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By *John Goddard, Donal McKillop and John O.S. Wilson*

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RRH: GODDARD, MCKILLOP & WILSON: US CREDIT UNIONS

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Keywords: Acquisition, Credit unions, Entry, Exit, Failure, Gibrat's Law

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ABSTRACT

This paper uses hazard function estimations together with cross-sectional growth regressions to examine the impact of exit through merger and acquisition (M&A) or failure, and internally-generated growth, on the firm-size distribution of the US credit union industry. Consolidation through M&A was the principal cause of a reduction in the number of credit unions, but impact on concentration was small. A positive relationship between size and growth, and a pattern of positive persistence in growth, reflects a divergence in the population size distribution. Divergence between average internally-generated growth of smaller and larger credit unions was the principal driver of the rise in concentration.

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I. INTRODUCTION

In banking and financial services, industry structure characterized by the firm-size distribution is a key determinant of the nature of competition. Competition among financial services providers has, in turn, implications for consumer welfare, and for the stability or fragility of the financial system. Accordingly, an understanding of the forces that shape industry structure is of central importance for competition policy, and for financial regulation and supervision. In banking and financial services, a tendency for industry concentration to increase was apparent in many developed countries throughout the 1980s, 1990s and 2000s.[1]

This study assesses the relative contributions of two key factors to the rise in industry concentration in financial services. The first factor is changes to the membership of the population of firms, through either entry or exit. Exit may occur as a result of corporate failure, or merger and acquisition (M&A) transactions in which established firms are acquired by another industry member firm. If new entrants are untypical of the current population in terms of their size measured by assets (as seems highly likely), or if firm-level failure rates are size-dependent (also likely), then it is self-evident that changes in the composition of the population through entry and corporate failure will impact upon industry structure. M&A transactions in which both acquirer and acquired are industry members will impact directly upon the Herfindahl industry concentration measure, while any such transactions involving firms in the top n positions in the firm-size distribution, as either acquirer or acquired, will also impact upon the n-firm concentration ratio measure.

The second factor shaping industry structure, the internally-generated growth of established firms, leaves the population membership unchanged, but alters the relative shares of members of the population in total industry assets. If firm-level growth rates are correlated with firm size, the link between internally-generated growth and industry concentration is self-evident. Even if growth and size are uncorrelated, however, Gibrat’s (1931) Law demonstrates a tendency for industry concentration to increase gradually over time through the cumulative impact on the firm-size distribution of growth that is distributed randomly across firms in the cross section (Sutton, 1997; Caves, 1998; Coad, 2009).

The US credit union industry is the focus of the empirical investigation reported in this study. At the end of 2010 credit unions accounted for approximately 10% of all consumer savings and deposits in the US, servicing over 90 million members. The contributions of exit and internally-generated growth to the evolution of the structure of the credit union industry are assessed, in order to provide an integrated analysis of industry demographics for the period 1994-2010. Apart from its significant market share in US retail banking, a key factor influencing our choice of the US credit union industry as a laboratory for the study is the unusually high quality of the available call report data. In particular, entry and attrition are tracked to an exceptional degree of accuracy, with a cause of disappearance identified for 99.5% of all exits. The acquiring credit union is identified for 98.8% of credit unions that exited as a result of M&A, and acquisitions account for 89.9% of all exits.

For the most part, the previous academic literature deals with entry into and exit from financial services markets, consolidation through M&A between financial institutions, and their internally-generated growth, as separate topics. On entry and exit, Jeon and Miller (2007) examine the relationship between deregulation and the rates of entry (births) and exit through merger or failure (marriages or deaths) for US commercial banks at state level for the period 1978-2004. A more passive intrastate and interstate regulatory stance correlates positively with the rates of both entry and merger. The latter suggests that deregulation has promoted significant consolidation. Attrition was higher among new entrants than for the population as a whole. Berger and Dick (2007) report further evidence on entry into local US banking markets and early-mover advantages. Wheelock and Wilson (1995, 2000) and Cole and White (2012) identify bank-specific, regulatory and regional economic conditions as key determinants of corporate failure for banks.

In the corporate finance literature on M&A, synergy refers to the increased market power of the merged entity, and the potential for cost savings through scale or scope economies, vertical integration, the adoption of more efficient production or organizational technology, or the elimination of overlapping costs by combining head office and back office functions or reduction of branch networks. Hubris refers to a tendency for managers to commit mistakes in evaluating target firms, overestimating the potential for synergy (Roll, 1986). Agency refers to a tendency for acquiring managers to overvalue their targets because they benefit personally, even if the stock price and shareholder wealth is adversely affected. For banks, Wheelock and Wilson (2000) and Focarelli et al. (2002) report evidence in support of the synergy motive. Banks with low earnings, low capital-to-assets ratios, high local market share, or which operate in urban areas, are more likely to be acquired (Hannan and Rhoades, 1987; Hadlock et al., 1999). Post-merger evidence indicates that the gains in efficiency or performance for the merged entity are limited. This suggests either that the hubris or the agency motive may be operative (Berger and Hannan, 1998); or that synergy derives from enhanced market power rather than cost savings (DeYoung et al., 2009).

The determinants of internally-generated growth on the part of banks is an under-researched topic. Several early studies present empirical evidence on the size-growth relationship, using Gibrat's Law as a benchmark (Alhadeff and Alhadeff, 1964; Rhoades and Yeats, 1974; Yeats et al., 1975; Tschoegl, 1983). More recently, Goddard et al. (2004) report that larger European commercial banks grew faster on average than smaller banks during the 1990s. High capitalization and x-inefficiency acted as a restraint on growth. In a recent cross-country study, Shehzad et al. (2013) report that large banks grew more slowly than small banks on average, and there was no persistence of growth.

Credit unions are not-for-profit cooperative financial institutions. Following deregulation during the 1990s and 2000s, many US credit unions have expanded the scale of their operations significantly. Consolidation through M&A has taken place on a large scale: the number of credit unions fell from 14,549 in 1990 to 7,334 in 2010. Consolidation was motivated by the objectives of realizing scale and scope economies, eliminating operational inefficiencies, and spreading risk through product diversification. A small number of new credit unions entered the industry, while many of those not grasping the new challenges have exited through acquisition or failure. At the end of 2010, 167 US credit unions had assets in excess of $1bn with their loan portfolios extending to first and second mortgages, construction and development loans and business loans: a loan portfolio structure similar to that of a commercial bank.

