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ABSTRACT

This article examines insurers' choice between independent and exclusive agents. We assume that alternative distribution systems are efficient mechanisms for controlling contracting problems among policyholders, insurers, and agents. Because the use of independent agents helps control potential expropriative behavior by the insurer, the independent agency system should be more valuable for ownership structures where such problems are more severe. Thus, ownership structures and distribution systems are strategic complements. We test this theory by analyzing the association between distribution-system choice and the firm's ownership structure, lines of insurance, advertising policy, size, geographic concentration, and cost structure among property-liability insurers.

INTRODUCTION

The insurance industry employs a variety of distribution systems: insurance contracts are sold through direct writers, exclusive agents, independent agents, and brokers. In the direct writer system, the sales agent is an employee of the insurance firm. An exclusive agent also represents a single insurer, yet is not technically the firm's employee. An independent agent represents more than one insurance company. Finally, a broker represents the customer and negotiates with multiple insurers.[1]

In this article, we examine the insurer's choice of distribution system. We identify complimentarities among corporate policies that arise from particular

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[1] The contractual arrangements between these intermediaries and the insurer also vary in other dimensions, such as ownership of expirations, delegation of authority, responsibility for administrative expenses, and method of compensation. See also Hammes et al. (1986), Harnett (1974), Nordhaus and Brown (1976), and Williams and Heins (1989) for discussions on various aspects of these contracts.

problems within contracting relationships among the insurer, the agent, and the insured. Much of the literature on distribution systems in the insurance industry focuses just on contracting problems between the insurer and the selling agent (for examples, see Marvel, 1982; Grossman and Hart, 1986; and Sass and Gisser, 1989). While including these contracting problems, our analysis also incorporates the contracting relationships involving policyholders.

Milgrom and Roberts (1995) examine complementarities among inputs to explain corporate choices of organizational structure, technology, and strategy. The standard definition of complementarity in economics states that two inputs to a production process are complements if a decrease in the price of one causes an increase in the use of the other. But Milgrom and Roberts use this term not just in its traditional sense of a relation between pairs of inputs, but also in a broader sense as a relation among groups of activities. They introduce a broader definition: several activities are *strategic complements* if doing more of one activity increases the marginal profitability of each of the other activities. If the activities can be expressed as differentiable functions, this corresponds to positive mixed partial derivatives of the payoff function—the marginal returns to one activity are increasing in the levels of other activities. Yet their analysis emphasizes that continuity, differentiability, and convexity of the payoff functions are not necessary—only an ability to order the various activities is required.

This framework is particularly useful here, where we want to examine various ownership structures, like stocks and mutuals, as well as different distribution systems, like independent and exclusive agents. The key idea in the Milgrom and Roberts analysis is that, if choosing a common stock ownership structure (rather than a mutual) changes the payoffs so that the returns from using independent agents rise, then ownership structure and distribution systems are strategic complements.

We argue that the use of independent agents better bonds the insurer's promise to provide services to the policyholder and helps control potential expropriative behavior by the insurer; thus, the independent agency system is more valuable for ownership structures where these incentive problems are more severe. Under those circumstances, we should observe a correlation between the choices of ownership structure and distribution systems across firms in the insurance industry.

Our tests employ data from a large sample of property-liability insurance firms.[2] We examine differences between independent agency and exclusive agency insurers. Our evidence documents strong associations between the choice of distribution system and both the insurance company's ownership structure and its lines of business. Our analysis also provides support for several additional hypotheses including the Grossman and Hart (1986) and Marvel (1982) hypotheses that link advertising policy and the choice of distribution system. Finally, we document a richer interaction between distribution systems and product mix than suggested by Marvel (1982).

[2] Data do not distinguish between exclusive agency insurers and direct writers, nor do they indicate the use of insurance brokers.

In the next section, we review theories on the choice of distribution system and identify testable implications. The third section describes our data. The fourth section provides an empirical examination of the hypotheses. The fifth section concludes the article.

DISTRIBUTION SYSTEM DETERMINANTS

With no contracting costs, the organization of economic activity cannot affect firm value because any advantage one structure provides can be eliminated through costless contracting (Coase, 1960). But writing fully contingent and costlessly enforceable contracts is not possible. Thus, contracting costs are important in determining the choice of organizational structure.

Insurer-Policyholder Conflicts

Insurance contracts are prepaid; in exchange for premiums, the policyholder receives a bundle of contingent cash payments and services. However, this prepayment creates opportunities for expropriative behavior. For example, the insurer might renege on the delivery of either promised payments or services. Mayers and Smith (1981) suggest that the use of independent agents helps control this type of opportunistic behavior.

In the Mayers and Smith analysis, independent agents have a comparative advantage because their knowledge makes them effective in influencing claim settlements and because a threat to switch their business to an alternative insurer is credible.[3] These advantages should be more important for insurance against risks for which the coverage involves a more complex and costly claims settlement process.

Claims settlement activities should vary across insurance lines (homeowners, farmowners, auto liability, etc.). For example, it is reasonable to assume that some lines have a higher frequency of disputes over loss amounts, more limited availability of information on loss distributions, and less stability of the legal environment within which claims are administered. Since these lines require more insurer discretion, and greater discretion permits more self-serving actions, contracting costs should be correspondingly larger. Because the choice of distribution system affects the costs of controlling contracting problems between insurers and policyholders, the distribution system choice should vary with these costs across lines of insurance.

Ownership structure. Ownership structures also vary across lines of insurance. Ownership structures in the insurance industry include Lloyds associations, which are coalitions of underwriters; stock companies, which employ the standard corporate form; and mutuals and reciprocals, which (like consumer cooperatives) merge customer and owner functions. Among stock companies, the equity can be

[3] Independent agents generally are given more discretion in claims administration than exclusive agents. They frequently administer small claims themselves, and for larger claims they can influence claims-administration services by interceding on the policyholder's behalf with the company's claims adjuster.

widely held or it can be owned by either an individual, a mutual insurance company, or an association (such as the American Medical Association or the California Farm Bureau Federation, for example).

