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Agency Costs among Savings and Loans*

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When the managers of a firm are not its owners, agency problems result if managers take actions that maximize their own utility rather than the value of the firm. This paper investigates the existence of agency problems in mutual savings and loans. Using a more general approach than in previous studies, I show that mutual S&Ls were operating with an inefficient output mix while stock S&Ls were not, suggesting an agency problem among mutual S&Ls. The results cast doubt on a common argument that mutuals convert to stock S&Ls to capture economies of scale. *Journal of Economic Literature* Classification Numbers: 310, 311, 314.

1. INTRODUCTION

Savings and loans (S&Ls) are organized as either stockholder-owned or mutual institutions. The separation between ownership and management is thought to be greater in the mutual form of organization than in the stock form. Stockholders choose managers to act on their behalf, and their ability to sell their ownership privileges potentially gives stockholders considerable influence over managers. Mutual institutions, however, are formally owned by their depositors, who have little control over man-

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agers. Hence, managers of mutuals should be better able to pursue their own goals at the expense of depositors.

Whether there are significant agency costs in mutual S&Ls is, however, an empirical question. Most previous studies of expense preference compared with expenditures of one group of firms to another and used an intercept test to test for significant differences.[1] Mester (1989) shows that the intercept test is appropriate only if the two groups of firms have the same production structure, and if the firms' logarithmic cost function is linear in the log of prices of inputs that provide utility to an expense-preferring manager. The S&L industry does not meet these conditions, so the intercept test is inappropriate.

This paper analyzes the cost structures of stock and mutual S&Ls just prior to the industry's deregulation in the mid-1980s, a period in which potential agency problems could be expected to be most pronounced. The results indicate that stock S&Ls were operating at efficient output levels, but that mutual S&Ls were not. While stock S&Ls were producing an efficient output mix, mutual S&Ls of all sizes were found to be operating with diseconomies of scope. This inefficiency is interpreted as evidence of non-value-maximizing behavior on the part of mutual S&L managers.

One possible motive for the recent plethora of conversions of mutual S&Ls to stock charter—over 200 since 1974—is their desire to capture scale and scope economies (Masulis, 1987). This assumes that such production economies exist, with stock S&Ls able to attain their minimum efficient scale while mutual S&Ls cannot. The evidence presented here, however, indicates that mutual and stock S&Ls do not differ with respect to economies of scale.

The rest of this paper is organized as follows. Section 2 discusses differences between stock and mutual S&Ls—possible agency problems and the impact of regulatory constraints—that might lead to different cost structures. Section 3 discusses the relationship between economies of scale and regulatory constraints and the relationship between diseconomies of scope and agency problems. Section 4 presents the model and estimation of stock and mutual S&L cost structures, and Section 5 compares these cost structures. Section 6 concludes and interprets charter conversion in light of the results.

[1] Edwards (1977), Hannan (1979), Hannan and Mavinga (1980), and Smirlock and Marshall (1983) studied commercial banks; Awh and Primeaux (1985) studied electrical utilities; Fields (1988) studied life insurers; Verbrugge and Goldstein (1981), Verbrugge and Jahera (1981), and Blair and Placone (1988) studied S&Ls; all used the intercept test. Akella and Greenbaum (1988) did not use the intercept test; they examined the effects of expense preference on an S&L's output decision. Assuming the S&Ls' intermediation technology has constant returns to scale, they found that mutual S&Ls tend to expand deposits and loans beyond profit-maximizing levels.

2. AGENCY COSTS IN STOCK AND MUTUAL S&LS

Two differences between a stock and a mutual S&L are: (1) the formal owners of a mutual S&L are its depositors (and possibly its borrowers) whereas the owners of a stock S&L are its stockholders; and (2) a stock S&L can augment its capital by selling common stock whereas a mutual cannot.

Both stock and mutual S&Ls are administered by managers whose goals may differ from owners'. However, the two types of S&Ls differ with regard to owners' ability to monitor managers. Stockholders have greater control over the activities of management because control can be consolidated through the purchase of stock.

Earlier literature viewed mutual S&Ls as either cooperatives, with depositors and borrowers working for a common goal, or benevolent associations organized to encourage saving and homeownership (Brigham and Pettit, 1969; Hester, 1968). This view was partly based on the observation that the first S&Ls were mutuals that serviced smaller depositors, leaving the larger ones to commercial banks and other financial institutions. Indeed, there are models that suggest such a role for the mutual form of organization (Rasmusen, 1988). With deposit insurance eliminating differences among deposits, this explanation for the existence of two forms of S&L organization became less compelling. Mutual S&Ls began to serve the same functions as stock S&Ls.

As operations became more complex, mutuals began to choose managers on the basis of expertise (Masulis, 1987). While mutual S&L depositors have the right to choose their directors, their voting rights are often limited and the depositors often sign them over to management when they open accounts. Although depositors can withdraw their funds if dissatisfied with management, they have had little incentive to do so because of deposit insurance, especially when interest rate ceilings bounded the return to depositors (O'Hara, 1981).

It is possible that competition with stock S&Ls might discipline mutual managers. If competition is sufficient to drive less efficient mutual S&Ls out of the market, then mutual managers, to avoid unemployment, might choose to become more efficient. But this assumes that the higher profits earned by stock S&Ls because of their efficiency are passed on to depositors or borrowers rather than to stockholders, giving customers of the mutual S&L an incentive to shift to a stock institution. In the pre-1986 era, when deposit interest rates were still regulated, it was unlikely that efficiency rents were passed on to depositors. Entry barriers reduce the need for stock S&Ls to pass along profits to borrowers—so loan market competition need not exert effective discipline. Thus, the separation of ownership and management, especially before 1986, is expected to have been greater among mutual than among stock S&Ls, and mutual managers should have been able to indulge in expense preference behavior.[2] This would imply cost differences between mutual and stock S&Ls.

Another difference between mutual and stock S&Ls that could lead to cost differences is the latter's ability to issue common stock. A mutual S&L can increase its net worth only by retaining earnings, while a stock S&L can sell new stock. Regulatory capital requirements, therefore, have a different impact on mutual and stock S&Ls. Accordingly, mutuals may use a different technology when intermediating, and so have a cost structure different from that of stock S&Ls.

