many more banks than credit unions crossed the threshold of failure probability into being considered high risk. In that regard, their deteriorated conditions may account for the recent relative increase in bank failures.

Our estimates can be used not only to assess risk, in the form of failure probabilities. They can also be used to gain insight into how risk might be reduced. Judiciously shifting assets away from “higher-impact” categories, gaining assets, or controlling expenses might reduce risk of failure, or at least be used to somewhat offset other sources of increased risk.

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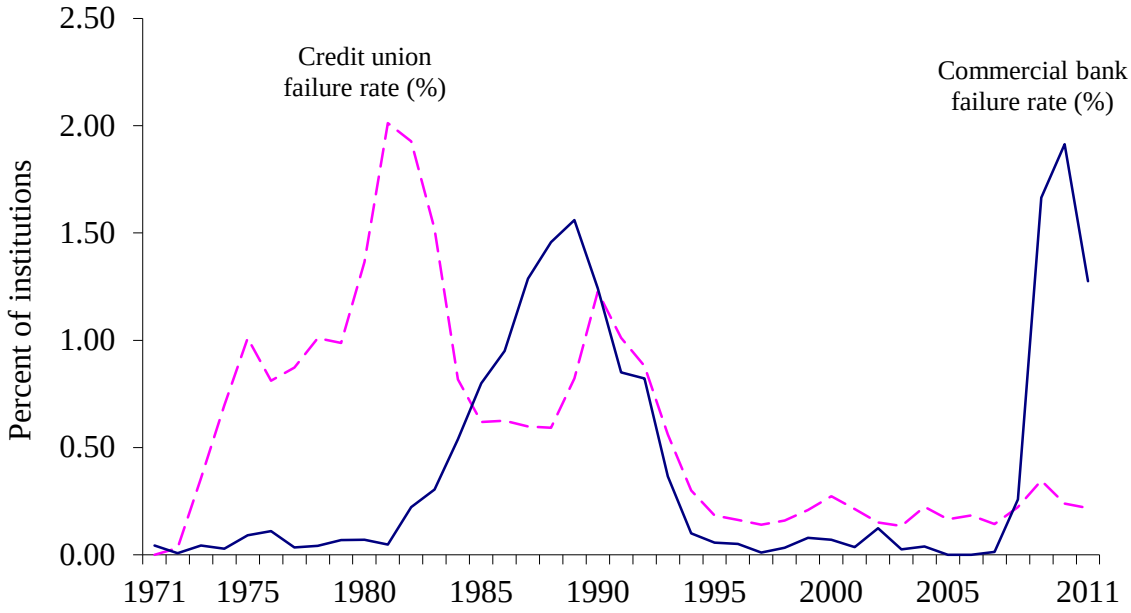
Figure 1

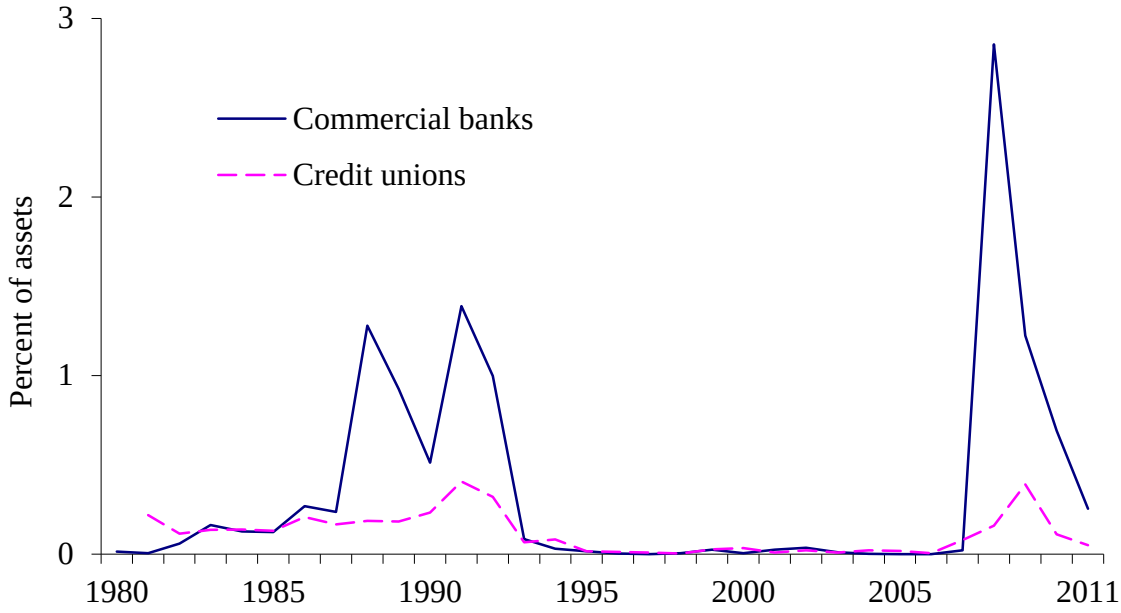
Failure Rates of Credit Unions and of Commercial Banks, 1971-2011



Sources: NCUA, FDIC.