Costs of controlling managers vary across the alternative ownership structures. Mayers and Smith (1981) hypothesize that, when control costs are high, authorized managerial discretion tends to be low. The evidence in Lamm-Tennant and Starks (1993) and Mayers and Smith (1993, 1994) implies that mutuals and mutual-owned stock companies have a comparative advantage in lines where management exercises less discretion. Thus, they tend to operate in lines where loss distribution data are more extensive and risk distributions are less subject to changes from technology or the legal/regulatory environment. Conversely, Lloyds associations, closely-held stock companies, and (to a lesser extent) widely-held stock companies have a comparative advantage in writing insurance for which managerial discretion is more important. Reciprocals are more difficult to classify in terms of managerial discretion. The ownership of a reciprocal can be like that of a mutual (in which the policyholders are nominally the residual claimants) or like that of a common stock insurance company (some reciprocals are organized and financed by corporations that bear the residual risk and hire and fire the manager) (see Mayers and Smith, 1988).

If the use of independent agents more effectively bonds against policyholder expropriation, the value of an independent agency system will be higher where the opportunities for expropriation are greater. This should occur in companies with ownership structures that allow more managerial discretion. With the Milgrom and Roberts framework, the choice of distribution system affects the marginal product of the ownership structure; hence, the distribution system and ownership structure are strategic complements. Therefore, independent agents should be used more frequently by Lloyds and closely-held stocks because the value of bonding against opportunistic behavior should be higher for these ownership structures. Conversely, independent agents should be used less frequently by mutuals and mutual-owned stocks because the value of such bonding is lower in these cases.

For reciprocals and association-owned stocks, the benefits of an exclusive agency system appear especially high, since the target population of potential policyholders typically is well defined. For example, insurance companies established by associations of physicians or lawyers provide malpractice insurance coverage for their members, and reciprocals often are formed to serve a relatively homogeneous population of potential policyholders. In addition, member-policyholders are more likely to possess professional knowledge of their insurance requirements, thus reducing the demand for assistance from sales agents in coverage design or claims settlement; and the association or group structure can provide alternative control mechanisms to limit expropriation. Therefore, the reciprocal or association-owned insurer has fewer reasons to adopt an independent agency system.

Cost-structure hypothesis. The Mayers and Smith (1981) analysis implies that insurance firms using independent agents have a comparative advantage in supplying higher-service, higher-priced coverage. Since the equilibrium insurance

premium must reflect both the expected costs of marketing and administering the policy as well as the present value of the expected indemnity payments, this service hypothesis implies that the loss-to-premium ratio should be smaller for firms using independent agents.

Other analyses also have potential implications for the relative size of the loss-to-premium ratios across firms employing exclusive and independent agency systems. For example, industrial organization texts (e.g., Scherer and Ross, 1990) suggest that firms adopt exclusive distribution systems to elicit additional promotional effort by their sales force. This promotions hypothesis implies that firms using exclusive agents should have smaller loss-to-premium ratios because they provide higher-service coverage. Also, Joskow (1973) argues that lower documented costs for insurers that employ exclusive agents indicate that the independent agency system is inefficient.[4] This inefficiency hypothesis generates the same prediction as the service hypothesis—loss-to-premium ratios should be smaller for firms using independent agents. We discuss this inefficiency hypothesis in more detail after examining the evidence.

Insurer-Agent Conflicts

In addition to contracting problems between insurers and policyholders, the choice of distribution system also affects the costs of controlling contracting problems between the insurer and the selling agent.

Advertising policy. Marvel (1982) argues that the exclusive agency system protects an insurer's property rights to its advertising and other marketing investments. Requiring exclusive representation prevents the agent from expropriating the firm's marketing efforts by diverting potential customers to other insurers who incur fewer advertising expenditures but pay larger commissions. In effect, the insurer vertically integrates into the distribution system to control the possibility of agent opportunism with respect to the firm's centralized promotional efforts (see also Klein, Crawford, and Alchian, 1978). To test this hypothesis, Marvel compares the ratio of advertising expenses to net premiums written for the 30 largest property-liability insurers and finds that the average ratio is reliably larger for his sample of exclusive agency insurers.

Grossman and Hart (1986) note that agents also face potential expropriation. Agents expend effort to attract and retain customers. Because monitoring effort is costly, agent compensation is based on policy sales. Thus, the insurer has an incentive to renew business directly with the customer, expropriating the agent's investment and reducing renewal commissions. Grossman and Hart suggest that this incentive can be controlled by giving the independent agent ownership of the expirations.[5] Within the exclusive agency system, this potential expropriation

[4] See also Hammond, Melander, and Schilling (1971), Etgar (1977), Cummins and VanDerhei (1979), Doherty (1981), Johnson, Flanigan, and Weisbart (1981), Cather, Gustavson, and Trieschmann (1985), and Barrese and Nelson (1992) for extensions and criticisms of this work.

[5] In an exclusive agency system, ownership of policy expirations belongs to the insurer. Thus, if an exclusive agent's relationship with the insurer ends, the customer information about coverage and renewal dates belongs to the company, not the agent.

problem is controlled by assigning agents limited property rights to the renewals, and paying higher commissions on new versus renewal business. Thus, exclusive agents are compensated for required investment as they incur it.

Within the Milgrom and Roberts framework, the Marvel and Grossman and Hart arguments imply that distribution system and advertising policy choice are strategic complements. In insurance lines for which centralized insurer promotion is more effective and opportunities for agent opportunism are greater, the value of the exclusive agency system is higher. Conversely, in lines where decentralized agent promotion is more effective and opportunities for insurer opportunism are greater, the value of the independent agency system is higher. Like Marvel, we use the advertising-to-premium ratio to measure advertising policy.

Firm size. Fixed costs and scale economies associated with hiring, firing, training, and otherwise managing an exclusive agent distribution system suggests that larger firms have a comparative advantage using exclusive agents. Sass and Gisser (1989) also argue that larger firms are more likely to achieve gains from the exclusive agent system. The Sass and Gisser model focuses on economies at the agent level, and since rational agents will accept an exclusive agency contract only if their income exceeds the amount they could earn as an independent agent, larger firms are more likely than smaller firms to generate sufficient business.