3. AGENCY COSTS AND DISECONOMIES OF SCOPE

An analysis of S&Ls' cost structures will test for differences and identify their probable source. If their inability to issue stock impedes mutual S&Ls' growth to minimum efficient scale, then the cost functions should indicate that mutuals are operating with increasing returns to scale while stock S&Ls are operating closer to efficient scale. On the other hand, the larger separation between ownership and control in mutuals would lead to a cost structure indicating inefficiency in general—i.e., either economies or diseconomies of scale or scope. A finding that mutuals select an inefficient product mix while stock S&Ls do not, and that mutuals and stock S&Ls are equally efficient with respect to scale of operations, would suggest an agency cost explanation rather than the capital constraint interpretation.[3,4]

[2] Mayers and Smith (1986) cite disadvantages and advantages of the mutual form of organization compared with the stock form in insurance companies. Disadvantages include the greater separation between owners and managers in mutuals, and the loss in risk-bearing efficiency because owners and customers are the same. The advantage cited is that the conflict between policyholders, who prefer less risk, and stockholders, who prefer more, is avoided in mutual companies. In S&Ls, this potential advantage of mutuals over stock institutions disappears—deposits are equally safe in either type of institution because of deposit insurance. Rasmusen (1988) makes a similar argument relating to banks.

[3] It is possible that differences in efficiency between stock and mutual S&Ls could reflect a systematic difference in management ability across S&L type. However, there is no evidence that managers of mutual S&Ls are systematically less capable than managers of stock S&Ls.

[4] Expense preference on the part of mutuals is not the only way the objective functions of stock and mutual S&Ls might differ. A referee suggested that a mutual might be seeking to maximize depositor wealth and because deposit rates are controlled, does this by providing its customers with cut-rate loans. However, this would not generate an inefficient output mix on the part of mutuals. The mutual would still seek to minimize costs in order to pass these cost savings on to customers. Additionally, in the sample there is no evidence that mutuals priced loans below stock S&Ls: for each type of S&L, interest on mortgages/mortgages loans (a rough proxy variable) averaged 10.5%.

Models of hierarchical control suggest that agency costs imply diseconomies of scope, since multiproduct operations usually involve additional layers of management. Managers' discretionary behavior (including expense preference) can be sustained up to the point where the owners' benefits and costs of monitoring the managers are equal. Several papers, including Williamson (1967) and McAfee and McMillan (1990), model these costs, and thus the degree of inefficiency, as an increasing function of the length of a firm's managerial hierarchy. Although these papers consider single-output firms, a similar model can be applied to multiproduct firms. The larger the number of products the firm produces, the more complicated the firm's management structure, involving both a longer and a broader managerial hierarchy. Thus, in firms where monitoring costs are positive, these costs, and hence the degree of sustainable inefficiency (caused by managers indulging their own preferences), should be increasing functions of the number of products the firm produces. Moreover, it is reasonable to assume an increasingly complex managerial structure, so that the average cost of monitoring the firm and the average degree of inefficiency are increasing functions of the number of products as well. If so, then in firms where monitoring is a problem (e.g., mutual S&Ls), the observed cost function would exhibit diseconomies of scope even though the production costs exhibited no such diseconomies or economies of scope.

For example, suppose that stock S&Ls are cost minimizers with cost function $C(y_1,y_2)$. This cost function measures just production costs if we assume that the market for corporate control works well enough to prevent managerial inefficiency, i.e., monitoring costs are negligible. There are neither economies nor diseconomies of scope if $C(y_1,0) + C(0,y_2) - C(y_1,y_2) = 0$. Now consider mutual S&Ls, where the separation between owners and managers permits discretionary behavior on the part of managers. Let $m(x)$ be the additional agency cost of a mutual S&L that produces x products. Because of the complexity of multiproduct firms, average monitoring costs and so average agency costs are an increasing function of the number of products; i.e., $m(x)/x$ is increasing in x. Then the total cost of production for the mutual S&L is given by $C(y_1,y_2) + m(i)$, where $i = 2$ if $y_1 > 0$ and $y_2 > 0$, and $i = 1$ if $y_1 = 0$ or $y_2 = 0$. This cost function exhibits diseconomies of scope, since $(C(y_1,0) + m(1)) + (C(0,y_2) + m(1)) - (C(y_1,y_2) + m(2)) = C(y_1,0) + C(0,y_2) - C(y_1,y_2) + 2m(1) - m(2) = 2m(1) - m(2) < 0$. Even if production costs indicate economies of scope, the observed cost function will exhibit diseconomies if the average agency cost is sufficiently steep.

Rather than model the agency cost as a function of the number of products, we could model it as a function of the levels of each product, i.e., $m(y_1,y_2)$, just as we modeled the production cost. Then, as long as the agency cost function exhibited sufficient diseconomies of scope, the observed cost function would exhibit diseconomies as well. That the agency cost function should exhibit diseconomies of scope in firms where the agency costs are significant seems reasonable, since the managerial configuration of a multiproduct firm is more complex and so harder to monitor than that of a single product firm.

The way in which the cost functions of stock and mutual S&Ls differ will suggest the source of these differences. Diseconomies of scope at mutual S&Ls, but not at stock S&Ls, and similar scale economies indicate agency problems at mutuals, while significantly higher scale economies at mutual S&Ls than at stock S&Ls, and similar scope economies, indicate the capital constraint.

