

An Empirical Test of Distribution System and Ownership Form Choice For Property-Liability  
Insurance Firms

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## Insurance Firms

### 1. Introduction

Recent research has argued that alternative organizational forms will coexist in an industry because of differential relative advantages (See for example Jensen and Meckling, 1976; Klein, Crawford, and Alchian, 1978; Fama and Jensen, 1983; Williamson, 1985). Two important elements of organizational form are the ownership structure of the firm, and the degree to which the firm internalizes or outsources production, that is, the level of vertical integration.

The property-liability insurance industry is characterized by firms which differ on both of these dimensions of organizational form. The range of ownership structures includes stock corporations, mutuals, and reciprocal organizations. Stockholder owned insurers dominate the market, with 67.7 percent share of premiums written in 1994. Stock insurers controlled 55 percent of the personal lines market, which includes auto and homeowners insurance, but held a commanding lead in commercial lines, with a 79 percent share. Property-liability insurance firms also exhibit a wide variation in the degree of vertical integration of the distribution system, with some firms using exclusive dealing arrangements, and others contracting the sales function out to independent agents who have ownership rights in the client list, and can represent a

number of competing insurers. Independent agency insurers controlled 52 percent of the total market in 1994, and 71.8 percent of the commercial lines market.<sup>1</sup>

The organizational form literature in property-liability insurance has largely treated ownership and distribution system choice as independently determined. However, there is some overlap between the theory and empirical predictions across the ownership form and distribution system literature. For example, Mayers and Smith (1988) argue that stock insurers should be associated with a more complex mix of business than mutual insurers, while Barrese and Nelson (1992), Cummins and Weiss (1992), Regan and Tennyson (1996), and Regan (1997) argue that independent agency insurers should be preferred to exclusive dealers when complexity is higher. It is difficult to separate these effects empirically.

An exception to treating these elements of organizational form as independent is Kim, Mayers, and Smith (1996), which argues that ownership form and distribution system are strategic complements. Under this theory, independent agency should be associated with the stock ownership form because the independent agency system better minimizes agency conflicts which might arise between insurers and policyholders. The authors test this hypothesis by examining the relationship between distribution system, ownership form, and lines of business, using company level data from 1981. Ownership form is treated as an independent variable in the analysis of the determinants of distribution system.

Our paper refines the Kim, Mayers, and Smith analysis in several ways. First, we use a more recent sample of firms to more closely reflect current market conditions. More importantly,

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<sup>1</sup>These market share figures are from Best's Aggregates and Averages, 1995.

we directly test the correlation between distribution system and ownership form choice across lines of insurance. Using independence tests on a sample of the 50 largest insurance organizations in each of ten lines of business in 1994, we find a statistically significant relationship between distribution system and ownership form, both across the market, and across individual lines of insurance. Further, we estimate the relationship between distribution system and ownership form within an endogenous choice framework. Probit analysis is undertaken using a sample of 257 property-liability insurance firms operating in 1990. We find strong support for the hypothesis that distribution system and ownership form are significantly related. Controlling for endogeneity, we find that independent agency insurers are characterized by higher levels of complexity, while stockholder owned insurers are more concentrated by line of business, and have higher levels of underwriting risk as measured by the variance of the loss ratio. These findings significantly improve our understanding of the relationship between distribution system and ownership structure in the property-liability insurance industry.

The paper proceeds as follows. Section 2 reviews the hypotheses regarding the determinants of ownership form and distribution system, and discusses testable hypotheses. Section 3 presents the empirical estimation and discussion of the results. Section 4 concludes.

## 2. Organizational Form

Below, we briefly summarize the theory regarding the determinants of organizational form for this industry. One important contribution of this paper is to analyze the implications of

this literature for predictions of the determinants of both stock ownership and distribution system separately and jointly.