Geographic concentration. Sass and Gisser also argue that the returns to adopting an exclusive agency system are higher in more geographically concentrated markets. Thus, exclusive agents should be more competitive in larger markets where gains from specialization are more easily exploited. This same prediction is implied by the Brickley and Dark (1987) analysis, which suggests that monitoring costs increase with greater geographic dispersion. The insurer-agent relationship in the exclusive agency system is more of an employment relationship, requiring more direct monitoring of the agent by the insurer. Hence, exclusive agency insurers should have more geographically concentrated operations than independent agency insurers.

DATA AND SAMPLE SELECTION

We have 1981 data from the A. M. Best Company on the type of distribution system, ownership structure, group affiliation, total admitted assets, premiums written, and losses incurred for 1,480 property-liability insurance companies.[6] The premium and loss data is subdivided by line of business and by state. Each firm is identified by ownership structure. There are 42 Lloyds associations, 1,058 stock companies, 320 mutual companies, and 60 reciprocals. We examine the 1982 edition of *Best's Insurance Reports: Property-Casualty* and *Moody's* to classify

[6] We use 1981 data because the detailed ownership information that we employ is not cheaply available in machine-readable form for more recent years. But a caveat is in order because of the age of our data and in view of the more recent decline in the personal lines market share of independent agency firms. Note that some of this decline may be attributable to the adoption of insurance guaranty funds which were fully in place by 1981 (see, e.g., Lee, Mayers, and Smith, 1995). Our arguments above suggest a reduced demand for the services of independent agents assuming guaranty funds make insolvency less of an issue for policyholders.

further the ownership of the 1,058 stock companies as closely-held, widely-held, mutual-owned, and association-owned.

We classify a stock company as closely-held if majority ownership ultimately rests within a single family and the family is active in the management of the corporation. We classify the firm as widely-held if ultimate ownership rests with individual stockholders and the firm is neither closely-held, mutual-owned, nor association-owned. We identify 102 closely-held, 594 widely-held, 118 mutual-owned, and 38 association-owned stock companies. For the remaining 204 stock companies, the ownership could not be determined from the above sources, and we eliminate them from the sample. Thus, our final sample has 1,274 firms.

Group operations. In our sample, 864 firms operate within groups.[7] Group operations pose potential problems for testing some of the hypotheses discussed above. For example, for our tests we must choose either the firm or the group as the unit of observation. Of our 804 group firms, 28 percent are in groups that include both independent and exclusive agency insurers. These groups with mixed distribution systems suggest that the firm, not the group, is the more appropriate unit for examining the distribution system choice. These groups also allow us to reject the hypothesis that all groups centrally decide the choice of a single distribution system and impose that choice on all firms in the group.

Nevertheless, interdependencies across group firms pose measurement problems for certain variables, such as size and advertising expense. For example, if advertising is managed centrally within groups, but advertising costs are allocated arbitrarily to the operating units, then advertising expenses at the firm level would be measured with greater error for the group firms. Further, if our unit of measure is the group (rather than the individual firms) some results for the group firms could change because of the accounting methods and because the group may be a better representation of the decision-making unit for some issues than the individual companies in the group. Because of these potential problems, we separately analyze group and nongroup insurers where these issues are likely important.

EVIDENCE

A. M. Best classifies 325 of our sample firms as exclusive agency insurers and the remaining 949 as independent agency insurers. These distribution system choices are investigated below using logistic regression models and two-sample tests. Our independent variables are dummy variables representing the various ownership structures, the percentages of direct business written in each of 21 lines of insurance, the advertising-to-premium ratio, firm size, and geographic concentration measures. We perform tests that estimate the significance of the

[7] Mayers and Smith (1994) hypothesize that group operations are, at least in part, a consequence of regulation. For example, property-liability and health-life business generally must be separated in different firms and regulatory environments vary across states. By organizing individual firms to supply insurance across states with relatively homogeneous regulatory requirements, the costs of complying with the regulatory constraints are reduced. Petroni and Shackelford (1995) offer evidence that taxes also play an important role in this decision.

marginal contribution for selected groups of variables as well as individual variables.

Table 1 reports separate logistic regression results (estimated via maximum likelihood) for group and nongroup companies.[8] We omit the Lloyds dummy variable from regressions 1, 2, and 3 and both the Lloyds and closely-held stock dummy variables from regressions 4, 5, and 6 to avoid singularity in the independent variable matrices. (We do not report the coefficient estimates or test statistics for the individual line of insurance variables to conserve space.) The various regressions contain different combinations of the independent variables with regressions 3 and 6 containing all the variables. These alternative specifications allow an assessment of the robustness of the associations within the data.

Tests of Hypotheses about Insurer-Policyholder Conflict

Ownership structure. The Chi-square statistics for ownership structure in regressions 3 and 6 indicate that including ownership structure contributes significantly to the explanatory power of each regression.[9] The relative sizes of the regression coefficient estimates in regressions 2 and 5 also conform reasonably to our hypothesized ranking of required managerial discretion across the ownership structures.

Table 2 provides an alternate specification for measuring the association between ownership structure and distribution system. The first two columns report the number of firms employing a particular distribution system in a given ownership classification (both group and nongroup firms are included). The Chi-square statistic, which tests the null hypothesis of no association between ownership structure and distribution system, is significant (Chi-square = 117.93). In particular, the independent agency system is adopted by a higher percentage of Lloyds and closely-held stocks, followed in order by widely-held stocks, mutuals, mutual-owned stocks, reciprocals, and association-owned stocks.

We also assess the relative importance of the two distribution systems in a given ownership classification by examining average direct business written by the firms using alternative distribution systems. The results (reported in the last three columns of Table 2) show that independent agency insurers (in terms of both mean and median) write more business than exclusive agency insurers in Lloyds, closely-held stocks, and widely-held stocks. The reverse is true in mutual-owned

[8] Ideally, we would provide a system of simultaneous equations to reflect the jointness in the determination of distribution systems, ownership structure, and advertising policy. Unfortunately, the theory currently is not rich enough to provide the necessary identifying restrictions to estimate such a system.

[9] Since ownership structure should itself be determined primarily by the lines of insurance in which the firm operates, we expect the significance of its contribution to be reduced when the lines of insurance are also included in the regression. The fact that the marginal contribution is significant when the lines of insurance are included implies either a measurement error in our line-of-insurance variables or that ownership structure entails independent effects. The way Best aggregates and reports data potentially introduces measurement error. For example, Best treats all fire insurance as homogeneous, yet there are obvious differences in the level of expertise required for insuring different fire risks. If different ownership structures specialize in risks requiring differing levels of managerial discretion, then ownership data can help sort out this aggregation problem inherent in Best's data.

