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Abstract: Credit unions are cooperative financial institutions specializing in the basic financial needs of certain groups of consumers. A distinguishing feature of credit unions is the legal requirement that members share a common bond. This organizing principle recently became the focus of national attention as the Supreme Court and the U.S. Congress took opposite sides in a controversy regarding the number of common bonds that could co-exist within the membership of a single credit union.

Despite its importance, little research has been done into how common bonds affect how credit unions actually operate. We frame the issues with a simple theoretical model of credit-union formation and consolidation. To provide intuition into the flexibility of multiple-group credit unions in serving members, we simulate the model and present some comparative-static results. We then apply a semi-parametric empirical model to a large dataset drawn from federally chartered occupational credit unions in 1996 to investigate the effects of common bonds. Our results suggest that credit unions with multiple common bonds have higher participation rates than credit unions that are otherwise similar but whose membership shares a single common bond.

Keywords: Credit union, common bond, participation rate, semi-parametric estimation
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CREDIT UNIONS AND THE COMMON BOND

Co-operative financial institutions have their roots in 19th century Europe, appearing first in the United States in the early 20th century. Co-operative financial institutions are ubiquitous in both developed and developing countries today, posing something of a puzzle in the former group of countries where one might have expected corporate financial institutions to have displaced them. This does not seem to be the case, however, as some groups of co-operative financial institutions in developed countries are holding steady or even increasing their market shares. In the United States, the most prominent types of co-operative financial institutions today are mutual savings and loans and savings banks, mutual insurance companies, and credit unions.

Credit unions are regulated and insured financial institutions dedicated to the saving, credit and other basic financial needs of selected groups of consumers. By law, credit unions are co-operative enterprises the members of which enjoy equal control rights—the principle of "one-person-one-vote." In addition, credit union members must be united by a "common bond of occupation or association, or [belong] to groups within a well-defined neighborhood, community, or rural district" (Supreme Court, 1998, p. 2, quoting from the Federal Credit Union Act of 1934).

Despite the rather low profile and mundane operations of the vast majority of credit unions, these institutions have long been a source of controversy in the United States. Public awareness of this long-simmering debate was piqued recently by a Supreme Court case pitting commercial banks against credit unions and their federal regulator (Supreme Court, 1998). The Court found in favor of banks in this case, ruling that the federal credit-union regulator must cease granting federally chartered credit unions the right to combine multiple common bonds of membership within a single

institution. Less than six months later, however, President Clinton signed into law new legislation that essentially reversed the Supreme Court's ruling.

This paper provides background on credit unions and the debate they have spurred in the United States. We also present new evidence relevant to the credit-union debate. Using an extensive dataset and a new empirical approach based on non-linear estimation techniques, we find that the participation rate among potential credit-union members is linked to the common-bond requirement in two important ways.

First, looking across credit unions whose members share a single common bond, participation rates generally decline as the group of potential members becomes larger. That is, the larger is the pool from which a single-group credit union can draw, the less effective it is in attracting members. Because participation in the credit union is a prerequisite for receiving benefits from it, it is plausible to assert that a lower participation rate signals less success in serving the potential membership.

This finding is consistent with standard economic analyses of egalitarian governance arrangements that stress free-riding problems arising from costly monitoring in the presence of falling marginal personal benefits of monitoring (Gorton and Schmid, 1998). It is also in line with the reasoning advanced by Congress in 1934 that credit unions were viable only when a strong—hence, by necessity, narrow—common bond existed among the membership.

The second link between particiption rates and the nature of the common bond is a contrast between single-group and multiple-group credit unions. Our paper appears to be one of the first to explicitly consider the differential impact of single versus multiple common bonds while holding all else constant. We find strong evidence that multiple-group credit unions perform better than single-group credit unions, ceteris paribus.

It is important to interpret this finding carefully, however, because our empirical design does not map into policy choices in a straightforward way. In particular, the positive co-efficient we find on a multiple-group dummy is the *partial* effect of multiple common bonds on participation rates while holding total asset size, potential membership, local banking competition, etc., at their median values in our sample. No actual credit union faces a decision problem that conforms to such an empirical exercise; a merger of two single-group credit unions, for example, results in a larger multiple-group credit union, violating the ceteris paribus assumption we require. Instead, our result aplies to two otherwise essentially identical credit unions that differ only with respect to the number of common bonds shared by their respective memberships.

In addition to our results linking the size of the potential membership and a credit union's common-bond status to participation rates, we provide new evidence on two more general banking policy issues. First, we find what might be interpreted as support for the structure-conduct-performance paradigm of local banking competition. Using the Herfindahl index calculated for local bank deposit market shares as a measure of local market structure, we find that higher levels of concentration are associated with higher participation rates at credit unions. This is consistent with the notion that banking competition is weaker in more concentrated markets, increasing the attractiveness of credit unions.

The second banking policy issue on which we shed some light is that of possible scale economies among financial institutions. Our empirical results show that credit unions face definite scale economies when scale is measured by total assets, while the same is true when measured by the number of members only for relatively large credit unions.

The paper is organized as follows. The following section provides some institutional and historical background on credit unions while the second section outlines the current credit-union debate in the United States. These sections can be skipped without loss of continuity by readers already familiar with credit unions in the United States. The third section develops a simple theoretical model of credit-union formation and consolidation that stresses the countervailing influences on participation rates of scale economies in production and decreasing within-group membership affinity as a credit union grows. The model provides intuition for why the number of common bonds within a credit union is important for their formation and growth. Section III also describes a simulation of the theoretical model that is calibrated to U.S. experience and that can be used to generate some comparative-static results. The fourth section briefly describes the dataset and the econometric methods we employ in our empirical analysis of federally chartered occupational credit unions. The fifth section presents our empirical results. The sixth and final section draws conclusions. In addition, the paper has three appendixes, providing details on credit-union regulation in historical perspective, the 1998 Credit Union Membership Access Act, and the empirical data and methodology we employ, respectively.

I. Background on Credit Unions

A. Overview of credit unions in the United States

Credit unions numbered 11,392 at year-end 1996, serving some 70 million individual members (U.S. Treasury, 1997, p. 15). At the same time, there were 11,452 commercial banks and thrift institutions (savings and loan associations and mutual savings banks). Credit union assets were only $327 billion compared to $5,606 billion held by commercial banks and thrifts (U.S. Treasury, 1997, p. 21). This overall

comparison is somewhat misleading, however, because credit unions are typically very narrowly focused institutions by virtue of their organizing principle, the common bond, and are hence unable to grow beyond certain limits. For example, a single-employer occupational credit union is not authorized to serve any one other than the employees of the sponsoring firm and their immediate relatives, who may total no more than a few hundred people. In addition, credit unions are restricted in the types of financial services they may provide, with traditional consumer financial services at the core of virtually all credit unions' activities.

Both federal and state credit-union charters are granted. Regardless of the type of charter they hold, the deposits (or technically, "share drafts") of virtually all credit unions are now federally insured by the National Credit Union Administration (NCUA). Federal credit unions are regulated by the NCUA while state-chartered credit unions are regulated by an agency of the chartering state.

Of the 7,068 federally chartered institutions at year-end 1996, about three quarters were occupational credit unions (U.S. Treasury, 1997, p. 19).[1] In an occupational credit union, one or more firms sponsor a credit union, sometimes providing office space, paid time-off for volunteer workers, and perhaps other forms of support. The remaining federal credit unions were associational, community, or multiple-group credit unions with more than one type of membership (i.e., several groups that span the usual classifications).

By size, most credit unions (65 percent of all federally insured institutions) had less than $10 million in assets (U.S. Treasury, 1997, p. 19). Large credit unions exist, however, and they are an important part of the sector. For example, the eleven percent

[1] Comparable data for state-chartered credit unions are not available.

of credit unions with more than $50 million in assets (1,284 institutions) accounted for 74 percent of total credit-union assets.

Credit unions play a limited role in the United States' financial system, catering to the basic saving, credit, and other financial needs of well-defined consumer groups. More than 95 percent of all federal credit unions offer automobile and unsecured personal loans, while a similar proportion of large credit unions (more than $50 million in assets) also offer mortgages, credit cards, loans to purchase planes, boats or recreational vehicles, ATM access, certificates of deposit, and personal checking accounts (U.S. Treasury, 1997, p. 23). Very small credit unions typically offer a limited range of services, are staffed by member-volunteers, and are likely to receive free or subsidized office space. Larger credit unions offer a broader array of services, may employ some full-time workers, including the manager, and are more likely to pay a market-based rent for office space.

Historically, members of credit unions were drawn from groups that were underserved by traditional private financial institutions; these consumers tended to have below-average incomes or were otherwise not sought out by banks. While credit-union members today still must share a common bond to be eligible for membership, the demographic characteristics of credit-union members have become more like the median American. While only one percent of the U.S. adult population aged 18 or over belonged to a credit union in 1935, some 33 percent of the adult population had joined by 1989 (American Bankers Assocation, 1989, p. 29). Subsequent strong growth of new credit-union charters has increased that proportion.[2]

According to a credit-union survey in 1987, 79 percent of all Americans who were eligible to join a credit union had done so (American Bankers Assocation, 1989, p. 29).

Given the prominent role of occupational credit unions, a majority of members is in the prime working ages of 25-44 (American Bankers Assocation, 1989, p. 30). Perhaps surprisingly given the origins of credit unions, current members are overrepresented in upper-middle income strata, defined as household incomes between $30,000 and $80,000 in 1987. Overall, it appears that credit unions and commercial banks are more direct competitors today than they were in the early part of this century.

B. Brief history of credit unions in the United States

The predecessors of American credit unions were co-operative banking institutions of various sorts in Canada and Europe in the 19th century. The first credit union in the United States was formed in Manchester, New Hampshire, in 1909 (U.S. Treasury, 1997, p. 15). Soon thereafter, Massachusetts created a charter for credit unions. The credit-union movement swept across the U.S. from there, meeting with particular success in the New England and upper midwestern states.

These early cooperative financial institutions often had a social, political, or religious character in addition to their explicit economic function. While the social and political aspects of the cooperative movement were acknowledged and accepted by the United States Congress, the Federal Credit Union Act (FCUA) of 1934 was focused more narrowly on the economic potential of credit unions (see Appendix 1).

The legislation itself was modeled closely on state credit-union statutes that had appeared in the early decades of the 20th century in the Northeast and upper midwestern states. The FCUA clearly reflected Congressional intent to create a class of federally chartered financial institutions that would operate in a safe and sound manner:

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[2] The estimated 70 million current credit-union members represent a bit more than 34 percent of the 1996 U.S. population over 16 years of age numbering 204 million (Haver, 1998).

> … the ability of credit unions to "come through the depression without failures, when banks have failed so notably, is a tribute to the worth of cooperative credit and indicates clearly the great potential value of rapid national credit union extension" (Supreme Court, 1998, pp. 17-18, citing the FCUA, S.Rep. No. 555).

The likelihood that federal credit unions would serve consumers not served by banks was an additional element in Congressional deliberations:

> Credit unions were believed to enable the general public, which had been largely ignored by banks, to obtain credit at reasonable rates (Supreme Court, 1998, pp. 17-18).

Because credit unions were seen as not-for-profit associations, they were not subjected to federal taxation as were profit-oriented commercial banks and thrift institutions.[3]

It is clear from the legislative history surrounding the passage of the FCUA in 1934 that Congress saw the common-bond requirement as critical to the success of credit unions. One might even say that Congress understood the Berle and Means (1932) dictum warning against the separation of ownership and control:

> The common bond requirement "was seen as the cement that united credit union members in a cooperative venture, and was, therefore, thought important to credit unions' continued success…."
>
> "Congress assumed implicitly that a common bond amongst members would ensure both that those making lending decisions would know more about applicants and that borrowers would be more reluctant to default" (Supreme Court, 1998, pp. 17-8, citing 988 F.2d, at 1276).

The subsequent history of credit unions in the United States has largely fulfilled the promise envisioned by Congress in 1934. Credit unions have grown and spread across the country. Although hundreds of individual credit unions failed in the 1980s and early 1990s, the National Credit Union Insurance Fund (NCUSIF, formed in 1970) avoided accounting insolvency—in marked contrast to the Federal Savings and Loan Insurance Corporation and the Bank Insurance Fund of the Federal Deposit Insurance

[3] Of course, credit unions could easily avoid taxation by paying out all "profits" to members in the form of lower borrowing rates or higher deposit rates, rendering the taxation issue moot.

Corporation (Kane and Hendershott, 1996). Credit unions control a small but growing share of household deposits and they may play a role in maintaining a high level of retail banking competition in some local markets (see our results below).