### *2.1 The Ownership Form Hypothesis*

Mayers and Smith (1981, 1988, 1994) develop the managerial discretion hypothesis which argues that different ownership structures arise as a way to minimize incentive conflicts between owners, managers, and policyholders in an insurance firm. There is a separation between ownership rights and managerial decision making within the stock ownership form. Policyholders face a risk of expropriation of wealth by stockholders who have an *ex post* incentive to maximize the value of their equity at the expense of policyholders. This can be done, for example, by investing in riskier assets, or by reducing the value of policyholder surplus. These conflicts can be controlled through costly restrictions on dividend payments or investments.

Alternatively, the conflicts between owners and policyholders can be eliminated by combining these functions, as in a mutual organization, where each policyholder is also an owner. The trade-off is that the potential for conflict between owners and managers is higher in a mutual than in a stock firm. Managers may maximize their own utility at the expense of the owners through increasing perquisite taking, or by foregoing value-added investments which present an unacceptable level of risk from the manager's viewpoint. These conflicts are difficult to control because the mutual firm owners do not have access to the takeover threat of the stock market, and must organize policyholders to vote to remove management. Further reducing the

owners' ability to control management is the fact that ownership shares in a mutual are not tradeable, nor are proxies assignable.

Since the cost of controlling managers is higher in a mutual and owners recognize this *ex ante*, managers will be limited in their decision making authority. These limits placed on management's discretion act as proxy for direct owner monitoring of management. Consequently, mutuals should concentrate in less complex lines of business, because the need for managerial discretion is lower when products are more standardized. Mutuals should also be less diversified across lines of business than stock insurers, and less geographically dispersed than stock firms because it is less costly for owners to monitor managers when operations are relatively concentrated.

The managerial discretion hypothesis extends to the firm's investment strategy as well as its underwriting strategy. Owners may seek to expropriate policyholder wealth through altering the firm's investment portfolio *ex post*. This incentive to increase firm risk is mitigated in a mutual. Moreover, since stock firms have more direct access to capital markets, firm risk can be diversified across the securities markets. Stock firms also possess greater ability to raise capital following unexpected losses. These advantages imply that stock firms should also be associated with higher levels of firm risk.<sup>2</sup> This hypothesis has been empirically supported in Mayers and Smith, 1988, 1994, and Lamm-Tennant and Starks, 1993.

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<sup>2</sup> Insurers may also diversify risk by offering participating insurance policies. Although this is more common in mutuals, stock insurers also offer participating policies. See Smith and Stutzer (1990) for a discussion of participating policies and the coexistence of ownership structures in the insurance industry.

## *2.2 Distribution System Choice*

Two distinct classes of insurance distribution systems are used in the U.S. markets. Exclusive dealing arrangements include insurers which operate through mass merchandising, where no salesperson is employed, companies which sell through employees, or companies who use exclusive agents. Exclusive agents are autonomous contractors, but are contractually bound to represent the products of only one insurer. Under any of these arrangements, the insurer owns the customer list, and thus captures the residual profits which arise from the insurance transaction. Exclusive dealing insurers are more likely to invest in things such as advertising or information technology which decrease production costs, because these costs can be recovered over the term of the agency relationship; the value of these relationship specific investments can not be easily expropriated by the agents (Marvel, 1982; Regan, 1997).

Under independent agency, the agent is an autonomous contractor, and represents the competing products of several insurers. The principal distinction between distribution systems is the agent's ownership rights to the customer list under independent agency. Agency ownership of the list means that the insurer may not solicit an independent agent's client directly, nor may an agent's client be unilaterally reassigned by the insurer. The agent, however, has the unrestricted legal right to terminate business and move her portfolio of clients to another insurer. This contractual relationship imposes costs on insurers because the agent may expropriate insurer wealth by threatening to move customers. Also, agents may have incentives to move business if

the commission rates paid upon policy renewal are lower than new business commission rates (Grossman and Hart, 1986; D'Arcy and Doherty, 1990).<sup>3</sup>