Figure 2

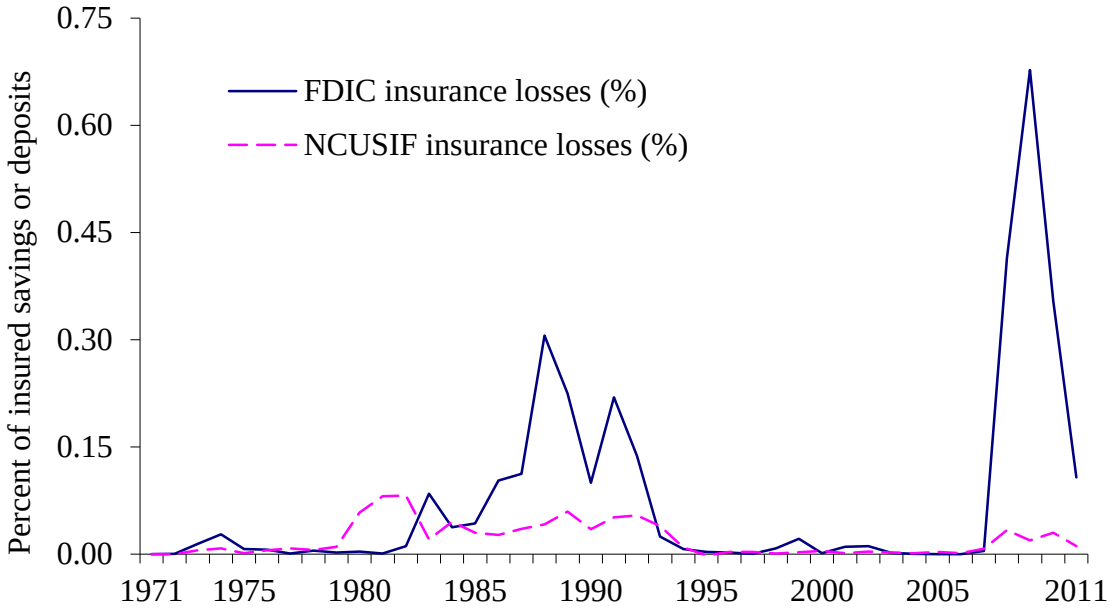
Percent of Industry Assets in Failed Credit Unions and in Failed Commercial Banks, 1981-2011



Sources: NCUA, CUNA, FDIC, Federal Reserve Bank of Chicago.

Figure 3

Deposit Insurance Loss Rates at the NCUSIF and at the FDIC, 1971-2011



Sources: NCUA, FDIC.

Figure 4

Distribution of Estimated Probabilities of Failure (EPFs)
of Small Credit Unions and of Small Commercial Banks, 2010

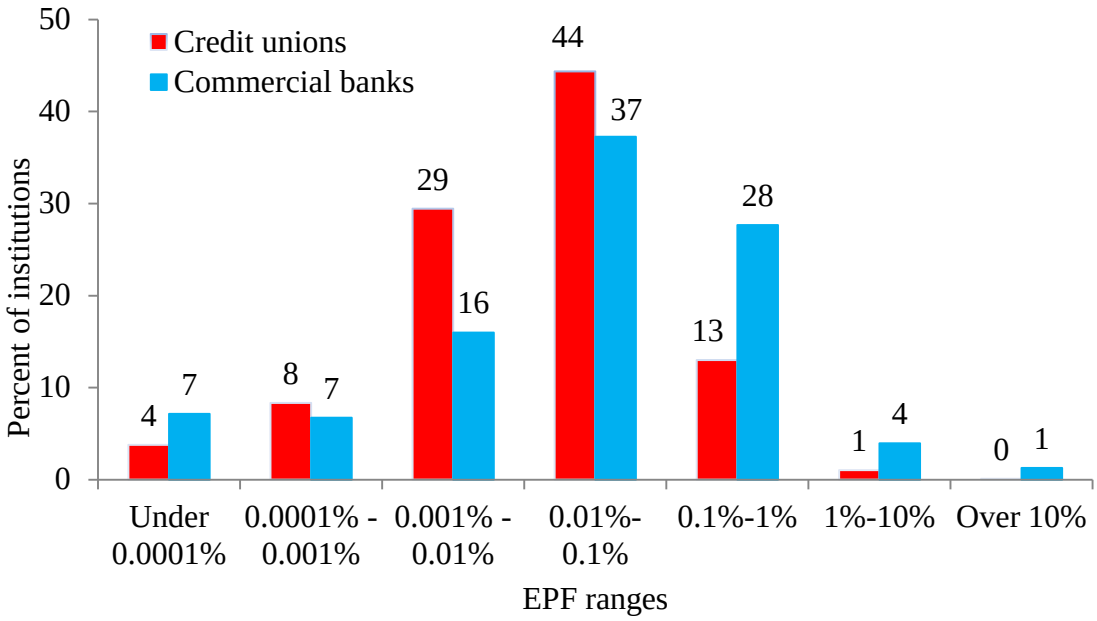


Figure 5

Percent of Credit Unions and of Commercial Banks with EPFs Greater Than 0.1%, by Size, 1990, 2000, and 2010