Table 1
Logistic Regression Results: Determinants of Distribution System
(Exclusive = 1; Independent = 0)

	Group Companies[a]			Nongroup Companies[b]		
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-3.843	-1.792	-1.932	-3.031	-1.792	-3.442
	(0.003)	(0.001)	(0.19)	(0.10)	(0.001)	(0.001)
Lines of Insurance[c]						
Collective Effect	[120.98]		[121.48]	[129.22]		[108.27]
	(0.001)		(0.001)	(0.001)		(0.001)
Ownership Structure						
Closely-Held Stock		-1.126	-2.547			
		(0.20)	(0.01)			
Widely-Held Stock		0.039	-1.262		1.087	0.632
		(0.94)	(0.06)		(0.005)	(0.17)
Mutual-Owned Stock		1.112	0.304		1.792	1.881
		(0.03)	(0.66)		(0.02)	(0.05)
Mutual		1.215	0.055		0.680	0.639
		(0.02)	(0.94)		(0.07)	(0.20)
Association-Owned Stock		2.890	2.137		2.262	1.830
		(0.19)	(0.05)		(0.001)	(0.000)
Reciprocal		2.015	0.675		2.773	2.185
		(0.001)	(0.395)		(0.001)	(0.001)
Collective Effect		[74.44]	[68.84]		[50.41]	[22.74]
		(0.001)	(0.001)		(0.001)	(0.001)
Alternative Hypotheses						
Advertising-to-Premium Ratio	0.140		0.335	8.769		9.370
	(0.83)		(0.63)	(0.08)		(0.07)
Log of Total Admitted Assets	0.251		0.217	0.219		0.211
	(0.001)		(0.002)	(0.04)		(0.06)
Premium-to-Population Ratio	0.03		0.040	0.13		0.140
	(0.01)		(0.008)	(0.002)		(0.002)
Geographic Herfindahl	0.448		0.103	-0.713		-0.724
	(0.16)		(0.77)	(0.10)		(0.11)
Collective Effect	[29.77]		[22.97]	[33.57]		[29.94]
	(0.001)		(0.001)	(0.001)		(0.001)
Concordant	77.5%	52.8%	82.4%	83.5%	54.1%	85.7%
Discordant	22.2%	17.0%	17.4%	16.4%	19.6%	14.2%
Somer's D_{YX}	0.55	0.36	0.65	0.67	0.35	0.72

Note: P-values are in parentheses. Chi-square statistics are in brackets. Chi-square statistics test the significance of the contribution for the group of covariates—the collective effect. Advertising-to-premium ratio = advertising expense divided by direct business written. Premium-to-population ratio = total direct premiums written divided by the population of the states in which the firm operates (in thousands of dollars). The Herfindahl geographic concentration index is the sum of the squares of the ratio of the dollar amount of direct business in state j to the total amount of direct business across all states. Concordant is the percentage of all possible pairs having different values of the dependent variable where the larger value has the higher predicted probability. Discordant is the similar percentage of all possible pairs where the opposite is true. Somer's D_{YX} is an index of rank correlation between predicted probabilities and observed outcomes. It can be calculated by dividing the difference between the number of concordant pairs and discordant pairs by the total number of pairs not tied on the dependent variable. See Goodman and Kruskal (1979) for a discussion.

[a] Sample comprises 804 property-liability insurers with group affiliation (626 independent and 178 exclusive).

[b] Sample comprises 470 property-liability insurers without group affiliation (323 independent and 147 exclusive).

[c] There are 21 lines-of-insurance coefficients which are suppressed to conserve space.

stocks, association-owned stocks, mutuals, and reciprocals. Except for widely-held stocks and mutual-owned stocks, these differences in means are statistically significant. The Wilcoxon test results are weaker, but consistent, indicating significance for widely-held stocks, mutuals, and reciprocals. We also note that these two-sample test results are based on relatively small samples for the Lloyds, closely-held stock, and association-owned stock comparisons so that power is an issue.

Table 2
Number of Firms and Mean/Median Direct Premiums Written by Ownership Structure and Distribution System

				Direct Premiums Written (in millions of dollars)				t-value[a]	
				Exclusive		Independent		Wilcoxon z-value	
	Exclusive	Independent	Total	Mean	Median	Mean	Median	Mean	Median
Lloyds	5 (12%)	37 (88%)	42	3	3	7	5	-2.62**	-1.01
Stock (Closely-Held)	12 (12%)	90 (88%)	102	7	2	18	5	-1.78*	-1.32
Stock (Widely-Held)	111 (19%)	483 (81%)	594	85	9	96	21	-0.23	-3.69***
Stock (Mutual-Owned	41 (35%)	77 (65%)	118	109	10	34	8	1.14	0.01
Mutual	92 (29%)	228 (71%)	320	185	34	32	10	2.24**	5.05***
Stock (Association-Owned)	25 (66%)	13 (34%)	38	49	13	11	7	2.05**	1.17
Reciprocal	39 (65%)	21 (35%)	60	109	17	23	5	2.38**	1.74*
Total	325 (25%)	949 (75%)	1,274						

Note: Samples consist of 325 exclusive agency insurers and 949 independent agency insurers.
[a] Two-sample t-tests assume unequal variances if the F-test for variance equality is rejected at the 5 percent level.
* Significant at 10 percent level. ** Significant at 5 percent level. *** Significant at 1 percent level.

Thus, both the proportions of firms choosing a particular distribution system and mean direct premiums written conform to our hypothesized ordering across ownership structures.[10] This ordering is consistent with our hypothesis that distribution system and ownership structure are strategic complements both because

[10] There are small ordering differences when group and nongroup firms are examined separately, but these differences are within usual limits of sampling variation. For example, for nongroup firms, the percentage of mutuals adopting the independent agency system is higher than the percentage for widely-held stocks, but the percentages are not reliably different.

of varying managerial discretion requirements and because the target customer population is better defined for reciprocals and association-owned stocks.[11]

Lines of insurance. There are 26 lines of insurance reported by A. M. Best. We omit five lines (reinsurance, international, glass, credit, and miscellaneous) to avoid singularity in the matrix of independent variables used in our regressions.[12] Including any of the omitted lines in the reported regressions does not qualitatively change any major result; the primary effect is to increase the standard errors of the estimated line-of-insurance coefficients. Two-sample tests (not reported) indicate that independent agency insurers have higher percentages of direct business written in 15 of the 21 lines of insurance. The three lines where the percentages are larger for exclusive agency insurers are medical malpractice, group accident and health, and automobile physical damage.