II. The Current Credit-Union Debate

The special status and comparative success of credit unions in recent decades, co-inciding as it has with a period of stress on thrift and commercial-banking institutions, has led to political conflicts between advocates of credit unions and banks. This conflict reached its high point in a series of court decisions culminating at the U.S. Supreme Court in October 1997. The particular case at issue involved the AT&T Family Credit Union and the NCUA's interpretation of the 1934 FCUA allowing multiple common bonds of membership. Brought by several banks and the American Bankers Association, the case was ultimately decided in February 1998 (on a 5-4 decision) in favor of the banks who sued to stop the NCUA from granting more multiple-group credit-union charters. The bankers' victory was short-lived, however, as Congress almost immediately drafted new legislation that enables credit unions to continue growing much as before—including multiple common bonds within a single credit union. Appendix 2 contains a summary of the key provisions of the Act.

Attacks on credit unions have come from a wide range of viewpoints, the proponents of which have wielded sometimes contradictory arguments. Some of the arguments used in the recent Supreme Court decision concerning the role of the common-bond requirement in credit unions reflects the unsettled nature of the debate. We focus on two strands of the credit-union debate here, namely the arguments stressing inefficient governance structures on the one hand and "unfair competition" on the other.

Some have argued that credit unions are inherently inefficient due to their one member-one vote governance structure. One might expect decision-making in a credit union to be of poor quality due to a lack of professionalism (i.e., volunteer managers and workers), free-rider problems among members, and weak incentives for members to intervene when action is needed to correct specific problems or deficiencies. Thus, credit unions may waste scarce resources and they may eventually impose significant costs on individual sponsoring firms or the economy as a whole.

The second prominent line of argument aimed at credit unions takes a nearly opposite view of their organizational effectiveness. This view presumes that credit unions operate efficiently enough to offer consistently better terms on savings and credit services than those offered by commercial banks and thrifts. Bank and thrift managers and owners often present this point of view in public discourse. To be sure, those arguing that credit unions represent unfair competition ascribe some or all of their competitive advantages to subsidies such as their tax-exempt status or sponsor subsidies rather than inherent efficiency.

Proponents of the first view—that credit unions are inherently inefficient—have a difficult time explaining why the number of credit unions and credit-union members continues to grow, and why members express high levels of satisfaction with the services they receive. If most credit unions were very inefficient, one would expect their members to become disaffected and their role in the financial system to diminish over time.

Proponents of the second view, on the other hand— that credit unions are unfair competitors due in part to subsidies—, cannot easily explain why credit-union sponsors and governments are such strong supporters of credit unions. It is hard to understand how large net subsidies could be delivered to credit-union members over time without

more opposition arising from constituencies that might be paying for the subsidies, such as employees who do not belong to their firm's occupational credit union or taxpayers who belong to no credit union. In fact, the most vocal complaints about alleged subsidies for credit unions are heard from banks and thrifts, whose resentment of credit-union competition could be expected even if there were no subsidies flowing to credit unions.

Ironically, the juxtaposition of these two lines of attack against credit unions appeared in the argumentation of the Supreme Court majority that decided the AT&T Family Credit Union case in favor of commercial banks. At one point in its opinion, the majority cited the legislative history surrounding the 1934 Federal Credit Union Act as support for the view that credit unions are a fragile—even flawed—type of institution, reasoning that:

> …the legislative history thus confirms that Section 109 (of the Act) was thought to reinforce the cooperative nature of credit unions, which in turn was believed to promote their safety and soundness and allow access to credit to persons otherwise unable to borrow. Because, by its very nature, a cooperative institution must serve a limited market, the legislative history of Section 109 demonstrates that one of the interests "arguably…to be protected" by Section 109 is an interest in limiting the markets that federal credit unions can serve (Supreme Court, 1998, footnote 6, pp. 8-9).

Thus, a credit union would become inefficient if it grew beyond its "limited market," as defined by its common bond.

At a different point in its opinion, however, the majority accepted the argument that credit unions with multiple groups of members would be *more* formidable competitors to banks and thrifts than single-group institutions. The majority argued that an expansive interpretation of the 1934 Act "would allow the chartering of a conglomerate credit union whose members included the employees of every company in

the United States (1998, p. 3)." In other words, credit unions would overwhelm banks and thrifts unless otherwise constrained.

The irony is, of course, that the argumentation based on the reductio ad absurdum of a hypothetical "conglomerate credit union" did not mention the legislative history of the 1934 Act, which had essentially predicted that such a huge credit union would not have been a safe and sound financial institution, nor consequently a viable one in the long run.

III. The Model and Simulation

In this section we present a simple model of credit-union formation and consolidation. We then describe the results of a simulation of the model. Subsequent sections of the paper discuss testable hypotheses emerging from the model, the data we examine, and empirical results.

A. The model

We take for granted that credit unions are typically very small; that they encounter operating economies of scale as they expand from a very small base of members and assets; and that they face direct competition from banks. The key trade-off we model is between decreasing affinity among members as the potential membership grows (i.e., as a given common bond is extended to more people)—making a credit union less effective— versus the increasing scale economies that come with a larger base of members and assets—making a credit union more effective. We show that the ability of credit unions to expand by adding multiple common bonds to their membership groups affects this trade-off in an important way.

We examine a Hotelling (1929) economy consisting of a "city" that lies on a straight line of unit length. The city's length is covered by a continuum of households the location of each of which corresponds to the household's preferences for banking services. In particular, each household demands exactly one unit of banking services but the nature of desired services differs. Preferences are in reality multidimensional, encompassing tastes for different menus of financial services, different levels of service, or different locational preferences, but we assume for the sake of simplicity that a household's preferences for banking services can be represented in terms of a single index running from zero to one. Figure 1 depicts the linear-city model.

Because we are interested only in the formation and consolidation of credit unions, we assume that credit unions are scarce (or differentiated) while commercial banks are ubiquitous (or uniform). In other words, consumption of credit-union provided financial services takes place at the point on the unit interval where a credit union is located, while commercial-bank services are available at a fixed price at any point on the line. This assumption makes household preferences critical for the existence of and participation in credit unions while maintaining the realistic assumption that commercial banks always provide an alternative to credit unions.

We assume that the entire city (i.e., every point on the line) is covered by at least one household and at most two households. Without loss of generality, we assume that all points covered by two households are arrayed continuously from zero upward toward, but potentially short of, one on the unit interval. For expositional purposes, we will refer to the households that inhabit the completely covered zero-to-one interval as being above the line and all others as below the line. Thus, two households that possess identical locations (preferences) are said to be "back-to-back" households.

Households are further grouped by affinity, or common bonds. For tractability, we discuss occupational common bonds and limit the number of employers in the economy to three. Each household located above the line contains an employee of either firm A or firm B (but not both). Because all households in employee group A share a common bond, they are located in a contiguous segment of the line that does not overlap the domain of employee group B. All households below the line contain employees of firm C. Each employer may sponsor a credit union, although, as we will see, not all will necessarily do so.

We examine two periods (or regimes), differentiated according to the permissability of forming credit unions with multiple common bonds. All households are born at the start of period one and live through the end of period two. Each household needs to consume one unit of banking services in each period. These services can be provided by an occupational credit union or by a bank in either period.

At the beginning of the first period, households find themselves arrayed along the city's unit interval. The lengths of the firm-A and firm-C segments are distributed as uniform random variables on the [0, 1] interval. The length of the firm-B segment is one minus the length of the firm A-segment.

Suppose first that each of the three employers sponsors a credit union (in the simulation below, not all firms necessarily sponsor a credit union). All credit unions are restricted to a single employee group in the first period. Each credit union has a life span of one period. The credit unions have idiosyncratic technologies for producing banking services. In particular, each operates with fixed costs $f_i = f_a + (f_b \times e_i)$, where f_a and f_b are common to all credit unions and e_i is an i.i.d. uniform random variable. In addition, each credit union faces constant marginal costs of v per unit of banking

services provided. Thus, a credit union's cost function is $C(m_i) = f_a + (f_b \times e_i), + v \times m_i$, where m_i is the number of actual members in the credit union, and $i = A, B, or C$.

At the beginning of period one, households vote on the credit-union management team for that period only. Voting is costless, so every household votes according to its preferences. The one household - one vote principle applies and side payments (bribes) are allowed, so we are assured that a socially optimal outcome emerges. The potential members choose a management team that locates the credit union to minimize the sum of member travel costs (see below). It is clear that the credit union will locate in the center of the preference spectrum of all potential members because we make the assumption that travel costs are quadratically increasing in the distance between member households and the credit union.

Credit-union services are offered at the price p_i to all potential members of a credit union (i.e., employees of the relevant firm). The price equals the credit union's average costs (AC_i) because credit unions are by their nature not-for-profit institutions. Households face marginal costs of $t \times d$ per unit of distance d when "travelling" to a credit union because the credit union's banking services are in general not identical to a given household's preferences (i.e., location on the line). Thus, the cost of using credit union i at a distance d_j from household j's location is $t/2 \times d_j^2$. Each household can also access banking services from a commercial bank at a constant price c. Together, these assumptions imply that the membership of credit union i will comprise all households j within the potential membership for which the following inequality holds (see also Figure 2):

$$p_i - c \leq t/2\, d_j^2$$

In particular, the marginal—i.e., most distant— households will be the ones (on either side of the credit union) for which the expression holds at equality:

$$p_i - c = - t/2 \times d^{*2}$$

As Figure 2 illustrates, not every potential member joins the credit union. For households relatively far from the credit union (at a distance greater than d^*), the household buys banking services from a commercial bank instead. The number of members credit union i attracts is therefore $2d^*$, which we will denote m^*.

Because the average cost as a function of the number of credit-union members, m, is $(f + mv) / m$, and price must be equal to average cost, we now obtain an expression relating the distance between the marginal member and the credit union, d^*, and the optimal number of members in the credit union, m^*:

$$- t/2 \times d^{*2} + c = (f + m^* \times v) / m^*. \qquad (1)$$

But we know that $d^* = m^* / 2$, so we can substitute in (1) for d^* to obtain a (cubic) expression that determines the optimal number of credit-union members, m^*, with respect to the demand-side parameters c and t (price of commercial-banking services and the travel-cost parameter, respectively), as well as the supply-side parameters f and v (fixed and variable costs of credit-union production of financial services, respectively):

$$– t/2 \times (m^* / 2)^2 + c = (f + m^* \times v) / m^*. \qquad (2)$$

The economic interpretation of the optimality condition (2) is straightforward (although its mathematical solution is non-trivial). The left-hand side represents the demand curve for credit-union services, while the right-hand side represents the average-cost (supply) curve of the credit union. Both curves are downward sloping (see Figure 3). For $m^{pot} > m^*$, where m^{pot} is the potential membership of the credit union, we obtain an interior solution. In other words, the participation rate—the fraction of the potential membership that chooses to join the credit union— is lower than one. For $m^{pot} < m^*$, on the other hand, the participation rate is equal to one because all potential members choose to join.

Notice that, if the domain of potential members of a credit unions is too small, the supply and the demand curves may not intersect. In this case, the credit union cannot operate (see Figure 4). Mathematically, there may be no real m* that satisfies (2).

The second period of the model corresponds to a regime in which the law allows credit unions to serve groups of households united by different common bonds (e.g., employees of both firms A and B). A new management team must be selected at the beginning of period two to operate each credit union. New credit unions may be formed in which multiple occupational groups are included. In addition to single-employer credit unions, we now might see four other combinations of common bonds:

- A multiple-group credit union encompassing employees of firms A and B plus a single-group credit union serving employees of firm C;
- A multiple-group credit union encompassing employees of firms A and C plus a single-group credit union serving employees of firm B;
- A multiple-group credit union encompassing employees of firms B and C plus a single-group credit union serving employees of firm A; and
- A multiple-group credit union encompassing employees of firms A, B, and C.

As in period one, none of these credit unions necessarily exists; the particular configuration of parameters will determine the outcome.

For simplicity, we focus on an economy in which side payments are allowed and thus, the socially optimal combination of occuptional groups will be chosen with certainty. As in period one, the new credit unions will be located in the center of the preference spectrums of their potential members in period two. Before voting, all potential members of the various credit unions observe the (random) technology the new credit unions possess. These are drawn anew at the beginning of period two.

After the new credit unions have been established, each household either purchases one unit of banking services from the credit union or it buys them from a commercial bank. The economy ends after period two.

Finally, we point out several comparative-static features of the model. The two important demand-side parameters are *t*, the households' travel-cost parameter, and *c*, the cost of alternative banking services as provided by a commercial bank. Recalling Figure 3, which shows the demand and supply curves facing a credit union, it is clear that as a household's travel costs increase—which we could interpret as an increase in the strength of a household's preferences for its ideal bundle of banking services—, the demand for credit-union services declines. This causes the demand curve to shift downward, decreasing m^*. That is, the optimal size of the credit union declines. On the other hand, an increase in the price of commercial-bank provided financial services, *c*, shifts the demand curve up. This has the opposite effect on the optimal size of the credit union, increasing m^*.