Apart from the observed cost differences, there are two reasons why differences are more likely due to agency considerations than to the possible growth constraint caused by capital paucity. First, regulatory forbearance, which allowed capital to fall below the regulatory requirements, weakened the effect of the capital constraint. Second, in the sample used in this paper (California stock and mutual S&Ls operating in 1982), the size (asset) range of stock S&Ls is wider than that of mutual S&Ls—the largest stock S&L is larger than the largest mutual S&L, and the smallest stock S&L is smaller than the smallest mutual S&L. Furthermore, the average mutual S&L is larger than the average stock S&L. Thus, mutuals do not appear to be any more size-constrained than stock S&Ls. Any inefficiency found is therefore more likely due to agency problems than to capital constraint problems.[5]

4. COST STRUCTURES OF STOCK AND MUTUAL S&Ls

Mester (1989) used data on 149 S&Ls operating in California in 1982 to show that stock and mutual S&Ls had different cost structures.[6] Data pertaining to a single state rather than to the entire nation were chosen as

[5] One possible explanation for the empirical findings might be that stock and mutual S&Ls are engaged in different activities and do not share the same technology. However, even if the S&Ls were engaged in different activities, they should be performing efficiently. While my empirical model assumes that the outputs of each type of S&L can be proxied by loans and securities, it does not assume that stock and mutuals serve the same loan customers. Nor does it assume that mutual and stock S&Ls share the same technology. There is little empirical evidence that mutual and stock firms produce different products—Mayers and Smith (1986) indicate that insurance companies produced the same types of products 5 years prior to and 5 years after converting to mutuals. Also, to meet the "qualified thrift lender test" S&Ls must hold a large percentage of their portfolios in housing-related assets. In 1982 the requirement was 60%; FIRREA raised it to 70%.

[6] Of the 149 S&Ls, 106 were stock and 43 were mutual S&Ls. The S&Ls included are those that operated the entire year. The 17 S&Ls that began or ceased operation during 1982 were excluded. Also, five S&Ls were excluded because of large discrepancies between data provided by the Federal Home Loan Bank Board and data provided by the Federal Home Loan Bank of San Francisco.

a parsimonious way to control for market differences. California was chosen since statewide branching was permitted (for both state and federally chartered S&Ls) and California had the largest number of S&Ls, with a sufficiently diverse mix of stock and mutuals. A two-step estimation procedure and F test strongly rejected the null hypothesis that mutual and stock S&Ls share the same cost structure: the test statistic was 6.4177 with (15,27) degrees of freedom.

Potentially, differences in the regulatory treatment of state and federally chartered S&Ls could be driving this result: state institutions (especially in California) are thought to be less restricted than federal institutions. However, this was unlikely here because much of this deregulation in California came *after* 1982 and the passage of the Garn–St. Germain Act. State-chartered S&Ls were actually fairly tightly controlled under Governor Jerry Brown's administration (1975–1983), and it was not until 1983 that state-chartered S&Ls in California were deregulated (Strunk and Case, 1988).

As a formal test of whether charter type (rather than organizational form) accounted for the differences in cost structures, I held organizational form constant and tested for differences across charter type. Of the 106 stock institutions, 17 are federally chartered and 89 are state chartered. Estimating the cost function for stock S&Ls alone, and using a likelihood ratio test, I could not reject the null hypothesis that federal and state stock S&Ls have the same cost structure—the test statistic was 13.62 while the critical value of the χ^2 distribution with 15 degrees of freedom is 25.00. Thus, the difference in cost structures between sample stock and mutual S&Ls appears to be due to organizational form rather than to charter type.[7]

To avoid the difficulties caused by the S&Ls having different cost structures, in this paper agency problems are tested for by estimating separate cost models for stock and mutual S&Ls. There has been much debate about what constitutes the outputs of a financial institution. The intermediation approach used here views the institution as using labor, physical capital, and deposits to produce earning assets (Sealey and Lindley, 1977). I consider two outputs: loans and other nonloan earning assets including cash, securities, and real estate investments, measured in dollars.[8] This approach, the most common in the literature, allows comparison of the results to those of other studies.[9]

[7] I could not perform the comparable test for mutuals because only 2 of the 43 mutual S&Ls in the sample are state-chartered mutuals.

[8] Since there are only 43 mutual institutions, only two outputs and three inputs are used to conserve on degrees of freedom—16 parameters are estimated.

[9] As discussed in Humphrey (1985), different approaches to measuring output (e.g., the intermediation approach vs the production approach) lead to the same general conclusions about economies of scale and scope in different cost studies. Thus, the results do not appear as sensitive to output definition as one might think.

The first output, y_1 = loans, is measured as the average of its dollar amount at the end of 1982 and the end of 1981, and the second output, y_2 = cash + securities + real estate investments in excess of the minimum liquidity requirements, is measured as the average of its dollar amount at the end of 1982 and the end of 1981.

The three inputs are labor, physical capital, and deposits. As there were no data on number of employees, an S&L-specific wage, w_1, is proxied by $\Sigma_i(B_i/\Sigma B_j)\omega_i$, where B_i is the number of branches the S&L has in county i, ΣB_j is the total number of branches the S&L has in all counties, and ω_i is the wage rate in county i.[10] The unit price of physical capital, w_2, is constructed as rent, depreciation, utilities, equipment, and furniture expenditure/average dollar of deposits during 1982.[11] The deposit price, w_3, is the effective rate of interest paid, net of service charges, on each dollar of deposits in passbook accounts, NOW accounts, and accounts earning in excess of the regular rate = (total interest and commissions paid on these accounts − service charges)/average dollars of deposits in these accounts during 1982. Total costs, C, include all expenditures on labor, rent, depreciation, utilities, equipment, and furniture, and interest payments net of service charges. A variable, GROWTH, measured as ln(assets in 1982/assets in 1981), is included to control for any short-run disequilibrium effects on cost behavior. Table I summarizes the data.

For *stock S&Ls*, a translog cost function is specified and cost-share equations are derived using Shephard's lemma (under the maintained hypothesis that stock S&Ls minimize cost).[12] Using data on the stock S&Ls, maximum likelihood estimates were obtained by estimating the cost equation with the labor and physical capital cost-share equations using iterative seemingly unrelated regression.[13] The stock S&L model is

[10] S&Ls with multiple branches may operate in more than one labor market, making determination of a single wage rate difficult. Branch data were available by county; labor expense data were unavailable on a per-branch basis. This weighting scheme tries to take into account multiple market operations of S&Ls and assumes that employment is more closely related to number of branches than number or size of accounts. Branching is permitted for all types of S&Ls in California.

[11] I would have preferred to measure w_2 as average rental cost per square foot of office space over all markets in which the S&L operates. However, these data were available for only seven metropolitan areas of California.