Although the individual coefficients are not included in Table 1, the null hypothesis that the lines of insurance collectively are not associated with the dependent variable is rejected at better than the 0.001 level for both group and nongroup samples in all regressions that include these variables. Moreover, the reported parametric Chi-square statistics (twice the difference in log-likelihood) for the collective effects (reported in brackets) and the index value of the rank-correlation between the predicted probabilities and the observed outcomes (Somer's D_{YX}) indicate that the lines of insurance are the most important variables for explaining the distribution system choices. For example, the rank-correlation index never approaches 0.5 unless the lines of insurance are included in the regression.[13] Also, the collective-effects Chi-square statistic (which assesses the marginal contribution of a set of variables) is largest for lines of insurance, even when all variables are included, as in regressions 3 and 6.

These results are consistent with our hypothesis that the distribution system should vary with insurance lines because contracting problems vary across lines. Unfortunately, using the percentages of direct business written in the lines rather than instrumental variables to measure frequency of disputes, claims complexity, or the stability of the legal environment lowers the power of our tests. Nevertheless, these variables should help control for variation in business strategy when we examine the associations between distribution system choice and other independent variables.

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[11] If exclusive agency reciprocals have a comparative advantage when target policyholder populations are well defined, then their business should be concentrated in fewer lines. To examine this hypothesis, we compute a Herfindahl line-of-business concentration index, using the data on premium volume by line of business for each firm. We then employ an analysis of covariance between the Herfindahl index and distribution system that controls for firm size for our sample of reciprocals. The results provide weak evidence that exclusive agency reciprocals are more line-of-business concentrated than independent agency reciprocals (p-value = 0.07), but the small sample size (60 firms, of which 39 are exclusive and 21 independent) limits the power of this test.

[12] Some of the omitted lines (international, glass, and reinsurance) are minor lines of insurance for most companies in the sample, and only a few companies do any business in the credit line. We drop the miscellaneous category because it is unlikely to be homogeneous across the sample.

[13] If only the lines of insurance are included in the regression, Somer's D_{YX} equals 0.51 for group and 0.60 for nongroup firms.

Tests of Hypotheses about Insurer-Agent Conflict

Table 3 reports summary statistics on the advertising-to-premium ratio, firm size, and geographic concentration variables for exclusive agency and independent agency insurers. We discuss these statistics along with the results from the regressions reported in Table 1. The statistics include means, medians, standard deviations, and two-sample mean and median test results. We also have examined the sample for differences between group and nongroup insurers; we note where the results differ from those for the pooled sample.

Advertising policy. The advertising-to-premium ratio is advertising expense divided by direct premiums written. In the data, the mean (median) advertising-to-premium ratio is 0.014 (0.0009) for exclusive agency insurers and 0.006 (0.0005) for independent agency insurers. The difference in means test is not significant ($t = 1.13$), but the Wilcoxon test suggests a significant difference ($z = 2.77$). When we divide the data into group and nongroup companies, the Wilcoxon test is significant only for group companies, and the means test again suggests insignificant differences.

Table 3
Summary Statistics and Comparison Tests on Cost Structure, Sales Structure, Firm Size, and Geographic Concentration Variables

	Exclusive			Independent			Mean Difference	Wilcoxon Rank Sum Test
	Mean	Median	S.D.	Mean	Median	S.D.	t-value	z-value
Advertising-to-Premium Ratio	0.014	0.0009	0.116	0.006	0.0005	0.088	1.13	2.77**
Firm Size								
Total Admitted Assets (in millions of dollars)	245	33	952	147	16	683	1.72	4.43***
Logarithm of Total Admitted Assets	17.3	17.3	2.0	16.8	16.6	1.8	4.12***	4.43***
Direct Premiums Written (in millions of dollars)	112	14	483	62	13	193	1.82*	0.34
Logarithm of Direct Premiums Written	16.3	16.5	2.4	16.3	16.3	1.9	0.30	0.48
Geographic Concentration								
Herfindahl Index	0.603	0.720	0.402	0.583	0.564	0.376	0.80	0.39
Direct Premiums Written Per Population	3013	358	7291	1469	362	9001	3.09***	0.84

Note: Samples consist of 325 exclusive agency insurers and 951 independent agency insurers. S.D. = standard deviation. Two-sample t-tests assume unequal variances if the F-test for variance equality is rejected at the 5 percent level. The advertising-to-premium ratio is the ratio of advertising expenses to direct business written. The Herfindahl geographic concentration index is the sum of the squares of the ratio of the dollar amount of direct business in state j to the total amount of direct business across all states. Premiums written per population is direct premiums written divided by the total population of states in which the firm does direct business.

* Significant at 10 percent level. ** Significant at 5 percent level. *** Significant at 1 percent level.

The advertising-to-premium coefficient generally is significantly positive for nongroup companies. The ratio is uniformly not significant for the group insurers. The nonsignificance of the variable for the group companies is consistent with our conjecture that accounting allocations cause problems for this variable within the group companies. Thus, our evidence supports the Marvel and Grossman and Hart hypotheses that firms with higher advertising expenses are more likely to employ exclusive agents, but only for the nongroup companies.

Firm size. We report several measures of firm size. Asset data suggest that exclusive agency insurers are larger than independent agency insurers: the mean (median) total admitted assets is $245 million ($33 million) for the exclusive agency insurers and $147 million ($16 million) for the independent agency insurers. The difference in means is marginally significant (t = 1.72), but if the data are segregated into group and nongroup insurers, the differences in means are significant for both subsamples. The difference in medians is highly significant (z = 4.43). If size is measured by the logarithm of total admitted assets, the evidence suggests that exclusive agency firms are reliably larger using either the mean or median. If size is measured by direct premiums written, the data suggest less reliable size differences between the two distribution systems. The mean (median) direct premiums written is $112 million ($14 million) for the exclusive agency insurers and $62 million ($13 million) for the independent agency insurers. The difference in means is marginally significant (t = 1.82), but the difference in medians is not significant (z = 0.34). Finally, the comparison of the logarithm of direct premiums written shows no significant difference, whether comparing means or medians.

