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ABSTRACT

Recent developments in the analysis of multiproduct cost economies at other depository institutions have not been incorporated in empirical work on savings banks (SBs). The purpose of this study is to examine the existence of multiproduct cost economies, particularly economies of scale and scope in the production of current services, provided by SBs. The generalized translog cost function and data on all insured SBs in the period 1986-88 are used. Results indicate that SBs achieve scale economies at small sizes and again beyond $500 million in total assets. Measures of scope economies are always positive, indicating that the joint product cost of the set of SB outputs is less than the sum of the costs of producing the outputs separately. Results suggest that the institutions that will survive are those that are large and efficient or those that are small but serving a particular niche market.

ARE U.S. SAVINGS BANKS VIABLE?

1. Introduction

One of the many important repercussions of the savings and loan crisis is that the savings and loan industry is shrinking rapidly in both market share and the number of associations. Some savings and loan associations (S&Ls) have been absorbed by commercial banks and other healthy thrifts, while some S&Ls have converted their charters to become savings banks (SBs). Thus, a by-product of the shrinkage of the S&L industry is a growth in the number of SBs.

S&L conversion to a savings bank charter is motivated by several important reasons. One reason is to escape the connection to an industry with a negative public image. Another is to avoid the extra regulatory pressure and costs imposed on a troubled, regulated industry.[1]

In addition, SBs have been given the flexibility to engage in a wider spectrum of financial activities than S&Ls. Although the liabilities of SBs are similar to those of S&Ls, SBs have a more diversified portfolio of assets. SBs for many years have had broader authority to invest in securities than S&Ls. As the number of SBs increases, an issue is whether the cost structure of financial intermediation by "typical" SBs can make them economically viable.

Recent developments in the analysis of multiproduct cost economies have not been incorporated in the empirical work on SBs.[2] Since the early 1980s, the cost structure in multiproduct depository institutions, including commercial banks, savings and loan associations, savings banks, and credit unions, has been examined by a number of studies [Murray and White (1983); Gilligan and Smirlock (1984); Gilligan, Smirlock, and Marshall (1984); Kim (1986); Lawrence and Shay (1986); Berger, Hanweck, and Humphrey (1987); Kolari and Zardkoohi (1987); Mester (1987b); Cebenoyan (1988); Lawrence (1989); Cebenoyan (1990); Hunter, Timme, and Yang (1990); Noulas, Ray, and Miller (1990); LeCompte and Smith (1990); Buono and Eakin (1990); Berger and Humphrey (1991); and Gropper (1991)]. Surveys of their results can be found in Mester (1987a), Clark (1988), Hunter and Timme (1989), and Humphrey (1990).

The purpose of this study is to examine the existence of multiproduct cost economies, particularly economies of scale and economies of scope, in the production of current services provided by SBs. This study is distinguished from other studies in banking by two features. The first feature is the use of Call Report data to examine multiproduct cost economies in SBs. One of the advantages of using this data base is that the population rather than a sample of the institutions can be analyzed.

The second feature of the study is the use of a state-of-the-art functional form. The computation of the measures of economies of scope and product-specific economies of scale require the assumption of a zero level of output for at least one of the products being produced. However, the translog cost function used in many other studies always yields zero total costs whenever the output of even one product is zero.[3] The generalized translog cost function used here overcomes the problem of zero output levels for some products. The output variables are the Box-Cox metric transformations of the actual output levels.[4]

The generalized translog functional form has been applied to multiproduct cost studies in other industries. Some notable examples in various industries are Fuss (1983) in telecommunications, Sing (1987) in gas and electric utilities, Kim (1987) in U.S. railroads, and Kellner and Mathewson (1983) and Fields and Murphy (1989) in life insurance.

The rest of this paper is divided into four sections. Section 2 specifies the model. Section 3 describes the data. Section 4 discusses the estimation procedure and presents the results. Section 5 presents the conclusions drawn from the analysis.

2. The Model

This study follows the development of the multiproduct cost function in the commercial banking industry. In developing statistical cost functions, researchers begin with the microeconomic principle that production costs depend on input prices and the level and composition of outputs. In a competitive environment, SBs are assumed to minimize the costs associated with a given level of output; i.e.,

$$\text{Min. } C = \sum_{j=1}^{m} W_j X_j \qquad (1)$$

subject to a production constraint $F(Y,X) = 0$

where C = total costs,

W = the vector of unit prices of m inputs (factors), $W_j = 1,\ldots,m$,

X = the vector of m inputs, X_j, $j = 1,\ldots,m$, and

Y = the vector of n output quantities, Y_i, $i = 1,\ldots,n$.