[12] I estimate the reduced-form cost function. The structural model consists of two equations: a translog cost function including a variable, ln BR ≡ ln(No. branches), which interacts with all other variables in the cost function, and a branch equation that relates branches to output, $\ln \text{BR} = q_0 + \Sigma_i q_i \ln y_i$. The reduced form is obtained by substituting the branch equation into the cost function.

[13] A share equation must be omitted; otherwise the variance–covariance matrix would be singular. I omit the deposit cost share, but the maximum likelihood estimates obtained via iterative SUR are invariant to which share equation is omitted.

$$\begin{aligned}\ln C = a_0 &+ \sum_{i=1}^{2} a_i \ln y_i + \sum_{j=1}^{3} b_j \ln w_j \\ &+ \frac{1}{2}\sum_{i=1}^{2}\sum_{k=1}^{2} s_{ik} \ln y_i \ln y_k \\ &+ \frac{1}{2}\sum_{j=1}^{3}\sum_{m=1}^{3} g_{jm} \ln w_j \ln w_m \\ &+ \sum_{i=1}^{2}\sum_{j=1}^{3} d_{ij} \ln y_i \ln w_j + L_1 \text{ GROWTH} + u\end{aligned} \tag{1}$$

$$\begin{aligned}\text{SH}_j = b_j &+ \sum_{m=1}^{3} g_{jm} \ln w_m \\ &+ \sum_{i=1}^{2} d_{ij} \ln y_i + u_j, \qquad j = 1,2\end{aligned} \tag{2}$$

with

$$\left.\begin{array}{ll} s_{ik} = s_{ki}, & i, k = 1, 2 \\ g_{jm} = g_{mj}, & j, m = 1, 2, 3 \end{array}\right\} \text{symmetry,}$$

$$\left.\begin{array}{ll} \sum_{j=1}^{3} b_j = 1 & \\ \sum_{m=1}^{3} g_{jm} = 0, & j = 1, 2, 3 \\ \sum_{j=1}^{3} d_{ij} = 0, & i = 1, 2 \end{array}\right\} \begin{array}{l}\text{linear homogeneity} \\ \text{in input prices,}\end{array}$$

where

C is the total costs,
y_i is the quantity of output i,
w_j is the price of input j,
SH_j is the cost share of input j.

Likelihood ratio tests are used to test for homotheticity (marginal rates of substitution in production are independent of scale effects and depend only on relative prices), homogeneity in outputs (a t-fold increase in all inputs leads to a t^k increase in output where k is the degree of homogene-

TABLE I
Data Summary

Variable	All S&Ls (149 insts.)	Stock S&Ls (106 insts.)	Mutual S&Ls (43 insts.)
C, Total cost (millions \$)			
Minimum	0.549	0.549	1.098
Mean	59.252	56.360	66.381
Maximum	1053.003	1053.003	548.240
Standard deviation	140.008	151.846	106.574
SH_1, Labor cost share			
Minimum	0.046	0.046	0.062
Mean	0.145	0.160	0.109
Maximum	0.518	0.518	0.181
Standard deviation	0.073	0.081	0.024
SH_2, Physical capital cost share			
Minimum	0.010	0.015	0.010
Mean	0.065	0.071	0.050
Maximum	0.195	0.195	0.091
Standard deviation	0.036	0.040	0.016
SH_3, Deposit cost share			
Minimum	0.409	0.409	0.739
Mean	0.790	0.770	0.841
Maximum	0.936	0.936	0.917
Standard deviation	0.102	0.112	0.036
y_1, Loans (millions \$)			
Minimum	1.550	1.550	5.922
Mean	530.171	518.505	558.929
Maximum	9548.301	9548.301	4816.834
Standard deviation	1319.800	1458.921	903.165
y_2, Cash, securities, real estate investments (millions \$)			
Minimum	0.727	0.727	1.673
Mean	54.934	53.628	58.152
Maximum	1324.986	1324.986	482.716
Standard deviation	143.359	155.968	107.663
w_1, Price of labor (\$)			
Minimum	4.770	4.770	5.490
Mean	7.511	7.578	7.345
Maximum	10.690	10.690	10.690
Standard deviation	1.656	1.698	1.554
w_2, Price of capital (\$)			
Minimum	0.001	0.002	0.001
Mean	0.010	0.011	0.007
Maximum	0.040	0.040	0.013
Standard deviation	0.007	0.008	0.002

TABLE I—*Continued*

Variable	All S&Ls (149 insts.)	Stock S&Ls (106 insts.)	Mutual S&Ls (43 insts.)
w_3, Price of deposits ($)			
Minimum	0.030	0.030	0.081
Mean	0.112	0.112	0.113
Maximum	0.215	0.215	0.133
Standard deviation	0.018	0.020	0.010
GROWTH, Disequilibrium			
Minimum	−0.097	−0.068	−0.097
Mean	0.439	0.544	0.178
Maximum	3.317	3.315	3.037
Standard deviation	0.616	0.637	0.474

ity), generalized Cobb–Douglas (homogeneity in outputs with the elasticity of substitution between inputs equal to one), and Cobb–Douglas (homogeneity of degree one in outputs with the elasticity of substitution between inputs equal to one). Table II shows that for stock S&Ls each of the restricted functional forms for the production technology is rejected at the 0.05 level. Thus, Table III reports the maximum likelihood parameter estimates, their standard errors, and t statistics for the unrestricted stock cost function.[14]

For *mutual S&Ls*, a translog cost function is estimated using ordinary least squares. To allow for expense preference behavior, I omit the cost shares from the model.[15] Thus, the mutual S&L cost model is Eq. (1) above.[16] F tests are used to test for the same restrictions on the parameters of the cost function as in the case of stock S&Ls, although duality cannot be used to draw the correspondence between these restrictions and those on the production technology, since mutuals may be showing expense preference. Since the restrictions $\{d_{ij} = 0, s_{ik} = 0, g_{jm} = 0\}$ are not

[14] These parameter estimates differ slightly from those reported in Table 2 of Mester (1989) for two reasons. Here service charges are netted out from interest expenses when measuring deposit price and total costs, and the TSP statistical package rather than SAS is used to estimate the model. TSP and SAS use different iterative processes and convergence criteria. The results discussed below are insensitive to these differences.