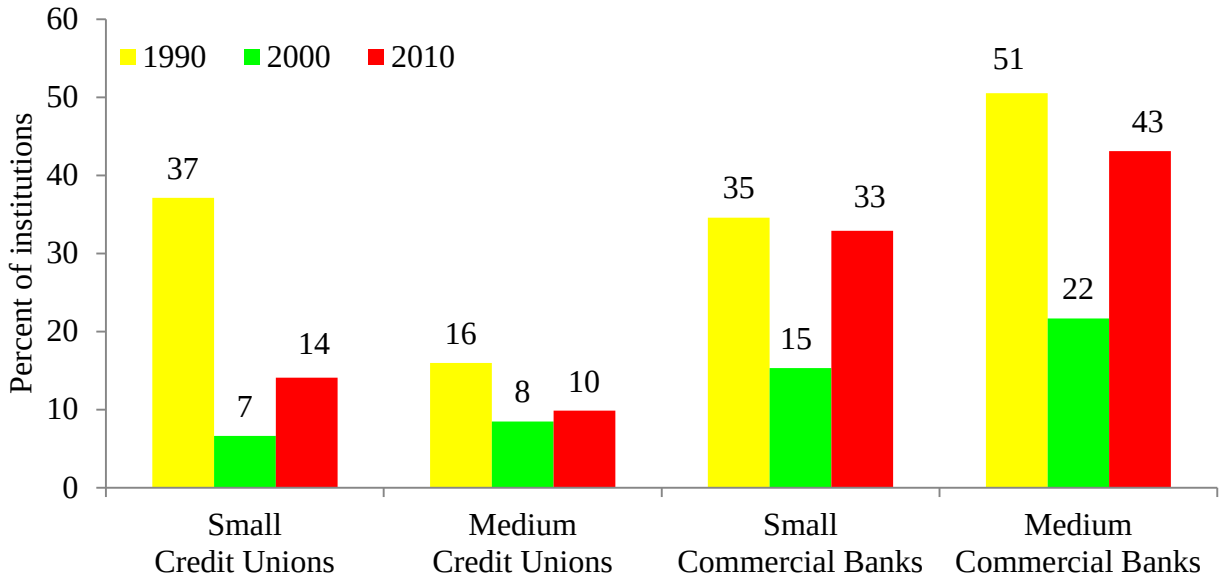


Figure 6

Distributions of Estimated Probabilities of Failure (EPF)
of Tiny, of Small, and of Medium-Sized Credit Unions, 2010

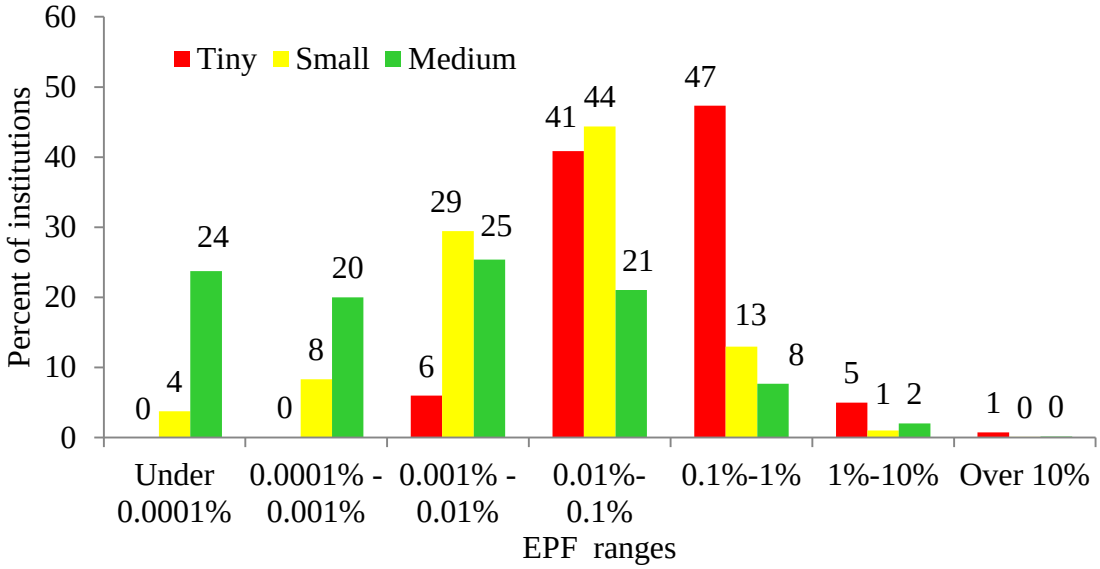


Table 1

Failures and Failure Rates of Credit Unions and of Commercial Banks,
by Size and by Sub-period

	Credit Unions					Commercial Banks				
	All	Tiny	Small	Medium	Large	All	Tiny	Small	Medium	Large
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					Failure rate (%)					
1. 1981-1986	0.75	0.87	0.20	0.09	0.00	0.48	0.97	0.61	0.25	0.13
2. 1987-1993	0.79	0.99	0.42	0.15	0.00	1.07	1.10	1.23	0.83	0.88
3. 1994-2007	0.18	0.31	0.05	0.02	0.00	0.05	0.07	0.05	0.04	0.04
4. 2008-2011	0.26	0.35	0.14	0.36	0.16	1.28	0.00	0.58	1.56	2.53
5. 1981-2011	0.44	0.58	0.18	0.11	0.02	0.52	0.47	0.50	0.45	0.57
					Number of failures					
6. 1981-1986	732	697	33	2	0	412	15	320	73	4
7. 1987-1993	741	622	112	7	0	979	13	654	275	34
8. 1994-2007	264	232	29	3	0	58	1	32	22	3
9. 2008-2011	80	43	19	17	1	354	0	57	241	56
10. 1981-2011	1,817	1,594	193	29	1	1,803	29	1,063	611	97
					Number of institutions					
11. 1980	17,325	14,626	2,466	249	3	14,424	320	9,193	4,468	442
12. 1986	14,693	10,415	3,661	598	12	14,171	191	8,174	5,235	564
13. 1993	12,317	7,266	4,197	819	32	10,960	105	6,007	4,317	531
14. 2007	8,101	3,478	3,338	1,149	135	7,356	93	2,834	3,879	550
15. 2010	7,339	2,739	3,208	1,220	172	6,588	59	2,255	3,746	528

Note: all boundaries between asset sizes are adjusted for inflation, expressed in 2011 dollars. Tiny institutions have fewer than $10 million (M) in assets, small have $10-100M, medium have $100M - $1 billion (B), and large have more than $1B.
Sources: NCUA, CUNA, FDIC, Federal Reserve Bank of Chicago.