This functional relationship follows from the property of duality between the production and cost functions. A standard result of duality theory is that the properties of the production transformation can be derived from the reduced form cost function: Min. $C(Y,W)$.

For purposes of this study, we are interested in the following multiproduct cost concepts:

2.1 Output Cost Elasticities

$$CE_i = \partial \ln C(Y,W)/\partial \ln Y_i \quad (2)$$

2.2 Marginal Costs

$$MC_i = \partial C(Y,W)/\partial Y_i = (C(Y,W)/Y_i)CE_i \quad (3)$$

2.3 Overall Scope Economies

$$SC = \frac{\Sigma_i C(Y_i,W) - C(Y,W)}{C(Y,W)} \quad (4)$$

SC measures the fraction cost savings (dissavings) that are due to joint production, and will be positive (negative) if overall economies (diseconomies) of scope exist. With nonjointness in production, SC will be zero.

2.4 Product-Specific Scope Economies

$$SC_i = \frac{C(Y_i,W) + C(Y_{N-i},W) - C(Y,W)}{C(Y,W)} \qquad (5)$$

where $C(Y_i,W)$ and $C(Y_{N-i},W)$, respectively, represent the cost of producing product i and all other products independently. This measure indicates the difference between the cost of joint production of all of the n outputs and the cost of producing n-1 outputs at their current level while separately producing the other output at its current level. Thus, if $SC_i > (<) 0$, SC_i measures the relative increase (decrease) in cost if Y were produced in two groups i and N-i.

2.5 Overall Scale Economies

$$SL = C(Y,W)/(\Sigma_i Y_i MC_i) = 1/(\Sigma_i CE_i) \qquad (6)$$

Overall scale economies are measured by the inverse of the sum of output cost elasticities with respect to outputs. If SL > 1, then overall scale economies exists; if SL = 1, then constant returns to scale exist; and if SL < 1, then there are diseconomies of scale.

2.6 Product-Specific Scale Economies

$$SL_i = \frac{IC_i(Y,W)}{Y_i MC_i(Y,W)} = \frac{IC_i/C(Y,W)}{CE_i} \qquad (7)$$

where $IC_i(Y,W) = C(Y,W) - C(Y_{N-i},W)$, and

$$C(Y_{N-i},W) = C(Y_1,\ldots,Y_{i-1},0,Y_{i+1},\ldots,Y_n,W).$$

The incremental cost of the i_{th} product, $IC_i(Y,W)$, is defined as the difference in cost incurred by the firm to produce the given level of product i as opposed to producing a zero level, while the quantities of other products are held constant. If $SL_i > (<) 1$, then scale economies (diseconomies) exist in the production of output i; and if $SL_i = 1$, then constant returns to scale exist in the production of output i.

The major models contain three equations - a cost function and two share equations. The two share equations are included to increase the efficiency of the estimations. We employ the generalized translog cost function to represent the total cost function. The generalized translog cost function which includes five bank outputs and these input prices is:

$$\ln(C) = A_0 + \sum_{i=1}^{5} A_i[(Y_i^{\lambda} - 1)/\lambda] + \sum_{j=1}^{3} B_j \ln(W_j)$$
$$+ 1/2 \sum_{i=1}^{5} \sum_{k=1}^{5} S_{ik}[(Y_i^{\lambda} - 1)/\lambda][(Y_k^{\lambda} - 1)/\lambda] \tag{8}$$
$$+ 1/2 \sum_{j=1}^{3} \sum_{h=1}^{3} G_{jk} \ln(W_j)\ln(W_h) + \sum_{i=1}^{5} \sum_{j=1}^{3} D_{ij}[(Y_i^{\lambda} - 1)/\lambda]\ln(W_j)$$

The dependent variable is logarithmic total cost. The output variables are transformed by the Box-Cox metric. Using Shephard's lemma, the input demand share equations are derived by differentiating the above generalized translog cost function with respect to the input prices:

$$C_j = \partial \ln(C)/\partial \ln(W_j)$$
$$= B_j + \sum_{h=1}^{3} G_{jh} \ln(W_h) + \sum_{i=1}^{5} D_{ij}[(Y_i^{\lambda} - 1)/\lambda] \qquad j = 1,2 \tag{9}$$