[15] If the mutuals are exhibiting expense preference, then the *observed* cost shares are not derivable using Shephard's Lemma, since the denominator of the observed cost share is a function of actual input prices rather than of the shadow input prices used by firms showing expense preference.

[16] The null hypothesis of homoscedastic disturbances could not be rejected at the 0.05 level of significance in either cost model. This was tested by ordering the observations by asset size ($y_1 + y_2$) and regressing the square of the residuals on the square of the assets.

TABLE II

χ^2 tests for structural form of stock S&L cost function

	Value of the test statistic $-2 \ln LR$	Degrees of freedom	Critical value at 95% confidence level
$d_{ij} = 0 \quad \forall i, j$ (Homothetic)	80.63	4	9.49
$d_{ij} = 0,\ s_{ik} = 0 \quad \forall i, j, k$ (Homogeneous in output)	86.45	7	14.07
$d_{ij} = 0,\ s_{ik} = 0,\ g_{jm} = 0 \quad \forall i, j, k, m$ (Generalized Cobb–Douglas)	311.37	10	18.31
$\sum_i a_i = 1,\ d_{ij} = 0,\ s_{ik} = 0,\ g_{jm} = 0 \quad \forall i, j, k, m$ (Cobb–Douglas)	332.32	11	19.68

F tests for structural form of mutual S&L cost function

	Value of the test statistic	Degrees of freedom	Critical value at 95% confidence level
$d_{ij} = 0 \quad \forall i, j$	0.1060	4, 27	2.73
$d_{ij} = 0,\ s_{ik} = 0 \quad \forall i, j, k$	0.7091	7, 27	2.37
$d_{ij} = 0,\ s_{ik} = 0,\ g_{jm} = 0 \quad \forall i, j, k, m$	0.6097	10, 27	2.20
$\sum_i a_i = 1,\ d_{ij} = 0,\ s_{ik} = 0,\ g_{jm} = 0 \quad \forall i, j, k, m$	3.2728	11, 27	2.16

rejected for mutual S&Ls, they are imposed on the translog function for the mutuals. Table III presents the OLS parameter estimates, their standard errors, and t statistics for the mutuals' restricted cost function, analyzed below.

It is possible that estimating cost shares with the stock S&Ls' cost function and not with the mutuals' accounts for the differences between stock and mutual S&Ls observed thus far. Under the maintained hypothesis that stockholders exert enough control on managers of stock S&Ls, it is appropriate to use Shephard's lemma to derive shares. However, if stockholders fail to monitor, then the managers may not minimize cost. To check the robustness of the results reported above, I estimated the stock S&Ls' cost function (Eq. (1)) without cost shares and performed the same tests of restricted functional forms. Again, all of the restrictions are rejected at the 0.05 level of significance. (See Appendix Tables A1 and A2.) Thus, the previous results are not due to the asymmetric treatment of stock and mutual S&Ls with respect to cost shares.

TABLE III

Parameter	Variable[a]	Estimate	Approx. std. error	$Z = \frac{\text{Est.}}{\text{Std. error}}$
	Parameter Estimates for the Stock S&L Cost Function			
a_0	Constant	0.7030	1.4185	0.50
a_1*	$\ln y_1$	0.8409	0.2450	3.43
a_2	$\ln y_2$	0.0846	0.2863	0.30
b_1	$\ln w_1$	0.4640	0.1012	4.58
b_2*	$\ln w_2$	0.1769	0.0201	8.78
b_3*$(= 1 - b_1 - b_2)$	$\ln w_3$	0.3591	0.0947	3.79
s_{11}*	$\ln y_1 \ln y_1$	0.0813	0.0375	2.17
s_{12}*	$\ln y_1 \ln y_2$	−0.0868	0.0419	−2.07
s_{22}**	$\ln y_2 \ln y_2$	0.0996	0.0516	1.93
g_{11}	$\ln w_1 \ln w_1$	0.0306	0.0214	1.43
g_{12}	$\ln w_1 \ln w_2$	0.0042	0.0042	1.01
g_{13}**$(= -g_{11} - g_{12})$	$\ln w_1 \ln w_3$	−0.0348	0.0199	−1.75
g_{22}*	$\ln w_2 \ln w_2$	0.0596	0.0021	28.63
g_{23}*$(= -g_{12} - g_{23})$	$\ln w_2 \ln w_3$	−0.0638	0.0041	−15.53
g_{33}*$(= g_{11} + g_{22} + 2g_{12})$	$\ln w_3 \ln w_3$	0.0986	0.0193	5.11
d_{11}*	$\ln y_1 \ln w_1$	−0.0422	0.0074	−5.67
d_{12}	$\ln y_1 \ln w_2$	−0.0013	0.0017	−0.73
d_{13}*$(= -d_{11} - d_{12})$	$\ln y_1 \ln w_3$	0.0434	0.0070	6.20
d_{21}*	$\ln y_2 \ln w_1$	0.0207	0.0088	2.35
d_{22}	$\ln y_2 \ln w_2$	0.0030	0.0019	1.61
d_{23}*$(= -d_{21} - d_{22})$	$\ln y_2 \ln w_3$	−0.0237	0.0082	−2.88
L_1	GROWTH	0.0251	0.0247	1.02

R^2 on cost equation = 0.9931,
R^2 on labor cost share equation = 0.5199,
R^2 on physical capital cost share equation = 0.9145

Parameter Estimates for the Mutual S&L Cost Function with $d_{ij} = 0$, $s_{ik} = 0$, $g_{jm} = 0$ Restrictions Imposed

Parameter	Variable[a]	Estimate	Approx. std. error	Z
a_0*	Constant	1.4328	0.3064	4.68
a_1*	$\ln y_1$	0.8178	0.0279	29.36
a_2*	$\ln y_2$	0.1343	0.0271	4.97
b_1	$\ln w_1$	0.0106	0.0580	0.18
b_2	$\ln w_2$	0.0443	0.0304	1.46
b_3*$(= 1 - b_1 - b_2)$	$\ln w_3$	0.9451	0.0626	15.10
L_1	GROWTH	0.0079	0.0275	0.29

$R^2 = 0.9975$

[a] y_1 = loans,
y_2 = cash, securities, and real estate investments,
w_1 = price of labor,
w_2 = price of physical capital,
w_3 = price of deposits,
GROWTH = ln (total assets in 1982/total assets in 1981).
* Significant at the 0.05 level.
** Significant at the 0.10 level.