Independent agency can offer benefits to insurers which outweigh these costs in some environments. Several researchers have argued that the independent agency system is preferred to direct writing for complex lines of business, because the agent can intervene on the policyholder's behalf in the event of conflicts between the policyholder and insurer. These conflicts are more costly for complex products (Mayers and Smith, 1988; Cummins and Weiss, 1992; Barrese and Nelson, 1992; Kim, Mayers, and Smith, 1996; Regan, 1997). Regan and Tennyson (1996) offer an alternative theory, arguing that independent agency adds value when agent participation in risk classification is more important. Since insurers can develop standardized risk assessment tools for relatively less complex lines of business, agent participation in risk assessment is less valuable for these lines. Under each theory, independent agency is associated with a more complex mix of business.<sup>4</sup>

Independent agency should also have an advantage over exclusive dealing when the insurer is exposed to higher levels of underlying risk (Regan, 1997). This is because the multiple placement opportunities available to independent agents allow the agent to diversify her portfolio both across insurers, and across lines of business. Further, since independent agents participate in the profitability of business underwritten through profit contingent commission arrangements,

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<sup>3</sup> Joskow (1973), Cummins and Vanderhei (1979), Barrese and Nelson (1992), and Regan (1997) have all documented a cost advantage to direct writing. However, Berger, Cummins, and Weiss (1996) show that this cost advantage does not translate into a profit advantage for direct writers.

an adverse shock which reduces insurer profitability can be partially absorbed by the distribution system.

Kim, Mayers, and Smith (1996) argue that ownership form and distribution system are strategic complements. Since independent agency helps to control potential opportunistic behavior by insurers, independent agency should be preferred where opportunism is more likely; that is, in stockholder owned firms. This hypothesis is tested by performing a logistic regression of ownership form on distribution system, where ownership is classified as closely or widely held stock, mutual or association owned stock, mutual, or reciprocal. Like Regan (1997), the authors find a significant relationship between ownership form and distribution system.

To summarize, since the opportunities for expropriation of policyholder wealth vary with ownership form, independent agency should be preferred when the agent's ability to safeguard policyholder wealth is more important, that is, in stockholder owned firms. In addition, since the stock ownership form affords greater opportunity to increase firm risk, independent agency should be more closely associated with riskier stock firms than with mutuals. We should also see independent effects of complexity and risk both on distribution system and ownership form choice. We examine these relationships below, first by analyzing data aggregated at the market level, and then by examining individual firm level data.

### 3. Empirical Evidence

#### 3.1 *Lines of Business Tests*

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<sup>4</sup> Posey and Yavas (1996), however, argue that both distribution systems will coexist if

Previous researchers have analyzed the elements of organizational form separately. For example, in analyzing the determinants of ownership structure, researchers have not controlled for the effects of distribution system choice (Mayers and Smith 1988, 1994; Lamm-Tennant and Starks 1993). Likewise, in examining distribution system choice, both Marvel (1982), and Sass and Gisser (1989) restrict their analysis to stockholder owned firms, and both Kim, Mayers, and Smith, (1996), and Regan (1997) treat ownership structure as an independent variable. While Regan and Tennyson, (1996) does treat ownership form as an endogenous variable, the analysis is of market shares across distribution systems, rather than determinants of organizational form.

We can take a first step towards separating the determinants of organizational form by examining the correlation between distribution system and ownership form choice, both in the aggregate, and by line of business. Independence tests are performed on a sample of the fifty largest firms in terms of net premiums written in personal and commercial lines, as well as ten individual lines of business in 1994. Table 1 presents  $X^2$  statistics for the significance of the correlation between ownership form and distribution system.<sup>5</sup> The lines of business shown represent a mix of standardized personal lines and more complex commercial lines. Premium volume in these lines accounted for over 80% of business written in 1994. Column 1 shows the test statistics for the largest fifty firms in each class of business. We find a significant relationship between distribution system and ownership form at the .01 level for the market as a

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consumers incur sufficiently high search costs, regardless of product segmentation.