Table 2

Determinants of Failures of Credit Unions and of Commercial Banks,
Pooled, Separately, and their Difference, 1987-2011

	Credit Unions and Commercial Banks (1)	Credit Unions Only (2)	Commercial Banks Only (3)	Difference (4)
1. Constant	-4.430***	-3.150***	0.030	-3.180***
	(-13.81)	(-7.20)	(0.04)	(-3.70)
2. Securities	-0.014***	-0.004	-0.027***	0.023***
	(-5.29)	(-1.45)	(-4.52)	(3.50)
3. Other assets (N.E.C.)	0.021***	0.016***	0.032**	-0.016**
	(8.57)	(5.74)	(5.41)	(-2.48)
4. Consumer loans	0.006***	0.008***	0.008	-0.001
	(2.75)	(3.13)	(1.29)	(-0.07)
5. Residential mortgages	0.001	0.016***	-0.010	0.026***
	(0.35)	(4.38)	(-1.61)	(3.59)
6. Commercial Mortgages	0.023***	0.065***	0.021***	0.043***
	(8.18)	(5.18)	(3.63)	(3.15)
7. C&I loans	0.032***	-0.026	0.013***	-0.039
	(10.74)	(-0.75)	(2.20)	(-1.13)
8. Log real assets	-0.086***	-0.207***	-0.179***	-0.028
	(-5.32)	(-8.41)	(-5.98)	(-0.72)
9. Noninterest expenses	0.152***	0.206***	-0.003	0.209***
	(14.03)	(14.41)	(-0.18)	(8.90)
10. Delinquent loans	0.211***	0.177***	0.230***	-0.053***
	(43.99)	(28.24)	(26.17)	(-4.95)
11. Capital	-0.302***	-0.175***	-0.556***	0.381***
	(-45.19)	(-24.98)	(-40.75)	(24.96)
12. ROA	-0.095***	-0.083***	-0.091***	0.008
	(-12.90)	(-8.15)	(-8.49)	(0.52)
13. Unemployment rate	0.127***	0.023	0.095***	-0.072***
	(10.47)	(1.20)	(4.92)	(-2.69)
14. Number of observations	509,053	270,275	238,778	
15. Number of failures	2,466	1,081	1,385	
16. Failure rate (%)	0.48	0.40	0.58	
17. R^2	0.22	0.12	0.37	0.26

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% level.

Table 3

Determinants of Failures of Credit Unions and of Commercial Banks, by Size, 1987-2011

	Credit Unions				Commercial Banks			
	Tiny	Small	Medium	Large	Tiny	Small	Medium	Large
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Constant	-4.436***	-0.785	27.659**		-10.147	3.367***	-3.340	3.320
	(-11.45)	(-0.26)	(2.10)		(-0.91)	(1.87)	(-1.59)	(0.83)
2. Securities	-0.004	0.011	-0.157**		0.071**	-0.025***	-0.033***	-0.053**
	(-1.53)	(0.97)	(-2.35)		(2.03)	(-2.95)	(-3.26)	(-2.54)
3. Other assets (N.E.C.)	0.011***	0.022*	0.073		0.043	0.026***	0.033***	0.010
	(3.92)	(1.88)	(1.64)		(1.13)	(2.75)	(3.48)	(0.54)
4. Consumer loans	0.004	0.012	0.023		-0.024	0.023**	-0.011	-0.103***
	(1.40)	(1.13)	(0.53)		(-0.65)	(2.40)	(-0.95)	(-2.81)
5. Residential mortgages	0.008*	0.028***	0.069*		0.060	0.010	-0.024**	-0.048**
	(1.66)	(2.74)	(1.77)		(1.46)	(1.12)	(-2.24)	(-2.22)
6. Commercial Mortgages	0.088***	0.019	0.113**		-0.060	0.016*	0.012	0.030*
	(2.87)	(0.60)	(2.26)		(-0.85)	(1.69)	(1.28)	(1.91)
7. C&I loans	-0.079	0.054	-0.178		0.008	0.030***	-0.004	-0.041*
	(-0.88)	(0.87)	(-1.32)		(0.18)	(3.49)	(-0.36)	(-1.91)
8. Log real assets	-0.100***	-0.373**	-1.898***		0.132	-0.435***	0.075	-0.209
	(-3.08)	(-2.21)	(-2.81)		(0.18)	(-4.40)	(0.77)	(-1.32)
9. Noninterest expenses	0.215***	0.322***	0.286		0.180	0.032	-0.082**	0.024
	(14.82)	(4.98)	(1.12)		(1.36)	(1.22)	(-2.51)	(0.29)
10. Delinquent loans	0.176***	0.210***	0.142**		0.244***	0.215***	0.227***	0.225***
	(27.34)	(7.12)	(2.26)		(3.35)	(16.09)	(16.20)	(6.92)
11. Capital	-0.144***	-0.420***	-0.233***		-0.243***	-0.586***	-0.546***	-0.441***
	(-20.84)	(-14.91)	(--2.97)		(-3.86)	(-31.82)	(-22.29)	(-7.97)
12. ROA	-0.063***	-0.153***	-0.223**		-0.157*	-0.054***	-0.185***	-0.083
	(-5.88)	(-4.03)	(-2.30)		(-1.77)	(-4.06)	(-8.37)	(-1.45)
13. Unemployment rate	0.011	0.049	-0.115		0.120	0.185***	0.015	-0.010
	(0.54)	(0.95)	(-0.88)		(0.51)	(6.30)	(0.50)	(-0.14)
14. Number of observations	149,647	95,099	23,735	1,794	2,465	119,451	103,707	12,975
15. Num. of failures	893	160	27	1	14	743	538	90
16. Failure rate (%)	0.60	0.17	0.11	0.06	0.57	0.62	0.52	0.69
17. R^2	0.12	0.19	0.22		0.16	0.40	0.37	0.34