Because none of the restricted forms is accepted for the stock S&Ls, the cost function involves many parameters, and estimating with the share equations increases degrees of freedom. The results reported below are based on this model; however, as presented in Appendix Table A3, the stock S&L model without cost shares yields similar results.

5. SCALE AND SCOPE ECONOMIES AT STOCK AND MUTUAL S&LS

Inefficiency at mutual S&Ls can be interpreted as evidence of agency problems. This is especially true if the inefficiency has less to do with scale than with scope of operations.

A. *Economies of Scale*

For the unrestricted stock S&L translog cost function, the degree of scale economies $S = 1/[\Sigma_i(a_i + \Sigma_k s_{ik} \ln y_k + \Sigma_j d_{ij} \ln w_j)]$. The firm is operating with economies (diseconomies) of scale if S is significantly greater (less) than 1. Since S is a function of output levels and input prices, I evaluate it at three different points: (1) the sample means of the input prices, GROWTH, and outputs for stock S&Ls; (2) the sample means of the input prices and GROWTH, and the *minimum* values of the output variables; and (3) the sample means of the input prices and GROWTH, and the *maximum* values of the output variables. These three points can be thought of as "representative," "small," and large" firms, respectively. Table IV shows that stock S&Ls are operating at output levels where there are increasing returns to scale. S is significantly greater than 1 for the small and representative stock firm at the 0.05 level of significance. Although the point estimate of S decreases with firm size, S at the small firm is not statistically different from S at the large firm. Letting $\beta_s = 1/S$ at the small firm, $\beta_\ell = 1/S$ at the large firm, and $\sigma = [\text{var}(\beta_s) + \text{var}(\beta_\ell) - 2\,\text{cov}(\beta_s, \beta_\ell)]^{1/2}$, the test statistic is $T = (\beta_s - \beta_\ell)/\sigma = -0.6610$. S is not particularly large—the representative stock S&L is operating within 5% of minimum efficient scale. Thus, only small efficiency gains are possible from increasing the scale of operations at stock S&Ls.

For the restricted mutual S&L translog cost function, $S = 1/\Sigma_i a_i$, which is independent of output levels and input prices. Table IV shows that all mutual S&Ls are operating with increasing returns to scale. But the magnitude of these scale economies is comparable to that of stock S&Ls. Thus, the source of the differences between the mutual and the stock S&Ls cost structures does not appear to be the impact of the capital requirement.

These results can be compared to those of three other multiproduct S&L studies (Mester, 1987; LeCompte and Smith, 1990; Zardkoohi *et al.*, 1987), bearing in mind that the studies use different definitions of output and do not distinguish between stock and mutual S&Ls. The results here accord with Mester (1987), where small but significant scale economies are observed at the representative firm, and with Zardkoohi *et al.* (1987), who observe significant scale economies over a range of output sizes. In contrast, LeCompte and Smith (1990) find constant returns for a 1983 sample. Most of the commercial bank cost studies also find small scale economies at smaller output levels (Gilligan *et al.*, 1984).

B. *Economies of Scope*

Economies of scope, $SC = [C(y_1, 0) + C(0, y_2) - C(y_1, y_2)]/C(y_1, y_2)$, measure whether it is less costly for a multiproduct firm to produce the two outputs together than for two single-product firms.[17] There are economies (diseconomies) of scope if SC is significantly greater (less) than 0. Since SC is a nonlinear function of the parameter estimates, an approximate standard error is calculated by expanding SC in a Taylor series of the parameters, dropping terms of order two or more, and solving for the standard deviation of this approximation. Table IV shows that SC is positive but insignificantly different from 0 for stock S&Ls of all sizes, but significantly negative for mutual S&Ls of all sizes. I infer that stock S&Ls operate with an efficient output mix, but that there are diseconomies of scope between loans and investments among mutuals.

This interpretation is supported by the finding of significant cost noncomplementarity between the two outputs at mutual S&Ls of all sizes, but only at small stock S&Ls and not at representative or large stock S&Ls. Noncomplementarity between outputs is a necessary, but not sufficient, condition for diseconomies of scope. Two outputs are noncomplements if the marginal cost of producing one of the outputs is an increasing function of the other, i.e., $\partial^2 C/\partial y_1 \partial y_2 > 0$. Table IV indicates that this derivative is significantly positive for mutual S&Ls across the three size classes, but insignificantly different from zero for representative and large stock S&Ls.

Mester (1987) found no evidence of scope economies, probably because when a single cost function is estimated for both stock and mutual S&Ls, it more closely resembles the stock cost function, since there are more stock S&Ls in the sample. Zardkoohi *et al.* (1987) find a positive point

[17] A drawback of the translog functional form is that it implies that cost is zero if any output level is zero. As a remedy, a zero output level is defined as 10% of the minimum level of that output over the sample. The results are robust to different values of (y_1^*, y_2^*)—see Section 5.C. below.