<sup>5</sup> The data is from the premium and loss exhibit for the top 50 writers in each line in *Best's Aggregates and Averages, Property-Casualty edition*. The classification tables for each line are shown in Appendix 1. Note that we were unable to identify the ownership form for 2 firms,

whole. This result also holds for more narrow classifications. In both personal lines and commercial lines there is a statistically significant correlation between distribution systems and ownership form, with stock independent agency firms more prevalent. This relationship also holds across all of the individual lines we tested, with  $X^2$  statistics ranging from 26.49 for general liability, to 6.49 in commercial multiperil.

[Table 1]

Interestingly, when the samples are ranked into the largest twenty-five and the next twenty-five insurers in each line, the tests are uniformly significant only for the largest insurers. For the smaller firms, shown in Column 3, we can not reject the hypothesis of no correlation between distribution system and ownership form for the market as a whole, or for the commercial lines sector. With the exception of private passenger auto physical damage and general liability, the  $X^2$  statistics for the sample of smaller firms are not as strong as for the larger firms. This might indicate that smaller firms rely more heavily on the independent agency system regardless of ownership form, because of the initial costs associated with setting up a tied distribution system. Sass and Gisser (1989) argue that direct writing insurers must be large enough to support a tied sales force, and our result seems to be supportive of that hypothesis.

To gain further insight, we examine patterns of specialization across lines of business for each element of organizational form. The theory discussed above indicates that both independent agency and stock insurers should be associated with more complex lines, and lines which are riskier to underwrite. Table 2 illustrates the relationship between firm specialization across these

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American Premium Underwriters Group, and Fortis Group, so some correlation tables have only 49

lines of business and the risk associated with each line across time. Aggregate specialization for stock and independent agency firms is shown in Columns 2 and 3. This is measured as the proportion of premiums written in a line by each category of insurer to the total market share for each category of insurer. The specialization measures shown are averages for each line over the fifteen year time period 1980 through 1994.

[Table 2]

The data indicate that both stock and independent agency insurers allocate a larger portion of their underwriting capacity to riskier commercial lines than to personal lines. Although personal lines accounted for 47.62 percent of all premiums written in 1994, stock firms devoted 37.19 percent of their underwriting capacity to private passenger auto and homeowners insurance, while independent agency insurers allocated just 30.18 percent.

Further, the pattern of specialization across stock and independent agency insurers is consistent with a correlation across these elements of organizational forms. A comparison of mean specialization ratios by line indicates that there is no statistically significant difference in specialization between independent agency and stock insurers at the 1% level for fire, ocean marine, inland marine, commercial multiperil, and general liability insurance. However, stock insurers are significantly more specialized in personal lines,<sup>6</sup> and significantly less specialized in workers compensation and allied lines than independent agency insurers are. This indicates that,

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observations.

<sup>6</sup> Of course there is likely to be correlation across specialization in personal auto damage, auto liability, and homeowners insurance because these are often sold together.

although correlated, there are relevant differences in business mix across stock and independent agency insurers which should be further investigated.

The coefficient of variation of the ratio of aggregate losses incurred to premiums written for each line is shown in Column 1. The personal auto lines are less risky on average than the commercial lines, with coefficients of variation of approximately 6 percent. However, the commercial lines in which both stock and independent agency insurers allocate the bulk of their business are characterized by higher coefficients of variation of loss ratios across the board.<sup>7</sup> This is consistent with the idea that both independent agency and stock insurers are associated with more complex and more risky lines.

### 3.2 *Firm Level Tests*

While the tests above provide some support our hypotheses, they do not control for other factors which might influence organizational form. More rigorous tests are conducted by analyzing data at the firm level. We are interested in testing for significant differences in risk and complexity across organizational forms. We expect to see both systematic effects by distribution system and ownership form separately, as well as joint effects.

