



## The evolution of cost-productivity and efficiency among US credit unions

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### ABSTRACT

Advances in information-processing technology have eroded the advantages of small scale and proximity to customers that traditionally enabled small lenders to thrive. Nonetheless, the membership and market share of US credit unions have increased, though their average size has also risen. We investigate changes in the efficiency and productivity of US credit unions during 1989–2006 by benchmarking the performance of individual firms against an estimated order- $\alpha$  quantile lying “near” the efficient frontier. We construct a cost analog of the Malmquist productivity index, which we decompose to estimate changes in cost and scale efficiency, and changes in technology. We find that cost-productivity fell on average across all credit unions but especially among smaller credit unions. Smaller credit unions confronted a shift in technology that increased the minimum cost required to produce given amounts of output. All but the largest credit unions also became less scale efficient over time.

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### 1. Introduction

Technological advances and changes in regulation have profoundly altered the landscape of banking in the United States and elsewhere. For example, the relaxation of restrictions on branching, both within and across state borders, precipitated a consolidated wave that has halved the number commercial banks in the United States since the mid-1980s. Over the same years, advances in information processing technologies lowered the cost of obtaining quantitative and other “hard” information about potential borrowers, and thereby reduced the advantages of small scale, close proximity and local ties that gave small, “community” banks a competitive advantage in lending to small businesses and other “informationally-opaque” borrowers (Petersen and Rajan, 2002; Berger, 2003; Bernanke, 2006). Besides promoting consolidation among banks, regulatory and technological changes have spurred growth in the size of banks (Berger et al., 1999). Large banks have tended to be more profitable than small banks in recent years, and exhibit larger increases in productivity and efficiency (Wheelock and Wilson, 2009).

Credit unions, like community banks, traditionally have served small retail customers. Credit unions are mutual organizations that provide deposit, lending, and other services to a membership defined by an occupational, fraternal, or other common bond. A common bond is advantageous because it can reduce the cost of assessing the credit-worthiness of potential borrowers and thereby facilitate unsecured lending on reasonable terms to a credit union’s members. The advances in information technology that have eroded the advantages of close customer relationships in business lending, however, have likely also eroded the advantages of small scale and common bond that traditionally have enabled credit unions to provide financial services to their members at low cost (Walter, 2006). Thus far, credit unions seem to be adapting to the new environment. Since 1985, the share of US depository institution assets held by credit unions has nearly doubled, from 3.3% to 6.0%, and credit union membership has increased faster than US population, from 52 million members in 1985 to 93 million members in 2009. The Credit Union Membership Access Act of 1998 may have facilitated the increase in membership by affirming the right of credit unions to accept members from unrelated groups. Since then, the number and size of credit unions characterized by multiple common bonds has increased rapidly (Walter, 2006). Credit unions now hold about 10% of US household savings deposits, 9% of all consumer loans, and 13.2% of non-revolving consumer loans. Credit unions are also increasingly a source of business loans, and legislation pending in Congress would permit

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credit unions to offer even more business loans by increasing the cap for such loans from 12.25% of a credit union's total assets to 25%.<sup>1</sup>

As with commercial banks, the evolving competitive environment appears to favor larger credit unions, which have tended to grow more rapidly than smaller credit unions (Goddard et al., 2002). Between 1985 and 2006, the average, inflation-adjusted total assets of US credit unions increased by more than 600%. US credit unions held an average of \$84.6 million of assets in 2006 (\$50.6 million in constant 1985 dollars) versus \$7.8 million in 1985. Consolidation has also sharply reduced the total number of credit unions from a peak of 23,866 in 1969 to just 8,662 in 2006. Further increases in scale seem likely because even the largest credit unions appear to operate under increasing returns to scale (Wheelock and Wilson, 2011). It remains an open question, however, whether credit unions, as a group, will continue to gain market share. Much of their recent increase in market share has come at the expense of savings and loan associations and savings banks, which saw a decline in market share from 30.1% to 15.9% between 1985 and 2006. By contrast, the share of industry assets held by commercial banks rose from 66.1% to 78.1% over the same years. Credit unions are likely to continue to fill a niche, but as an industry may not thrive unless they can exploit new technologies to become more productive and scale efficient.

This paper investigates productivity growth among US credit unions to assess how successfully credit unions have contained costs while fulfilling the desire of their members for favorable terms on loans and deposits. In this framework, we examine changes in cost-productivity, i.e., the extent to which the cost of producing given levels of output has changed over time. Credit unions become more cost-productive if the cost they incur to produce given levels of outputs declines over time or, equivalently, if the levels of outputs they produce for a given level of cost rises. We also estimate changes in cost and scale efficiency for credit unions. Credit unions become more cost efficient if they move closer to the efficient frontier, and more scale efficient if they move closer to a region of the underlying technology characterized by constant returns to scale. A credit union could become more cost or scale efficient without becoming more cost-productive as a result of an unfavorable shift in the technology that increases the minimum feasible cost of producing given levels of outputs.