The econometric analysis reported in this study comprises a panel estimation of hazard functions for the determinants of acquisition or failure, and a series of cross-sectional estimations of the relationship between asset size and internally-generated growth, with a control for survivorship bias. Principal findings are as follows. Smaller credit unions are at higher risk of acquisition or failure than their larger counterparts. Older credit unions are more likely to be acquired, but the failure probability is not age-dependent. Credit unions holding a high proportion of liquid assets, and those with low loans-to-assets ratios, are at increased risk of exit through acquisition or failure. Consolidation through M&A has greatly reduced the population size, but the impact on industry concentration has been modest, owing to the relatively small asset size of acquired credit unions. Gibrat's Law is unequivocally rejected, and divergence in the average rate of internally-generated growth between the smaller and larger credit unions is identified as the principal factor driving the increase in industry concentration since the mid-1990s. A pattern of positive persistence in growth over successive time intervals tended to increase the pace of divergence.

The empirical results extend the previous literature on the dynamics of growth in two significant respects. First, in order to focus solely on growth that is internally generated (rather than growth that is achieved by means of M&A), the lagged size and lagged growth covariates of any credit union that was an acquirer within a two-year interval are adjusted by defining the lagged values for a 'synthetic' credit union constructed using the aggregate assets of the acquirer and the acquired credit union as separate entities at the relevant data-points. Second, possible survivorship bias is addressed by estimating cross-sectional size-growth regressions using a sample-selection model. This model is used to correct any violation of the standard conditions for valid estimation and statistical inference in cases where a pattern of dependence between growth and survival exists.

The paper proceeds as follows. Section II describes the US credit union industry. Section III reports an empirical analysis of the determinants of exit through acquisition or failure. Section IV reports an empirical analysis of patterns of survivorship and internally-generated growth. Finally, Section V summarizes and concludes.

II. THE US CREDIT UNION INDUSTRY

The US credit union industry data are compiled from the '5300 Call Reports', published by the National Credit Union Association (NCUA). Semi-annual data are available for the period June 1994 to December 2010. These data are augmented with information (provided by the NCUA in response to several Freedom of Information requests) on entrants and exits. The data are of exceptionally high quality, providing virtually 100% coverage over a 17-year period.

Table 1 reports the total number of US credit unions at the end of December in each year from 1994 to 2010, and an analysis of the evolution of the distribution of the population by asset size. The average total assets of credit unions in the smallest size quintile in 2010 was 222% higher than the 1994 figure. The corresponding increase for the largest size quintile was 438%. The number of credit unions with total assets less than $1m decreased from 2,393 in 1994 to 563 in 2010. Over the same period, the number of credit unions with total assets of more than $1bn increased from 13 to 169.

This pattern of growth in the average size, and an increasing tendency for the larger credit unions to offer portfolios of financial services closely resembling those of medium-sized commercial banks,[2] has been encouraged by developments in regulation and fiscal treatment. The NCUA revised the field of membership rules in 1994, diluting the common bond and permitting credit unions to add occupational groups of up to 100 persons without regulatory approval. The 1998 Credit Union Membership Access Act (CUMAA) permitted federal credit unions to add select employee groups (SEGs) to their fields of membership. In some cases a credit union's common-bond designation makes it difficult to add SEGs, and some credit unions converted from occupational to residential common bonds in order to expand their membership base.[3]

Owing partly to the restrictions on their activities and their high capitalization, credit unions have, in general, withstood the current financial crisis better than many of their banking counterparts (Smith and Woodbury, 2010). The crisis in the real-estate market has impacted on the credit union industry, primarily through the investment policies of a number of corporate credit unions,[4] which used cash deposits received from retail credit unions to purchase risky asset-backed securities, and realized large losses in several cases. The 2010 Dodd-Frank Act made radical changes to financial services regulation and supervision. For credit unions, deposit insurance was increased from $100,000 to $250,000 per account, and the supervision of corporate credit unions was strengthened.[5]

Table 2 reports an analysis of the survivorship and average asset sizes of credit unions classified by their assets size quintile membership in June 1994. Only 30.1% of the credit unions in the smallest June 1994 asset size quintile that were live in December 1994 survived until December 2010. The average asset size of the survivors in December 2010 was 107% larger than the corresponding figure for December 1994. By contrast, 85.8% of the credit unions in the largest June 1994 asset size quintile that were live in December 1994 survived until December 2010. The average asset size of the survivors in December 2010 was 294% larger than the corresponding figure for December 1994. The final two columns of Table 2 report the numbers and average asset size of the post-June 1994 entrants. While the latter are relatively few in number they were, on average, larger in asset size than credit unions in all except the largest of the June 1994 size quintiles.

Tables 3 and 4 examine the degree of churning in the rankings of US credit unions by asset size, at the top end (Table 3) and throughout (Table 4) the asset size distribution. Both tabulations reflect stability in the size distribution over time. Table 3 reports the ten largest credit unions by asset size in December 1995, 2000, 2005 and 2010. The same two credit unions, Navy Federal and State Employees, occupied the top two positions throughout this period; and seven of the ten largest credit unions in December 1995 also featured among the ten largest in December 2010. Table 4 reports transition matrices between asset size quintiles over the five-year intervals 1995-2000, 2000-2005 and 2005-2010. Between 64% and 69% of credit unions in the smallest quintile at the start of each interval remained in the smallest quintile five years later, and most of the rest were classified as exits. Between 82% and 85% of credit unions in the largest quintile at the start of each interval remained in the largest quintile five years later.

Table 5 reports an analysis of changes in the population owing to entry and exit. Between December 1994 and December 2010, the total number of credit unions fell from 12,051 to 7,334. This decline in numbers reflects the net effect of entry (156 new credit unions) and exit for various reasons documented in Table 5 (4,873 credit unions). A large majority of the credit unions that exited did so as a consequence of having been acquired (4,382 credit unions, or 89.9% of the total number that exited). The exit rate was remarkably stable throughout the 2000s (between 3% and 4% per year), and the exit rate does not appear to be sensitive to the economic cycle.

III. EMPIRICAL ANALYSIS OF EXIT THROUGH ACQUISITION OR FAILURE

Section III reports an investigation of the determinants of credit union disappearance through acquisition or failure during the period 1994-2010.

Literature Review.

The mature credit union movements in the US, Australia and Canada have witnessed significant levels of M&A activity. Evidence on the motives for credit union mergers, however, is limited to a relatively small number of country-specific studies.

Fried et al. (1999) investigate more than 1,600 US credit unions that were involved in one or more mergers between 1989 and 1994. Members of acquiring credit unions typically experienced no deterioration in service provision following a merger, while members of acquired credit unions typically experienced an improvement in service provision of at least three years' duration. Acquired credit unions with weak loans portfolios were likely to benefit from acquisition, while acquirers with past experience of M&A were more likely to benefit. Learning-by-doing spreads the overhead cost of successive mergers, and minimizes the loss of focus on managements' primary objective of serving members.