We undertake a more precise test for the determinants of organizational form by estimating a two-stage probit model in which distribution system and ownership form are treated

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<sup>7</sup> Although the coefficient of variation of the loss ratio shown for homeowners insurance is relatively high, the time period used in the analysis includes several years with catastrophic property losses beginning in 1989, including Hurricane Andrew, which caused approximately \$16 billion in

as endogenous. The sample analyzed is a cross section of insurance firms operating in 1990, classified as either groups or unaffiliated insurers.<sup>8</sup> A sample of 400 firms was initially chosen from accounting information provided by the A.M. Best Company. Since several of the variables discussed below are calculated as means or variances over time, data had to be continuously available over the eleven year sampling period 1980 through 1990 for each firm. After eliminating reinsurers, risk retention groups and firms which had incomplete information, 257 firms were included in the analysis. These firms accounted for 81.25 percent of premiums written in 1990, and so should fairly represent the population. The final sample consists of 176 groups and 81 unaffiliated firms, of which 188 are classified as independent agency insurers and 113 are stock firms.

From the theory above, because independent agency can help diversify insurer risk, we expect both stockholder owned and independent agency firms to be exposed to higher levels of underlying uncertainty. There are several ways to measure the insurer's exposure to risk. The variation of the loss ratio of the insurer across time measures the volatility of the entire portfolio of business, and so is an indicator of exposure to underlying risk [VLR]. We expect to see both

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insured property damage, and the Northridge, CA earthquake in 1994, which caused approximately \$12.5 billion in insured damage. Excluding these years, the risk measure is approximately 6%.

<sup>8</sup> We use A.M. Best's classification for ownership structure and distribution system of the group. Although groups might consist of subsidiary firms with different distribution systems or ownership forms, the data at the individual firm level are very noisy. Further, using groups rather than individual subsidiary firms allows us to measure independent decision making units.

independent agency (Regan, 1997), and stock insurers (Lamm-Tennant and Starks, 1993), associated with greater variation in loss experience.<sup>9</sup>

Insurance regulators have historically used a series of financial ratios to monitor the safety of insurers.<sup>10</sup> Insurers which score outside the acceptable ranges for these tests are identified for further regulatory review. One measure of the overall strength of an insurer is the change in premiums written on a year to year basis. Fluctuations in premium volume might signal that an insurer is changing its underwriting standards, or is otherwise in financial difficulty. A range of five to fifteen percent is considered acceptable for this test [DPREMIUM]. A dummy variable is set equal to one if the insurer's growth rate is within this range, and zero otherwise. A positive coefficient on this variable indicates that the insurer meets the test.

Another test of the riskiness of the profitability of an insurer is the change in policyholder surplus on a year to year basis [DSURPLUS]. A rate between five and ten percent is considered normal for this test, but a growth rate of less than five percent is considered unacceptable. A dummy variable set equal to one indicates that the insurer's growth in surplus is greater than five percent, and thus meets the test. The value is set to zero if the growth rate is less than five percent.

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<sup>9</sup> This is the measure used in Lamm-Tennant and Starks (1993). We also estimated the equations with the coefficient of variation of the loss ratio as a measure of risk, and found no significant difference in the results.

<sup>10</sup> The variables described below, Dpremium and Dsurplus, were used in the Insurance Regulatory Information System (IRIS), which was developed by the National Association of Insurance Commissioners as an aid in monitoring the financial strength of insurers.

One additional measure is used to indicate the insurer's exposure to underlying uncertainty. The liabilities to surplus ratio is a leverage measure used by A. M. Best Company to rate the safety of insurers. This captures a firm's exposure to errors in loss reserve estimation. Firms with a larger portion of business in long-tailed lines are likely to have higher liabilities to surplus ratios. Controlling for mix of business in commercial lines, a firm with a higher measure is more risky. [LIABSURP].<sup>11</sup>

We also include a variable to test the effect of complex lines of business on distribution system and ownership form choice. We calculate the proportion of business written in complex lines, [COMMERCIAL], by taking the sum of each insurer's share of business in workers compensation, commercial multiperil, commercial general liability, inland marine, ocean marine, and fire insurance. Together, these lines account for over 65 percent of commercial business written in the market, and represent a mix of commercial property and liability insurance.