As shown in Table 1, size measured as the logarithm of total admitted assets has a significantly positive sign in all regressions. But if we use the logarithm of direct premiums written (not reported), the coefficient is never significant. The logic of the Sass and Gisser hypothesis appears to suggest that premium income is a better measure of firm size than assets. In that case, our results provide little support for the Sass and Gisser hypothesis that the ability to generate business is an important factor in the adoption of the exclusive agency system.[14]

Geographic concentration. We provide two measures of geographic concentration. The first is a Herfindahl concentration index of direct premiums written by state for each company. The Herfindahl index sums the squares of the firm's percentage of direct business in each state. Both the mean and median point estimates are greater for the exclusive agency insurers (means = 0.603 and 0.583; medians = 0.720 and 0.564), but the differences are not significant (t = 0.80; Wilcoxon rank-sum test z = 0.39).

A second measure of geographic concentration is total direct premiums written divided by the population of the states in which the firm operates. This measure (also used by Sass and Gisser) attempts to measure the firm's ability to generate

[14] Note, however, that our lack of results using premium income might be attributable to employing this same variable also to deflate advertising and in the premium-to-population ratio; alternatively, the greater variability in premium income might induce a larger measurement error problem and, hence, more attenuated coefficient estimates.

business for its agents. Mean direct business per capita is significantly greater for the exclusive agency insurers (3,013 vs. 1,469; t = 3.09), but the medians do not differ significantly.

The ratio of premium to population is significant with the expected sign in all regressions. This evidence is consistent with both the Sass and Gisser hypothesis that exclusive agency insurers have a comparative advantage in more geographically concentrated markets and the Brickley and Dark hypothesis that insurer monitoring is important for the exclusive agency system. However, the geographic Herfindahl evidence offers less support; that variable is not significant.

Economic Significance of the Results

To better assess the impact of the various factors on the choice of distribution system, we report estimated conditional probabilities that a property-liability insurer has an independent agency distribution system. The probabilities assume an independent variable is at the 5th or 95th percentile of its empirical distribution, while all other variables are at their sample mean. Table 4 reports the probabilities, the probability range (varying the independent variable from the 5th to 95th percentile), the values of the independent variables at the 5th and 95th percentiles, and the p-values of the estimated logistic coefficients for each variable. The probability estimates presented in Table 4 are calculated using the coefficient estimates from regression 6 in Table 1. (Qualitatively similar estimates are obtained using regression 3 of Table 1.)

Variables that are statistically significant in the logistic regression are not necessarily informative about the distribution system choice over much of the empirical distribution of the variable. For example, the probability estimate changes by only 0.01 when the fraction of business in earthquake insurance varies from the value at the 5th percentile to the value at the 95th percentile of the empirical distribution (both are small). This also is true for the advertising-to-premium ratio, where the probability range is only 0.02. Thus, although the advertising-to-premium ratio is statistically significant, knowing the value of the ratio tells us little about a firm's distribution system choice for the vast majority of firms in the sample. On the other hand, ownership structure and some lines of insurance are more informative. For example, for ownership structure, the minimum estimated probability range is 0.12 and the maximum is 0.49; hence, knowing an insurance company is organized as a reciprocal tells much about its probable choice of distribution system. Thus, the data presented in Table 4 suggest that the important predictive variables are ownership structure, specific lines of insurance, firm size, and the premium-to-population concentration measure.

Tests of Sales-Structure and Cost-Structure Hypotheses

Two additional hypotheses focus on the insurer's sales structure and cost structure.

Sales structure hypothesis. Marvel (1982) argues that personal lines of insurance generally involve a larger, more homogeneous market. In such cases, large-scale advertising and centrally-conducted market research are more likely to

Table 4
Estimated Probabilities that a Property-Liability Insurer Has an Independent Agency Distribution System for the Sample of 470 Property-Liability Insurers Without Group Affiliation

	Value at 5th Percentile[a]	Value at 95th Percentile[a]	Probability at 5th Percentile	Probability at 95th Percentile	Probability Range[b]	p-value[c]
Lines of Insurance						
Fire	0	0.48	0.77	0.77	0.01	0.95
Allied Lines	0	0.20	0.75	0.81	0.06	0.17
Farmowners Multiple Peril	0	0.21	0.77	0.73	0.04	0.57
Homeowners Multiple Peril	0	0.73	0.58	0.99	0.40	0.00
Commercial Multiple Peril	0	0.30	0.76	0.81	0.06	0.30
Ocean Marine	0	0.00	0.77	0.77	0.00	0.90
Inland Marine	0	0.10	0.77	0.76	0.01	0.58
Medical Malpractice	0	0.99	0.77	0.71	0.06	0.68
Earthquake	0	0.00	0.70	0.72	0.01	0.00
Group Accident and Health	0	0.00	0.78	0.78	0.00	0.10
Credit Accident and Health	0	0.00	0.77	0.77	0.00	0.24
Other Accident and Health	0	0.00	0.76	0.76	0.00	0.11
Workers' Compensation	0	0.42	0.76	0.83	0.07	0.21
Other Liability	0	0.38	0.75	0.83	0.08	0.15
Auto Liability	0	0.63	0.70	0.91	0.22	0.01
Auto Physical Damage	0	0.51	0.76	0.79	0.03	0.72
Aircraft	0	0.00	0.77	0.77	0.00	0.30
Fidelity	0	0.00	0.77	0.77	0.00	0.50
Surety	0	0.22	0.74	0.85	0.11	0.02
Burglary and Theft	0	0.00	0.77	0.77	0.01	0.65
Boiler and Machinery	0	0.00	0.77	0.77	0.00	0.26
Ownership Structure						
Widely-Held Stock	0	1	0.80	0.68	0.12	0.17
Mutual-Owned Stock	0	1	0.81	0.39	0.42	0.05
Mutual	0	1	0.81	0.70	0.12	0.20
Association-Owned Stock	0	1	0.78	0.37	0.42	0.01
Reciprocal	0	1	0.79	0.30	0.49	0.00
Alternative Hypotheses						
Logarithm of Total Admitted Assets	14.09	18.82	0.84	0.66	0.18	0.06
Advertising-to-Premium Ratio	0.00	0.01	0.78	0.76	0.02	0.07
Premium-to-Population Ratio	15.15	6224.5	0.81	0.64	0.17	0.00
Geographic Herfindahl	0.09	1	0.68	0.80	0.12	0.11

