

Managerial Discretion, Regulation, and Stock Insurer Ownership Structure

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ABSTRACT

Variation in operating characteristics across ownership structures in the property-liability insurance industry could be caused by regulatory and tax differences as well as control-related incentives. We exploit variation in ownership structure within the population of common stock insurers to help solve this identification problem. Consistent with the managerial discretion hypothesis, we find that different ownership classes operate in lines that are statistically distinguishable. Because of our focus on stock firms, this variation is not attributable to taxes and regulation alone.

Introduction

The insurance industry employs a broad range of ownership structures. Included are stock companies, which employ the standard corporate form; mutuals and reciprocals, which (like cooperatives) merge customer and ownership functions; and Lloyd's associations, which supply insurance through coalitions of individual underwriters. Managerial control mechanisms differ across these ownership structures; for example, stock company managers can receive stock-based incentive compensation, whereas mutual managers cannot. As a result, the discretion authorized management also differs. Variation in managerial decision-making authority implies that different ownership structures have a comparative advantage in different activities.

Mayers and Smith (1988) test this managerial discretion hypothesis employing cross-sectional data; they document variation in product specialization across ownership structures in the property-liability insurance industry. Lamm-

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Tennant and Starks (1993) also examine activity choices using panel data. Their evidence indicates that, compared to mutual insurers, stocks write more business in lines with higher underwriting risk. Yet, since taxes and regulation vary across ownership structures as well as across states in which the firms do business, it is unclear how much of this documented variation is attributable to the control-related arguments of the managerial discretion hypothesis.

This article focuses on common stock insurers, which vary widely in ownership structure. At one extreme, the equity is owned by a mutual insurer; at the other, by a single individual. We argue that the analysis of managerial control problems of mutuals also applies to stock companies owned by mutuals, and that the incentives associated with Lloyd's are similar to those for closely-held stock companies. By employing more detailed information on the ownership of stock companies than heretofore has been used, we are better able to control for significant components of regulatory and tax variation. For example, minimum capital requirements and tax rules vary between mutual and stock companies.¹ Because states vary widely in regulation and tax policies, we also control for the states in which our sample insurers do business.

This article thus extends our understanding of ownership structure in the insurance industry in three primary ways: First, by distinguishing among widely-held, closely-held, and mutual-owned and association-owned stock companies, we exploit more texture in the ownership data than previous studies, thereby deriving a richer understanding of this industry. Second, by focusing on variation among stocks, we better control for potential effects of taxes and regulation. Third, our use of empirical methods such as seemingly unrelated regressions and multinomial logistic regressions provide a more precise set of metrics for explaining the determinants of ownership structure.

Our evidence indicates that an insurer's activity choices are significant determinants of ownership structure. In particular, the activities of stocks owned by mutuals are more like those of mutuals than widely-held stocks. Our evidence also indicates that ownership structure varies across states (presumably because of regulatory differences). We find no evidence of a life cycle in ownership structure; none of the variation appears related to company age.

In the next section, we classify ownership of stock insurers and discuss the differences between widely-held stocks, closely-held stocks, stocks owned by mutual insurers, and stocks owned by associations. Then, we describe our data

¹ State insurance codes prescribe minimum capital requirements that differ for mutual and stock companies in 16 states as of 1981. Usually the requirements are lower for mutuals. Interestingly, New York favored mutuals (1939 statute), but now favors stock companies (1968 statutes). Major differences in the federal tax laws for stocks and mutuals have been resolved at this time. However, most mutuals were exempt from income taxes until 1942. From that time until 1962 they were taxed under special formulas that did not take into account underwriting gains or losses (i.e., they were taxed on investment income only). The revenue acts of 1962 and 1964 eliminated most major differences in taxation between mutuals and stocks. However, differences persist; for example, taxable income calculations are not the same for stocks and mutuals (see Vaughan, 1992, p. 142; see also Lenrow, Milo, and Rua, 1979, for a technical discussion).

and present evidence on the variation of production activities by ownership class. Our conclusions are presented in the last section.

Analysis of Insurer Ownership Structure

Three important functions in any insurer are those of the managers, the owner/risk-bearers, and customers. The managers are the decision-makers and administrators who quote rates, market policies, and administer claims. The owner/risk-bearers provide capital and own the claim to the residual (risky) cash flow stream of the organization. The customers are individuals who pay policy premiums in return for a promise to receive contractually agreed amounts upon the occurrence of specified events.

Alternative ownership structures combine these functions in different ways: stock companies permit the complete separation of the three functions, Lloyd's associations merge the manager and owner/risk-bearer functions, and mutuals join the customer and owner/risk-bearer functions. These different combinations produce different comparative advantages.

We focus on the important aspect of managerial discretion. Required managerial discretion varies across lines of insurance. Managerial discretion should be less important, for example, in lines of insurance for which more loss data are available, variance is lower (Fama and Jensen, 1983; Lamm-Tennant and Starks, 1992; and Doherty and Dionne, 1993), screening is less valuable (Hansmann, 1985, and Smith and Stutzer, 1990), and claims are expected to be adjudicated within a stable legal environment. Generally, the more discretion managers are authorized to exercise, the larger the potential for the managers to operate in their own self-interest at the expense of the firm's other claimholders.