Researchers also have argued that mutual insurers should be relatively more concentrated by lines of business than stock insurers (Mayers and Smith 1988, 1994), and that direct writers should be more concentrated than independent agency insurers (Regan, 1997). To control for this effect, we measure interfirm concentration by the sum of the squared shares of business in

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<sup>11</sup> To be consistent with Regan (1997) we also tested the assets to liabilities ratio as a measure of leverage. Using that measure did not change the significance of any of our other results, but did result in a poorer fit for the model.

each line for the insurer [CONCENTRATION].<sup>12</sup> A higher value indicates a more specialized insurer.

Several other control variables are also included in the analysis. Given the results of our correlation tests above, differences in firm size may have important implications for organizational form choice. Smaller insurers may rely more on the independent agency system because it is initially less expensive to set up and administer. Sass and Gisser (1989) argue that exclusive dealing insurers must be larger than independent agency insurers so that they can offer their sales force a sufficient volume of business. We include the log of firm assets to control for differences across firm size, [LOGASSETS]. We also control for differences in reinsurance use across insurers by including the ratio of net to direct premiums written in the analysis, [REINSURANCE]. This formulation controls for reinsurance transactions which take place between subsidiary firms within groups, and represents a measure of risk retained.

To distinguish between stock and independent agency insurers in the two-stage probit regression model, we include a dummy variable to control for the possible effects of group affiliation in the stock equation. Mayers and Smith (1994) suggest that stock insurers are more likely to be members of groups than mutual insurers are because the group form minimizes costs of regulatory compliance across states. This variable is set equal to one if the insurer is a group, and zero otherwise [GROUP]. Likewise, relationship specific investments are argued to be an important determinant of distribution system choice because tied agents are unable to expropriate

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<sup>12</sup> The shares for the largest ten lines of business in the market and a composite share representing other lines are squared and aggregated to create an intrafirm concentration variable that

the gains from the investments *ex post*. Marvel (1982), Grossman and Hart (1986), and Regan (1997), argue that advertising should be more important for exclusive dealing insurers. There is no theoretical argument that these relationship specific investments will differ across ownership forms independent of distribution system. Advertising is measured as the ratio of advertising expenses to net premiums written [ADVERTISE].<sup>13</sup> The summary statistics for the numerical variables used in the analysis are shown in Table 3.<sup>14</sup>

[Table 3 here]

The two-stage model to be estimated is as follows. We estimate this system twice, once for distribution system choice with ownership form endogenous, and once for ownership form choice with distribution system as endogenous. Both  $y_1$  (distribution system) and  $y_2$  (ownership form) are binary variables, and each is treated as endogenous in the estimation of the other. We have  $y_i^*$  ( $i = 1,2$ ) is a latent variable such that

$$y_i = 1 \quad \text{if } y_i^* > 0$$

$$y_i = 0 \quad \text{otherwise.}$$

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is similar to the herfindahl index.

<sup>13</sup> We treat this variable as exogenous in this estimation. Sass and Gisser (1989) and Regan (1997) test advertising as both an endogenous and exogenous variable in the determinants of distribution system choice, and find no significant difference in outcomes based on the treatment of this variable. Kim, Mayers, and Smith (1996) also treat advertising as an independent variable.

<sup>14</sup> An examination of the correlation matrix revealed no problematic correlations among these variables. The most highly correlated variables are VLR and Commercial, with a correlation coefficient of .25116

We can estimate the reduced forms of the equations by probit using all of the exogenous variables in both equations. Then in the second stage we substitute the predicted values of  $y_i^*$ , ( $\hat{y}_i$ ), and estimate the structural equations by probit.<sup>15</sup>

$y_1 = 1$  if the firm is classified as an independent agency insurer, 0 otherwise

$y_2 = 1$  if the firm is classified as a stock insurer, 0 otherwise

$X$  = the vector of all exogenous variables

$X_1$  = the vector of exogenous variables for distribution system choice

$X_2$  = the vector of exogenous variables for ownership form choice

Then  $y_i^{**} = F(\hat{y}_i, X_i)$

Table 4 presents the results for the distribution system choice models. Models 1 and 2 estimate the probability that the firm will choose independent agency, controlling for endogeneity of ownership form. The results indicate that, as expected, independent agency insurers have a significantly greater proportion of their business in complex lines, and are significantly less concentrated overall than are direct writers. This strongly supports the theory of an independent effect of distribution system on firm line of business choice, (Kim, Mayers, and Smith, 1996; Regan, 1997), and is consistent across models.