We specify a cost relationship for credit unions that takes account of the unique objectives of the owners of mutually-owned depository institutions for high deposit interest rates and low loan interest rates. We estimate the cost relationship non-parametrically using a suitably adapted version of the “order- $\alpha$  quantile” frontier estimators developed by Daouia (2003), Daouia and Simar (2007), and Wheelock and Wilson (2008). By using a nonparametric estimator, we avoid the problem of specifying and estimating a potentially incorrect parametric cost function.<sup>2</sup> Further, unlike traditional nonparametric estimators, such as data envelopment analysis (DEA), our nonparametric order- $\alpha$  quantile estimator has a relatively rapid, root- $n$  convergence rate (similar to parametric estimators) and is robust to data outliers.<sup>3</sup>

<sup>1</sup> H.R. 3380, the Promoting Lending to America's Small Business Act was introduced in Congress during July 2009 by Representative Paul Kanjorski. S. 2919, which would amend the Federal Credit Union Act, was introduced by Sen. Mark Udall on December 21, 2009. Data on credit union membership, deposits and loans are available from the Credit Union National Association: <http://www.cuna.org/>.

<sup>2</sup> Many studies have found that even relatively flexible functional forms, such as the translog function, are mis-specifications of cost relationships for banks and other depository institutions (e.g., McAllister and McManus, 1993; Wheelock and Wilson, 2001, 2011).

<sup>3</sup> The root- $n$  convergence rate obtains only if the estimator is used to estimate a partial frontier lying close to the full frontier, which is the approach we take here.

We construct the cost analog of the familiar Malmquist productivity index, defined in terms of our nonparametric estimator, and decompose the index to allocate changes in cost-productivity to changes in cost efficiency, technology and scale efficiency. In addition, we decompose a residual term to gain insight into the sources of changes in scale efficiency. Our results indicate that, in general, credit unions became less cost-productive between 1989 and 2006, indicating that they incurred higher (inflation-adjusted) operating costs to produce given levels of output in 2006 than in 1989. We also find that smaller credit unions tended to experience larger declines in cost-productivity than large credit unions. Small credit unions appear to have faced a shift in the cost frontier that increased the minimum cost of producing given amounts of output. Although small credit unions, on average, became more cost efficient over time, they also became less scale efficient. By contrast, the largest credit unions became marginally less cost efficient on average, but somewhat more scale efficient. Thus, our results are consistent with the conjecture that recent advances in technology and changes in regulation have favored larger credit unions.

The rest of the paper unfolds as follows: Section 2 discusses recent literature on credit union performance. Section 3 describes the variables in a credit union cost relationship and presents our statistical model for estimation method. Section 4 defines measures of changes in cost-productivity, efficiency, etc., and Section 5 reports and discusses the estimation results. The final section presents our conclusions.

## 2. Literature review

The performance of US credit unions has been evaluated on several dimensions. Most studies assume that credit unions seek to minimize operating cost while maximizing member benefits in terms of the prices or variety of services they offer.<sup>4</sup> Fried et al. (1993), for example, estimate the productive efficiency of credit unions in the context of a model in which credit unions seek to maximize member benefits in terms of the price, quantity and variety of services offered to members subject to resource availability and the operating environment. The study employs a nonparametric free disposal hull (FDH) estimator and data from 1990, and obtains a mean inefficiency estimate of 9.2%. That is, they find that, on average, credit unions are capable of producing 9.2% more service with the amounts of variable resources available. Notably, the study also finds that larger credit unions, measured in terms of total assets, are more efficient than small credit unions.

Frame et al. (2003) also examine efficiency in the context of a model that assumes that credit unions seek to minimize non-interest costs subject to input prices, the level and types of output they produce, and the prevailing production technology. Based on estimation of a parametric translog cost function using data from 1998 for credit unions with more than \$50 million of total assets, Frame et al. (2003) find significant differences in the performance of large credit unions with different types of common bonds. Specifically, they find that credit unions with residential common bonds have higher costs than those with occupational or associational bonds.

Studies have also examined the effects of mergers on credit union performance. For example, Fried et al. (1999) investigate the impact of mergers on credit union efficiency in the context of a model in which credit unions seek to minimize cost while maximizing the services provided to members. The study uses data

<sup>4</sup> See Smith et al. (1981), Smith (1984), Fried, Lovell, and Eckhaut (1993), Fried, Lovell, and Yaisawarng (1999), Frame et al. (2003), and Bauer (2008). A few studies have found some evidence of agency problems at credit unions to the detriment of their members (Emmons and Schmid, 1999b; Frame et al., 2003; and Leggett and Strand, 2002). However, we make no attempt here to distinguish between the interests of credit union managers and members.

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