Stock Company Ownership Classes

Widely-held stocks. The distinguishing characteristic of common stock insurers is the potentially complete separation of the manager, owner/risk-bearer, and customer functions. Separation permits gains from specialization; for example, unrestricted common stock allows risk-bearing efficiencies and provides liquidity that are unattainable when an insurer's ownership claims are restricted to managers (as in Lloyd's) or to customers (as in mutuals). The risk-bearers in widely-held stocks can diversify by holding ownership claims in many organizations and thereby lower the cost of supplying risk-bearing services. Managerial specialization also offers benefits; in a widely-held stock company, managerial talent can be chosen without strong consideration of the manager's wealth or willingness to bear risk (see also Mayers and Smith, 1981, and Fama and Jensen, 1983).

These benefits of specialization are not without costs. For example, separation of the manager and owner/risk-bearer functions implies that managers of a widely-held stock company do not bear the full wealth effects of their actions. This generates an important control problem since the managers typically will not have interests that are aligned perfectly with those of the owner/risk-

bearers. However, separate equity claims allow the use of stock options, stock appreciation rights, restricted stock, and phantom stock in the managers' compensation package (Smith and Watts, 1982, 1992, and Mayers and Smith, 1992).

Mutual-owned stocks. The owner/risk-bearers of a stock insurer owned by a mutual are ultimately the policyholders of the parent mutual. The merger of policyholder and owner/risk-bearer functions in the parent mutual controls incentive conflicts between customers and owners. However, the potential advantage mutuals have in controlling this incentive problem is offset by less effective control of the incentive problem between the owners and managers. In a widely-held stock firm, if management imposes too many costs, someone can purchase control, change management, and thus realize a significant fraction of the capitalized value of the cost reduction. In a mutual, the incentive to achieve control is weaker since the owners must remove the existing management through a proxy fight, and thus individually capture only a pro rata share of the gain.²

The problems of controlling the managers of a mutual-owned stock are similar, since the managers of the subsidiary stock company are appointed by the managers of the parent mutual. In fact, the control problem facing the policyholders is potentially more severe for stock companies owned by mutuals since they are not eligible to participate in a parent's proxy fight. Their major control mechanism is the withdrawal of patronage. Hence, in competing for business, a stock company owned by a mutual is more likely to rely on implicit contracts and reputational capital. We thus expect mutual-owned stocks to limit the activity choices of management since such limitations enhance the value of implicit contracts and reputational capital. The activity choices of mutual-owned stock insurers should be similar to those of mutual companies. Consequently, if the cost of controlling management in mutual insurers is higher than in stock firms, mutuals and mutual-owned stocks should be more prevalent in lines of insurance requiring less managerial discretion.

Closely-held stocks. A stock company is closely held if there is a substantial merger of the manager and owner/risk-bearer functions. Merging these two functions reduces control costs that arise if they are separate. Thus, in this dimension, a closely-held stock insurer is like a member of a Lloyd's association.³ The more complete the merger of owners and managers, the greater the internalization of the wealth consequences of the managers' decisions. In cases where the functions are only partially merged (both Lloyd's and closely-held

² Although proxy fights are a potential control mechanism, in practice they are ineffective, expensive, and rarely employed. In part, this limited use reflects the fact that eligible voters in a proxy contest are the mutual's customers, and courts have ruled that an insurer's customer list is a proprietary asset that does not have to be disclosed.

³ This similarity is greater for Lloyd's of London than American Lloyd's. Most American Lloyd's are domiciled in Texas. An important motive for establishing these firms is regulation; specifically, they face fewer constraints from rate and policy-form regulation. Some of the American Lloyd's are owned by other insurers. These Lloyd's have been eliminated from our sample.

stocks employ managers who are not owners), the owners have stronger incentives to more actively monitor managers' decisions.

Increased managerial discretion also raises the potential costs imposed on customers. In a Lloyd's association, mutual monitoring by members of the association helps to control the incentive problems between individual underwriters and the policyholders. In a closely-held stock company, implicit contracts and reputational capital must provide substitute bonding mechanisms to control this policyholder-stockholder conflict.

Because the benefits of both closely-held stocks and Lloyd's stem from managerial discretion, we expect these structures to have a comparative advantage in writing insurance where discretion is important. This broader discretion is not without cost: ownership claims are less liquid and owner/managers are less able to exploit fully the risk-reducing opportunities for diversification.