Note 1: all boundaries between asset sizes are adjusted for inflation, expressed in 2011 dollars. Tiny institutions have fewer than $10 million (M) in assets, small have $10-100M, medium have $100M - $1 billion (B), and large have more than $1B.

Note 2: *, **, and *** indicate significance at the 10%, 5%, and 1% level.

Table 4

Determinants of Failures of Credit Unions and of Commercial Banks, by Sub-periods, 1987-2011

	Credit Unions			Commercial Banks		
	1987-1993	1994-2007	2008-2011	1987-1993	1994-2007	2008-2011
	(1)	(2)	(3)	(4)	(5)	(6)
1. Constant	-4.333***	-0.430	-3.391**	2.09**	-4.87*	-7.48***
	(-7.83)	(-0.49)	(-2.47)	(2.24)	(-1.75)	(-4.03)
2. Securities	0.001	-0.012**	-0.041***	-0.020***	-0.072***	0.006
	(0.39)	(-2.14)	(-3.46)	(-2.87)	(-2.75)	(0.41)
3. Other assets (N.E.I.)	0.011***	0.025***	-0.006	0.039***	-0.010	0.067***
	(3.25)	(4.48)	(-0.40)	(5.49)	(-0.36)	(4.21)
4. Consumer loans	0.007**	0.010**	-0.022**	0.017**	-0.030	-0.014
	(2.16)	(2.26)	(-2.23)	(2.27)	(-1.22)	(-0.41)
5. Residential mortgages	0.017***	0.016**	-0.021*	0.003	-0.009	0.023
	(3.75)	(2.03)	(-1.84)	(0.38)	(-0.38)	(1.53)
6. Commercial Mortgages	0.053***	0.099**	0.014	0.015**	-0.034	0.060***
	(5.55)	(2.53)	(0.65)	(1.97)	(-1.36)	(4.31)
7. C&I loans		-0.097	-0.044	0.024***	0.008	0.047***
		(-0.79)	(-0.75)	(3.22)	(0.34)	(2.84)
8. Log real assets	-0.134***	-0.370***	0.060	-0.327***	0.000	0.228***
	(-4.46)	(-7.09)	(0.72)	(-8.18)	(0.00)	(3.73)
9. Noninterest expenses	0.266***	0.116***	0.125**	-0.010	0.242***	-0.043
	(14.94)	(4.16)	(2.21)	(-0.43)	(4.66)	(-0.80)
10. Delinquent loans	0.179***	0.142***	0.221***	0.199***	0.178***	0.212***
	(24.14)	(10.68)	(8.46)	(15.73)	(5.15)	(12.37)
11. Capital	-0.151***	-0.176***	-0.191***	-0.563***	-0.225***	-0.658***
	(-16.65)	(-12.65)	(-6.32)	(-33.53)	(-5.27)	(-16.49)
12. ROA	-0.091***	-0.119***	-0.088**	-0.064***	-0.288***	-0.191***
	(-6.74)	(-6.08)	(-2.15)	(-5.38)	(-5.78)	(-4.97)
13. Unemployment rate	-0.001	-0.019	-0.099**	0.136***	0.045	-0.214***
	(-0.04)	(-0.36)	(-2.07)	(5.17)	(0.47)	(-5.87)
14. Number of observations	94,267	145,289	30,719	89,197	121,649	27,932
15. Number of failures	740	262	79	976	58	351
16. Failure rate (%)	0.79	0.18	0.26	1.09	0.05	1.26
17. R^2	0.12	0.15	0.09	0.37	0.10	0.48

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% level.

Table 5

Determinants of Failures of Small Credit Unions and of Small Commercial Banks, by Sub-periods, 1987-2011