TABLE IV
Economies of Scale and Scope[a]

	Stock S&Ls			Mutual S&Ls		
	"Small" firm[b]	"Representative firm[c]	"Large" firm[d]	"Small" firm[b]	"Representative firm[c]	"Large" firm[d]
S = Degree of economies of scale	1.0803††	1.0537†	1.0265	1.0503†	1.0503†	1.0503†
	(0.0437)	(0.0153)	(0.0454)	(0.0091)	(0.0091)	(0.0091)
SC = Degree of economies of scope	−0.0284	1.4417	8.2648	−0.1138*	−0.5406*	−0.6564*
	(0.1101)	(2.7527)	(19.5564)	(0.0365)	(0.0714)	(0.0738)
WSC = Within-sample degree of economies of scope	‡	0.1283	1.3561	‡	−0.3603*	−0.5291*
		(0.5619)	(2.9010)		(0.0560)	(0.0708)
$\frac{\partial^2 C}{\partial y_1 \partial y_2}$ = Cost noncomplementarity	0.297×10^{-7}*	0.131×10^{-9}	0.835×10^{-11}	0.115×10^{-7}*	0.232×10^{-9}*	0.251×10^{-10}*
	(0.119×10^{-7})	(0.121×10^{-9})	(0.594×10^{-11})	(0.232×10^{-8})	(0.410×10^{-10})	(0.450×10^{-11})

[a] Approximate standard deviations in parentheses.
[b] Statistics evaluated at mean values of input prices and minimum values of outputs.
[c] Statistics evaluated at mean values of input prices and outputs.
[d] Statistics evaluated at mean values of input prices and maximum values of outputs.
* Significantly different from 0 at the 0.05 level, two-tailed test.
** Significantly different from 0 at the 0.10 level, two-tailed test.
† Significantly different from 1 at the 0.05 level, two-tailed test.
†† *Significantly different from 1 at the 0.10 level, two-tailed test.*
‡ Within-sample degree of economies of scope is undefined for the "small" firm since this firm operates at the minimum output levels. See footnote 19.

estimate for their measure of scope economies, but because no significance test is provided, it is difficult to interpret their results. Using 1978 data, LeCompte and Smith (1990) find that an approximation to the degree of scope economies is significantly negative for mortgage and consumer loans, and also for mortgage loans and investments; the approximation is significantly positive for consumer loans and investments. Using 1985 data, Hess (1987) finds that the approximation is significantly negative for nonmortgage loans and loans serviced, and significantly positive for other assets and loans serviced. It is insignificant for mortgage loans and other assets, and for nonmortgage loans and other assets. While the cost studies mentioned are not directly comparable, they all found some evidence of noncomplementarity between outputs, which is necessary for diseconomies of scope.

C. *Robustness of the Economies-of-Scope Result*

A criticism of the translog cost function is that it cannot be evaluated at zero output levels, and thus the "zero" output vector in the scope economies measure must be approximated by some small output vector. This is inherently an arbitrary choice to which the results may be sensitive. To address this criticism, I reevaluated the measure of scope economies using different "zero" output vectors ranging from $(0.10 \times \min y_1, 0.10 \times \min y_2)$ down to $(0.0001 \times \min y_1, 0.0001 \times \min y_2)$. The results remain the same—for stock S&Ls the degree of scope economies is insignificantly different from zero, while for mutual S&Ls it is significantly negative.

Another approach is to estimate the model using a flexible functional form like the hybrid translog, which permits evaluation at $y_i = 0$. The hybrid translog cost function replaces $\ln y_i$ in the translog cost function with y_i transformed by the Box–Cox metric, i.e., $[(y_i^\lambda - 1)/\lambda]$, where λ is a parameter to be estimated. As λ approaches 0, the hybrid translog function converges to the translog function. Since $[(y_i^\lambda - 1)/\lambda]$ is defined at $y_i = 0$ when $\lambda > 0$, there is no need to approximate the zero output vector in measuring economies of scope. The hybrid translog cost function is estimated for both mutual and stock S&Ls.[18] For mutual S&Ls, the Box–Cox parameter λ was insignificantly different from 0. (The estimate was 0.00322 with standard error 0.01134.) Not surprisingly, then, the hybrid translog function with (0, 0) as the zero output vector yielded the same results as the translog function: mutual S&Ls exhibited diseconomies between the two outputs. For the stock S&Ls, λ was significantly negative. When estimated with cost shares, λ was -0.09135 with standard error 0.03184; when estimated without cost shares, λ was -0.09204 with standard error 0.03227. The hybrid translog with $\lambda < 0$ loses its advantage

[18] The estimates are available from the author.

over the translog since the function is not defined at zero output levels. Evaluating the hybrid translog cost function at the same low output vectors as earlier with the translog cost function yields similar results: no evidence of economies or diseconomies of scope.

A more telling criticism of the conventional measure of scope economies is that it requires the cost function to be evaluated at zero output levels even if all firms in the sample are producing positive levels of each output, as they are here. So the scope measure involves extrapolation outside the sample. This problem is not resolved by functional forms like the hybrid translog, which permit evaluation at zero output. For a remedy, I measure *within-sample economies of scope*, which avoids extrapolation. For two outputs, within-sample global economies of scope evaluated at $\mathbf{y}$, $\text{WSC}(\mathbf{y}) \equiv [C(y_1 - y_1^m, y_2^m) + C(y_1^m, y_2 - y_2^m) - C(y_1, y_2)]/C(y_1, y_2)$, where y_i^m is the minimum value of y_i in the sample. The specialized firms in the within-sample measure produce positive amounts of each output, but tend to specialize in one or the other. Table IV presents within-sample scope economies for the representative and the large firm.[19] Consistent with the conventional measures of scope economies, the within-sample measures show significant diseconomies for mutual S&Ls, but neither economies nor diseconomies of scope for stock S&Ls.

6. CONCLUSIONS

This paper presents evidence of agency problems at mutual S&Ls. A comparison of the cost structures of stock and mutual S&Ls shows that both types of S&Ls operate with slight economies of scale. However, while stock S&Ls operate with an efficient output mix, mutual S&Ls operate with significant diseconomies of scope. This inefficiency suggests agency problems among mutual S&Ls. The results cast doubt on a common argument that conversions of mutual S&Ls to the stock form of ownership are motivated by the mutuals' desire to capture scale economies in the production of financial services (Masulis, 1987). The argument assumes that mutual S&Ls' inability to issue stock constrains growth to efficient scale. The evidence presented here suggests that capturing scale economies cannot be a motive for conversion. First, the measures of scale economies indicate that mutuals are operating within 5% of their minimum efficient scale, and, more importantly, that this is about the same as for the representative stock S&L.