Association-owned stocks. Some stock insurers are owned by associations; examples include the American Medical Association, California Farm Bureau Federation, and AGWAY Inc. (a farm supply and food marketing cooperative). In ways, these companies are similar to stocks owned by mutuals. For example, the residual risk-bearers are the members of the association. However, we expect stock companies that are owned by associations have a comparative advantage in offering insurance only in lines closely related to the purpose of the association. For example, the AMA-owned stock insurer primarily provides medical malpractice insurance. Since the mechanism for control of the parent by the association members is not clearly delineated and unlikely to be uniform, we analyze this class of stock insurers separately.

Empirical Implications

In a given market for common lines of insurance, competition among insurers of different ownership classes limits the difference in net premiums or in the types of coverage offered. We do not expect material differences in contracts for a given type of coverage. We focus on the comparative advantage of ownership classes and examine variations in activity choice and operating cost across the alternative classes.

Activity choices. Our analysis implies that mutuals and mutual-owned stocks should be more prevalent in lines where management exercises little discretion in setting rates because the cost of controlling management is higher. Similarly, because of the managerial control problem, Lloyd's associations and closely-held stocks should more frequently offer coverage where discretion in adjusting rates to changing risks is most important. Finally, we expect association-owned stocks to supply coverage closely related to the purpose of the association.

Given the difficulty of measuring the degree of managerial discretion required across insurance lines, the evidence that we examine initially is more indirect: The managerial discretion hypothesis implies that we should be able to distinguish ownership classes by their activity choices. Four dimensions in which we measure activity choices are lines of business, line-of-business spe-

cialization, geographic concentration, and firm size. These four dimensions should be related to managerial discretion.

The actual lines of business are important for determining the managerial discretion requirements and, hence, the choice of ownership structure. The choice of ownership structure, on the other hand, has implications for line-of-business specialization. Specialization can limit discretion, but the effectiveness of limitations varies across lines. Similarly, geographic concentration can limit discretion. But with geographically localized business it is more difficult to distinguish between a random local change in business conditions and a market-wide change. Thus, operating across a broader geographic area facilitates information aggregation. Managerial discretion also should be related to firm size. In a widely-held stock, control problems are likely to be more difficult for larger firms. Moreover, firm size is a function of scale economies in production and the organization of the firm.

We analyze the activity choices of insurers by ownership class in two ways. First, we examine the firm's allocations of business across lines of insurance while controlling for firm size: a distance measure allows us to test the proposition that ownership classes can be distinguished by their patterns of business activity. The measure also allows a more intuitive assessment of which ownership structures have more similar patterns of business activity. We include the stock company classes as well as Lloyd's associations and mutuals in this analysis and perform pairwise tests. Second, we estimate a multinomial logistic regression. We assess the determinants of ownership structure choice by including measures of lines of business, line-of-business specialization, geographic concentration, and firm size. We limit the logistic regression analysis to closely-held, widely-held, and mutual-owned stock company classes. We thus control for regulation and tax differences across stocks, mutuals, and Lloyd's by restricting our sample to common stock companies. We include dummy variables indicating the states in which each company does business to control for the potential impact of varying state regulatory and tax structures.

Company age. An alternative explanation for the observed structure of ownership is the life-cycle hypothesis, which suggests that the optimal ownership structure of the firm changes over time. For example, start-up insurance firms might be closely held with ownership structure becoming more diffuse over time. (Note, however, that this hypothesis has no implications for the ownership structure of mutuals, Lloyd's, mutual-owned stocks, or association-owned stocks.) To test the life-cycle hypothesis, we include company age as a potential determinant in our logistic regression analysis.

Operating costs. Lloyd's associations, closely-held stocks, and widely-held stocks are expected to offer insurance in lines requiring relatively more managerial discretion than those offered by mutuals, and, hence, they are expected to incur additional costs. These incremental costs are driven by several potentially important factors: (1) a widely-held stock that sells insurance requiring greater managerial discretion will also have higher control-related resource expenditures. (2) Owner/managers of Lloyd's associations and closely-held stocks bear underdiversification costs since their human capital and much of their financial capital is invested in the firm. (3) Where the risks are unique or

changing, necessary specialized decision-making skills are likely to be obtained only at higher costs. For example, screening costs are likely to be higher in these cases. This suggests that loss-to-premium ratios should be smallest for Lloyd's associations and largest for mutuals.

To test this implication of our analysis, we examine whether loss-to-premium ratios are inversely correlated with our hypothesized ranking of required managerial discretion across ownership classes. However, we do not include the loss-to-premium ratio in our logistic regression analysis of activity choices. Our analysis implies that firms choose ownership structure to facilitate particular activities. Those activities also determine the firms' cost structure. Thus, although ownership structure and operating costs should be correlated in the cross-section, we do not assume they are related causally.⁴

Data Description

Our data are from the A. M. Best Company (1982); the line-of-business file contains 1981 data on premiums, losses, and expenses for a large sample of property-liability insurers by line of insurance. Line-of-business data are given for 26 lines of insurance. The file also identifies each firm's basic ownership structure (Lloyd's, stock, mutual, or reciprocal) and provides total admitted assets and the number of states licensed. Data are available on 1,058 common stock insurers, 320 mutual insurers, 60 reciprocal associations, and 42 Lloyd's associations.