	Small Credit Unions			Small Commercial Banks		
	1987-1993	1994-2007	2008-2011	1987-1993	1994-2007	2008-2011
	(1)	(2)	(3)	(4)	(5)	(6)
1. Constant	6.279*	-12.70***	-16.463*	5.35***	-1.930	-20.18***
	(1.65)	(-4.25)	(-1.90)	(2.75)	(-0.28)	(-2.58)
2. Securities	0.016	-0.036	0.062	-0.026***	-0.098**	0.030
	(1.27)	(-1.11)	(1.21)	(-2.82)	(-2.48)	(0.93)
3. Other assets (N.E.I.)	0.005	0.104***	0.108*	0.020**	-0.025	0.101***
	(0.40)	(3.48)	(1.82)	(1.98)	(-0.62)	(3.22)
4. Consumer loans	0.001	0.040	0.038	0.024**	-0.015	0.059
	(0.07)	(1.60)	(0.76)	(2.41)	(-0.37)	(1.15)
5. Residential mortgages	0.030**	0.035	0.034	0.011	-0.007	0.043
	(2.53)	(1.32)	(0.67)	(1.09)	(-0.18)	(1.45)
6. Commercial Mortgages	0.026	0.194	0.045	0.024**	-0.023	0.038
	(0.87)	(1.21)	(0.59)	(2.30)	(-0.61)	(1.24)
7. C&I loans		-0.500	0.073	0.033***	0.010	0.062**
		(-1.01)	(1.00)	(3.45)	(-0.28)	(1.96)
8. Log real assets	-0.747***	0.150	0.429	-0.533***	-0.035	0.742*
	(-3.47)	(0.37)	(0.95)	(-4.98)	(-0.09)	(1.78)
9. Noninterest expenses	0.360***	0.179	0.243	-0.011	0.265***	0.166*
	(4.09)	(1.18)	(1.50)	(-0.37)	(3.40)	(1.71)
10. Delinquent loans	0.148***	0.419***	0.294***	0.211***	0.155***	0.229***
	(4.06)	(6.65)	(2.85)	(12.72)	(3.52)	(6.33)
11. Capital	-0.481***	-0.367***	-0.411***	-0.586***	-0.337***	-0.575***
	(-11.60)	(-5.13)	(-3.68)	(-27.56)	(-5.10)	(-7.30)
12. ROA	-0.094*	-0.226***	-0.128	-0.047***	-0.346***	-0.069
	(-1.89)	(-2.78)	(-1.01)	(-3.37)	(-4.83)	(-1.00)
13. Unemployment rate	0.057	0.172	-0.012	0.182***	-0.261*	0.009
	(0.84)	(0.97)	(-0.13)	(5.24)	(-1.86)	(0.11)
14. Number of observations	26,736	55,302	13,061	51,275	58,100	10,076
15. Number of failures	112	29	19	654	32	57
16. Failure rate (%)	0.42	0.05	0.15	1.28	0.06	0.57
17. R^2	0.07	0.23	0.18	0.42	0.18	0.38

Note 1: Small institutions have assets of $10-100M. All boundaries between asset sizes are adjusted for inflation, expressed in 2011 dollars.
Note 2: *, **, and *** indicate significance at the 10%, 5%, and 1% level.

Table 6

Determinants of Failures of Small Credit Unions and of Small Commercial Banks, Truncated Specification before 1987, by Subperiods, 1981-2011

	Credit Unions				Commercial Banks			
	1981-2011 (1)	1981-1986 (2)	1987-2011 (3)	1987-2011 (4)	1981-2011 (5)	1981-1986 (6)	1987-2011 (7)	1987-2011 (8)
1. Constant	2.09***	2.83***	1.909***	-3.15***	-2.947***	3.174**	-4.362***	0.029
	(8.19)	(7.79)	(5.27)	(-7.20)	(-4.67)	(2.11)	(-6.37)	(0.04)
2. Securities	-0.007***	-0.011***	-0.002	-0.004	0.001	0.017**	-0.009	-0.027***
	(-3.40)	(-3.39)	(-0.80)	(-1.45)	(0.26)	(1.98)	(-1.41)	(-4.52)
3. Other assets (N.E.I.)	0.021***	0.015***	0.082***	0.016***	0.059***	0.042***	0.055***	0.032***
	(7.26)	(4.01)	(12.48)	(5.74)	(10.15)	(3.53)	(8.65)	(5.41)
4. Consumer loans				0.008***				0.008
				(3.13)				(1.29)
5. Residential mortgages	0.034***	0.029***	0.040***	0.016***	0.026***	0.022*	0.018***	-0.010
	(12.51)	(6.09)	(11.03)	(4.38)	(4.40)	(1.69)	(2.75)	(-1.61)
6. Commercial Mortgages				0.065***				0.021***
				(5.18)				(3.36)
7. C&I loans				-0.026				0.013**
				(-0.75)				(2.20)
8. Non-residential loans	0.018***	0.016***	0.027***		0.071***	0.110***	0.051***	
	(10.16)	(6.03)	(10.94)		(12.89)	(10.54)	(8.30)	
9. Log real assets	-0.467***	-0.531***	-0.529***	-0.207***	-0.206***	-0.657***	-0.094***	-0.179***
	(-30.47)	(-21.09)	(-24.34)	(-8.41)	(-8.91)	(-10.59)	(-3.65)	(-5.98)
10. Noninterest expenses				0.206***				-0.003
				(14.41)				(-0.18)
11. Loan loss provisions	0.129***	0.078***	0.124***		0.119***	-0.019	0.135***	--
	(10.35)	(4.21)	(6.75)		(8.75)	(-0.43)	(8.37)	--
12. Delinquent loans				0.177***				0.230***
				(28.24)				(26.17)
13. Capital	-0.160***	-0.130***	-0.194***	-0.175***	-0.601***	-0.513***	-0.588***	-0.556***
	(-28.73)	(-14.12)	(-26.26)	(-24.98)	(-51.27)	(-17.81)	(-43.64)	(-40.75)
14. ROA	-0.119***	-0.098***	-0.130***	-0.083***	-0.137***	-0.245***	-0.140***	-0.091***
	(-10.76)	(-6.55)	(-7.83)	(-8.15)	(-13.77)	(-5.54)	(-13.51)	(-8.49)
15. Unemployment rate	-0.069***	-0.067***	0.049***	0.023	0.143***	0.050*	0.242***	0.095***
	(-5.84)	(-3.54)	(2.69)	(1.20)	(10.76)	(1.78)	(13.98)	(4.92)
14. Number of observations	366,707	96,433	270,274	270,275	325,171	86,393	238,778	238,778
15. Num. of failures	1,814	732	1,082	1,081	1,794	409	1,385	1,385
16. Failure rate (%)	0.49	0.76	0.40	0.40	0.55	0.47	0.58	0.58
17. R^2	0.06	0.04	0.09	0.12	0.27	0.14	0.33	0.37

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% level.