[19] The within-sample scope economies measure is not defined for the "small" firm because it is not defined at the minimum values of the outputs. The within-sample measure is well defined for the "representative" and "large" firms because at these values of y_i, $y_i - y_i^m$ is within the sample and greater than y_i^m for each i.

While my results are not conclusive, they do suggest a different explanation for increased conversions in recent years. As the environment has become more competitive, mutual S&L managers are finding it harder to compete with their more efficient stock S&L counterparts. That is, the probability of bankruptcy, and so of unemployment for the manager due to inefficient behavior, has increased because competition has risen. Thus, any given level of perquisite-taking on the part of mutual managers is now more costly. Given that managers were optimally selecting their level of perquisites *prior* to deregulation, this means that the level of perquisite-taking in mutuals *after* deregulation must be lower, as managers weigh the benefit of perks against the increased probability of unemployment. Thus, the benefit of mutual organization to managers is decreasing. There is less incentive to remain a mutual and positive incentive to convert, since managers usually benefit in the initial stock sale: they receive rights to purchase the new stock, which is usually underpriced (as in other IPOs). When the benefits of conversion outweigh the benefits of the new optimal (and lower) level of perk-taking, the S&Ls will convert. This could explain the increased number of conversions that have occurred in the new, deregulated environment.

APPENDIX

TABLE A1
Parameter Estimates for the Stock S&L Cost Function (without Cost Shares)

Parameter	Variable	Estimate	Approx. std. error	$Z = \frac{\text{Est.}}{\text{std. error}}$
a_0	Constant	−1.6263	4.1150	−0.40
a_1*	$\ln y_1$	1.6653	0.4800	3.47
a_2	$\ln y_2$	−0.5297	0.4733	−1.12
b_1	$\ln w_1$	0.9249	1.3971	0.66
b_2	$\ln w_2$	0.9613	0.7271	1.32
$b_3(= 1 - b_1 - b_2)$	$\ln w_3$	−0.8862	1.5931	−0.56
s_{11}*	$\ln y_1 \ln y_1$	0.1175	0.0576	2.04
s_{12}	$\ln y_1 \ln y_2$	−0.0921	0.0589	−1.56
s_{22}	$\ln y_2 \ln y_2$	0.0827	0.0630	1.31
g_{11}	$\ln w_1 \ln w_1$	0.2560	0.2859	0.90
g_{12}	$\ln w_1 \ln w_2$	−0.0208	0.1756	−1.19
$g_{13}(= -g_{11} - g_{12})$	$\ln w_1 \ln w_3$	−0.0478	0.3154	−0.15
g_{22}*	$\ln w_2 \ln w_2$	0.1983	0.0778	2.55
$g_{23}(= -g_{12} - g_{23})$	$\ln w_2 \ln w_3$	0.0099	0.1659	0.06
$g_{33}(= g_{11} + g_{22} + 2g_{12})$	$\ln w_3 \ln w_3$	0.0379	0.4166	0.09
d_{11}*	$\ln y_1 \ln w_1$	−0.3197	0.1110	−2.88
d_{12}**	$\ln y_1 \ln w_2$	−0.0808	0.0467	1.73

TABLE A1-*Continued*

Parameter	Variable	Estimate	Approx. std. error	$Z = \frac{\text{Est.}}{\text{std. error}}$
$d_{13}^*(= -d_{11} - d_{12})$	$\ln y_1 \ln w_3$	0.2389	0.1225	1.95
d_{21}^*	$\ln y_2 \ln w_1$	0.2089	0.1008	2.07
d_{22}	$\ln y_2 \ln w_2$	−0.0602	0.0649	−0.93
$d_{23}(= -d_{21} - d_{22})$	$\ln y_2 \ln w_3$	−0.1488	0.1240	−1.20
L_1	GROWTH	−0.0156	0.0288	−0.54

R^2 on cost equation = 0.9944

* Significantly different from 0 at the 0.05 level, two-tailed test.
** Significantly different from 0 at the 0.10 level, two-tailed test.

TABLE A2
F Tests for Structural Form of Stock S&L Cost Function (without Cost Shares)

	Value of the test statistic	Degrees of freedom	Critical value at 95% confidence level
$d_{ij} = 0 \quad \forall i, j$	3.2112	4, 90	2.47
$d_{ij} = 0,\ s_{ik} = 0 \quad \forall i, j, k$	2.4210	7, 90	2.11
$d_{ij} = 0,\ s_{ik} = 0,\ g_{jm} = 0 \quad \forall i, j, k, m$	4.2408	10, 90	1.93
$\sum_i a_i = 1,\ d_{ij} = 0,\ s_{ik} = 0,\ g_{jm} = 0 \quad \forall i, j, k, m$	7.2960	11, 90	1.89

TABLE A3
Economies of Scale and Scope: Stock S&Ls (without Cost Shares)[a]

	"Small" firm[b]	"Representative firm[c]	"Large" firm[d]
S = Degree of economies of scale	1.1684† (0.0702)	1.0383 (0.0365)	0.9931 (0.0765)
SC = Degree of economies of scope	0.0073 (0.0566)	1.9059 (4.4940)	17.0785 (55.2598)
WSC = Within-sample degree of economies of scope	‡	0.3627 (0.9784)	3.5063 (8.3973)
$\frac{\partial^2 C}{\partial y_1 \partial y_2}$ = Cost noncomplementarity	0.2633×10^{-7}** (0.1616×10^{-7})	0.9981×10^{-11} (0.2152×10^{-9})	0.6166×10^{-12} (0.1167×10^{-10})

[a] Approximate standard deviations in parentheses.
[b] Statistics evaluated at mean values of input prices and minimum values of outputs.
[c] Statistics evaluated at mean values of input prices and outputs.
[d] Statistics evaluated at mean values of input prices and maximum values of outputs.
* Significantly different from 0 at the 0.05 level, two-tailed test.
** Significantly different from 0 at the 0.10 level, two-tailed test.
† Significantly different from 1 at the 0.05 level, two-tailed test.
†† Significantly different from 1 at the 0.10 level, two-tailed test.
‡ Within-sample degree of economies of scope is undefined for the "small" firm since this firm operates at the minimum output levels. See footnote 19.

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