To determine the ultimate owners of the stock insurers, we examine A. M. Best (1982b). We define ultimate ownership in terms of individuals. For example, if a company is owned by another, we examine the parent to determine ultimate ownership. If the parent is owned by individuals (stockholders, policyholders of a mutual, or members of an association), our task is complete; if it is owned by another company, we examine that company's ownership. If the ultimate ownership is not clear from Best's, the information is supplemented with information from Moody's Investors Service (1982). Employing this procedure, we classify 854 of the 1,058 stock insurers in the file. (Of the 204 firms where the ultimate ownership cannot be determined from these sources, approximately two-thirds are owned by non-U.S. insurers).

We classify a stock company as closely held if majority ownership rests with one individual or with a single family and the individual or family is active in the management of the corporation (102 firms). We classify it as widely held if the ultimate ownership rests with individual stockholders and it is not closely held (596 firms). There are 118 firms that are owned by mutual insurers and 38 firms where the ultimate ownership is held by an association. We also include the 320 mutual associations and 42 Lloyd's associations in some of our empirical analyses.

⁴ When we assess the cross-sectional correlation we do it unconditionally. A conditional assessment that includes firm size and the other activity choice variables (i.e., the causal variables) fails to detect any cross-sectional correlation.

Summary statistics on size (total admitted assets), geographic concentration (number of states licensed), line-of-business specialization (Herfindahl concentration index), and age (number of years in business) for each ownership-structure class for our sample of 1,216 firms are presented in Table 1.⁵ The means and medians of these measures across the ownership classes vary considerably. For example, the size data indicate that Lloyd's associations are on average the smallest companies. Among the stock companies, the closely-held stocks are the smallest, operate in the fewest states, are most concentrated in their business operations, and are the youngest. These statistics are broadly consistent with the life-cycle hypothesis.

Hypothesis Tests

Ownership Structure and Activity Choices

The managerial discretion hypothesis predicts that different ownership structures should have a comparative advantage in particular lines of insurance. We analyze the production allocations of our sample of insurers across property-liability lines to assess whether the ownership classes can be differentiated.

Production allocation analysis. We define a firm's production allocation as its percentages of direct business in the 26 lines of insurance. We compare production allocations of firms in alternative ownership structures using the following procedure: We estimate a seemingly unrelated system of 25 regression equations (since the proportions sum to one, we have only 25 independent lines).⁶ There is one equation for each line of insurance where the dependent variable is firm j 's percentage allocation of direct business to that line. The independent variables are dummy variables representing each ownership structure (we omit one to avoid singularity) and a size control variable (or covariate), the log of total admitted assets. An estimated dummy variable coefficient thus represents an assessment of the mean level of business activity (relative to that of the omitted ownership structure) in the particular line by the represented ownership structure, controlling for any size effects. The equation system is

$$\begin{aligned} \gamma_{1j} &= \beta_{10} + \beta_{11} D_{1j} + \cdots + \beta_{15} D_{5j} + \beta_{16} \text{SIZE}_j + e_{1j} \\ &\vdots \\ \gamma_{25j} &= \beta_{250} + \beta_{251} D_{1j} + \cdots + \beta_{255} D_{5j} + \beta_{256} \text{SIZE}_j + e_{25j} \end{aligned}$$

⁵ The Herfindahl index is calculated for each company as $H = \sum_{L=1}^{26} S_L^2$, where L stands for line of insurance, and $S_L = \text{PI}_L / \text{TPI}$. PI_L is the dollar amount of direct business written in a particular line of insurance, and TPI is the dollar amount of direct business summed across all 26 lines.

⁶ See, for example, Davidson and Mackinnon (1993) for a discussion about estimating a system of seemingly unrelated regressions.

Table 1
Total Admitted Assets, Number of States Licensed, Herfindahl
Concentration Index, and Number of Years in Business by
Type of Ownership Structure for 1,216 Property-Liability
Insurers Using 1981 Data

	Ultimate Ownership Structure					
	<i>Lloyd's</i>	<i>Stock: Closely Held</i>	<i>Stock: Widely Held</i>	<i>Stock: Mutual Owned</i>	<i>Stock: Association Owned</i>	<i>Mutual</i>
Total Admitted Assets (in millions of dollars)						
Mean	2.47	34.22	234.73	110.64	90.33	154.57
Median	0.75	7.42	28.02	16.37	22.96	19.79
Standard Deviation	3.44	155.54	925.29	396.77	194.63	772.90
Number of States Licensed ^a						
Mean	1.48	7.42	21.64	15.41	9.26	10.86
Median	1.00	2.00	13.00	6.50	3.00	3.00
Standard Deviation	2.47	13.49	20.75	17.95	13.07	15.57
Herfindahl Concentration Index ^b						
Mean	0.52	0.55	0.44	0.42	0.81	0.43
Median	0.50	0.46	0.35	0.37	0.51	0.34
Standard Deviation	0.25	0.30	0.28	0.20	0.28	0.25
Number of Years in Business ^c						
Mean	---	19.35	33.57	26.46	---	77.18
Median	---	10.00	23.00	19.00	---	74.00
Standard Deviation	---	25.58	34.29	28.48	---	39.65
Number of Firms	42	102	596	118	38	320

Note: A stock company is closely held if majority ownership rests with one individual or a single family, widely held if ultimate ownership rests with individuals and it is not closely held.