In addition, the system of equations must satisfy certain regularity restrictions such as symmetry and homogeneity.

$$S_{ik} = S_{ki} \text{ for all } i,\ k; \text{ and } G_{jh} = G_{hj} \text{ for all } j,\ h. \quad \text{(symmetry)}$$
$$\sum_{j=1}^{3} B_j = 1;\ \sum_{h=1}^{3} G_{jh} = 0,\ j = 1,\ 2,\ 3; \tag{10}$$
$$\text{and } \sum_{j=1}^{3} D_{ij} = 0,\ i = 1,\ 2,\ 3,\ 4,\ 5. \quad \text{(homogeneity)}$$

The multiproduct cost concepts discussed above can be obtained from the generalized translog cost function as follows. The cost elasticity of the i^{th} output obtained from the generalized translog cost equation (8) can be expressed as:

$$CE_i = [A_i + \Sigma_j S_{ik}((Y_k^{\lambda} - 1)/\lambda) + \Sigma_j D_{ij} \ln W_j] Y_i^{\lambda}. \tag{11}$$

When mean-scaled data are used in the estimation procedure, at the point of approximation where $Y_i = W_j = 1$, the cost elasticity reduces to $CE_i = A_i$.

The degree of overall scope economies is measured by:

$$SC = [C(Y_1,0,0,0,0,W) + C(0,Y_2,0,0,0,W) + C(0,0,Y_3,0,0,W)$$
$$+ C(0,0,0,Y_4,0,W) + C(0,0,0,0,Y_5,W) \tag{12}$$
$$- C(Y_1,Y_2,Y_3,Y_4,Y_5,W)]/C(Y_1,Y_2,Y_3,Y_4,Y_5,W)$$

The degree of product-specific scope economies, for example for product Y_1, is measured by

$$SC_1 = [C(Y_1,0,0,0,0,W) + C(0,Y_2,Y_3,Y_4,Y_5,W) - C(Y_1,Y_2,Y_3,Y_4,Y_5,W)]/C(Y_1,Y_2,Y_3,Y_4,Y_5,W). \quad (13)$$

Similarly, the degree of product-specific scale economies, for example for product Y_1, is measured by

$$SL_1 = \{[C(Y_1,Y_2,Y_3,Y_4,Y_5,W) - C(0,Y_2,Y_3,Y_4,Y_5,W)]/C(Y_1,Y_2,Y_3,Y_4,Y_5,W)\}/CE_1. \quad (14)$$

Finally, the measure of overall scale economies at the approximation point reduces to:

$$SL = 1/(\Sigma_i A_i). \quad (15)$$

3. Data

All data were obtained from the Call Reports of Condition and Income for the period 1986-1988. The numbers of available SBs insured by Federal Deposit Insurance Corporation are 444 in 1986, 456 in 1987, and 469 in 1988. The final list contains SBs which were in operation in all three years. After SBs with missing values for variables were dropped, a total of 417 "typical" SBs remained and were used for empirical analysis. Table 1 categorizes all sample SBs according to asset size for the three years. The variables used in the estimating equations are described below.

[Insert Table 1 about here]

3.1 Total Costs

Total costs, C, include all labor and physical capital expenses, as well as interest expense; that is, total costs of inputs used to provide the various outputs of the SBs. Humphrey (1990) found that believable estimates for scale economies should be based on models using total costs. We include interest expense in the measure of total costs because it is significant in size and likely to differ among SBs. Ignoring interest expense could lead to serious specification error and inconsistent empirical estimation.

3.2 Output and Input Measures

As suggested by Sealey and Lindley (1977), our analysis employs the intermediation approach to measuring SB output. Outputs are measured as the dollar value of all of the SB's earning assets.[5] Earning assets include (1) interest-bearing balances due from depository institutions, Y_1, (2) securities and assets held in trading accounts, Y_2, (3) Federal funds sold and securities purchased under agreements to resell, Y_3, (4) total loans and leases net of unearned income, Y_4, and (5) direct and indirect investments in real estate ventures, Y_5.

Three input categories, including labor, physical capital, and funds (including deposits), are treated as inputs that are intermediated to produce SB assets.