The important supply-side paramenters of the model are *f*, the credit union's fixed cost, and *v*, the credit union's variable cost of providing banking services. An increase in *f* pushes the supply curve of credit-union services up, with the sharpest increase at low

levels of membership. An increase in the variable cost of credit-union production also translates into an upward shift of the supply curve. In both cases, the size of the potential membership required to achieve full participation increases.

B. Simulation of the model

We simulate the model by drawing repeatedly (10,000 times) a set of five uniformly distributed random numbers from the [0, 1] interval. The first draw determines the length of the segment containing households with an employee of firm A. Recall that the length of the segment containing firm-B households equals one minus the length of the firm-A segment. The second draw determines the length of the segment containing households with an employee of firm C. This determines the length of the line segment that is covered by two households. The last three random numbers enter the three (potential) credit unions' cost functions as stochastic elements of their fixed costs (denoted e_i in the model description above, $i = A, B, C$). These random elements in the credit unions' cost functions ensure that a "conglomerate" credit union consisting of the employees of all three firms is not degenerate— i.e., existing with probabilities of either zero or one.

Recall that in the first period, all credit unions must consist of a single common bond. The first step in the formation of a credit union is a vote by the potential membership on the management team. Since side payments (bribes) are allowed, the team that minimizes the sum of the travel costs of all potential members— i.e., which picks the most central location— will win. In a second step, all households decide whether to become members or to purchase financial services from a commercial bank.

We calculate the preferred outcome for each group of households in turn (A, B, and C). The equilibrium solution for each employee group must be one of three

possibilities: the credit union exists at a corner solution, in which all households participate; the credit union achieves an interior solution with a participation rate less than one; or the credit union does not exist. To compare the various outcomes, we calculate a welfare index for each group of households. The index equals the sum of the production costs of the credit union (if it exists), the travel costs incurred by households that use credit unions, and the expenditures made by households that obtain financial services from a commercial bank:

$$-(f + mv) - \int_0^{d^*}\int_0^{d^*} td \; \mathrm{d}d \; \mathrm{d}d - \left(m^{pot} - m\right) \; c. \tag{3}$$

In the second period, multiple-group credit unions are allowed. We iterate through the possible combinations by first allowing mergers between two given credit unions and forcing the third to operate independently (if it exists). Then we allow all three credit unions to merge. This results in the four possible regimes described above:

- A multiple-group credit union for firms A and B plus a single-group credit union at firm C;
- A multiple-group credit union for firms A and C plus a single-group credit union at firm B;
- A multiple-group credit union for firms B and C plus a single-group credit union at firm A; and
- A multiple-group credit union for firms A, B, and C.

In each regime, households vote on the management team (i.e., choose the credit union's location). In particular, households choose between a team that would operate the credit unions independently and a team that would merge them. Because bribing is allowed, the team that maximizes the welfare index over all potential members

will win. It is possible that a stand-alone credit union that could not exist on its own could be part of a multiple-group credit union. The reason is that the post-merger credit union is able to spread its fixed costs over a larger membership. It is also possible that a credit union that could not exist on its own is also not viable as part of a multiple-group credit union. On the other hand, any employee group that is served by a credit union in period one will also be served by a credit union in period two because all mergers must be welfare-enhancing.

Table 1 displays a summary of the simulation results.[4] The table presents two measures of credit-union activity: the fraction of all employee groups served by a credit union and the fraction of households served by a credit union. When only single-employer credit unions are allowed (Period One), only six percent of employers actually sponsor a credit union and only four percent of households actually belong to credit unions. Among households that are eligible to join a credit union, some 50 percent do so. All other households use commercial banks to obtain financial services. We have chosen parameter values to reflect the fact that single-group credit unions are relatively small and may not be viable for many employee groups.

The bottom part of Table 1 presents results when multiple-group credit unions are allowed (Period Two). It is clear that the permissability of multiple common bonds dramatically increases the viability of credit unions. When two employee groups are combined in a single credit union (A and B, A and C, or B and C), the fraction of employee groups in the economy served by a credit union rises to between 14 and 50 percent, while the fraction of households served by a credit union rises to between four

[4] Table 1 uses the following parameter values: $t = 22$; $v = 1$; $c = 1.6$; $f_a = 0.1$; and $f_b = 0.1$. Table 2 provides comparative-statics results for small changes in t and c.

and 37 percent, depending on the combination.[5] When all three employee groups are allowed to combine in a single credit union (A and B and C), the fraction of employee groups served by a credit union jumps to 49 percent, although only 30 percent of households are served.

Examination of column (7) indicates that multiple-group credit unions comprising groups A and B or A and B and C are characterized by relatively low participation rates. This reflects the fact that many members of employee groups A and B are located far from any multiple-group credit union, reducing their incentive to join. The credit union formed by employee groups A and C alone, on the other hand— what we have termed the "back-to-back" groups— is characterized by a very high participation rate (77 percent of those eligible actually join).

In general, the rate at which households join credit unions does not change a great deal when multiple-group credit unions are allowed (see column (5), where the exception is the credit union comprising groups A and C). Thus, it is clearly the fact that more credit unions are viable when multiple common bonds are allowed that is responsible for their expanded role in the economy, rather than greatly increased participation rates per se (although this may also play a role in some cases). Comparison of columns (2) and (3) shows that newly viable multiple-group credit unions are indeed the key to greater credit-union access by households, as the lion's share of all credit unions in every possible configuration in Period Two include multiple common bonds.

The final row of Table 1 presents the social optimum, which is the welfare-maximizing combination of single- and multiple-group credit unions that is feasible in the

[5] In all simulations of multi-group credit unions, we allow the employee group not involved in a possible merger to operate (or not) according to its own situation. In addition, in economies

economy. Multiple-group credit unions serve 93 percent of all employee groups in the social optimum, while single-group credit unions serve only two percent. Average household participation rates are similar across the two types of credit unions, with the multiple-group average slightly higher except when groups A and B are included (columns (6) and (7)). Even in these cases (including A and B or A and B and C), the multiple-group credit union participation rates are higher than single-group rates *for a given level of potential membership* (e.g., when both a single-group and a multiple-group credit union have potential membership of one half).

The averages presented in Table 1 conceal two important features of credit unions in our model, however. Figure 5 is a scatterplot showing the participation rates of all the (optimally formed) credit unions from our 10,000 runs as a function of potential membership. The horizontal scale runs from about 0.1 (the minimum segment length needed to support a credit union under our baseline parameterization) to 2.0 (the sum of two unit-length segments, corresponding to the maximum potential membership of any multi-group credit union). The two distinct downward-curving sets of points represent the declining participation rates of single-group (the left-most set of points, ending at 1.0) and multiple-group credit unions (the right-most arc of points plus some lower points near the center of the chart), respectively.

Figure 5 gives a clear visual representation of the first important result obscured by average participation rates. This is that participation rates of multiple-group credit unions lie above those of single-group credit unions for a given number of potential members. This points to the fact that multiple-group credit unions can be closer to the average member's preferences due to the existence of "back-to-back" households. This

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where proposed multiple-group credit unions are not feasible, all individual employee groups may form a single-group credit union if it is feasible to do so.

effect is entirely due to the households in employee group C in our model, whose preferences overlap those of some households in other employee groups.

The second important feature of the model that is not revealed in the table is the downward slope of both main sets of points. This implies that a larger potential membership reduces the participation rate of any credit union, ceteris paribus. Given the travel costs that represent preference heterogeneity among the potential membership, it is not surprising that credit unions that span a more heterogeneous set of households are able to attract proportionately fewer of them.

Table 2 presents comparative-static results for small changes in the parameters t and c (the travel parameter and commercial-bank prices, respectively). The first row restates the results of the benchmark simulation summarized in the last row of Table 1. Columns (1)-(5) show the number of times in the 10,000 runs of the simulation that each configuration of credit unions was optimal. The most frequently preferred configuration was a two-group credit union comprising employee groups A and C (column (3)). In this configuration, employees of firm B were sometimes served by a credit union and sometimes not; the feasibility of a credit union for employee group B depends on the random technology of the potential credit union. The next most frequently preferred configuration involved a three-group credit union. Across all simulations, almost 27 percent of employee groups were left unserved by credit unions even though all mergers were chosen optimally (this figure is calculated from column (6), which is divided by the total number of employee groups in the simulation, 30,000). It is apparent that participation rates of multiple-group credit unions (column (10)) are dragged down primarily by the relatively low participation rate in three-group credit unions (recall the result from column (7) of Table 1).

The first comparative-static exercise we performed is summarized in the second row of Table 2. When the price of financial services offered by commercial banks rises, the fraction of employee groups as well as the fraction of households served by credit unions increases, as expected. From column (6) we know that only 16 percent of employee groups have no credit union after the higher cost of bank-provided services is imposed, while only 46 percent of households use a commercial bank (down from 57 percent in the benchmark case; see column (7)). Interestingly, all of the multiple-group credit unions are increasingly preferred when banking services become more costly, while only the single-group credit unions become less likely to be optimal. A higher price for bank-provided services is predicted by higher banking concentration in the structure-conduct-performance paradigm, and our comparative-static result demonstrates that credit unions are indeed likely to benefit from such concentration and high bank prices.

The second comparative-static result we computed is summarized in the last row of Table 2. When the cost of travelling to a credit union is increased— intuitively, when preferences for banking services become more idiosyncratic or strongly held— both the fraction of employee groups served by credit unions and the participation rate of households declines (columns (6) and (7)-(10), respectively). Compared to the benchmark case, the number of single-group credit unions in optimal configurations increases (column (1)). On the other hand, multiple-group credit unions appear somewhat less attractive (columns (2)-(5)).

Taken together, the comparative-static results in Table 2 indicate that the optimal configuration of credit unions in the economy is sensitive to model parameters such as the market price of bank-provided financial services and the intensity of preferences for specific bundles of banking services. On the other hand, we are left with the impression that the existence of, and household participation in, credit unions are not dependent on

particular parameter constellations. With the flexibility provided by mergers of multiple membership groups, credit unions appear at least potentially capable of providing important competition for commercial-bank provided financial services.

C. Hypotheses

Based on our theoretical model and the insights delivered by simulating it, we are now in a position to state several testable hypotheses. The hypothese are of three types, focusing in turn on characteristics of individual credit unions themselves and on market conditions as determinants of credit-union participation rates, and finally on the validity of our maintained assumption that credit unions face scale economies in production of financial services.

First, we focus on participation rates at credit unions. We suggest that a credit union is more successful in providing services to its constituency, the higher is its participation rate, all else equal. Consequently, our first two null hypotheses are:

- HYPOTHESIS 1. A credit union's participation rate is invariant to the number of its potential members, all else held constant.
- HYPOTHESIS 2. The participation rate is the same for single-group and for multiple-group credit unions, all else held constant.

The second type of hypothesis we consider concerns the effects of local banking-market conditions on credit-union participation rates:

- HYPOTHESIS 3. A credit union's participation rate is invariant to the level of local bank-deposit concentration, all else held constant.

Finally, we investigate the validity of our maintained assumption that credit unions face scale economies in production:

- HYPOTHESIS 4a. A credit union's cost ratio is invariant to the number of its potential members, all else held constant.
- HYPOTHESIS 4b. The cost ratio is the same for single-group and for multiple-group credit unions, all else held constant.
- HYPOTHESIS 4c. A credit union's cost ratio is invariant to its level of total assets, all else held constant.

The next section describes the data and empirical methods we employ in testing these hypotheses.

IV. Data and Empirical Methods

We examine a subset of all federally chartered and federally insured occupational credit unions in 1996 (see Appendix 3 for details on construction of the dataset). Table 3 provides a breakdown of our sample according to the type of membership group characterizing each credit union. The table distinguishes between credit unions with a single common bond and those with multiple common bonds. Credit unions sponsored by a single educational institution, for example, numbered 299 in our sample. Credit unions with a membership comprising multiple common bonds, most of which were educationally oriented, numbered 469, and so on for the other membership types. Overall, 1,980 credit unions in our sample had a single common bond (41.8 percent of the sample) while 2,753 credit unions had multiple common bonds among the membership (58.2 percent).

In addition to data on individual credit unions, we collected two types of environmental variables. To control for differences in local economic conditions, we gathered growth rates of real gross state product for each state. We also calculated the

Herfindahl index of concentration of bank deposit shares in each credit union's local banking market.

We test our hypotheses using a semi-parametric model of a credit union's participation rate of the form

$$y_i = x_{pi} \times \beta_p + f(x_i) + \varepsilon_i, \qquad i = 1, \ldots, n \tag{4}$$

where y_i is the *i*-th observation of the dependent variable; x_{pi} is a row vector consisting of the *i*-th observation of the explanatory variables of the linear (parametric) part of the model; β_p is a (column) vector of the parameters of the linear part of the model; x_i is a vector consisting of the *i*-th observation of the explanatory variables in the nonparametric part of the model; and ε_i is the i-th realization of the error term.