^a Includes District of Columbia and Puerto Rico.

^b The Herfindahl Index is calculated for each company as $H = \sum_{L=1}^{26} S_L^2$, where L stands for line of insurance, and $S_L = PI_L/TPI$. PI_L is the dollar amount of direct business written in a particular line of insurance, and TPI is the dollar amount of direct business totaled across all 26 lines of insurance.

^c The difference between 1982 and the year of first incorporation.

where γ_{Lj} represents the percentage allocation of direct business to line of insurance L ($L = 1, \dots, 25$) by firm j . The D_{1j} through D_{5j} dummy variables indicate the appropriate ownership structure for firm j , and $SIZE_j$ is the log of total admitted assets. Note that the disturbances are potentially correlated across insurers with common ownership.

To compare the pattern of business activity across lines for the different ownership structures, we employ a distance measure defined as the sum across the 25 lines of the squared differences between assessed mean levels of business activity for pairs of ownership structures. Specifically, the regression equations produce the dummy variable slope coefficients (β_{Lj}) which measure the assessed mean levels of business activity in line of business L for owner-

ship structure j . Using these, the distance measure is $D = \sum_{L=1}^{25} (\beta_{Lj} - \beta_{Lk})^2$ for ownership-structure comparisons involving other than the omitted ownership structure. For comparisons involving the omitted ownership structure, $D = \sum_{L=1}^{25} (\beta_{Lj})^2$, where β_{Lj} is the dummy variable slope coefficient for the ownership structure with which the omitted structure is being compared. This measure using the sum of squared differences allows us to test for differences between the production allocations of the alternative ownership classes. It also allows an assessment of which ownership structures are more closely aligned in their production allocation patterns.

Two potential problems arise with this test: First, there is an aggregation problem with the line-of-business numbers reported by A. M. Best. For example, Best treats all fire insurance policies as homogeneous. Thus, heterogeneity within lines limits our ability to differentiate among lines where more or less managerial discretion is required in underwriting. Second, all lines of insurance are not of equal economic importance. For the 14 line-of-insurance regressions where ownership structure appears important, at least one ownership class has at least 4 percent of its total business in that line. In the 11 lines of insurance where ownership structure appears unimportant, no ownership class has even 2 percent of its business in the line. In spite of these problems, the regressions (although not separately reported) have explanatory power: The R^2 s range from 0.00 to 0.18, with a mean of 0.04 and a median of 0.02, and 17 of the 25 regressions have overall F-statistics significant at the 0.05 level or better. The F-statistics that assess the contribution of the ownership structure dummy variables are significant in 14 of the regressions at the 0.05 level or better.

The sum-of-squared-deviations distance measures and z-statistics for pairwise comparisons of the production allocations for alternative ownership structures are presented in Table 2; the asymptotic variance is employed in the tests.⁷ For every pairwise comparison, the distance measure is significant.⁸ Thus, the production allocation patterns of the alternative ownership classes are statistically distinguishable. Moreover, our analysis indicates that the production allocations of stock insurers owned by mutuals are more similar to those of mutuals than are those of widely-held stock companies, and the allocations

⁷ The distance measure is asymptotically normal. See Billingsley (1979, p. 340) for a discussion of the delta method. Essentially, if x is distributed normal then a transformation of x is asymptotically distributed normal with variance JVJ' , where V is the covariance matrix of x and J is the Jacobian of the transformation.

⁸ We also perform other more usual pairwise multivariate tests restricting the regression coefficients to be the same across all 25 line-of-business regressions. These multivariate tests are described in detail in Morrison (1976). SAS Institute, Inc. (1985) describes these tests as Wilks lambda, Pillai's trace, Hotelling-Lawley trace, and Roy's maximum root. All four of these statistics are significant at the 0.0001 level or better.

of closely-held stocks are more differentiated from the allocations of mutuals than are those of widely-held stocks. Also, the production allocations of association-owned stocks and Lloyd's associations are more differentiated from the allocations of mutuals than any other ownership except the closely-held stocks. This relative distance ordering is consistent with our managerial discretion hypothesis.