Note: Probabilities are estimated using the coefficient estimates reported for logistic regression 6 of Table 1. These estimates assume an independent variable is at either the 5th or 95th percentile of the cross-sectional empirical distribution while other variables are at their sample mean. The base case probability where all variables are at their sample mean is 0.77. Advertising-to-premium ratio = advertising expense divided by direct business written. Premium-to-population ratio = total direct premiums written divided by the population of the states in which the firm operates (in thousands of dollars). The Herfindahl geographic concentration index is the sum of the squares of the ratio of the dollar amount of direct business in state j to the total amount of direct business across all states.

[a] Values are from the designated percentile of the cross-sectional empirical distribution of the variable.

[b] The probability range is the difference between the probabilities at the 5th and 95th percentiles.

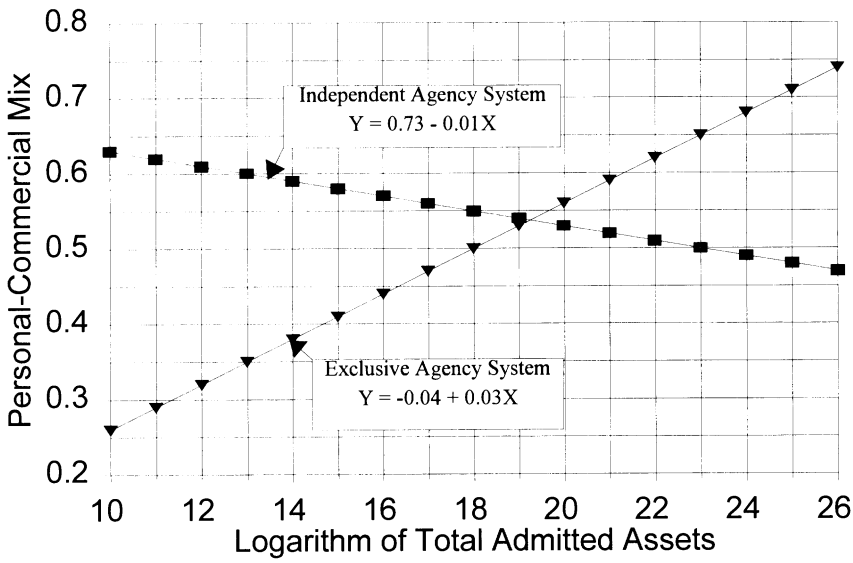
[c] The p-values are for the coefficients of regression 6 of Table 1.

be effective; hence, exclusive agents would have a comparative advantage. However, our analysis suggests that, if insurer-policyholder problems are more severe or if other agent-provided services are more important for personal lines, then independent agents could have a comparative advantage. Therefore, our analysis implies that the relative importance of exclusive versus independent agents for personal and commercial lines is an empirical matter.

The A. M. Best Company considers homeowner and farmowner multiple peril and automobile liability and physical damage lines as personal lines; all other lines are classified as commercial. We calculate the personal-commercialmix as the ratio of direct business in these personal lines to total business written.The mean (median) ratio of direct business in personal lines is 0.442 (0.401) for exclusive agency insurers and 0.494 (0.526) for independent agency insurers. Both the mean and Wilcoxon tests are significant (t = -2.02; Wilcoxon rank-sum test z = -2.45).

We include the personal-commercial mix in logistic regressions similar to those in Table 1 (but omit the lines of insurance covered by the variable). Inconsistent with Marvel's hypothesis, personal-commercial mix is significantly negative in these regressions for both group and nongroup companies. To investigate further, we regress personal-commercial mix on firm size (logarithm of admitted assets) separately for both independent agency and exclusive agency firms. As

Figure 1
Plot of Estimated Regression Equations for Personal-Commercial Mix on Logarithm of Total Admitted Assets by Type of Distribution System



Note: Personal-commercial mix is the percentage of direct business in personal lines. The t-statistic for the slope coefficients are -2.3 (p-value = 0.02) and 2.4 (p-value = 0.2) for the independent agency and exclusive agency regressions, respectively.

illustrated in Figure 1, the slope coefficients are significant in both regressions but of opposite sign, indicating an interaction with firm size. (In similar regressions estimated separately for each insurance line, the relations between personal-commercial mix and firm size are driven primarily by homeowners multiple peril.)

Adding an interaction term (the product of the logarithm of admitted assets and the personal-commercial mix) in the logistic regressions directly yields the result that small firms specializing in personal lines are more likely to adopt the independent agency system, and large firms are more likely to adopt the exclusive agency system. The personal-commercial mix is still significantly negative in the regressions, but the interaction term with firm size is significantly positive. The coefficients and test statistics of the affected variables are shown in Table 5.[15] (Marvel examined data only from the 30 largest property-liability insurers; with the limited variation in firm size across his sample, this interaction would be difficult to identify.) This result potentially is related to aggregation problems in the Best data discussed above. For example, smaller firms might specialize in personal lines where insurer-policyholder problems are more severe, while larger firms specialize in personal lines where these problems are less severe and the gains to centrally-conducted market research and promotional activities are more fully realized.[16]

Cost-structure hypothesis. The loss-to-premium ratio is measured as total direct business losses paid divided by direct premiums written. Both mean and median loss-to-premium ratios are larger for exclusive agency insurers. The mean (median) loss-to-premium ratio is 0.542 (0.552) for exclusive agency insurers and 0.473 (0.502) for independent agency insurers. Both mean and median tests are significant ($t = 2.15$, $z = 2.16$).[17]

Loss-to-premium ratios are compared line-by-line for the firms using alternative distribution systems. We focus on a comparison of median ratios because, for many lines, several companies incur large losses resulting in very skewed and fat-tailed distributions with large standard deviations. Although not reported, median ratios are greater for exclusive agency insurers in 15 of 25 lines.[18] Wilcoxon z-values are significant for nine of these lines (farmowners, homeowners, ocean marine, earthquake, group accident health, auto liability, auto physical damage, burglary, and credit insurance). There is no line for which median loss-to-premium ratios are greater for independent agency insurers.