We use a semi-parametric model in order to isolate independent variables whose effects we expect to be non-linear, such as the number of members or total assets. The parametric part of the model contains independent variables whose effects may be approximately linear, such as the Herfindahl index.

Our hypotheses are framed in terms of two different dependent variables, namely: 1) PARTICIPATION, the participation rate of those eligible to join the credit union, defined as the number of actual members divided by the number of potential members as specified in the credit union's charter; and 2) COST, the credit union's total operating expenses divided by total assets. The independent variables of interest are the number of members (Mem)—or the number of potential members (PotMem) when we examine participation rates—, total assets (TA), and the Herfindahl index of local bank-deposit concentration (Herfindahl). Figure 6 shows a scatterplot relating the log of the number of members with the log of total assets at all credit unions in our sample. These two measures are positively but not perfectly correlated.

Membership, potential membership, and total assets are included in the nonparametric part of the model in logarithmic form and are lagged by one period (LogMem; LogPotMem; LogTA). The parametric part of the model includes the following: a 0/1 variable (MultGroup) that is equal to one if the credit union has multiple groups and zero if the credit union's membership comprises a single common bond; a county-specific Herfindahl index of bank deposits; the log growth rate of the credit union's home state's real state gross product (GrRealGSP); and 0/1 variables representing the type of membership of a particular credit union. Membership types include educational, military, government, manufacturing, and services classifications. Because a dummy variable is included in the nonparametric part, we must drop one of the dummy variables; we chose the educational dummy variable for exclusion.

Table 4 presents descriptive sample statistics for the dependent and some of the independent variables. The participation rate among sample credit unions ranged from three percent to 100 percent, with the median at 62 percent. The median cost ratio was 3.90 percent, with a range of 0.63 to 41.70 percent of assets. Total assets ranged from $43,000 to $8.92 billion, with the median credit union holding $6.23 million in assets. The number of actual and potential members ranged from 45 to 1.6 million and 75 to 2.03 million, respectively, while median actual and potential membership counts were 1,865 and 3,198, respectively. Finally, Herfindahl indexes in relevant banking markets ranged from 0.0535 to 1.00 (where the index is defined on an interval (0,1]) with a median value of 0.1966.

V. Empirical Results

Our results are presented in two sections according to the dependent variable we investigate, first the participation rate and then the cost ratio.

A. Participation rates

Hypothesis 1 concerns the relationship between the size of a credit union's potential membership and its participation rate, while Hypothesis 2 concerns the relationship between a credit-union's common-bond status (single or multiple) and its participation rate. Regressions including PARTICIPATION are the only ones in which we use the lagged value of the log of potential members (instead of log of actual members). This is because we seek to determine how effective a credit union is in exploiting the (predetermined) economic potential it faces.

Figure 7 provides visual evidence of a strong rejection of the null in Hypothesis 1 (no relationship between participation rates and potential membership). As we found in simulating our model (recall Figure 5), the data indicate that there is a negative relationship between the size of the membership pool and the participation rate.[6] A statistically significant negative relationship is evident for all but the very smallest and very largest credit unions, where widening confidence intervals due to the presence of relatively few observations make inference unreliable in any case.

Table 5 provides evidence on the question of whether credit-union participation rates differ when comparing credit unions with a single common bond to those with multiple common bonds, holding all else equal (Hypothesis 2). Parallel to our findings with respect to the detrimental effect of increasing size of the potential membership on

[6] The series of plots presented in Figures 7-9 are "conditioning plots" (see Cleveland and Devlin, 1988; also see Appendix 3 of this paper for details). The dotted lines in Figures 7-9 are 90-percent confidence bounds. In each plot, one variable is kept at its median value while the other variable (identified on the abscissa) is allowed to vary. The graph displays the impact of this independent variable on the level of the dependent variable. In other words, the slope of the graph at a particular point reflects the marginal impact of the independent variable at that point. The intercept is not identified in regressions of this type, so only vertical distances are meaningful (not the level itself). In sum, the key to interpreting these graphs is to focus on the slope of the curve and on the vertical differences along the abscissa.

participation rates (Figure 7), we find support for a positive influence on participation rates of multiple groups because this implies *smaller* average group size. The positive and significant co-efficient estimate on MultGroup in Table 5 conforms with our simulation results, as well (recall Figure 5).

This important result should not be interpreted as unambiguous support for multiple-group credit unions, however. Our analysis holds constant important credit-union characteristics— most notably the size of the potential membership—when evaluating the partial impact of a single variable. This result applies to a comparison of two credit unions with essentially identical potential memberships, levels of assets, local banking concentration, etc., where one credit union's potential membership comprises a single common bond and the other's comprises multiple common bonds. The result does *not* apply to a credit union with a single common bond among its members that expands by adding another group to its membership. In this case, the potential membership increases, violating the ceteris paribus assumption of our analysis. As noted above, the predicted impact of a larger potential membership is negative.

Another interesting result in Table 5 is the positive and significant co-efficient on the Herfindahl index of bank deposit concentrations in credit unions' local markets (Hypothesis 3). This indicates that, the more concentrated is the local banking market, the higher is the level of participation among potential members in the credit union. In other words, credit unions may provide an attractive alternative for consumers who are faced with a relatively uncompetitive local banking market.

In sum, our first set of results using participation rates among potential members as the dependent variable reveals that credit-union participation rates deteriorate as the size of the potential membership increases. This indicates that increased membership heterogeneity (travel costs in our theoretical model) is detrimental. Relatedly, multiple

common bonds can improve credit-union participation rates if they are associated with increased credit-union operating scale while minimizing membership heterogeneity. Intuitively, credit-union mergers are most likely to be successful when new members have preferences that are "back-to-back" with those already in a given credit union.

B. Cost ratio

Hypotheses 4a, 4b, and 4c refer to tests of an important maintained assumption of our model, namely, that a credit union's operating expenses should decline with an increase in its scale of operation. Figure 8 indicates that COST tends to rise over a range of membership levels before declining (Hypothesis 4a). Our maintained assumption of scale economies predicts declining average costs as the scale of operations increased (especially for very small credit unions), but it is also likely to be the case that unrecorded operating subsidies (such as rent-free office space, volunteer workers, etc.) distort the cost accounting of some credit unions while varying levels of service provision across the spectrum of credit unions entail differing cost structures.

Table 6 indicates that there is a strong positive relationship between the existence of multiple membership groups in a credit union and COST, in contrast to the null of Hypothesis 4b. In other words, the smaller the average membership group, the higher is the cost ratio. This is consistent with most credit unions operating in the range of positive scale economies. Similarly, Figure 9 indicates that the greater the level of assets held by a credit union, the lower is COST, contradicting the null of Hypothesis 4c.

It is noteworthy that the significantly negative co-efficient on the Herfindahl index in Table 6 implies that higher levels of bank concentration in a local market lead to lower levels of the cost ratio reported by credit unions. One possible explanation for this

finding is that credit unions may provide lower levels of service in less competitive markets, perhaps following the lead of local banks.

VI. Conclusions

We investigate the relationships between several proxies for the size of credit unions—measured as the number of members in a credit union, the amount of total assets on its balance sheet, and the existence of a single or multiple common bonds among its membership— and two measures of credit-union activity. We also examine the role of several environmental variables, such as economic conditions and banking concentration in the local market.

We find that a larger potential membership translates into lower participation rates. Furthermore, direct examination of the independent effect of multiple common bonds shows that multiple-group credit unions have higher participation rates, all else equal. We also find evidence that credit unions in more concentrated banking markets experience higher participation rates among potential members.

While greater asset size does appear to be associated with lower average costs, holding all else equal, we find that a larger number of members is associated with a lower cost ratio only for larger credit unions. On the other hand, multiple-group credit unions have higher costs on average, all else equal, indicating that scale economies are important overall. We also find that credit-union cost ratios are higher in more concentrated banking markets, consistent with the desire of credit-union managers to enjoy a "quiet life" when possible.

Our findings are particularly interesting in light of the recent AT&T Family Credit Union case decided by the Supreme Court in February 1998, and its sequel in the U.S. Congress that culminated in the Credit Union Membership Access Act of August 1998.

This new federal legislation upholds the right of federally chartered credit unions to grow under an expansive definition of the common-bond requirement. The new law allows multiple groups of members to belong to a single credit union as long as the members of each group are united by a common bond. This statute therefore upholds regulatory actions taken in recent years and overturns the Supreme Court's narrow reading of the 1934 Federal Credit Union Act restricting a federal credit union to a single common bond.

While some positive operating efficiencies might be expected from a larger credit union measured in terms of total assets, the negative effects of a larger membership may overwhelm any such technical gains. Hence, the desirability of allowing credit unions to expand by adding multiple membership groups, each with its own common bond, must be weighed very carefully. A credit union with multiple common bonds is very likely to perform better than another credit union with only a single common bond only if the two institutions are otherwise very similar.

REFERENCES

American Bankers Association, *The Credit Union Industry: Trends, Structure, and Competitiveness* (Washington, D.C., 1989).

Berle, Adolph A., and Gardiner C. Means, *The Modern Corporation and Private Property* (New York: Harcourt, Brace & World, 1932).

BNA Banking Report, "House Passes Credit Union Bill; Clinton Wastes No Time Signing It," August 10, 1998, Vol. 71, No. 6.

Cleveland, William S., and Susan J. Devlin, "Locally Weighted Regression: An Approach to Regression Analysis by Local Fitting," *Journal of the American Statistical Association* 83 (1988), September, No. 403, pp. 596-610.

Cleveland, William S., Susan J. Devlin, and E.H. Grosse, " Regression by Local Fitting: Methods, Properties and Computational Algorithms," *Journal of Econometrics* 37 (1988), pp. 87-114.

Hastie, Trevor J., and Bovert J. Tibshirani, *Generalized Additive Models* (London: Chapman and Hall, 1990).

Haver Analytics, 1998.

Hotelling, Harold, "Stability in Competition," *Economic Journal* 39 (1929), pp. 41-57.

Gorton, Gary, and Frank Schmid, "Corporate Governance, Ownership Dispersion, and Efficiency: Empirical Evidence from Austrian Cooperative Banking," Forthcoming in *Journal of Corporate Finance*, 1998.

Kane, Edward J., and Robert Hendershott, "The Federal Deposit Insurance Fund that Didn't Put a Bite on U.S. Taxpayers," *Journal of Banking and Finance* 20 (1996), pp. 1305-27.

Speckman, Paul, "Kernel Smoothing in Partial Linear Models," *Journal of the Royal Statistical Society B* 50 (3), 1988, pp. 413-436.

Supreme Court, "National Credit Union Administration, Petitioner, v. First National Bank & Trust Co., et al.; AT&T Family Federal Credit Union, et al., Petitioners, v. First National Bank and Trust Co., et al." Decided Feb. 25, 1998. Nos. 96-843, 96-847. 118 S. Ct. 927.

U. S. Treasury Department, *Credit Unions* (Washington, D.C.: USGPO, 1997).

White, Halbert, "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity," *Econometrica* 48 (1980), pp. 817-838.

APPENDIX 1

CREDIT UNIONS IN THE CONTEXT OF THE GREAT DEPRESSION

Much of the federal financial legislation enacted in the United States in the years leading up to, during, and immediately after the Depression focused on enhancing the safety and soundness of individual financial institutions. Traumatized by the failures of thousands of banks and other financial institutions in the 1920s and 1930s, Congress sought to re-inforce the financial system by strengthening its individual components. Among many other federal initiatives, the period 1929-1940 saw the enactment of the following financial legislation:

- The McFadden Act (1927), prohibiting interstate bank branching;
- The Banking Acts of 1933 and 1935, creating federal deposit insurance and separating commercial from investment banking;
- The Federal Savings and Loan Act (1934), creating a federal savings and loan charter and federal deposit insurance for savings institutions;
- The Federal Credit Union Act (1934), creating a federal credit union charter and establishing a "common-bond" requirement for members;
- The McCarran-Ferguson Act (1934), eliminating competition across state lines among insurance companies;
- The Securities and Exchange Act (1935), strengthening public disclosure requirements and the governance of securities exchanges; and
- The Investment Company Act (1940), strengthening regulation of mutual funds.

The predominant themes of this legislative era were to restrict competition among and between financial institutions and to increase governmental involvement in monitoring and sharing risk. Very little explicit attention appears to have been paid to the negative

implications for operating efficiency that were an inevitable byproduct of the new and restrictive institutional arrangements.