3.3 Input Prices

A separate input price is assigned to each input. Due to the aggregated nature of Call Report data, the three input prices are approximated in the following manner:

(1) price of labor, W_1: calculated by dividing total salaries and fringe benefits by the number of full-time equivalent employees (including SB officers);

(2) price of physical capital, W_2: calculated by dividing total expenses of premises and fixed assets by the dollar value of total assets;

(3) price of funds, W_3: calculated by dividing the total interest expense paid on deposits, Federal funds purchased and securities sold under agreements to repurchase, demand notes issued to the U.S. Treasury, mortgage indebtedness, subordinated notes and debentures, and other borrowed money by the sum of funds from these sources. In line with traditional banking firm behavior, the cost of deposits in the form of interest paid to attract them is considered as the price paid for inputs.

The definitions of the variables are summarized in Table 2. Summary statistics of the variables are presented in Table 3. Not all SBs in our sample produce in all product lines. In fact, zero levels are always present for some SBs in Y_1, Y_3, and Y_5. For the purpose of examining economies of scope and product-specific economies of scale, inclusion of such SBs is important. This allows extrapolation of the multiproduct cost function to regions of zero outputs. Since Y_2 and Y_4 do not have zero levels in our sample, we use the minimum to replace the zeros in equations (12) to (14) to avoid any overextrapolation.

[Insert Tables 2 and 3 about here]

4. Empirical Results

4.1 Estimation Procedure

Cost equations for SBs are estimated separately by year. All variables entering the equations are standardized by dividing by their respective sample means to eliminate the upward bias in t-statistics associated with unscaled variables, as suggested by Spitzer (1984).[6]

While the estimates are unbiased and consistent, estimating only the cost equation is relatively inefficient because of unused information. We augment the total cost equation with two derived input demand share equations using Shephard's lemma. Since these two equations do not involve any new coefficients, greater efficiency in estimation can be achieved by including such share equations along with the cost equations. Only two share equations are estimated since any attempt to estimate the complete system will lead to singularity in the variance-covariance matrix because the shares sum to one for each observation, as implied by the linear homogeneity in input prices. The share equation corresponding to the third input is omitted. Barten (1969) has shown that the parameter estimates are invariant to which share equation is omitted.

The three equations (8) and (9) - one cost function and two share equations - comprise the major models to be estimated. We estimate the system of equations using Zellner's seemingly unrelated regressions (SUR) procedure. This technique uses estimates of the covariance of the residuals across equations to improve the efficiency of the estimates.[7]

The system of equations to be estimated is linear conditioned on λ. The method used to determine the value of λ is an iterative least-square search. Specifically, we proceed by specifying a set of values for λ (in increments of 0.001), estimating the remainder of the parameters conditional on λ, and selecting those parameter estimates that correspond to the λ which maximizes the log of the likelihood function for the system, therefore minimizing the residual sum of squares.

The coefficients for the generalized translog cost function are used to calculate the cost measures. Each of the cost measures is computed by multiplying the estimated coefficients by the vector of means of the variables. Since the function computes total costs in logarithms, we take the exponential of each of the above components and calculate the cost measure if they are involved with total costs.

All cost measures are estimated at mean output levels. Because we deal with the population rather than a sample of the SBs in question, standard deviations are not calculated. Since the effects on costs of changes in the variables included in the cost function may differ depending on the levels of the variables, the measures of overall scale economies are evaluated at eight different points for both types of SBs: (1) the point consisting of the means of the input prices and outputs, which corresponds to the "typical" (or average) SB; and (2) the points consisting of the means of the input prices, and the seven mean values of the output variables which corresponds to the seven size categories in Table 1.

4.2 Results

The parameter estimates and their t-statistics for the generalized translog multiproduct cost functions are presented in Table 4. The coefficients of output and input price variables carry their expected positive signs and are, except for Y_5 in 1986, statistically significant at the 0.01 level of significance.

[Insert Table 4 about here]

Goodness-of-fit measurements for the cost equation and the two estimated share equations are given in Table 5. Measures show F probabilities of 0.0001 for the cost and share equations with adjusted R-square of at least 0.9974, 0.5133, and 0.8905 for the cost, labor share, and capital share equations, respectively. This indicates that the explanatory variables and the functional form specified do capture the variations in the total costs and also have high explanatory power.[8]

[Insert Table 5 about here]

For convenience of discussion, as outlined in Table 2, we will still use Y_1 to represent interest-bearing balances due from depository institutions, Y_2 to represent securities and assets held in trading accounts, Y_3 to represent Federal funds sold and securities purchased under agreements to resell, Y_4 to represent total loans and leases net of unearned income, and Y_5 to represent direct and indirect investments in real estate ventures.