Table 7

Descriptive Statistics for Credit Unions and for Commercial Banks,
Percent of Assets (%), by Size, by Subperiods, 1981-2011

	Credit Unions					Commercial Banks				
	All	Tiny	Small	Medium	Large	All	Tiny	Small	Medium	Large
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Number of institutions										
1. 1980	17,344	14,626	2,466	249	3	14,423	320	9,193	4,468	442
2. 1986	14,686	10,415	3,661	598	12	14,164	191	8,174	5,235	564
3. 1993	12,314	7,266	4,197	819	32	10,960	105	6,007	4,317	531
4. 2007	8,101	3,478	3,338	1,149	135	7,356	93	2,834	3,879	550
5. 2010	7,339	2,739	3,208	1,220	172	6,588	59	2,255	3,746	528
Assets ($ Billion, 2011 Dollars)										
6. 1980	151	30	68	48	5	4,851	2.4	432	1,065	3,352
7. 1986	302	28	112	139	23	6,001	1.3	402	1,294	4,303
8. 1993	429	24	134	205	65	5,738	0.7	309	1,073	4,356
9. 2007	810	13	116	341	339	12,016	0.6	154	1,127	10,735
10. 2010	942	11	115	370	446	12,454	0.4	129	1,081	11,243
Percent of Industry Assets in each Asset Group										
11. 1980	100.0	19.9	45.0	31.8	3.3	100.0	0.0	8.9	22.0	69.1
12. 1986	100.0	9.3	37.1	46.0	7.6	100.0	0.0	6.7	21.6	71.7
13. 1993	100.0	5.6	31.2	47.8	15.2	100.0	0.0	5.4	18.7	75.9
14. 2007	100.0	1.6	14.3	42.1	41.9	100.0	0.0	1.3	9.4	89.3
15. 2010	100.0	1.2	12.2	39.3	47.3	100.0	0.0	1.0	8.7	90.3
Cash										
16. 1981-1986	14.14	10.99	15.29	14.79	11.43	14.87	12.39	8.82	10.05	17.14
17. 1987-1993	12.84	15.82	16.73	9.99	10.85	10.51	15.57	8.30	7.36	11.58
18. 1994-2007	7.92	15.06	11.05	6.63	6.01	6.08	13.21	5.68	4.67	6.36
19. 2008-2011	7.18	15.22	9.97	7.63	5.74	7.21	21.08	7.97	5.56	7.37
20. 1981-2011	10.14	14.46	13.02	9.10	8.12	8.93	14.60	7.18	6.43	9.76
Securities										
21. 1981-1986	16.95	14.58	15.42	20.06	14.62	15.71	31.03	29.09	25.68	10.92
22. 1987-1993	23.67	18.94	20.24	26.22	26.91	18.27	25.83	30.34	26.57	14.94
23. 1994-2007	25.05	23.10	23.78	25.43	27.41	18.46	24.80	27.17	25.01	16.95
24. 2008-2011	22.32	28.60	26.61	21.39	21.72	16.60	28.99	22.13	18.82	16.30
25. 1981-2011	22.82	21.22	21.73	24.05	24.09	17.65	26.78	27.61	24.69	15.25
Consumer Loans										
26. 1987-1993	33.52	47.53	36.02	30.19	29.41	11.60	10.09	10.09	11.87	11.64
27. 1994-2007	34.94	48.94	38.45	34.25	30.45	10.43	8.57	7.71	7.73	10.93
28. 2008-2011	27.64	42.48	31.03	28.04	25.85	8.76	3.30	4.77	3.54	9.33
29. 1987-2011	33.37	47.51	36.58	32.12	29.42	10.52	8.01	8.23	8.60	10.81
Residential Mortgages										
30. 1981-1986	7.12	2.22	6.12	10.30	10.46	7.40	6.63	10.55	11.10	5.85
31. 1987-1993	18.75	5.76	15.91	22.29	21.78	10.60	10.23	13.28	15.10	9.12
32. 1994-2007	24.52	5.83	18.69	25.77	29.45	15.53	9.81	15.89	17.82	15.07
33. 2008-2011	32.60	7.24	23.20	31.34	37.24	17.56	7.44	15.54	16.66	17.67
34. 1981-2011	20.89	5.30	16.21	22.71	25.04	13.11	8.98	14.22	15.75	12.28
Commercial Mortgages										
35. 1987-1993	0.51	0.21	0.46	0.64	0.42	11.72	5.49	10.75	13.60	11.29
36. 1994-2007	0.90	0.16	0.52	1.14	0.75	12.12	8.32	17.45	23.52	10.26
37. 2008-2011	2.99	0.13	0.98	3.31	3.35	14.01	6.52	24.22	34.80	11.80
38. 1987-2011	1.12	0.17	0.58	1.35	1.07	11.36	6.64	14.87	20.03	10.00

Table 7 (continued)

Descriptive Statistics for Credit Unions and for Commercial Banks,
Percent of Assets (%), by Size, by Sub-periods, 1981-2011