Ironically, the Depression-era consensus regarding anti-competitive legislation of financial institutions unravelled in the 1980s and 1990s not merely because its efficiency-sapping effects became evident for all to see in the rapidly declining market shares of heavily regulated financial institutions. Instead, the clinching argument in the case for financial reform was the failure of the system to achieve its primary objective—namely, the maintenance of safe and sound financial institutions. In the end, the gross inefficiencies imposed on regulated financial institutions, together with ill-structured incentives emanating from the federal safety net, a series of economic and financial shocks, and inadequate supervision, had led many regulated institutions to take inordinate risks with their owners' capital and taxpayers' guarantees. Recent experience has demonstrated that, while efficiency concerns may be swept under the rug in the short run in order to increase safety and soundness, in the long run no such trade-off exists—reduced efficiency ultimately undermines safety and soundness as well.

APPENDIX 2

THE CREDIT UNION MEMBERSHIP ACCESS ACT

President Clinton signed the Credit Union Membership Access Act on August 7, 1998, following approval in the Senate on July 28 and in the House of Representatives on August 4. The Act substantially reverses a Supreme Court ruling handed down on February 25, 1998, that would have barred federally chartered credit unions from accepting multiple membership groups, each with its own common bond.

This landmark credit-union legislation represents a major defeat for the top lobbying group representing commercial banks, which had argued successfully at the Supreme Court that credit unions with multiple common bonds violated both the letter and the spirit of federal legislation dating from 1934. The subsequent legislative response in support of multiple common bonds at credit unions was swift and overwhelming, passing both chambers with large majorities.

The Act contains three provisions upholding the rights of federal credit unions to serve membership groups encompassing multiple common bonds. First, all federal credit unions that already included multiple common bonds before February 25, 1998, were allowed to continue operating without interruption. Second, all federal credit unions were given the right to accept additional membership groups with multiple common bonds so long as the relevant groups have fewer than 3,000 members. Third, the Act gives the National Credit Union Administration the right to grant exemptions to the 3,000-member limit under certain circumstances, such as when the group in question could not reasonably support its own credit union.

Other important provisions of the Act include the following:

- Requires annual independent audits for insured credit unions with total assets of $500 million or more;

- Authorizes and clarifies a federally insured credit union's right to convert to a mutual savings bank or savings association without prior NCUA approval;
- Limits business loans to members to 12.25 percent of total assets;
- Establishes new capital standards for insured credit unions similar to those enacted for banks and thrifts in 1991;
- Gives the NCUA authority to base deposit-insurance premiums on the reserve ratio of the insurance fund;
- Directs the Treasury to report to Congress on differences between credit unions and other federally insured financial institutions, including the potential effects of applying federal laws—including tax laws— to credit unions.

Hailing the new legislation, President Clinton said, "This bill ensures that consumers continue to have a broad array of choices in financial services….and [makes] it easier for credit unions to expand where appropriate." Meanwhile, a spokeswoman for the American Bankers Association termed it "ironic" that the bill was presented as a measure to protect credit unions because in the long run, she said, it will dilute them, turning them into larger and larger institutions.

Source: *BNA Banking Report*, "House Passes Credit Union Bill; Clinton Wastes No Time Signing It," August 10, 1998, Vol. 71, No. 6.

APPENDIX 3

ECONOMETRIC METHODOLOGY, DATASET AND VARIABLES

I. Econometric Methodology

We estimate a semi-parametric model of the additive partially linear type

$$y_i = x_{pi} \times \beta_p + f(x_i) + \varepsilon_i, \qquad i = 1, \ldots, n \tag{A1}$$

with y_i : i-th observation of the dependent variable

x_{pi}: row vector of the i-th observation of the explanatory variables of the linear (parametric) part

β_p: (column) vector of the parameters of the linear part

x_i : vector of the i-th observation of the explanatory variables in the nonparametric part

ε_i : i-th realization of the error term.

We estimate the model following Speckman (1988). In a first step, y is smoothed on the variables in the nonparametric part of the semi-parametric model. The "smoother" matrix, S, establishes a linear relationship between y and the estimate $\hat{y}$:

$$\hat{y} = S \times y \tag{A2}$$

We use the smoother LOESS (locally weighted regression) as developed by Cleveland and Devlin (1988) and Cleveland, Devlin and Grosse (1988). In contrast to univariate smoothers (e.g., kernel methods) that are used in conjunction with the

backfitting algorithm, this so-called "locally weighted running-line smoother" does not impose the restriction that the influence of the explanatory variables within the nonparametric part is additive (Hastie and Tibshirani, 1990, pp. 29-31). We use locally quadratic fitting with a smoothing parameter of 0.3.

In a second step, the vector containing the dependent variable and the matrix of the explanatory variables of the parametric part are adjusted for the influence of the nonparametric part:

$$\tilde{y} = (I - S) \times y \tag{A3.a}$$

$$\tilde{X}_p = (I - S) \times X_p \tag{A3.b}$$

with I being the identity matrix.

In a third step, the vector β_p is estimated using ordinary least squares:

$$\hat{\beta}_p = (\tilde{X}'_p \tilde{X}_p)^{-1} \times \tilde{X}'_p \tilde{y}. \tag{A4}$$

As Speckman (1988) has shown, the bias of the estimator $\hat{\beta}_p$ is asymptotically negligible.

The estimated impact of the explanatory variables in the partially linear model is given by

$$\hat{f}_p = S \times (y - X_p \hat{\beta}_p). \tag{A5}$$

Thus, we obtain as the estimated vector of the dependent variable the following:

$$\hat{y} = X_p \hat{\beta}_p + \hat{f}_p. \qquad \text{(A6)}$$

It is then straightforward to show that $\hat{y}$ is a linear function in y:

$$\hat{y} = L_S \times y \qquad \text{(A7.a)}$$

with $$L_S = X_p (\tilde{X}'_p \tilde{X}_p)^{-1} \tilde{X}'_p (I - S) + S_F \qquad \text{(A7.b)}$$

$$S_F = S[I - X_p (\tilde{X}'_p \tilde{X}_p)^{-1} \tilde{X}'_p (I - S)]. \qquad \text{(A7.c)}$$

Based on the linearity of (A7.a), we use results from Cleveland and Devlin (1988, p. 599) on the distribution of the residuals of LOESS regressions to estimate standard errors for $\hat{\beta}_p$ as proposed by Speckman (1988, p. 421). We correct these standard errors for heteroskedasticity following White (1980).

We present the impact of each of the variables of the nonparametric part (partial impact) in so-called "conditioning plots" (Cleveland and Devlin, 1988). While one of these variables is set equal to its median, the other one is varied over all observations. Since the intercept in the estimated semi-parametric model is not identified, only the changes in the values on the ordinate, not the values themselves, should be interpreted. The graphs we present include bands representing 90 percent confidence intervals.

II. The Dataset

We analyze a dataset comprising all federally chartered and federally insured credit unions in the year 1996. The dataset was obtained from the Report of Condition and Income for Credit Unions (NCUA 5300, 5300S), produced by the National Credit Union Administration (NCUA). These reports are issued semi-annually in June and December. We used the December data. The flows in the December income statements include the entire year of 1996.

We concentrate on the following types of membership groups among occupationally based credit unions: educational; military; federal, state, and local government; manufacturing; and services. This means that we do not include community credit unions, associational credit unions, or corporate credit unions. Lists of Type of Membership (TOM) classification codes are from the NCUA (Instruction No. 6010.2, July 28, 1995).

The following filter was applied to the dataset to determine which observations would be dropped:

- missing Types of Membership (TOM) codes
- activity codes other than “active”
- number of members or of potential members not greater than one; applies to acutal and to lagged values
- nonpositive values for total assets or lagged total assets
- zero number of employees
- zero value for “employee compensation and benefits.”

We analyzed the calendar year 1996. When using total assets, the number of members or the potential number of members as regressors, we lagged the values by one year. All other observations are from the year 1996.

We calculated county-specific Herfindahl indexes as measures of concentration of the local banking market. A Herfindahl index is defined as the sum of squared market shares. We measured market shares by the fraction of total bank deposits (as of June 30th) within a county based on FDIC Summary of Deposits data. This data is available online at <http://192.147.69.47/drs/sod/>.

We used log growth rates of the Real Gross State Product (Real GSP) to control for cross-sectional differences in macroeconomic conditions facing credit unions. The Real GSP data are in millions of chained 1992 dollars. We obtained the data from the U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Analysis Division. The data are available online at <http://www.bea.doc.gov/bea/dr1.htm>.

III. Definition of Variables

In order to ensure that the dependent variables (y) are not bounded, we transformed them in some cases. These transformations are necessitated by the assumption of normally distributed error terms. For variables that are restricted to the positive orthant of real numbers, we substitute their natural logarithms. For variables expressed as fractions (i.e., restricted to the interval [0,1]), we applied the transformation log(y/(1-y)). In this case, observations equal to one were eliminated from the set of observations; there were no cases in which the transformed variable equalled zero.

Listed below are the definitions of variables used in this paper along with the underlying data sources. For data taken from the Report of Condition and Income for Credit Unions—produced by the National Credit Union Administration—, the relevant item numbers are in brackets.

Dependent Variables

1) Participation Rate (PARTICIPATION): Number of actual credit-union members [CUSA6091] divided by the number of potential members [CUSA6092]. In the regressions, we use the transformation log(y/(1-y)). No zero values for the number of members occurred. 42 cases of full participation (y=1) were eliminated from the dataset for these regressions only.
2) Cost Ratio (COST): Total operating expenses [CUSA4130] divided by total assets [CUSA2170]. In the regression, we use log values.

Independent Variables

When total assets (measured in units of one dollar), the number of members, or the number of potential members served as regressors, they were lagged by one period and transformed into natural logarithms.

1) MultGroup: equal to one if the credit union has multiple groups; zero otherwise.
2) Herfindahl: Sum of squared market shares of commercial banks within a county based on total bank deposits. By definition, the Herfindahl index is greater than zero; its maximum value is one.
3) GrRealGSP: Logarithmic changes in the real gross state product (chained 1992 dollars).
4) Type of Membership (TOM) code variables: equal to one if the credit union is of a specific type (educational, military, government, manufacturing, or services). Because we use an intercept in (the nonparametric part of) the regression, the TOM code variable for the educational credit union was dropped.

TABLE 1
SIMULATION RESULTS (1)

	Welfare index	Fraction of employee groups served by…			Participation rates as a fraction of… [H]			
Credit Unions in the Economy		(1) Any Credit Union	(2) A Single-Group Credit Union	(3) A Multiple-Group Credit Union	(4) All Households	(5) All Households Eligible to Join an Existing Credit Union	(6) All Households Eligible to Join an Existing Single-Group Credit Union	(7) All Households Eligible to Join an Existing Multiple-Group Credit Union
Period One								
Only single-group credit unions	-23,951.89	0.06	0.06	----	0.04	0.50	0.50	---
Period Two								
A&B, C	53.09	0.14	0.04	0.10	0.04	0.40	0.50	0.31
A&C, B	1,048.20	0.50	0.03	0.47	0.37	0.74	0.48	0.77
B&C, A	523.49	0.34	0.04	0.30	0.16	0.46	0.45	0.60
A&B&C	1,123.34	0.49	0.01	0.48	0.30	0.42	0.58	0.41
Optimal Combination		0.94	0.02	0.93	0.43	0.56	0.54	0.56

Parameter values: f_a=0.1; f_b=0.1; t=22; c=1.6; v=1.

H: Participation rate is the fraction of eligible households that belongs to a credit union. Rates are weighted by segment lengths.

TABLE 2

SIMULATION RESULTS (2)

Parameter Values		Number of times this configuration of credit unions was optimal: [H]						Participation rates as a fraction of… [HH]			
t	c	(1) A, B, C	(2) A&B, C	(3) A&C, B	(4) B&C, A	(5) A&B& C	(6) Number of employee groups not served by a credit union	(7) All Households	(8) All Households Eligible to Join a Credit Union	(9) All Households Eligible to Join a Single-Group Credit Union	(10) All Households Eligible to Join a Multiple-Group Credit Union
22	1.6	746	168	4,452	1,168	3,466	7,959	0.43	0.56	0.54	0.56
22	1.7	302	394	4,580	1,223	3,501	4,782	0.54	0.61	0.64	0.61
24	1.6	926	99	4,436	1,169	3,370	8,793	0.40	0.55	0.50	0.55

H: Based on 10,000 runs.
HH: Weighted by segment lengths.

TABLE 3

DISTRIBUTION OF CREDIT UNIONS BY TYPE OF MEMBERSHIP

Number of Credit Unions	Type of Membership (TOM) Codes[H]	Type of Membership
299	4	Educational
37	5	Military
392	6	Federal, state, local government
744	10-15	Manufacturing
508	20-23	Services
469	34	Multiple group – primarily educational
124	35	Multiple group – primarily military
621	36	Multiple group – primarily federal, state, local government
821	40-49	Multiple group – primarily manufacturing
718	50-53	Multiple group – primarily services
Total: 4,733		

H: National Credit Union Association (NCUA), Instruction No. 6010.2, July 28, 1995.