Table 2

Sum of Squared Deviation Distance Measures and Z-Statistics (in parentheses) for Pairwise Production Plan Comparisons for Alternative Ownership Structures

<i>Ultimate Ownership Structure</i>	<i>Lloyd's</i>	<i>Stock: Closely Held</i>	<i>Stock: Widely Held</i>	<i>Stock: Mutual Owned</i>	<i>Stock: Association Owned</i>	<i>Mutual</i>
Lloyd's	---	0.195 (16.24)	0.166 (28.72)	0.192 (22.43)	0.229 (13.31)	0.201 (28.4)
Stock: Closely Held		---	0.015 (3.74)	0.044 (7.54)	0.075 (6.11)	0.095 (7.56)
Stock: Widely Held			---	0.024 (10.33)	0.067 (5.95)	0.057 (10.06)
Stock: Mutual Owned				---	0.071 (3.85)	0.032 (3.76)
Stock: Association Owned					---	0.085 (10.06)
Mutual						---

Note: The statistics summarize a seemingly unrelated system of 25 regression equations, where each regression represents a line of insurance. The dependent variable for each regression is the percentage of total business allocated by company *j* to the particular line. The independent variables are dummy variables representing each ownership structure (we omit one) and a control variable (log of total admitted assets). The squared deviations between the dummy variable coefficients, for alternative pairs of ownership structures, summed across the 25 regressions defines the distance measure. A stock company is closely held if majority ownership rests with one individual or a single family, widely held if ultimate ownership rests with individuals and it is not closely held.

Logistic-regression analysis. We estimate a multinomial logistic regression that simultaneously examines the managerial discretion hypothesis, the life-cycle hypothesis, and the regulation hypothesis as explanations for ownership structure choice. We employ data from the 816 closely-held, widely-held, and mutual-owned stock companies to estimate this analysis of covariance model (see Table 3). The first 12 coefficients examine the managerial discretion hypothesis: line-of-business specialization (the Herfindahl business concentration index), geographic concentration (a Herfindahl index constructed using direct business written by state to avoid collinearity with the state dummy variables), log of total admitted assets, and the allocations of business in nine rebundled lines of insurance.⁹

⁹ To conserve degrees of freedom, we employ the percentage allocations in nine rebundled lines derived through factor analysis (Mayers and Smith, 1988). These rebundled lines are factor scores. Each factor score (there are nine for each firm) is a weighted average of the percentage allocation of direct business the insurance firm has in the original 26 lines. The weights represent the importance of a particular line of insurance in the rebundled line. Thus, the scores can be

Table 3

Analysis of Variance for Ownership Structure Multinomial Logistic Regression Including 816 Closely-Held, Widely-Held, and Mutual-Owned Stock Insurers from the Property-Liability Insurance Industry

<i>Variable</i>	<i>Chi-Square^a</i>	<i>P-value</i>
Intercept	1.38	0.502
Line-of-Business Specialization	0.26	0.877
Geographic Concentration	3.79	0.150
Log of Total Admitted Assets*	7.34	0.026
Rebundled Lines*	74.51	0.000
Age	3.09	0.213
States*	145.47	0.000

Note: Line-of-business specialization is a Herfindahl business concentration index defined as the sum of the squared fraction of direct business written in each of 26 lines of insurance. Geographic concentration is also a Herfindahl index but calculated using direct business written by state. The rebundled lines are the percentage allocations in nine rebundled lines of insurance derived through factor analysis and discussed more fully in footnote 9 of the text. We omit a list of the individual rebundled lines of insurance to conserve space. The chi-square statistic given for rebundled lines tests the null hypothesis that the nine rebundled lines of insurance (as a group) are not associated with the dependent variable. Age is the number of years the company has been in business—the difference between 1982 and the year of first incorporation. States is a vector of 50 dummy variables and indicate which states the company does business in. (We omit the District of Columbia, Puerto Rico, and foreign.) We omit a list of individual states in this table to conserve space. The chi-square statistic given for states tests the null hypothesis that the 50 states (as a group) are not associated with the dependent variable. The states that are significant (at the 0.10 level or better) are Alaska, Arizona, Colorado, Florida, Illinois, New Jersey, North Dakota, Oregon, Tennessee, West Virginia, and Wyoming.

*These chi-square statistics have 2 degrees of freedom, except for the ones associated with rebundled lines and states, which have 18 and 100 degrees of freedom, respectively.

* Significant at the 0.05 level.

Our analysis indicates that six of these coefficients are significant: the log of total admitted assets, and five of the nine rebundled lines of insurance. Moreover, the null hypothesis that the nine rebundled lines of insurance (as a group) are not associated with the dependent variable is rejected at the 0.001 level. This result is consistent with the managerial discretion hypothesis: The allocation of business across insurance lines is an important determinant of ownership structure choice. Note that we control for size, company age, and regulation (by focusing on stock companies and controlling for the states in which the firms do business).

The age coefficient tests the life-cycle hypothesis. The chi-square statistic of 3.09 is not significant at standard levels. Recognizing that the life-cycle hypothesis pertains to only the closely- and widely-held stocks, we also esti-

thought of as the insurance firm's direct business in the rebundled lines.