Goddard et al. (2009) estimate hazard functions for the propensity to be acquired, using data for the period 2001-06. The hazard was inversely related to asset size and profitability, and positively related to liquidity. Growth-constrained credit unions were less attractive acquisition targets, but credit unions with low capitalization and those with relatively small loans portfolios were attractive. There is evidence of a link between technological capability and the hazard of disappearance: the absence of an internet banking capability rendered a credit union more vulnerable to acquisition.

Bauer et al. (2009) examine post-merger performance for three stakeholder groups: members of the acquired and acquiring credit unions, and the NCUA. Members of the acquired credit union experienced improvements in performance, owing to the financial stability of the merged credit union, but the performance of the acquiring credit union was unaffected.

Beyond the US, Ralston et al. (2001) report mixed evidence of post-merger gains and losses in technical and scale efficiency, following Australian credit union mergers during the period 1993-95. Contrary to the notion that efficiency gains are realized by transferring assets from inefficient to efficient managers, the largest gains were achieved where pre-merger efficiency scores were low for both parties. Mergers did not typically yield efficiency gains larger than those that non-merging credit unions were able to achieve through internal growth. Worthington (2004) finds that asset size, asset management, liquidity and regulatory variables were significant influences on the probability of Australian credit unions acquiring or being acquired during the period 1992-95. Mcalevey et al. (2010) report evidence of gains in efficiency in merged New Zealand credit unions during the period 1996-2001. Goth et al. (2006) suggest no single explanation can be offered for the motivation and consequences of UK credit union mergers. Mergers involving a transfer of engagements from weak or failing credit unions tended to have negative consequences for the healthier party, by diluting its focus on its own members, increasing the level of arrears, or reducing dividend payments.

In respect of corporate failure, Smith and Woodbury's (2010) comparative study of US banks and credit unions suggests that credit unions are less exposed to fluctuations in the business cycle, and credit union balance sheets are better able to withstand macroeconomic shocks. Elsewhere, it has been shown that small or weakly capitalized credit unions are among those most likely to fail. Other factors that increase the risk of failure include poorly trained management, lax lending standards and weak collection operations, poor record-keeping, and the closure of sponsoring companies (Kharadia and Collins, 1981; Gordon, 1987; US Government Accountability Office, 1991; Barron et al., 1994; Wilcox, 2005). For Canadian credit unions, Pille and Paradi (2002) report that a simple equity/asset ratio is a good predictor of failure. More complex models, based on z-scores or data envelopment analysis, fail to deliver superior predictive capability.

Empirical Model for the Determinants of Acquisition or Failure.

The hazard function estimations reported in this section are based on the method used by Wheelock and Wilson (2000) to model the hazards of failure and acquisition for US banks. The empirical model is the Cox (1972) proportional hazard model with time-varying covariates. The probabilities of disappearance through events defined as failure and acquisition are modelled separately, using a competing-risks framework. The alternative modes of disappearance are treated as independent events, and the observations on a credit union that disappeared through each event are treated as right-censored in the estimations of the hazard for disappearance through the other event.

The hazard function expressing the probability that credit union i disappears through event k between time t and time t+1 (k=1 denotes acquisition; k=2 denotes failure), conditional on a vector of covariates specific to credit union i at time t that influence the probability of event k, denoted $x_{k,i}(t)$, is modelled as follows:

$$\lambda_{k,i}(t \mid x_{k,i}(t), \beta_k) = \bar{\lambda}_k(t)\exp(x_{k,i}(t)'\beta_k)$$

The baseline hazard is denoted $\bar{\lambda}_k(t)$, and β_k is a vector of coefficients to be estimated. The time-index t is measured in calendar time elapsed since December 1994. R_t

denotes the set of credit unions that are in existence at time t and exposed to risk of disappearance between t and t+1, and $D_{k,t}$ denotes the set of $d_{k,t}$ credit unions that disappear through event k between time t and time t+1. The contribution to the partial likelihood function of credit union i, which disappears through event k between t and t+1, is:

$$\exp(x_{k,i}(t)'\beta_k) / \sum_{j \in R_t} \exp(x_{k,j}(t)'\beta_k)$$

The baseline hazard $\bar{\lambda}_k(t)$ drops out of the partial likelihood function, and is not parameterized explicitly. The (semi-parametric) log-partial likelihood function is:

$$\ln[L(\beta_k)] = \sum_{t=1}^{T}[\sum_{i \in D_{k,t}} x_{k,i}(t)'\beta_k - d_{k,t} \ln\{\sum_{j \in R_t} \exp(x_{k,j}(t)'\beta_k)\}]$$

The hazard function covariate definitions are as follows: $S_{i,t}$ = Total Assets; $K_{i,t}$ = capital-to-assets ratio = Net Worth /Total Assets; $Q_{i,t}$ = Liquid Assets / Total Assets; $N_{i,t}$ = Non-performing Loans / Total Assets; $L_{i,t}$ = Loans / Total Assets; $E_{i,t}$ = Non-interest Expenses / Total Assets; $A_{i,t}$ = Age. Table 6 reports descriptive statistics for the covariates at each end-of-year (December). In the empirical hazard functions, logarithmic transformations are applied to the total assets and age covariates.

<u>Estimation Results</u>.

Table 7 reports the empirical hazard function estimation results. The anticipated inverse relationship between asset size and the hazard of disappearance is evident in both of the hazard function estimations, indicating that smaller credit unions were at significantly greater risk of disappearance through either acquisition or failure than larger ones. The coefficient on the age covariate in the M&A hazard is positive and significant, suggesting that older credit unions were at greater risk of acquisition. The coefficient on the age covariate is insignificant in the failure hazard.

The coefficients on the capital-to-assets ratio covariate are negative and significant in the M&A hazard, and positive and significant in the failure hazard. These results are consistent with Hannan and Piloff's (2009) explanation for a negative relationship between the capitalization of US banks and the hazard of acquisition: high capitalization is a proxy for efficiency, indicating limited scope for post-merger efficiency gains, while low capitalization reduces the purchase price and increases the attractiveness of the target. Contrary to results reported by Wilcox (2005), highly capitalized credit unions appear to be at greater risk of failure. The negative correlation between asset size and the capital-to-assets ratio is highly significant, however, and the size effect might account for the negatively signed coefficient on the latter in the failure hazard.

The coefficients on the liquidity ratio covariate are positive and significant in both hazards. The coefficient on the loans-to-assets ratio covariate is insignificant in the M&A hazard, but the corresponding coefficient is negative and significant in the failure hazard. A credit union that hordes cash, or does not create a loans portfolio of a size commensurate with its deposits, may be either an attractive target for an acquirer that believes itself capable of earning a higher return by expanding the loans portfolio, or at risk of failure due to an inability to generate an adequate return.