TABLE 4

DESCRIPTIVE STATISTICS [H]

	Minimum	Median	Mean	Maximum	Standard Deviation
Participation Rate (PARTICIPATION)	3.050×10^{-2}	6.246×10^{-1}	6.142×10^{-1}	1	2.139×10^{-1}
Cost Ratio (COST)	6.268×10^{-3}	3.897×10^{-2}	4.088×10^{-2}	4.169×10^{-1}	1.739×10^{-2}
Total Assets	4.300×10^{4}	6.231×10^{6}	3.300×10^{7}	8.922×10^{9}	1.652×10^{8}
Number of Members	4.500×10^{1}	1.865×10^{3}	6.833×10^{3}	1.601×10^{6}	2.860×10^{4}
Number of Potential Members	7.500×10^{1}	3.193×10^{3}	1.432×10^{4}	2.032×10^{6}	5.540×10^{4}
Herfindahl Index	5.346×10^{-2}	1.966×10^{-1}	2.080×10^{-1}	1	9.469×10^{-2}

H: 4733 observations.

TABLE 5

PARTICIPATION RATE

Independent Variable	Coefficient	*t*-statistic
MultGroup	9.368×10^{-2}	3.074 ***
Herfindahl	2.972×10^{-1}	2.094 **
GrRealGSP	8.902×10^{-1}	0.819
Military	2.290×10^{-1}	3.024 ***
Government	5.301×10^{-2}	1.284
Manufacturing	-2.217×10^{-2}	-0.585
Services	1.226×10^{-1}	3.092 ***
Number of Observations	4691	

/*: Significant at the 5/1 percent level (*t*-tests are two-tailed).

TABLE 6

COST RATIO

Independent Variable	Coefficient	*t*-statistic
MultGroup	7.509×10^{-2}	6.847 ***
Herfindahl	-1.813×10^{-1}	-3.427 ***
GrRealGSP	-8.448×10^{-1}	-2.377 **
Military	1.038×10^{-1}	4.533 ***
Government	1.149×10^{-1}	8.043 ***
Manufacturing	1.036×10^{-1}	7.444 ***
Services	8.915×10^{-2}	6.019 ***
Number of Observations	4733	

/*: Significant at the 5/1 percent level (*t*-tests are two-tailed).