The factor analysis uses all the firms in the file. The software default criterion that accepts all factors to the point where the factor eigenvalues sum to the total eigenvalue of the reduced correlation matrix indicates that nine factors are sufficient. The rebundled lines appear to be representative of the allocations made in the original 26 lines. For example, we duplicate the production allocation analysis using the factor scores, and we obtain distance measures that are similar to those shown in Table 2.

mate a logistic regression (unreported) restricted to those companies. The chi-square statistic on the age coefficient again is not significant (p -value = 0.24). Thus, we find no statistically reliable evidence of ownership structure changes over the life of the insurer.

The 50 state coefficients (we omit data on the District of Columbia, Puerto Rico, and foreign) test the regulation hypothesis. The null hypothesis that the 50 states as a group are not associated with ownership structure is rejected at the 0.001 level. Moreover, eleven of the state coefficients are individually significant at the 10 percent level, seven at the 5 percent level. Thus, even though we control for variation in operating allocations induced by variation in regulation and taxation across Lloyd's, stocks, and mutuals by focusing on closely-held, widely-held, and mutual-owned stocks, a statistically significant component of the variation in the choice of ownership structure appears to be driven by other aspects of state regulation of the industry.¹⁰

Although our analysis allows us to document a managerial discretion effect, we cannot conclude that the tax/regulation hypothesis is unimportant. For example, the tax code favors long-tailed lines such as medical malpractice over short-tailed lines such as automobile theft.¹¹ Hence, taxes can exacerbate the magnitude of observed variation in activity choice. However, under the null hypothesis, there is no difference in the choice of lines written by widely-held stocks and stocks owned by mutuals. Nevertheless, there appears to be little debate that taxes and regulation have important effects on the structure of the industry.

Ownership Structure and Operating Costs

We now examine the evidence on the relationship between expected loss-to-premium ratios and ownership classes. If firms operating in lines requiring more managerial discretion incur additional costs, then we should be able to use cost data to measure managerial discretion. Our hypothesis implies that Lloyd's have the smallest ratios and mutuals the largest.

We examine the means and medians of the ratio of total direct business losses paid to total direct business written for each ownership structure. Our tests of this ratio are potentially affected by two measurement problems. First, the lag between the receipt of premiums and the payment of losses introduces two sources of potential bias: (1) Long-tailed lines should have higher loss-to-premium ratios because insurers expect greater investment returns over the life of the policy (see Smith, 1989). If such lines also are riskier, this biases our test against the managerial discretion hypothesis. (2) Differing sales growth rates across ownership classes introduces a bias; higher growth lowers the loss-

¹⁰ We have also looked at the probability assessments of the logistic model. The model accurately classifies 95 percent of the widely-held stocks, 21 percent of the closely-held, and 31 percent of the mutual-owned. Overall, 77 percent of the 816 observations are correctly classified.

¹¹ Statutory accounting practices used in determining taxable income by insurers allow considerable discretion in the timing of taxable income. Longer-tailed lines allow the insurer more timing discretion than shorter-tailed lines and are thus more valuable from a tax perspective.

to-premium ratio. A. M. Best (1982a) contains aggregate data on direct business written for mutuals and stocks. Over the years 1977 through 1981, the average growth rate is 11.44 percent for mutuals and 10.05 percent for stocks; this average difference, 1.39 percent, is marginally significant. If the tails of the loss distributions were the same for stocks and mutuals, this difference would imply a bias against the managerial discretion hypothesis; however, if mutuals have longer-tailed lines, there could be an opposite bias, even with differential growth rates. The second measurement problem is that reported premium income data are not adjusted for dividend payments to mutual policyholders, meaning that direct premiums overstate the effective cost to the mutual policyholders. Effective loss-to-premium ratios, thus, are understated for mutuals. This also implies a bias against our hypothesis.

The ordering of the loss-to-premium ratios, by both the mean and the median, is consistent with our hypothesis. The smallest ratios are those of the Lloyd's associations followed by the ratios of closely-held stocks, widely-held stocks, mutual-owned stocks, association-owned stocks, and finally mutuals (see Table 4).

The lower half of Table 4 contains one-tailed p-values for mean and median two-sample comparisons. There is considerable noise in the mean and median estimates; the skewness measure and evidence from normality tests suggest that more weight should be attached to the median results.¹² These tests indicate that Lloyd's have both mean and median ratios that are reliably lower than the ratios for mutuals; closely-held stocks have mean and median ratios that are lower than the ratios for mutual-owned stocks, association-owned stocks, and mutuals; and widely-held stocks have mean and median ratios that are reliably lower than the ratios for mutuals. There is weak evidence (significant for the median but not the mean) that the expected ratio is less for Lloyd's than mutual-owned stocks or association-owned stocks and for widely-held stocks than for mutual-owned stocks or association-owned stocks. These results are consistent with the managerial discretion hypothesis.¹³

Conclusion

Variation in operating characteristics across ownership structures in the property-liability insurance industry could be caused by regulatory and tax differences or control-related incentives. We focus on a large sample of com-

¹² The skewness measure reported in Table 2 as well as by other tests indicate that these data depart significantly from normality. For Lloyd's associations and stocks owned by associations (the two smallest samples), the Shapiro-Wilk statistic is computed. For other samples, the Kolmogorov D-statistic is computed. These tests reject normality at the 0.01 level or better for all distributions except those of the closely-held stocks and the stocks owned by associations.