The coefficients on the non-performing loans covariate are positive and significant in both hazards, suggesting that a lack of control over the quality of lending may act as a trigger for disappearance through either failure or acquisition by an acquirer that may be capable of exercising stronger control. Finally, the coefficients on the ratio of non-interest expenses to assets covariate are positive and significant. This appears consistent with the interpretation of the ratio of non-interest expenses to assets as a managerial inefficiency measure, and the hypothesis that inefficient credit unions are more vulnerable to either acquisition or failure.

Impact of Consolidation on Industry Structure.

Table 8 reports a descriptive analysis of the trend in industry concentration over the period 1994-2010. The first five columns report five-, ten- and twenty-firm concentration ratios, together with the Herfindahl-Hirshman Index (HHI) and the HHI Numbers Equivalent. Consistent with the patterns reported in Tables 1 and 2, these data indicate a trend towards increased industry concentration that has been remarkably steady and consistent over time.

The final two columns of Table 8 provide an indication of the contribution of consolidation through M&A to the trend in industry concentration, in the form of a 'counterfactual' HHI based on hypothetical population data. For the purposes of calculating the counterfactual HHI, each acquired credit union is assumed to have continued to operate as a separate entity to the end of 2010. A proportion of the combined assets of the acquirer at each data-point after the merger took place is reallocated to the (counterfactually surviving) acquired credit union. The proportion of the assets reallocated is based on the relative asset sizes of the acquirer and the acquired at the data point immediately preceding the merger: the final data point at which separate assets data are available for both institutions.

The large number of credit union mergers notwithstanding, the analysis reported in Table 8 suggests that the contribution of M&A to the rise in industry concentration was modest. The counterfactual 2010 HHI of 43.8 is only slightly smaller than the observed HHI of 46.5; and the observed drop in the HHI Numbers Equivalent from 520.9 in 1994 to 215.2 in 2010 would have been mitigated only marginally, to a counterfactual figure of 228.5 in 2010, had no credit unions mergers taken place between 1994 and 2010. The disparity between the large effect of M&A on the population size, and the much smaller effect on industry concentration, is attributed to the majority of acquired credit unions having been drawn from the lower end of the assets size distribution.

IV EMPIRICAL ANALYSIS OF INTERNALLY-GENERATED GROWTH

The empirical analysis reported in Section III suggests that while consolidation through M&A accounts for most of the large decline in the number of US credit unions over the period 1994-2010, the effect on industry structure was relatively small. With the industry also having experienced modest rates of entry and failure, it appears that internally-generated growth may have been the main driver of the trend towards increased industry concentration over the same period. Section IV reports an empirical analysis of the relationship between credit union size and growth, using Gibrat's law as a benchmark.

Literature Review.

Barron et al. (1994) investigate the evolution of state-chartered credit unions in New York City over the period 1914-90, by analyzing the effects of organizational age, size, and population density on the rates of failure and growth. Old and small institutions were more likely to fail, while young and small institutions had the highest growth rates. Goddard et al. (2002) test the law of proportionate effect for US credit unions, using data for the period 1990-99. Larger credit unions grew faster than smaller ones. On average, credit unions with above-average growth in one period experienced below-average growth in the following period. Small credit unions exhibited more variable growth than large credit unions. Wheelock and Wilson (2011) report evidence of increasing returns to scale among credit unions of all sizes for the period 1989-2006. They anticipate that continued deregulation, allowing credit unions to expand their scale or scope of financial service provision, would encourage further growth at the upper end of the size distribution.

Empirical Model for the Relationship Between Firm Size and Growth.

The empirical analysis of the size-growth relationship consists of a series of cross-sectional regressions, in which growth over a two-year interval is the dependent variable, and size at the start of the two-year interval and growth over the previous two-year interval are the explanatory variables. This specification allows for a size-growth relationship that might be either positive, neutral or negative, while controlling for any persistence of growth between successive time intervals.

In order to focus solely on growth that is internally generated, rather than growth that is achieved by means of M&A, the lagged size and lagged growth covariates of any credit union that was an acquirer within a two-year interval are adjusted by defining the lagged values for a 'synthetic' credit union constructed using the aggregate assets of the acquirer and the acquired credit union as separate entities at the relevant data-points.[6] The cross-sectional size-growth regressions are estimated using the Heckman (1979) sample-selection model, to mitigate potential survivorship bias. The latter might arise because the probability that a credit union survives over a two-year interval, and therefore appears in the data set for the estimation of the growth regression, might be related to the credit union's propensity for growth. The direction of any association between growth and survival might be positive or negative: on the one hand, reckless growth in lending might increase the risk of disappearance as a consequence of financial distress; but on the other hand, sluggish growth in lending might reflect operational inefficiency or underperforming management. The sample-selection model specification is as follows:

Survivorship regression observed for all credit unions live at T–2:

$$z^*_{i,T} = \gamma_0 + \gamma_1 s_{i,T-2} + \gamma_1 (s_{i,T-2} - s_{i,T-4}) + \gamma_3 K_{i,T-2} + \gamma_4 L_{i,t-2} + \gamma_5 Q_{i,T-2} + \gamma_6 N_{i,T-2} + \gamma_7 E_{i,T-2}$$

$z_{i,T} = 1$ if $z^*_{i,T} + \varepsilon_{i,T} > 0$; $z_{i,T} = 0$ if $z^*_{i,T} + \varepsilon_{i,T} < 0$

Growth regression observed for credit unions that survived from T–2 to T, for which $z_{i,T} = 1$:

$$(s_{i,T} - s_{i,T-2}) = \beta_0 + \beta_1 s_{i,T-2} + \beta_2 (s_{i,T-2} - s_{i,T-4}) + u_{i,T}$$

The disturbances $\varepsilon_{i,T}$ and $u_{i,T}$ are assumed bivariate normal, with $\mathrm{var}(\varepsilon_{i,T}) = 1$, $\mathrm{var}(u_{i,T}) = \sigma_u^2$, $\mathrm{corr}(\varepsilon_{i,T}, u_{i,T}) = \rho_{\varepsilon u}$.

Estimation Results.