FIGURE 1

LINEAR CITY WITH THREE COMMON BONDS OF OCCUPATION

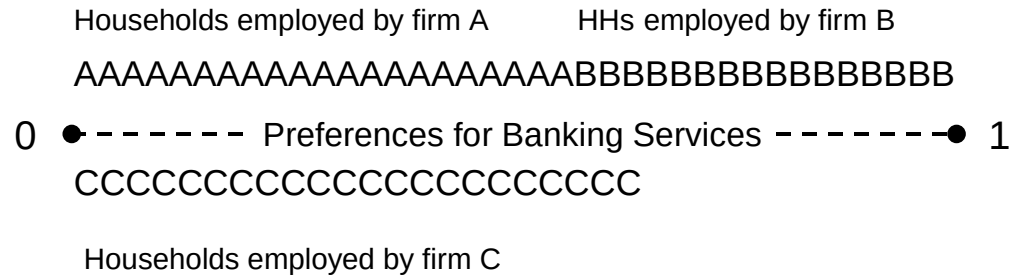

FIGURE 2

TRAVEL COSTS FACING HOUSEHOLDS EMPLOYED BY FIRMS A AND B

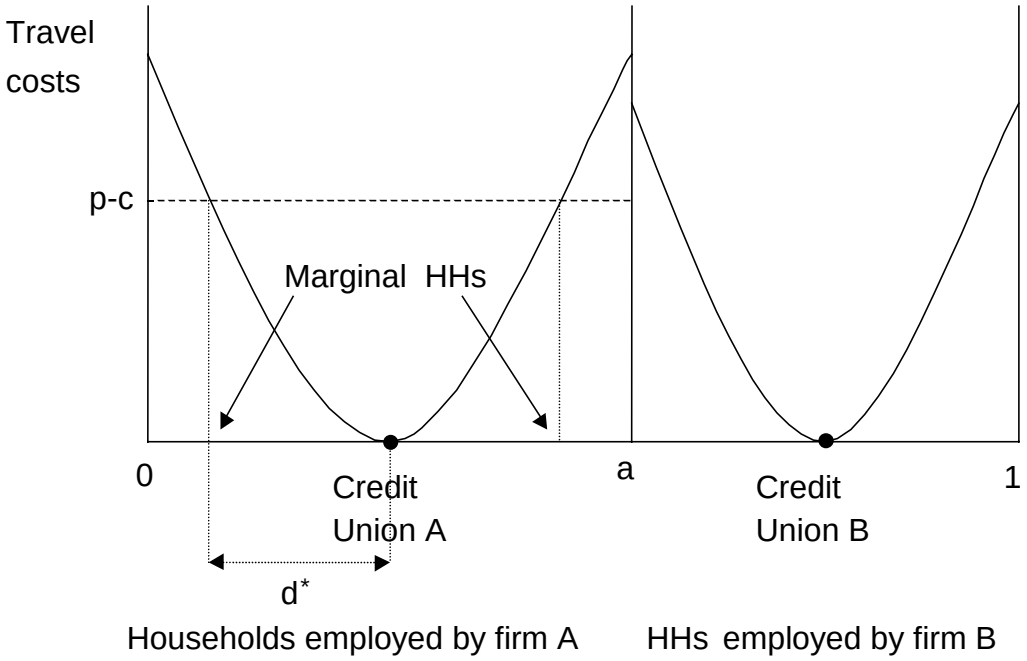

FIGURE 3

DEMAND AND SUPPLY CURVES FOR CREDIT-UNION SERVICES

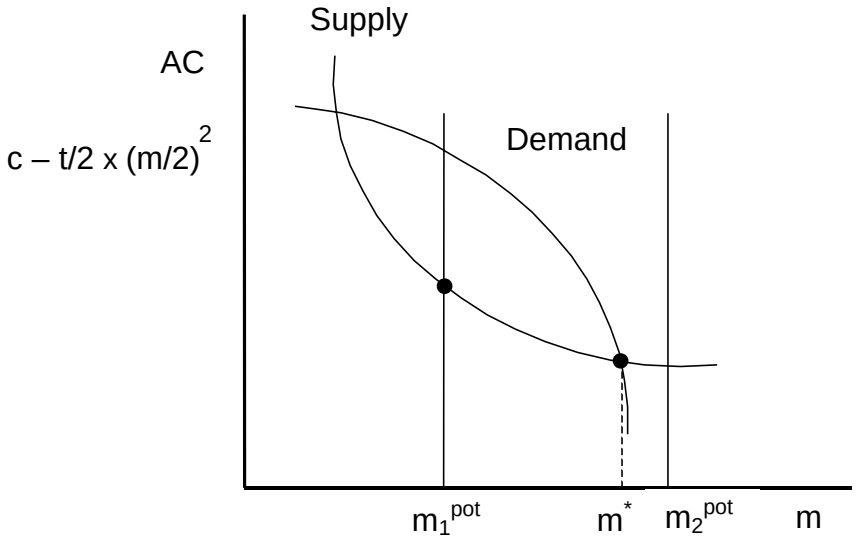

FIGURE 4

A CASE IN WHICH NO CREDIT UNION EXISTS

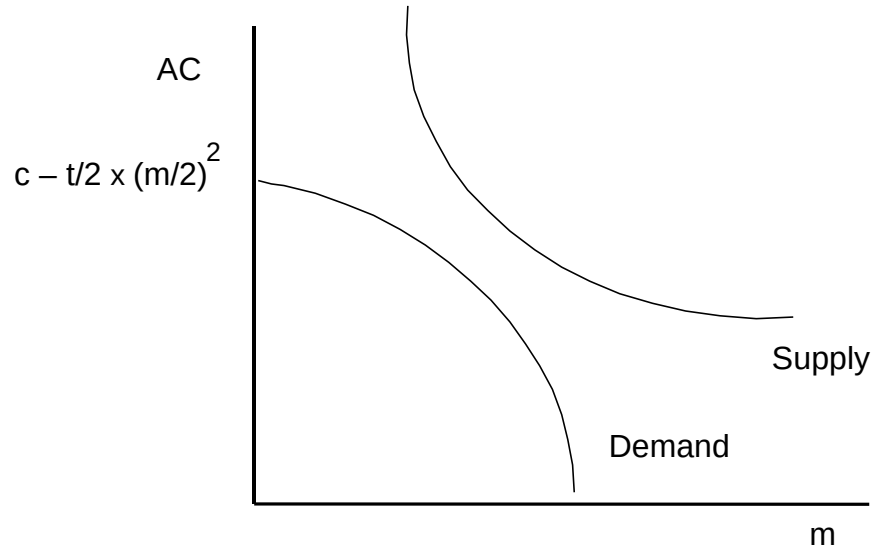

FIGURE 5

PARTICIPATION RATES AS A FUNCTION OF POTENTIAL MEMBERSHIP

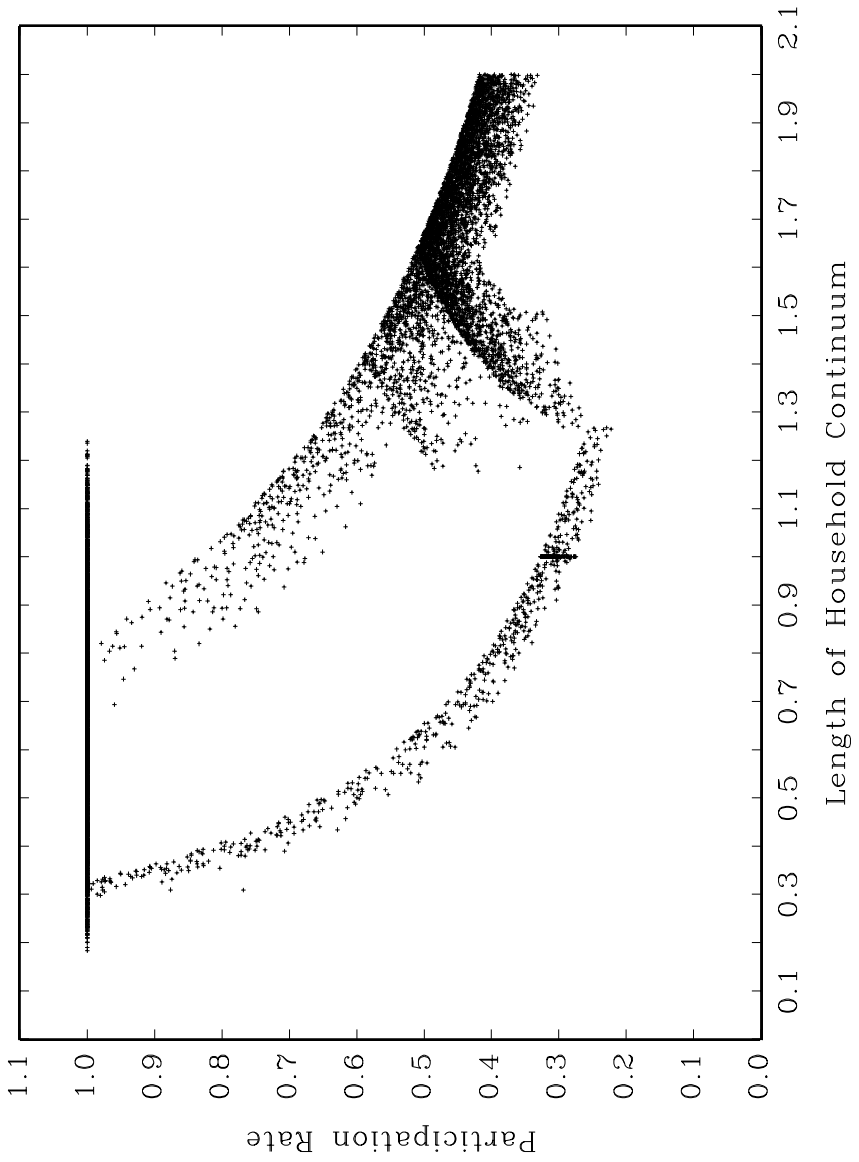

FIGURE 6

SCATTERPLOT: TOTAL ASSETS VERSUS NUMBER OF MEMBERS

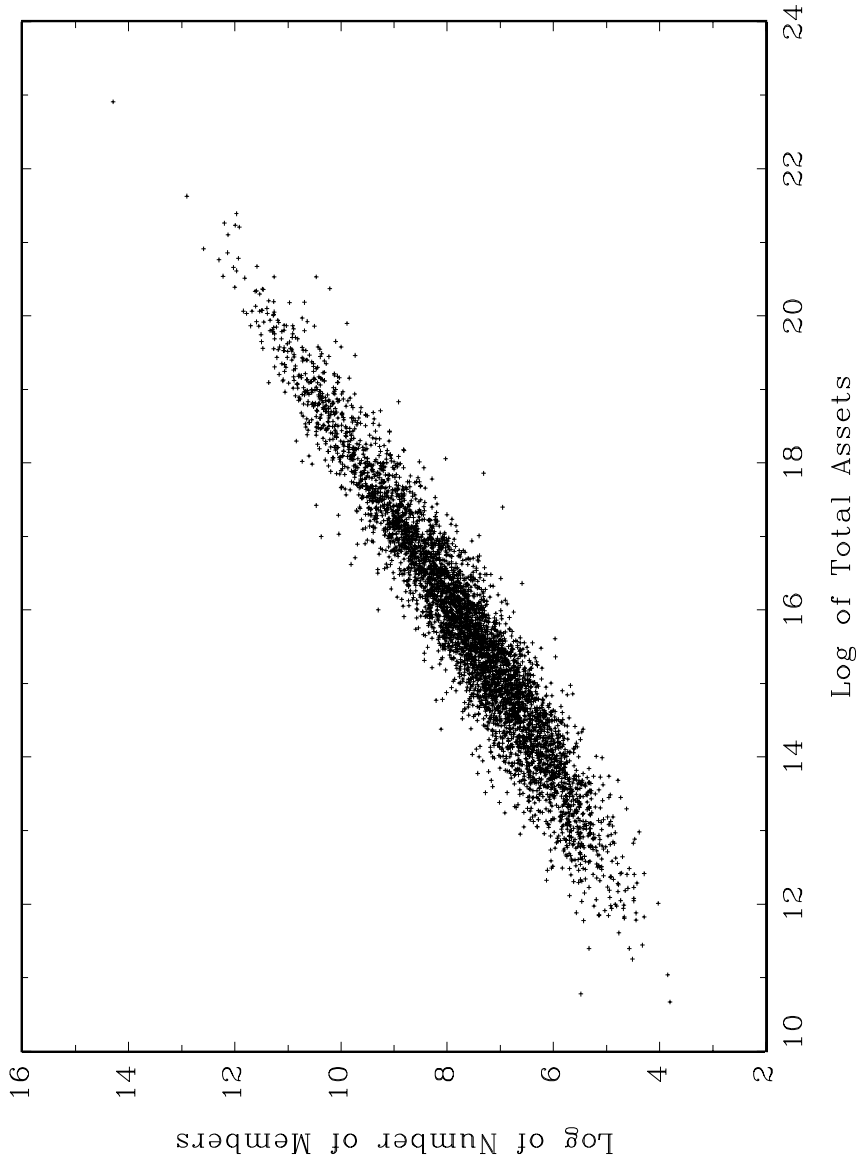