¹³ If the loss-to-premium ratio is included in the regression reported in Table 3, it is not significant, as we expected. By including measures of the lines of business and the states in which the firms operate, we explain the choice of ownership structure. Adding the loss-to-premium data (which are determined by size, line-of-business, and state-of-operation choices) adds no significant explanatory power.

Table 4
Summary Statistics and Test Results Comparing the Ratio of
Total Direct Business Losses Paid to Total Direct Business
Written for Alternative Ownership Structures

<i>Ultimate Ownership Structure</i>	<i>Median</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Number of Firms</i>	<i>Skewness</i>
Lloyd's	0.401	0.460	0.419	42	1.178
Stock: Closely Held	0.464	0.462	0.276	102	0.992
Stock: Widely Held	0.483	0.494	0.378	596	5.473
Stock: Mutual Owned	0.524	0.520	0.284	118	1.942
Stock: Association Owned	0.551	0.533	0.290	38	-0.176
Mutual	0.558	0.542	0.391	320	10.192

One-Tailed P-Values for Two Sample Mean/Median Tests

<i>Ultimate Ownership Structure</i>	<i>Stock: Closely Held</i>	<i>Stock: Widely Held</i>	<i>Stock: Mutual Owned</i>	<i>Stock: Association Owned</i>	<i>Mutual</i>
Lloyd's	0.487 (0.258)	0.291 (0.130)	0.198 (0.053)	0.184 (0.051)	0.067 (0.010)
Stock: Closely Held		0.161 (0.181)	0.065 (0.023)	0.094 (0.047)	0.004 (0.000)
Stock: Widely Held			0.914 (0.036)	0.217 (0.052)	0.008 (0.000)
Stock: Mutual Owned				0.405 (0.200)	0.135 (0.159)
Stock: Association Owned					0.317 (0.308)

Note: The losses paid are net of any salvage. A stock company is closely held if majority ownership rests with one individual or a single family, widely held if ultimate ownership rests with individuals and it is not closely held. Median test p-values are in parentheses. The median test is from Brownlee (1965, pp. 246-247) with the p-value calculated using the normal approximation corrected for continuity. The mean tests assume unequal variances if the equality of variances is rejected at the 0.05 level or better.

mon stock insurers to identify these variations. There is important variation in ownership among common stock insurers. Within this group we distinguish among stocks that are widely held, closely held, mutual owned, and association owned. We exploit this variation in ownership to better control for regulation and tax effects in testing the managerial discretion hypothesis.

We examine variation in geographic concentration, line-of-business choices, age, and location choices as explanations of ownership structure. The evidence on cross-sectional differences across lines of insurance indicates that production allocation patterns of the classes are statistically distinguishable. Since we concentrate our analysis on the closely-held, widely-held, and mutual-owned stock companies, the activity-choice variation is unlikely to be explained by variation in taxes or regulation alone.

Much prior analysis of the relationship between ownership structure and activity choice is limited by the difficulty of independently identifying activities which involve high versus low discretion. This article provides an important advance by directly linking variation across lines of business to significant variation in loss ratios. Our analysis complements that of Lamm-Tennant and Starks (1993), who develop proxies for managerial discretion from time-series

data. Together, these articles provide significant evidence on the importance of managerial discretion in explaining variation in ownership structure.

Other research also indicates significant links between ownership structure and reinsurance purchases (Mayers and Smith, 1990), the structure of executive compensation (Mayers and Smith, 1992), the choice of distribution system (Kim, Mayers, and Smith, 1993), and board of director composition (Mayers, Shivdasani, and Smith, 1993). In each of these cases, the implications of variation in managerial discretion on the policy choices is more easily measured. Evidence of greater use of reinsurance, lower levels of executive compensation, more extensive use of direct writers, and more extensive use of outside board members by mutual insurers is consistent with the predictions of the managerial discretion hypothesis. These joint hypothesis tests thus offer potentially important corroborating evidence for the importance of managerial discretion in understanding variation in ownership structure within the insurance industry.

Although our analysis offers no support for the life-cycle hypothesis, it does suggest that a significant component of the variation in ownership structure is related to state regulation. This underscores the fact that some of the variation in ownership structure observed in the insurance industry occurs for reasons unrelated to the hypothesis examined here. For example, the Management and Operations section of *Best Reports: 1990* indicates that CIGNA has subsidiaries which write multiple lines at standard rates, multiple lines at deviated rates, personal lines only in California, "complex and unusual risks," and reinsurance, as well as one company which writes no direct business at all yet still shows net premiums because of pooling arrangements with other members of the group. Such examples underscore the important additional work that is required to derive a more complete understanding of the determinants of organization structure and to identify more precisely the impact of state regulatory and tax policy on these choices.

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