Table 9 reports the estimation results for the cross-sectional sample-selection model of survivorship and growth. A separate set of equations is reported for growth rates defined for a series of overlapping two-year intervals ending in December of each year from 1998 to 2010 inclusive. The survivorship regressions include the same set of covariates as the hazard functions reported in Section IV with the exception of the age covariate, for which the coefficients were small and insignificant in preliminary estimations of the survivorship regressions. A lagged two-year growth covariate is included in the cross-sectional survivorship regressions. The latter, which are dominated by disappearances owing to M&A, are similar to the M&A hazard function reported in Table 7 (with a reversal of signs on all coefficients because survival, rather than disappearance, is coded one, and disappearance coded zero). The coefficients on the size, lagged growth and capitalization covariates are all positive, and predominantly significant. The coefficients on the liquidity and non-interest expenses covariates are negative, and predominantly significant. The coefficients on the non-performing loans covariate are negative, but predominantly insignificant. The coefficients on the loans-to-assets covariate are positive and predominantly significant prior to the late-2000s financial crisis; but negative coefficients are obtained from T=2008 onwards.

The estimates of the correlation coefficient between the stochastic components of the survivorship and growth regressions are varied in sign but apparently pro-cyclical: positive correlations are obtained in the estimations that correspond to the economic upturns of the late-1990s and mid-2000s; but negative correlations are obtained in the estimations that correspond to the downturns of the early- and late-2000s. A plausible interpretation is that rapid expansion of a financial-service provider's balance sheet correlates positively with survival during an upturn; but negatively during a downturn.

In the growth regressions, the coefficients on the lagged assets size covariate are all positive and significant; and the coefficients on the lagged growth covariate are likewise positive and significant. These results are indicative of a pattern of divergence in the size distribution, with the larger institutions growing faster on average than their smaller counterparts. Clearly, Gibrat's Law is unequivocally rejected. A pattern of positive persistence in growth has enhanced the pace of divergence. The magnitude of the positive persistence effect may have declined somewhat, however, over the study period.

V. CONCLUSION

This paper examines the impact of exit and internally-generated growth on the firm-size distribution of the US credit union industry for the period 1994-2010. This period represents the most recent stage of a longer-term phase of industry consolidation that has seen the number of credit unions reduced from a peak of 23,866 in 1969 to 7,334 in 2010.

The econometric analyses reported in this paper comprise a panel estimation of hazard functions for the determinants of exit through acquisition or failure, and a series of cross-sectional regressions for the relationship between firm size and internally-generated growth, which include a control for survivorship bias. The hazard function estimations indicate that smaller credit unions are at significantly higher risk than larger ones of disappearance through either acquisition or failure. Older credit unions are at higher risk of acquisition, but the failure probability is not age-dependent. The empirical relationship between capitalization and the probability of acquisition is negative as anticipated, but highly capitalized credit unions appear to be at greater risk of failure. This latter pattern might be driven by a size effect (smaller institutions are more highly capitalized on average, but are also at higher risk of failure). Credit unions holding a high proportion of their assets in liquid form, and credit unions with low loans-to assets ratios, are at increased risk of exit through acquisition or failure, or both. While consolidation through M&A has had a large impact on the size of the credit union population, the impact of consolidation on industry concentration is modest, owing to the majority of the acquired credit unions having been small in terms of asset size.

Consistent with the trend in the population size distribution and industry concentration revealed in descriptive tabulations, the cross-sectional growth regressions are indicative of a pattern of divergence in the population size distribution that is highly consistent over time, with the larger institutions having grown faster, on average, than their smaller counterparts. A pattern of positive persistence in growth over successive time intervals has a tendency to increase the pace of divergence, though there are signs that the magnitude of the positive persistence effect diminished somewhat over the study period. The inclusion of a control for survivorship bias in the growth regressions suggests that rapid expansion of a credit union's balance sheet correlates positively with survival during an economic upturn, but negatively during a downturn. Gibrat's Law (the law of proportionate effect) is unequivocally rejected. Divergence in the average rate of internally-generated growth between the smaller and larger institutions is identified as the principal factor driving the observed increase in industry concentration.

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TABLE 1
Trends in the size distribution of the population of US credit unions, 1994-2010

	Average assets by asset size quintiles					Number of credit unions by asset size band					Total
	Q5	Q4	Q3	Q2	Q1	$1bn or more	$100m-$1bn	$10m-$100m	$1m-$10m	below $1m	number
Dec 94	101.3	12.6	4.80	1.88	0.477	13	575	3407	5663	2393	12051
Dec 95	110.4	13.5	5.09	1.98	0.502	18	616	3417	5440	2255	11746
Dec 96	120.7	14.7	5.50	2.14	0.533	23	647	3460	5237	2075	11442
Dec 97	132.1	15.8	5.87	2.27	0.554	26	689	3493	5073	1964	11245
Dec 98	149.9	17.6	6.49	2.49	0.596	30	748	3584	4816	1813	10991
Dec 99	164.1	19.2	7.14	2.77	0.658	36	787	3616	4570	1618	10627
Dec 00	181.0	20.6	7.58	2.92	0.691	43	822	3591	4336	1522	10314
Dec 01	214.5	24.1	8.86	3.42	0.785	56	905	3677	4022	1322	9982
Dec 02	248.0	26.9	9.92	3.88	0.879	72	980	3672	3802	1160	9686
Dec 03	281.5	29.9	11.06	4.34	0.974	83	1042	3672	3527	1043	9367
Dec 04	311.5	32.4	11.90	4.69	1.059	99	1060	3605	3312	938	9014
Dec 05	340.4	34.3	12.43	4.85	1.093	107	1084	3488	3138	874	8691
Dec 06	372.7	36.1	12.92	4.97	1.118	116	1088	3357	2968	830	8359
Dec 07	409.9	38.5	13.61	5.17	1.162	127	1095	3283	2817	774	8096
Dec 08	456.9	42.8	15.17	5.75	1.273	145	1139	3248	2566	701	7799
Dec 09	512.2	48.7	17.15	6.43	1.427	159	1205	3195	2374	614	7547
Dec 10	545.0	51.6	18.30	6.93	1.534	169	1199	3188	2215	563	7334

TABLE 2
Number of survivors and average assets for credit unions in June 1994 asset size quintiles, and post-June 1994 entrants