Table 6 gives the values at the means of output cost elasticity, marginal cost, incremental cost, as well as degrees of product-specific scale economies and product-specific scope economies for each output, Y_i (i = 1, 2, 3, 4, 5). We would expect positive marginal costs associated with the production of banking services. As expected, the marginal costs of producing outputs are all positive.

[Insert Table 6 about here]

Product-Specific Scale Economies

Since there may be scale economies associated with production of a particular product, product-specific scale economies are investigated. For SBs, the degrees of product-specific scale economies with respect to Y_2 and Y_3 are less than one, while those for Y_4 and Y_5 are greater than one. The results of this measure for Y_1 are mixed. From the standpoint of cost alone, the typical SB would gain by increasing the levels of Y_4 and Y_5 while reducing the levels of Y_2 and Y_3 on an individual basis. The results also indicate that direct and indirect investments in real estate ventures enjoy product-specific scale economies (though declining) over the three-year period.

Product-Specific Scope Economies

Table 6 gives the estimates of product-specific scope economies, SC_i (i = 1, 2, 3, 4, 5) at the means. For SBs, the degrees of product-specific scope economies with respect to Y_2, Y_3, and Y_4 are positive, while those for Y_5 are negative. The results of this measure for Y_1 are mixed. When they are positive (negative), the typical SB would gain by producing that particular product and the other four products jointly (separately). Interestingly, the joint production of direct and indirect investments in real estate ventures and the other four products always exhibit slight scope diseconomies.

Overall Scale Economies

Table 7 documents the estimates of overall scale economies at means and additional seven mean points. The results at mean output levels indicate that SBs exhibit constant returns to scale. Slow but sure improvement in overall scale economies are found over the three-year period.

[Insert Table 7 about here]

There is evidence that scale economies first decrease as SBs grow larger and then increase as SBs grow even larger. In other words, the pattern of estimates of scale economies is that in general the small and large SBs exhibit overall scale economies while the SBs in between exhibit slight overall scale economies or constant returns to scale. More cost savings usually occur beyond $500 million in asset size.

Overall Scope Economies

Table 8 documents the estimates of overall scope economies at the means. The measures of overall scope economies are always positive. Thus, the results at mean output levels indicate that SBs exhibit overall scope economies. That is, the joint product cost of the existing five outputs is less than the sum of the costs of producing the five outputs separately by five SBs.

[Insert Table 8 about here]

Table 8 also gives the estimates of overall scope economies at the additional seven mean points. The results show that scope measures first decrease as SBs grow larger and then increase as SBs grow even larger. That is, the larger and smaller SBs enjoy more cost savings from joint production than the SBs in between.

5. Conclusions

The use of an expanded data base which contains all SBs in question should provide the best possible information about multiproduct cost economies of SBs. The generalized translog cost function used here overcomes the problem of zero output levels for some products and, therefore, enables us to examine the existence of overall economies of scope as well as product-specific economies of scale and scope in SBs' production of banking services.

Our results for product-specific scale economies indicate that the typical SB would gain by increasing the levels of Y_4 and Y_5 while reducing the levels of Y_2 and Y_3 on an individual basis. The results for product-specific scope economies indicate that the typical SB would gain by producing Y_2, Y_3, and Y_4 (Y_5) and the other four products jointly (separately).

Constant returns to scale were evidenced for typical SBs in recent years. In general, larger and smaller SBs exhibit overall scale economies while those of intermediate size exhibit slight overall scale diseconomies or constant returns to scale. The results of overall scope economies indicate that typical SBs exhibit overall scope economies - that is, they incurred lower costs by engaging in multiproduct production. SBs of all asset sizes exhibit overall scope economies while larger and smaller SBs seem to enjoy even more cost savings from joint production than the intermediate-sized SBs.

These results conform to the conventional view of depository institution viability. That is, the institutions that will survive are those that are large and cost-efficient or small but serving a particular niche market. New laws allowing interstate mergers and acquisitions may result in just such an industry structure for savings banks.