FIGURE 7

PARTICIPATION RATE – NUMBER OF POTENTIAL MEMBERS

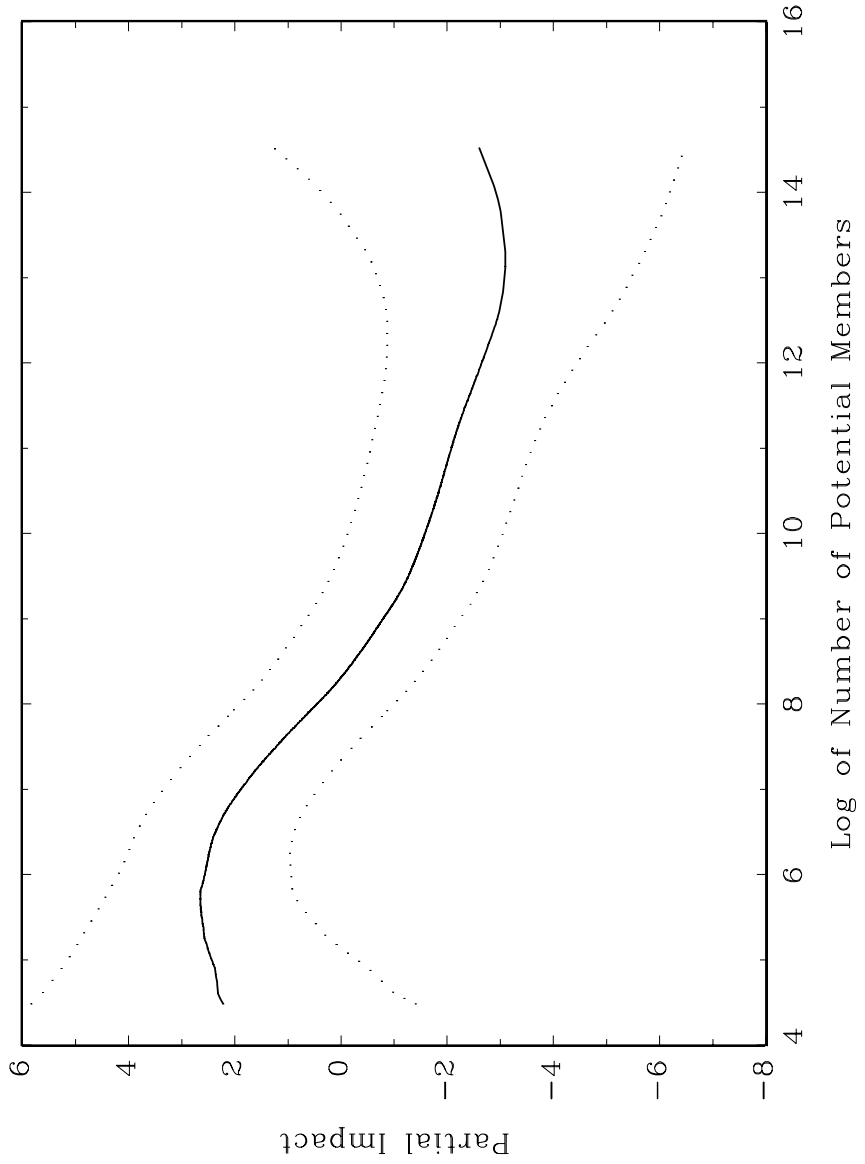

FIGURE 8

COST RATIO - NUMBER OF MEMBERS

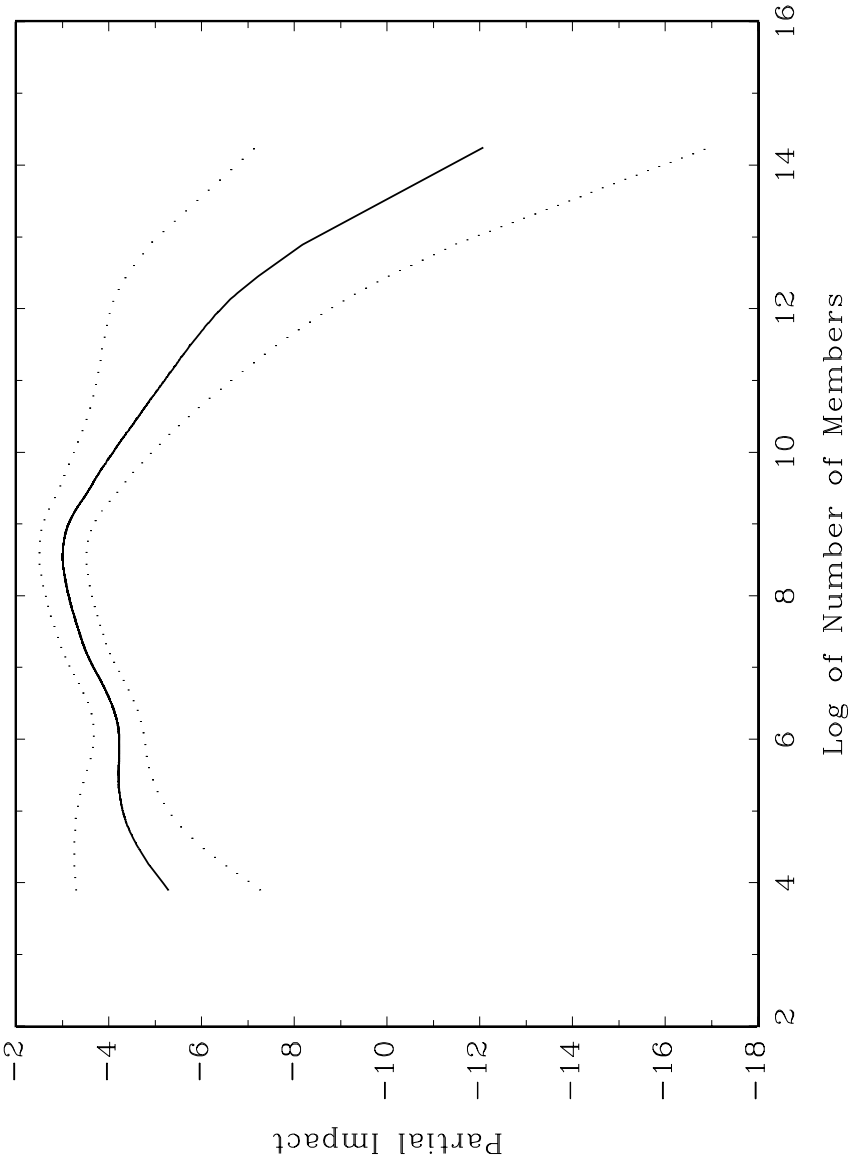

FIGURE 9

COST RATIO - TOTAL ASSETS

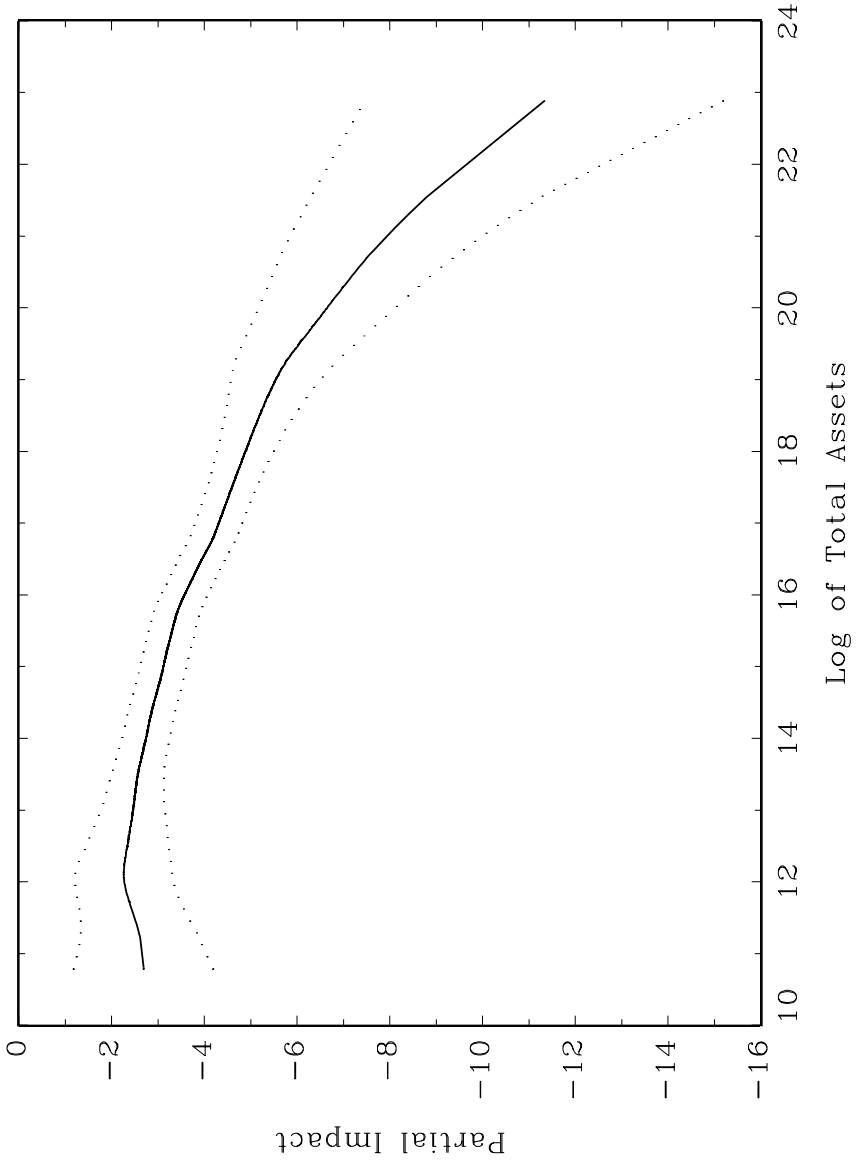

FIGURE a

A, B, C IN SOCIAL OPTIMUM

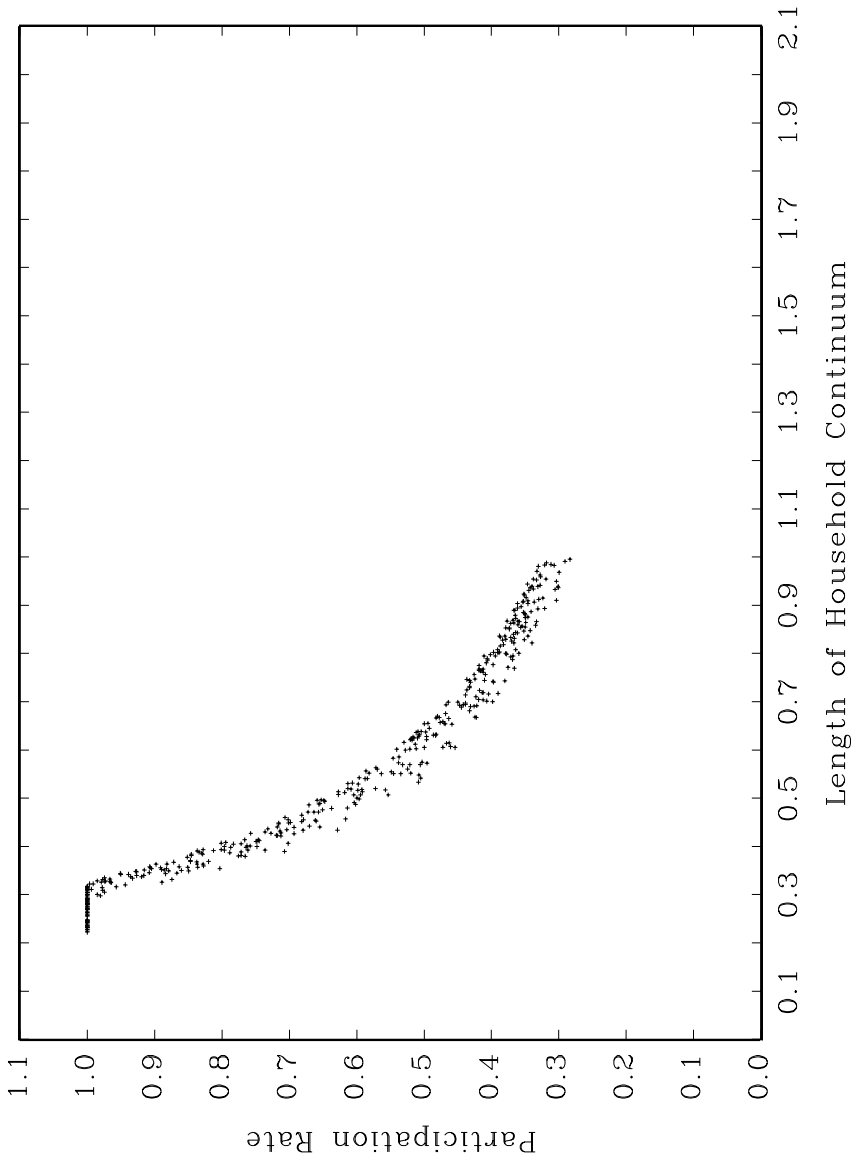

FIGURE b

A&B IN SOCIAL OPTIMUM

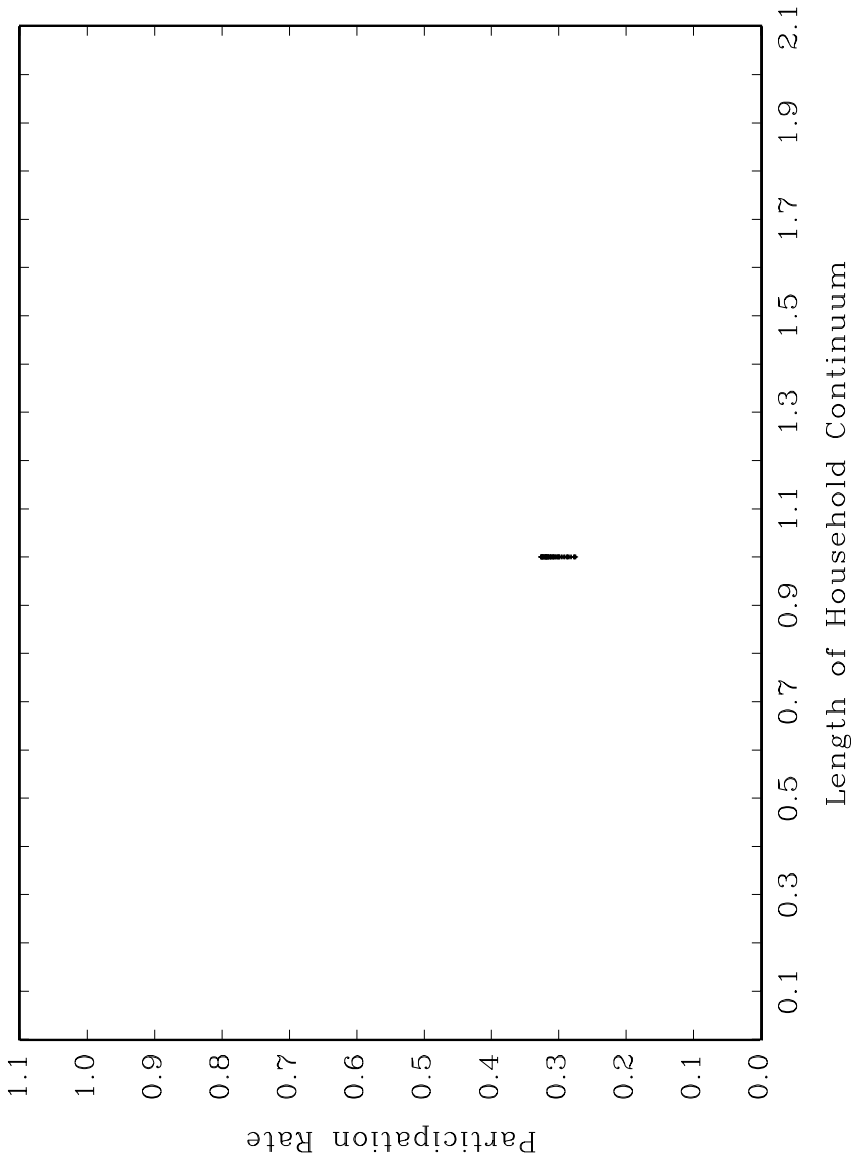

FIGURE c

A&C IN SOCIAL OPTIMUM

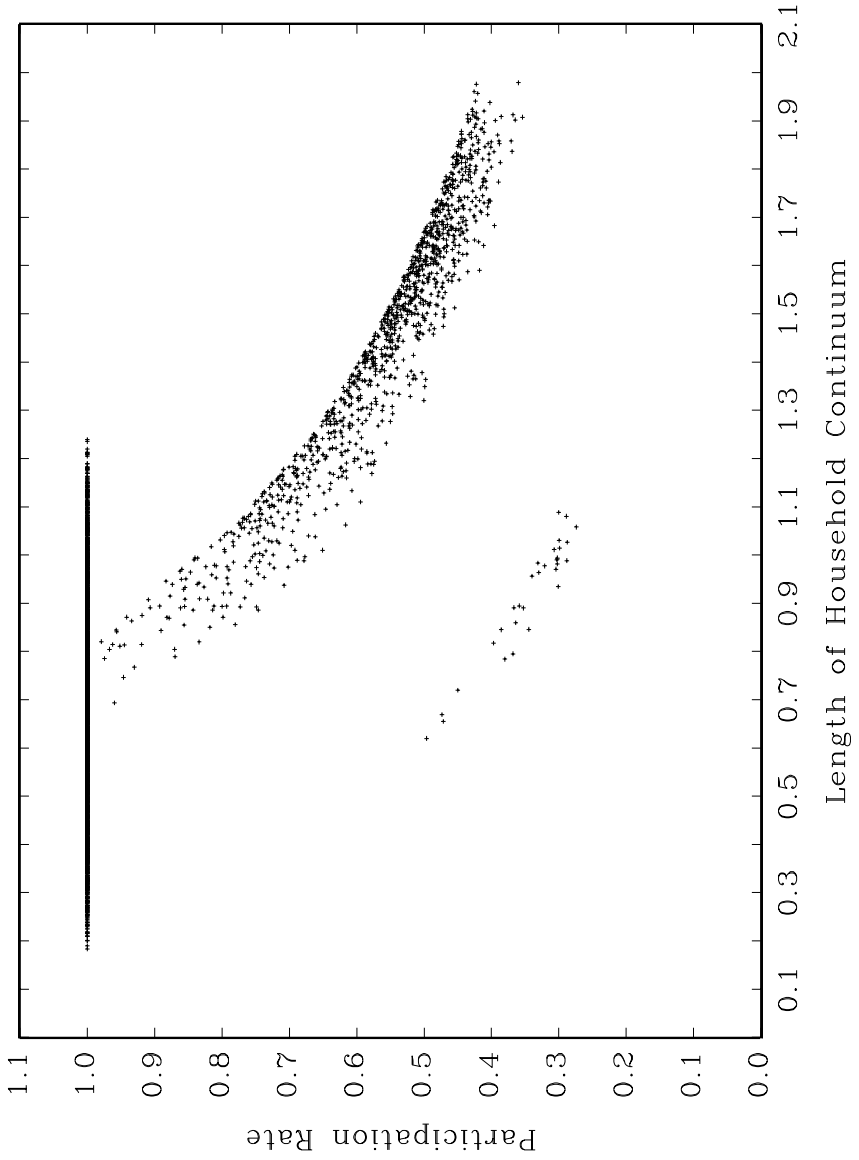

FIGURE d

B&C IN SOCIAL OPTIMUM

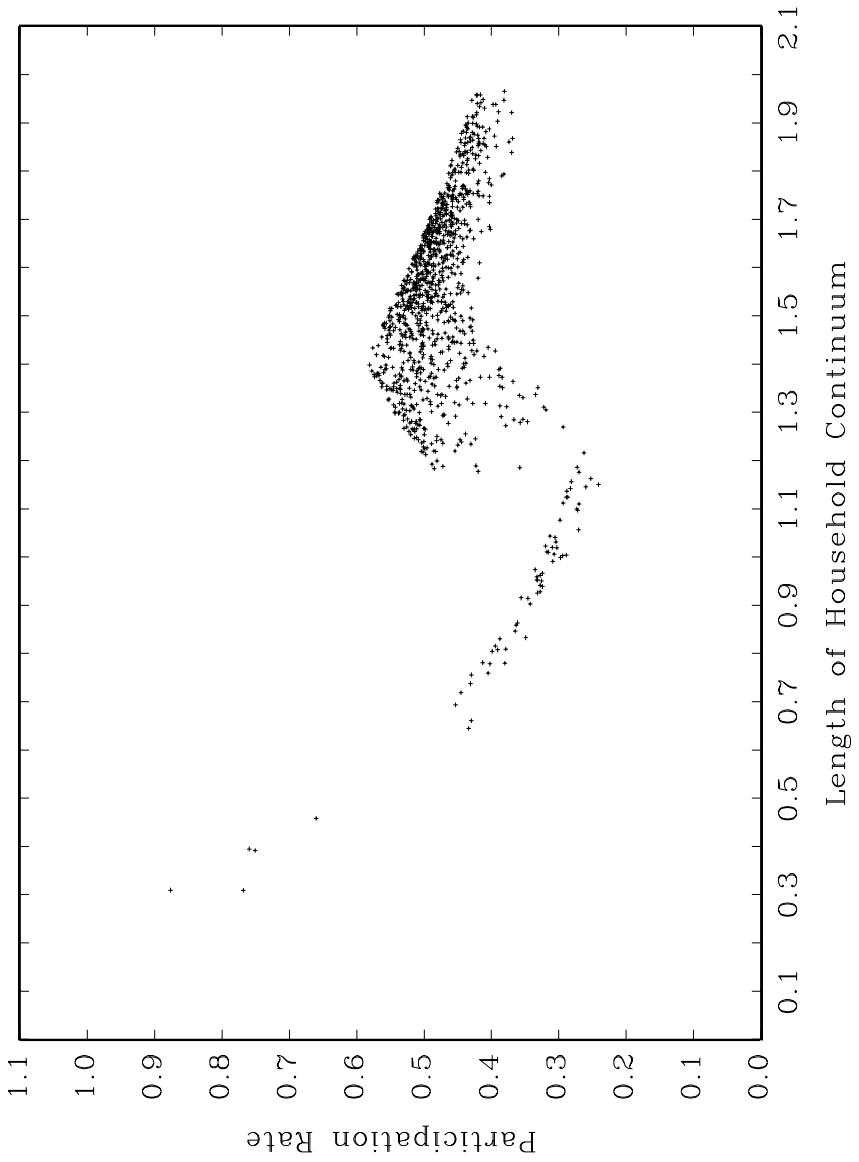

FIGURE e

A&B&C IN SOCIAL OPTIMUM