	Asset size quintile, June 1994:										post-June 1994 entrants	
	Q1		Q2		Q3		Q4		Q5			
	No.	average assets, $m	No.	average assets, $m	No.	average assets, $m	No.	average assets, $m	No.	average assets, $m	No.	average assets, $m
Dec 94	2342	.468	2412	1.84	2423	4.72	2438	12.5	2428	100.7	8	.287
Dec 95	2175	.477	2320	1.86	2388	4.82	2422	12.9	2421	107.7	20	.414
Dec 96	2028	.495	2230	1.94	2331	5.04	2400	13.6	2413	115.1	40	29.9
Dec 97	1933	.508	2176	2.02	2289	5.27	2382	14.4	2408	124.2	57	25.3
Dec 98	1826	.581	2099	2.17	2255	5.71	2359	15.7	2387	139.1	65	26.5
Dec 99	1679	.626	1990	2.32	2186	6.08	2335	16.5	2366	149.1	71	27.2
Dec 00	1554	.648	1913	2.38	2112	6.21	2301	17.2	2355	160.8	79	26.2
Dec 01	1434	.718	1819	2.70	2055	7.00	2260	19.5	2328	187.1	86	27.7
Dec 02	1339	.789	1722	2.99	2008	7.61	2221	21.2	2308	212.1	88	32.5
Dec 03	1233	.873	1631	3.27	1942	8.23	2180	23.0	2283	235.8	98	32.7
Dec 04	1130	.928	1534	3.43	1864	8.49	2131	24.0	2261	254.2	94	36.3
Dec 05	1032	.963	1446	3.46	1790	8.57	2084	24.5	2242	270.9	97	36.4
Dec 06	946	1.006	1367	3.44	1720	8.64	2021	24.9	2208	290.0	97	39.3
Dec 07	882	1.026	1307	3.58	1665	8.91	1973	25.9	2173	313.9	96	46.1
Dec 08	818	1.055	1218	4.22	1598	9.61	1924	27.8	2146	342.1	95	48.9
Dec 09	756	1.121	1160	4.69	1554	10.56	1874	30.8	2112	378.2	91	55.2
Dec 10	706	.969	1106	4.81	1512	11.10	1837	32.1	2083	397.0	90	58.4

TABLE 3
Top 10 US credit unions by assets size, 1995, 2000, 2005, 2010

December 1995		December 2000		December 2005		December 2010	
	Assets, $m		Assets, $m		Assets, $m		Assets, $m
1. Navy Federal	8720	1. Navy Federal	12400	1. Navy Federal	24600	1. Navy Federal	44200
2. State Employees	3940	2. State Employees	6580	2. State Employees	12900	2. State Employees	21500
3. Pentagon	2280	3. Pentagon	3630	3. Pentagon	8090	3. Pentagon	14900
4. Boeing Employees	2070	4. Boeing Employees	3550	4. The Golden 1	6180	4. Boeing Employees	9180
5. Alliant	1970	5. Alliant	3110	5. Boeing Employees	6140	5. Schoolsfirst	8500
6. American Airlines	1790	6. The Golden 1	3040	6. Schoolsfirst	5960	6. The Golden 1	7750
7. The Golden 1	1710	7. Schoolsfirst	2730	7. Suncoast Schools	5000	7. Alliant	7590
8. Kinecta	1590	8. American Airlines	2660	8. Alliant	4380	8. Security Services	6170
9. Alaska USA	1590	9. Suncoast Schools	2430	9. American Airlines	4010	9. Star One	5430
10. Schoolsfirst	1480	10. Kinecta	2150	10. Security Services	3980	10. Americal Airlines	5190

TABLE 4
Transition matrix from asset size quintiles at T–5 to asset size quintiles at T

Asset size quintile,T–5	↓	Asset size quintile, T → Q1	Q2	Q3	Q4	Q5	Exited (T–5,T)
T=2000							
	Q1	69.0	1.8	0.1	0.0	0.0	29.0
	Q2	18.3	61.8	2.7	0.1	0.0	17.1
	Q3	0.0	23.6	63.3	3.1	0.0	10.0
	Q4	0.0	0.0	21.2	71.9	2.2	4.6
	Q5	0.0	0.0	0.0	12.2	85.0	2.8
T=2005							
	Q1	64.0	0.7	0.1	0.0	0.0	35.1
	Q2	19.9	57.3	2.1	0.0	0.0	20.6
	Q3	0.0	25.9	59.8	1.9	0.0	12.4
	Q4	0.0	0.0	21.9	68.2	1.6	8.3
	Q5	0.0	0.0	0.0	13.7	82.2	4.1
T=2010							
	Q1	66.7	1.0	0.0	0.0	0.1	32.2
	Q2	17.3	60.6	1.8	0.1	0.0	20.1
	Q3	0.1	22.4	63.4	2.2	0.0	11.8
	Q4	0.0	0.0	18.9	70.7	1.4	9.1
	Q5	0.0	0.0	0.0	11.1	82.6	6.3

Note: Q1 denotes the smallest quintile by asset size; Q5 denotes the largest.

TABLE 5
Entrants and exits, 1995-2010

	Entrants	Acquisition	Purchase & Assumption	Liquidation	Conversion to bank	Conversion to privately insured	Unclassified disappearance	Total exits	Exit rate	Number live at end of year
1994	-	-	-	-	-	-	-	-	-	12051
1995	13	290	5	22	1	0	0	318	.0264	11746
1996	20	293	11	17	1	1	1	324	.0276	11442
1997	19	192	4	17	0	3	0	216	.0189	11245
1998	8	215	5	28	3	11	0	262	.0233	10991
1999	13	335	11	24	3	4	0	377	.0343	10627
2000	13	292	13	18	3	0	0	326	.0307	10314
2001	10	296	8	25	6	2	5	342	.0332	9982
2002	7	265	7	23	1	4	3	303	.0304	9686
2003	15	315	5	10	2	2	0	334	.0345	9367
2004	3	332	6	11	3	0	4	356	.0380	9014
2005	8	302	1	25	2	0	1	331	.0367	8691
2006	10	313	2	23	1	0	3	342	.0394	8359
2007	4	248	2	10	3	0	4	267	.0319	8096
2008	4	275	1	19	1	1	4	301	.0372	7799
2009	4	229	1	23	1	2	0	256	.0328	7547
2010	5	190	7	19	0	0	2	218	.0289	7334

TABLE 6
Descriptive statistics: Number of credit unions, and mean values of key variables, by year