Footnotes

[1]New regulations under federal law have placed significant restrictions on S&Ls. For example, S&Ls must have 70 percent of their assets in home mortgages, this against a background of declining real estate values. State-chartered SBs in many states have to meet only a 60 percent requirement for home mortgage lending.

[2]Of the very few studies on SBs, Benston (1972), Eisenbeis and Kwast (1991), Rosen et al. (1989), and Stansell and Hollas (1990) use approaches other than multiproduct cost function. Kolari and Zardkoohi (1990) use a translog cost function approach to examine economies of scale and scope in thrift institutions, but they study Finnish cooperative and savings banks.

[3]To see why this is so, let the cost function be represented by: $\ln C = b \ln Y + X$ where X represents the remaining terms in cost equation, then $C = Y^b \exp(x)$, which equals zero when Y is zero.

[4]This function form was first used by Caves, Christensen, and Tretheway (1980). As its name suggests, this function is a generalization of the translog because the expression for output approaches the natural logarithm of output as λ approaches zero; i.e.,

$$\lim_{\lambda \to 0} \frac{(Y_i^{\lambda}-1)}{\lambda} = \ln Y_i .$$

[5]The authors are aware of the controversy regarding appropriate measures of bank output, that is, the choice between the production approach and the intermediation approach as discussed in Mester (1987a) and Clark (1988). We believe that Sealey and Lindley make a compelling case for using earning assets as outputs. Moreover, even if we wanted to use the production approach, the limitations of Call Report data preclude the best use of this approach for being lack of number of accounts. Since there is no ideal way to disaggregate bank earning assets into distinct categories, we simply go by the characterization of the Call Reports.

[6]Spitzer (1984) suggested that the transformed variables be scaled by their sample means before estimation. Failure to scale the transformed variables can result in biased hypothesis testing. The scale of this bias is likely to be substantial. The use of mean-scaled variables in the estimation will reduce such bias.

[7]The system estimates are preferred to the single-equation ordinary least squares (OLS) estimates because of their greater efficiency, as evidenced by the decreases in the magnitudes of standard errors. The results of the OLS estimation are available upon request.

[8]Our estimated cost functions satisfy all the regularity conditions when evaluated at the means of the relevant samples. Since the model has imposed symmetry and homogeneity, the regularity conditions are satisfied if the cost function is monotonically increasing and concave in input prices.

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Table 1

Size Distribution of U.S. Savings Bank

Asset size (millions)	1986 Number of Banks	1986 % of Total Number	1987 Number of Banks	1987 % of Total Number	1988 Number of Banks	1988 % of Total Number
Less than $25	27	6.5	21	5.0	17	4.1
$25-49	41	9.8	40	9.6	40	9.6
$50-99	80	19.2	78	18.7	69	16.5
$100-299	152	36.5	151	36.2	156	37.4
$300-499	46	11.0	49	11.8	44	10.6
$500-999	37	8.9	41	9.8	48	11.5
$1,000 or more	34	8.2	37	8.9	43	10.3
Total	417	100.0	417	100.0	417	100.0

Table 2

Definitions of the Variables

Variable	Definition
C:	Total costs
Y_1:	interest-bearing balances due from depository institutions
Y_2:	securities and assets held in trading accounts
Y_3:	Federal funds sold and securities purchased under agreements to resell
Y_4:	total loans and leases net of unearned income
Y_5:	direct and indirect investments in real estate ventures
W_1:	input price of labor
W_2:	input price of physical capital
W_3:	input price of funds

Table 3

Data Summary for U.S. Savings Banks

Variable	Mean	Standard deviation	Minimum	Maximum
1986				
C	30186	85297	193	1396085
Y_1	7873	30933	0	533189
Y_2	110265	432731	6	7670028
Y_3	9828	22327	0	220792
Y_4	257748	574256	2614	7669261
Y_5	1709	9532	0	129082
W_1	24.606	5.347	11.529	48.818
W_2	0.003	0.001	0.000	0.010
W_3	0.066	0.006	0.013	0.083
1987				
C	31161	90555	195	1505538
Y_1	6963	33136	0	407974
Y_2	113641	484137	25	8624492
Y_3	7434	18970	0	205800
Y_4	296365	621799	2787	7557750
Y_5	2379	11523	0	148270
W_1	26.977	6.231	11.921	61.457
W_2	0.003	0.001	0.000	0.010
W_3	0.061	0.005	0.037	0.077
1988				
C	35122	92628	209	1450659
Y_1	9039	57613	0	842642
Y_2	104033	409758	25	7375876
Y_3	7089	17803	0	179700
Y_4	336077	674402	2974	6988041
Y_5	2698	13266	0	159234
W_1	28.069	5.791	3.416	61.455
W_2	0.003	0.001	0.000	0.011
W_3	0.065	0.005	0.031	0.083