	Credit Unions					Commercial Banks				
	All	Tiny	Small	Medium	Large	All	Tiny	Small	Medium	Large
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					C&I Loans					
39. 1987-1993	0.17	0.07	0.15	0.21	0.14	19.23	12.96	16.24	14.33	20.86
40. 1994-2007	0.34	0.09	0.26	0.47	0.21	14.97	14.09	16.70	12.83	15.34
41. 2008-2011	0.87	0.14	0.61	1.20	0.67	11.18	8.04	15.88	12.28	11.01
42. 1987-2011	0.38	0.09	0.29	0.51	0.26	15.55	12.31	16.44	13.16	16.19
					Noninterest Expenses					
43. 1987-1993	3.01	3.68	3.26	2.86	2.32	3.36	5.34	3.39	3.22	3.40
44. 1994-2007	3.14	3.76	3.63	3.26	2.40	3.32	5.35	3.22	3.11	3.36
45. 2008-2011	3.26	4.21	4.04	3.63	2.68	2.84	8.75	3.38	3.03	2.81
46. 1987-2011	3.17	3.88	3.57	3.14	2.50	3.23	5.63	3.29	3.13	3.26
					Provisions for Loans Losses					
47. 1981-1986	0.28	0.36	0.28	0.23	0.35	0.42	0.49	0.52	0.41	0.42
48. 1987-1993	0.40	0.46	0.39	0.40	0.38	0.88	0.61	0.58	0.57	0.99
49. 1994-2007	0.33	0.40	0.31	0.33	0.33	0.41	0.26	0.23	0.27	0.44
50. 2008-2011	0.78	0.48	0.50	0.70	0.93	1.22	0.18	0.47	0.75	1.28
51. 1987-2011	0.39	0.42	0.35	0.37	0.42	0.63	0.37	0.40	0.43	0.67
					Capital					
52. 1981-1986	6.61	8.62	6.82	5.66	4.55	5.96	17.86	8.99	7.54	5.10
53. 1987-1993	7.22	9.25	7.45	6.84	6.53	6.48	17.65	9.06	7.86	5.87
54. 1994-2007	10.73	13.77	11.59	10.67	9.74	8.80	21.55	11.03	9.60	8.57
55. 2008-2011	10.51	15.94	12.48	10.75	9.55	10.45	26.98	12.27	10.05	10.47
56. 1981-2011	9.11	12.03	9.85	8.85	7.99	7.94	20.66	10.35	8.87	7.53
					ROA					
57. 1981-1986	0.97	1.20	0.99	0.85	0.81	0.68	0.29	0.87	0.89	0.59
58. 1987-1993	0.96	0.95	0.91	0.99	0.98	0.57	0.35	0.67	0.81	0.50
59. 1994-2007	0.99	0.77	0.86	1.00	1.09	1.20	0.47	0.95	1.19	1.20
60. 2008-2011	0.33	-0.03	0.17	0.29	0.41	0.45	2.53	0.38	0.44	0.45
61. 1981-2011	0.90	0.79	0.81	0.88	0.92	0.86	0.68	0.80	0.95	0.83

Note: all boundaries between asset sizes are adjusted for inflation, expressed in 2011 dollars. Tiny institutions have fewer than $10 million (M) in assets, small have $10-100M, medium have $100M - $1 billion (B), and large have more than $1B.

Table 8

Distributions of Estimated Probabilities of Failure (EPFs) of Credit Unions and of Commercial Banks, by Size, 1990, 2000, and 2010

	Under 0.0001% (1)	0.0001% -0.001% (2)	0.001% - 0.01% (3)	0.01%- 0.1% (4)	0.1%-1% (5)	1%-10% (6)	Over 10% (7)
Tiny credit unions							
1. 1990	0.0	0.0	0.7	13.9	71.4	12.6	1.3
2. 2000	0.0	0.0	3.0	39.1	53.7	3.8	0.4
3. 2010	0.0	0.1	6.0	40.9	47.3	5.0	0.8
Small credit unions							
4. 1990	1.0	2.9	13.6	45.5	32.3	4.0	0.8
5. 2000	2.9	10.5	36.5	43.4	6.2	0.3	0.1
6. 2010	3.8	8.3	29.4	44.4	13.0	1.0	0.1
Medium credit unions							
7. 1990	11.6	18.3	27.6	26.5	12.6	2.6	0.8
8. 2000	22.5	22.2	26.4	20.4	7.7	0.8	0.0
9. 2010	23.7	20.0	25.4	21.0	7.7	2.0	0.2
Tiny commercial banks							
10. 1990	1.3	5.8	6.6	24.2	49.2	11.4	1.5
11. 2000	18.7	19.8	17.6	22.0	18.7	2.2	1.1
12. 2010	4.5	18.2	28.8	21.2	22.7	4.5	0.0
Small commercial banks							
13. 1990	2.3	4.6	15.1	43.4	28.4	4.3	1.9
14. 2000	8.8	8.4	23.6	43.9	15.0	0.2	0.1
15. 2010	7.1	6.7	16.0	37.3	27.7	3.9	1.3
Medium commercial banks							
16. 1990	0.5	1.0	5.7	42.4	43.6	5.6	1.3
17. 2000	1.7	3.7	16.0	56.9	21.3	0.3	0.0
18. 2010	1.3	2.4	10.7	42.4	33.2	6.0	3.8
Large commercial banks							
19. 1990	1.3	2.4	4.3	44.8	39.1	6.2	1.9
20. 2000	4.6	1.9	13.1	58.9	20.3	1.2	0.0
21. 2010	3.9	2.4	6.0	30.0	38.4	12.2	7.1

Note 1: EPFs below 0.1% (columns 1-4) are commonly deemed "safe" and those above 0.1% (columns 5-7) are commonly deemed "risky."
Note 2: all boundaries between asset sizes are adjusted for inflation, expressed in 2011 dollars. Tiny institutions have fewer than $10 million (M) in assets, small have $10-100M, medium have $100M - $1 billion (B), and large have more than $1B.