	$S_{i,t}$		$A_{i,t}$		$K_{i,t}$		$Q_{i,t}$		$L_{i,t}$		$N_{i,t}$		$E_{i,t}$	
	mean	st.dev.	mean	st.dev.	mean	st.dev.	mean	st.dev.	mean	st.dev.	mean	st.dev.	mean	st.dev.
Dec 94	24.22	114.0	38.82	14.25	.127	.059	.0384	.0557	.615	.184	.00432	.0188	.0200	.0149
Dec 95	26.29	122.1	39.86	14.29	.134	.060	.0403	.0542	.643	.174	.00436	.0229	.0208	.0133
Dec 96	28.71	130.8	40.91	14.38	.140	.062	.0377	.0509	.651	.172	.00430	.0207	.0216	.0129
Dec 97	31.32	144.2	41.88	14.46	.145	.064	.0380	.0514	.651	.173	.00426	.0196	.0223	.0232
Dec 98	35.42	164.5	42.90	14.50	.145	.066	.0397	.0529	.617	.168	.00429	.0184	.0218	.0121
Dec 99	38.78	178.1	43.96	14.54	.148	.066	.0994	.1144	.625	.178	.00397	.0159	.0179	.0094
Dec 00	42.55	197.5	44.97	14.61	.145	.066	.1095	.1179	.662	.183	.00387	.0209	.0201	.0091
Dec 01	50.32	240.6	46.00	14.67	.138	.065	.1573	.1372	.600	.168	.00411	.0217	.0192	.0087
Dec 02	57.91	283.4	47.03	14.72	.135	.061	.1560	.1380	.570	.174	.00419	.0203	.0188	.0088
Dec 03	65.55	324.0	48.03	14.82	.133	.061	.1631	.1496	.553	.182	.00408	.0212	.0187	.0093
Dec 04	72.26	366.6	49.08	14.83	.136	.061	.1410	.1381	.564	.189	.00385	.0210	.0190	.0102
Dec 05	78.61	403.3	50.20	14.89	.143	.064	.1209	.1261	.595	.192	.00389	.0199	.0198	.0218
Dec 06	85.53	449.7	51.21	14.98	.151	.067	.1200	.1159	.618	.188	.00310	.0152	.0208	.0131
Dec 07	93.64	525.1	52.23	15.02	.155	.071	.1287	.1191	.613	.185	.00314	.0189	.0213	.0140
Dec 08	104.3	587.2	53.36	15.05	.151	.072	.1251	.1185	.586	.186	.00364	.0214	.0208	.0130
Dec 09	117.2	650.6	54.43	15.09	.138	.072	.1410	.1227	.552	.183	.00388	.0228	.0199	.0154
Dec 10	124.6	716.7	55.50	15.10	.134	.070	.1471	.1320	.530	.184	.00402	.0183	.0216	.0134

Note: Variable definitions are as follows: $S_{i,t}$ = Total Assets; $A_{i,t}$ = Age; $K_{i,t}$ = capital-to-assets ratio = Net Worth /Total Assets; $Q_{i,t}$ = Liquid Assets / Total Assets; $L_{i,t}$ = Loans / Total Assets; $N_{i,t}$ = Non-performing loans / Total Assets; $E_{i,t}$ = Non-interest Expenses / Total Assets.

TABLE 7
Estimation results: M&A and failure hazard functions

	M&A hazard	Failure hazard
$s_{i,t-1}$	-.4026	-.3719
	(-49.9)	(-12.8)
$a_{i,t-1}$	.2872	.0209
	(8.46)	(0.25)
$K_{i,t-1}$	-4.0676	2.1194
	(-19.7)	(6.00)
$Q_{i,t-1}$	.9074	1.4864
	(8.89)	(5.55)
$L_{i,t-1}$	.1402	-1.3137
	(1.76)	(-4.48)
$N_{i,t-1}$	.6501	2.4346
	(2.32)	(6.45)
$E_{i,t-1}$	3.4153	1.0401
	(20.7)	(3.36)
No. of observations	311637	311637
No. of disappearances	4471	341
log-likelihood	-39459.0	-2665.3

Note: Variable definitions are as follows: $s_{i,t-1}$ = logarithm of Total Assets at the six-monthly data-point prior to disappearance; $a_{i,t-1}$ = log Age; $K_{i,t-1}$ = capital-to-assets ratio = Net Worth /Total Assets; $Q_{i,t-1}$ = Liquid Assets / Total Assets; $L_{i,t-1}$ = Loans / Total Assets; $N_{i,t-1}$ = Non-performing loans / Total Assets; $E_{i,t-1}$ = Non-interest Expenses / Total Assets.

TABLE 8
Trends in industry concentration measures, 1994-2010

	Concentration ratios			Actual		Counterfactual (no M&A)	
	CR_5	CR_{10}	CR_{20}	HHI	Numbers equivalent	HHI	Numbers equivalent
Dec 94	6.2	8.8	12.2	19.2	520.9	19.2	521.8
Dec 95	6.1	8.8	12.4	19.2	520.3	19.1	523.9
Dec 96	6.1	8.8	12.5	19.0	525.9	18.8	530.9
Dec 97	6.3	8.9	12.8	19.7	506.6	19.5	513.1
Dec 98	6.5	9.2	13.2	20.5	486.8	20.2	494.3
Dec 99	6.5	9.4	13.4	20.8	480.9	20.4	489.8
Dec 00	6.7	9.6	13.8	21.9	457.3	21.4	467.2
Dec 01	7.0	10.2	14.4	23.9	418.5	23.4	428.2
Dec 02	7.4	10.7	15.0	25.8	388.2	25.1	397.9
Dec 03	7.6	10.9	15.2	27.1	368.3	26.4	378.8
Dec 04	8.1	11.4	15.8	29.7	337.1	28.8	347.3
Dec 05	8.5	11.9	16.5	31.4	318.2	30.4	328.7
Dec 06	9.0	12.4	17.3	34.3	291.9	32.9	303.7
Dec 07	9.9	13.3	18.4	40.1	249.5	38.5	259.7
Dec 08	10.1	13.7	18.8	41.9	238.6	40.2	248.7
Dec 09	10.2	13.6	18.4	42.2	237.1	40.3	248.0
Dec 10	10.8	14.3	19.1	46.5	215.2	43.8	228.5