Table 4

Parameter Estimates (SUR) for U.S. Savings Banks

Variable	1986 Estimate	1987 Estimate	1988 Estimate
λ	0.089	0.097	0.095
INTERCEP	0.003	0.006	0.007
	(0.285)	(0.781)	(0.909)
Y_1	0.018***	0.016***	0.019***
	(5.547)	(5.765)	(7.138)
Y_2	0.256***	0.267***	0.222***
	(26.576)	(37.084)	(31.442)
Y_3	0.044***	0.029***	0.026***
	(11.650)	(9.158)	(9.434)
Y_4	0.684***	0.680***	0.719***
	(51.870)	(68.756)	(73.699)
Y_5	0.005	0.012***	0.013***
	(1.169)	(3.311)	(3.796)
W_1	0.132***	0.142***	0.138***
	(42.820)	(50.783)	(54.118)
W_2	0.042***	0.046***	0.045***
	(61.159)	(81.607)	(80.312)
W_3	0.826***	0.812***	0.817***
	(261.906)	(294.438)	(326.722)
Y_1*Y_1	0.003***	0.003***	0.003***
	(5.688)	(4.994)	(6.791)
Y_1*Y_2	-0.002***	-0.001	-0.000
	(-2.991)	(-0.853)	(-0.272)
Y_1*Y_3	-0.000**	0.000**	0.000
	(-2.013)	(2.127)	(0.527)
Y_1*Y_4	0.001	-0.002	-0.002**
	(1.320)	(-1.547)	(-2.038)
Y_1*Y_5	-0.000	0.000	0.000
	(-1.515)	(0.036)	(0.364)
Y_2*Y_2	0.141***	0.154***	0.140***
	(27.437)	(28.681)	(26.049)
Y_2*Y_3	-0.006***	-0.002**	-0.002**
	(-5.544)	(-2.059)	(-2.126)
Y_2*Y_4	-0.148***	-0.168***	-0.156***
	(-22.823)	(-26.341)	(-24.175)
Y_2*Y_5	-0.002*	-0.001	-0.002***
	(-1.840)	(-1.335)	(-2.593)
Y_3*Y_3	0.008***	0.006***	0.005***
	(12.363)	(10.347)	(9.779)
Y_3*Y_4	0.002	-0.001	-0.001
	(1.334)	(-0.892)	(-1.190)
Y_3*Y_5	0.000*	-0.000**	-0.000
	(1.653)	(-2.113)	(-0.074)
Y_4*Y_4	0.070***	0.084***	0.081***
	(6.762)	(8.641)	(8.387)
Y_4*Y_5	0.002*	0.002	0.001
	(1.784)	(1.588)	(1.313)
Y_5*Y_5	0.001	0.002***	0.002***
	(0.836)	(2.848)	(3.328)

Table 3 (continued)

Variable	1986 Estimate	1987 Estimate	1988 Estimate
W_1*W_1	0.061***	0.067***	0.047***
	(10.433)	(11.813)	(9.593)
W_1*W_2	0.008***	0.003***	0.003***
	(6.684)	(3.057)	(3.107)
W_1*W_3	-0.069***	-0.070***	-0.051***
	(-11.495)	(-12.294)	(-10.240)
W_2*W_2	0.034***	0.037***	0.037***
	(59.342)	(68.379)	(65.001)
W_2*W_3	-0.042***	-0.040***	-0.040***
	(-32.977)	(-32.787)	(-33.369)
W_3*W_3	0.111***	0.110***	0.091***
	(17.485)	(18.418)	(17.422)
Y_1*W_1	0.000	-0.000	-0.000
	(1.539)	(-0.336)	(-0.853)
Y_1*W_2	-0.000	-0.000	-0.000
	(-0.535)	(-1.364)	(-0.675)
Y_1*W_3	-0.000	0.000	0.000
	(-1.393)	(0.620)	(1.020)
Y_2*W_1	-0.014***	-0.011***	-0.010***
	(-8.575)	(-7.320)	(-6.617)
Y_2*W_2	-0.000	0.000	0.000
	(-0.605)	(0.476)	(0.234)
Y_2*W_3	0.014***	0.011***	0.010***
	(8.528)	(7.313)	(6.678)
Y_3*W_1	-0.001	-0.002***	-0.001*
	(-1.415)	(-4.009)	(-1.821)
Y_3*W_2	-0.000	-0.000	-0.000
	(-0.346)	(-0.714)	(-0.833)
Y_3*W_3	0.001	0.002***	0.001**
	(1.462)	(4.207)	(2.041)
Y_4*W_1	0.004*	0.002	-0.002
	(1.817)	(0.770)	(-1.291)
Y_4*W_2	-0.000	-0.001*	-0.000
	(-0.829)	(-1.715)	(-0.824)
Y_4*W_3	-0.003	-0.001	0.003
	(-1.601)	(-0.425)	(1.500)
Y_5*W_1	0.001***	0.001***	0.001***
	(3.176)	(3.339)	(4.427)
Y_5*W_2	-0.000	-0.000	-0.000
	(-1.337)	(-0.351)	(-1.249)
Y_5*W_3	-0.001***	-0.001***	-0.001***
	(-2.816)	(-3.300)	(-4.216)