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[15] The personal-commercial mix and interaction variables have similar signs in the group and nongroup logistic regressions, but the coefficients are not significant in the nongroup regression. (Omitting firm size, the personal-commercial mix is significantly negative, and the interaction is significantly positive at the 10 percent level for the nongroup firms.)

[16] These effects may be less visible with more current data where independent agents play a less prominent role. This does not mean that the underlying forces are not at work, just that their results may be less visible; for example, see footnote 6.

[17] Looking at the group and nongroup evidence separately, we find significant differences only for the group firms. The loss-to-premium ratios are not significantly different between exclusive and independent agency insurers for the nongroup firms. However, the nongroup ratios are also not significantly different from those of the respective category of group firms. The nongroup sample size is roughly half that of the group firms.

[18] We lose the reinsurance line because there are too few observations for two-sample tests.

Table 5
Selected Statistics from Logistic Regressions of Distribution System (Exclusive = 1; Independent = 0) on Lines of Insurance, Ownership Structure, and Variables Representing Alternative Hypotheses

Sample	Total	Group	Nongroup	Nongroup
Affected Variables				
Logarithm of Total Admitted Assets (1)	-0.007	0.036	0.182	
	(0.92)	(0.72)	(0.21)	
Personal-Commercial Mix (2)[a]	-8.403	-7.987	-3.373	-6.249
	(0.001)	(0.001)	(0.37)	(0.03)
Interaction ((1) × (2))	0.382	0.354	0.090	0.279
	(0.001)	(0.01)	(0.70)	(0.10)
Number (Independent/Exclusive)	949/325	626/178	323/147	323/147

Note: p-values are in parentheses. These regressions also include the variables listed in Tables 1 and 2 except for the four lines of insurance that make up the personal-commercial mix. The coefficient estimates for these additional variables are suppressed to conserve space. The estimated values are not materially different from those reported in Tables 1 and 2.

[a] The personal-commercial mix variable is the fraction of total direct business represented by homeowners multiple peril, farmowners multiple peril, and automobile physical damage and liability.

This evidence is consistent with both the Mayers and Smith (1981) service hypothesis that independent agency insurers provide higher-service, higher-price policies as well as the Joskow (1973) inefficiency hypothesis, but it is inconsistent with the Scherer and Ross (1990) promotions hypothesis. Since the inefficiency and the service hypotheses are not mutually exclusive, our cost-structure evidence cannot separate them unless additional structure is imposed upon the estimation problem.

However, two arguments suggest that the inefficiency hypothesis is unlikely to account for much of the reported difference. First, it begs the question of how the independent agency system survives. Considering the low barriers to entry and the large number of firms in this industry, there is little reason to question the existence of effective competition. With effective competition among firms choosing alternative distribution systems, inefficient systems should not survive (see Alchian, 1950). Second, the inefficiency hypothesis leaves unexplained three empirical regularities: (1) Our data show (although not reported in our tables) that independent agency insurers generate the majority of premium income in 20 of the 26 lines. Moreover, they dominate several lines (accounting for 85 percent of commercial multiple peril, 86 percent of ocean marine, and 94 percent of the surety business). (2) The use of the independent agency system dominates in particular ownership classes. (For example, the fraction of direct premiums written by independent agency insurers is 82 percent for widely-held stocks, 95 percent for closely-held stocks, and 95 percent for Lloyds.) (3) We observe substantial variation in distribution system choice within groups (28 percent of the group

firms are in groups that include both independent agency and exclusive agency insurers). This observed variation in the use of independent agents across lines of insurance, ownership structure, and within groups is consistent with the Mayers and Smith service hypothesis; the inefficiency hypothesis cannot explain such variation. Therefore, we suggest that evidence of higher policy premiums for independent agency insurers reflects additional service provision, not inefficiency of the independent agency system. (See also Berger, Cummins, and Weiss, 1995, for further examination of these issues.)

CONCLUSION

We examine the choice between exclusive agency and independent agency distribution systems by firms in the insurance industry. It is assumed that different organizational forms serve as efficient mechanisms for controlling contracting problems arising in relationships among the policyholders, insurers, and agents. Alternative distribution systems have comparative advantages in predictable segments of the insurance market; thus, firms having different characteristics adopt different distribution systems. The implications of this control-based theory are tested by investigating the association between the type of distribution system and the firm's ownership structure, lines of insurance, advertising policy, size, geographic concentration, and cost-structure measures for a large sample of property-liability insurers.

Exclusive agency insurers typically have lower costs (both across and within individual lines of insurance), are larger, have more geographically concentrated operations, advertise more, and sell less insurance in personal lines than independent agency insurers. The most important group of variables for explaining the firms' distribution systems are the lines of insurance in which they operate. These results are consistent with the Mayers and Smith (1981) hypothesis that independent agency insurers offer higher-service and higher-price policies (especially where claims are complex), the Brickley and Dark (1987) hypothesis that the exclusive agency system requires more monitoring from the insurer, the Sass and Gisser (1989) hypothesis that exclusive agency insurers have a comparative advantage in more geographically concentrated markets, and the Marvel (1982) and Grossman and Hart (1986) hypotheses that advertising policy is a significant factor affecting the choice of distribution system. We find that Marvel's (1982) conclusion that exclusive agency insurers specialize in personal lines is valid only for large insurers; small insurers that specialize in personal lines tend to use independent agents.

The independent agency system is more prevalent among Lloyds associations and closely-held stock companies, followed by widely-held stock companies, mutuals, and mutual-owned stock companies. This finding that ownership structure and distribution system are strategic complements is generally consistent with the Mayers and Smith (1981) hypothesis that differing degrees of managerial discretion across ownership structures lead to different patterns of product specialization and, hence, different contractual relationships for product distribution. Our finding that the exclusive agency system is more prevalent among reciprocals and

association-owned stock companies is also consistent with the Marvel (1982) and Grossman and Hart (1986) analyses, since firm-level marketing is likely to be more effective when firms face well-defined populations of potential policyholders.

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