TABLE 9
Estimation results: Survivorship and growth regressions

T	Growth regression dep. var. = $(s_{i,T}–s_{i,T–2})$			Survivorship regression dep. var. = 1 for credit unions that survived from T–2 to T, 0 for credit unions that disappeared							
	$s_{T–2}$	$s_{i,T–2}–s_{i,T–4}$	const.	$s_{T–2}$	$s_{i,T–2}–s_{i,T–4}$	$K_{i,T–2}$	$Q_{i,T–2}$	$L_{i,T–2}$	$N_{i,T–2}$	$E_{i,T–2}$	const.
1998	.0166***	.3747***	-.1835***	.1592***	1.497***	.090	-.3011	.1387	-.428	-9.188***	-.285
	(22.7)	(41.6)	(-16.1)	(9.46)	(9.44)	(0.27)	(-0.73)	(0.98)	(-0.26)	(-8.65)	(-0.99
1999	.0122***	.3050***	-.1127***	.1868***	1.331***	.824***	-.4046	.4296***	-1.649	-7.795***	-1.237**
	(16.3)	(32.7)	(-9.6)	(12.37)	(9.01)	(2.63)	(-1.09)	(3.36)	(-0.91)	(-7.74)	(-4.84
2000	.0100***	.2643***	-.1309***	.2026***	.897***	1.600***	-.9322***	.4772***	-1.604	-9.831***	-1.591**
	(13.7)	(29.7)	(-11.4)	(13.9)	(7.06)	(5.31)	(-2.81)	(3.88)	(-0.97)	(-10.66)	(-6.48
2001	.0181***	.2728***	-.2005***	.1894***	1.322***	1.771***	-.0583	.3562***	-2.488	-11.79***	-1.413**
	(23.0)	(26.5)	(-15.9)	(13.0)	(8.69)	(5.84)	(-0.34)	(2.75)	(-1.52)	(-8.90)	(-5.73
2002	.0151***	.2246***	-.0836***	.1718***	1.435***	1.457***	-.2891*	.3334***	-1.829	-11.32***	-1.038**
	(18.2)	(21.1)	(-6.2)	(11.6)	(9.82)	(4.60)	(-1.68)	(2.60)	(-0.93)	(-8.69)	(-3.99
2003	.0098***	.3010***	-.0652***	.1528***	1.532***	1.584***	-.5092***	.3905***	-1.170	-11.30***	-.855**
	(11.4)	(26.8)	(-4.7)	(10.1)	(10.58)	(4.85)	(-3.43)	(2.69)	(-0.55)	(-8.20)	(-3.23
2004	.0133***	.2897***	-.1905***	.1796***	1.148***	1.723***	-.1987	.6199***	-3.956**	-11.04***	-1.575**
	(17.7)	(31.1)	(-15.5)	(12.8)	(8.42)	(5.13)	(-1.40)	(4.48)	(-2.18)	(-8.55)	(-6.40
2005	.0194***	.2416***	-.3388***	.202***	1.031***	1.993***	-.2925**	.2958**	-1.635	-10.39***	-1.767**
	(23.8)	(23.2)	(-24.9)	(13.9)	(7.61)	(5.70)	(-2.11)	(2.15)	(-0.76)	(-8.53)	(-6.66
2006	.0222***	.2790***	-.4087***	.1721***	1.059***	1.284***	-.0866	.4360***	-1.428	-10.77***	-1.298**
	(26.3)	(23.1)	(-29.1)	(11.9)	(7.82)	(3.78)	(-0.57)	(3.33)	(-0.63)	(-8.80)	(-4.85
2007	.0176***	.2716***	-.2952***	.1281***	1.499***	.993***	-.1938	.2448*	-4.701**	-9.469***	-.391
	(21.9)	(26.4)	(-21.8)	(8.6)	(9.20)	(2.95)	(-1.11)	(1.87)	(-2.19)	(-7.49)	(-1.40
2008	.0136***	.2050***	-.1620***	.1518***	1.301***	1.909***	-0.2004	-0.0666	-10.43***	-8.105***	-0.706*
	(15.9)	(17.7)	(-11.3)	(9.8)	(8.49)	(5.50)	(-1.00)	(-0.49)	(-3.67)	(-6.99)	(-2.44
2009	.0156***	.1511***	-.1389***	.1656***	1.603***	2.714***	-.5849***	-.1917	-3.355	-3.039***	-1.183**
	(14.8)	(10.1)	(-7.8)	(10.5)	(9.83)	(7.83)	(-2.94)	(-1.45)	(-1.13)	(-4.90)	(-4.05
2010	.0092***	.1331***	-.0578***	.1126***	2.291***	2.136***	-.7988***	-.4545***	-.405	-.259	-.273
	(10.0)	(14.8)	(-3.8)	(6.4)	(14.65)	(6.04)	(-3.81)	(-3.23)	(-0.21)	(-0.56)	(-0.87

Note: Variable definitions are as follows: $s_{i,T–2}$ = logarithm of Total Assets at the data point at the start of the two-year interval over which growth is measured; $(s_{i,T}–s_{i,T–2})$ = logarithmic growth in assets from T–2 to T; $(s_{i,T–2}–s_{i,T–4})$ = logarithmic growth in assets from T–4 to T–2; $K_{i,T–2}$ = capital-to-assets ratio = Net Worth /Total Assets; $Q_{i,T–2}$ = Liquid Assets / Total Assets; $L_{i,T–2}$ = Loans / Total Assets; $N_{i,T–2}$ = Non-performing loans / Total Assets; $E_{i,T–2}$ = Non-interest Expenses / Total Assets.

ENDNOTES

[1] According to the World Bank Financial Structure database (2010), the five-firm concentration ratio (CR_5) for the US banking industry was 21% in 2003 and 37% in 2009; for the UK: 86% (1993) and 88% (2009); for France: 46% (1993) and 52% (2009); for Germany: 50% (1993) and 77% (2009); and for Japan: 30% (1993) and 65% (2009).

[2] With the exception of some securities investments, credit unions were originally distinguished from other financial institutions by their emphasis on small value, unsecured, non-mortgage loans to individuals and households. Federal credit unions gained the authority to make long-term (up to 30 years) mortgage real estate loans in 1977. At the end of 2010, first mortgages accounted for 39.3% of all loans, and second mortgages accounted for 7.6%. The 1994 figures were 21.3% and 5.5%, respectively. Other changes to the typical product mix of credit unions include growth in the importance of credit-card lending. Around 53% of credit unions offered credit cards in 2010 (CUNA, 2010). Unsecured lending accounted for only 10.8% of all credit union lending in 2010, down from 20.3% in 1994.

[3] CUMAA also introduced a capital regulation system of net worth requirements and prompt corrective action, which came into force in 2000. Congressional hearings were held in 2005 to examine the tax-exempt status of credit unions, justified by its proponents as a policy tool to tackle financial exclusion. Tax-reform proponents argue that credit unions should be subject to corporate taxation (US Government Accountability Office, 2005). Following the 2005 hearings tax-exempt status was maintained, despite lobbying by banks.

[4] Corporate credit unions provide services for (retail) credit unions, including deposit of excess funds, payment services and access to liquid funds if required.

[5] In addition the NCUA has approved a new rule requiring credit union directors to receive financial literacy training, and opened a new office of Consumer Protection.

[6] For the observation following an acquisition that took place between T–2 and T, for example, the acquirer's 'synthetic' growth rate is $s_{i,T} - s^*_{i,T-2}$, where $s^*_{i,T-2}$ is the logarithm of the sum of the assets of the acquirer and the acquired as separate entities at T–2, and the lagged 'synthetic' growth is $s^*_{i,T-2} - s^*_{i,T-4}$, with $s^*_{i,T-4}$ defined in the same manner at T–4. Where the acquisition took place between T–2 and T–4, the lagged 'synthetic' growth is $s_{i,T-2} - s^*_{i,T-4}$.

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