T statistics in parentheses.
***Significant at 0.01 level for a two-tailed test.
**Significant at 0.05 level for a two-tailed test.
*Significant at 0.10 level for a two-tailed test.

Table 5

Goodness-of-Fit Measurements

	SSE	DF	MSE	R^2
1986				
Cost Equation	1.63494816	381	0.00429120	0.9974
Labor Share	0.30073207	408	0.00073709	0.5154
Capital Share	0.01440929	408	0.00003532	0.8905
1987				
Cost Equation	1.37969548	381	0.00362125	0.9977
Labor Share	0.28207297	408	0.00069136	0.5133
Capital Share	0.01150806	408	0.00002821	0.9090
1988				
Cost Equation	1.25989230	381	0.00330680	0.9980
Labor Share	0.24000568	408	0.00058825	0.5379
Capital Share	0.01160510	408	0.00002844	0.9006

SSE: Sum of Squared Errors.
DF: Degrees of Freedom.
MSE: Mean Square Error (MSE = SSE/DF).
R^2: Adjusted R-squared.

Table 6

Product-Specific Cost Measures at Mean Points

	Y_1	Y_2	Y_3	Y_4	Y_5
1986					
CE_i	0.018	0.256	0.044	0.684	0.005
MC_i	0.018	0.257	0.044	0.686	0.005
IC_i	0.004	-2.871	-0.007	0.877	0.014
SL_i	0.220	-11.166	-0.155	1.279	2.991
SC_i	0.005	3.009	0.017	0.900	-0.006
1987					
CE_i	0.016	0.267	0.029	0.680	0.012
MC_i	0.016	0.268	0.029	0.684	0.012
IC_i	0.029	-1.786	-0.017	0.864	0.018
SL_i	1.834	-6.658	-0.587	1.264	1.499
SC_i	-0.021	1.906	0.026	1.291	-0.009
1988					
CE_i	0.019	0.222	0.026	0.719	0.013
MC_i	0.019	0.223	0.027	0.724	0.013
IC_i	0.023	-1.865	0.004	0.890	0.018
SL_i	1.195	-8.357	0.145	1.229	1.306
SC_i	-0.014	1.956	0.005	1.288	-0.009

Table 7

Estimates of Overall Scale Economies at Eight Mean Points

Asset Size (millions)	1986	1987	1988
"Typical" bank	0.993	0.997	1.001
Less than $25	1.070	1.081	1.093
$25-49	1.047	1.047	1.057
$50-99	1.020	1.022	1.033
$100-299	1.001	1.004	1.012
$300-499	0.993	0.999	1.001
$500-999	0.994	1.003	1.002
$1,000 or more	1.010	1.032	1.023

Table 8

Estimates of Overall Scope Economies at Eight Mean Points

Asset Size (millions)	1986	1987	1988
"Typical" bank	0.948	1.306	1.302
Less than $25	0.706	0.856	0.942
$25-49	0.311	0.443	0.445
$50-99	0.206	0.319	0.349
$100-299	0.396	0.568	0.528
$300-499	1.096	1.471	1.247
$500-999	1.817	2.475	2.146
$1,000 or more	6.967	9.493	8.065