[Table 4]

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<sup>15</sup> This model is from Maddala (1983), p. 246, and is derived from Nelson and Olsen, 1978. The latter authors show that this method produces consistent and asymptotically normal estimators.

Like Marvel (1982), Kim, Mayers and Smith (1996), and Regan (1997), we find that independent agency insurers are less likely to invest in relationship specific assets. ADVERTISE is negative and significant at the 1% level. We also find a difference in firm size across distribution systems, with direct writing insurers significantly larger as measured by the natural log of assets than independent agency insurers. Our reinsurance variable is positively related to independent agency, but is significant at the 10% level only when ownership form is treated as endogenous.

The results for the risk variables are somewhat unexpected. When ownership form is treated as endogenous, with the exception of VLR our measures of risk are all significant predictors of independent agency. Independent agency insurers are associated with higher liability to surplus positions. They are also associated with less adequate premium or surplus growth. However, controlling for line of business mix, independent agency insurers do not have higher volatility in loss ratios across time. This is contrary to the finding in Regan (1997) that independent agency insurers had more variation in loss ratios. More surprisingly, when treated endogenously the ownership form variable is not a significant predictor of distribution system. This result has potentially important implications for interpreting the determinants of insurance distribution system.

To examine this further, Model 2 presents the results when the risk variables are dropped from the estimation. Although the model loses some explanatory power, the signs and significance levels of the remaining variables are consistent across models. Moreover, the ownership form variable [STOCKHAT] is now significant at the .001 level. The sensitivity of

this result to the model specification might imply that risk is more associated with ownership form than with distribution system, and that the ownership form variable is a proxy for the risk associated with the firm.

To more carefully interpret this result, and also to make our results comparable to those of previous researchers, we test ownership form as an independent variable<sup>16</sup>. Model 3 presents these results when the risk variables are included, and Model 4 when the risk variables are omitted from the model. The results of Model 3 indicate that stock ownership form is significantly related to independent agency, even when the risk variables are included. Moreover, the surplus growth variable and the liability to surplus variables are negative but no longer significantly related to independent agency. The signs and significance levels of the remaining variables are robust with respect to the treatment of ownership form. These results also hold when the risk variables are dropped, shown in Model 4.

Our evidence indicates that, controlling for risk, ownership form does not have an independent effect on distribution system choice. That is, independent agency insurers may be either stock or non-stock owned firms. This is consistent with the theoretical argument that independent agency offers advantages to stock firms, not that stock ownership offers advantages to independent agency insurers. These results imply that the direction of this relationship is important. Moreover, the results indicate that it is important to treat ownership form as an endogenous variable when estimating distribution system choice.

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<sup>16</sup> Here, STOCK is set equal to one if the firm is classified as a stock insurer by the A.M. Best company, and zero otherwise.

The results for the ownership form estimation, shown in Table 5, are more straightforward. Two models are presented. Model 1 estimates the determinants of stock ownership with distribution system endogenous, while Model 2 treats distribution system as an exogenous variable. Independent agency is a significant predictor of stock ownership form for both models. This is consistent with theoretical predictions that stockholder owned insurers choose independent agency to minimize agency conflicts (Mayers and Smith, 1981, 1988, 1994; Cummins and Weiss, 1992; Barrese and Nelson, 1992), as well as the argument that stock insurers choose independent agency to help spread risk (Regan, 1997).

[Table 5]

The important risk variable for predicting stock ownership form is VLR. The variation of the loss ratio is significantly higher for stock firms, even after controlling for commercial mix of business and the endogenous effect of distribution system choice. The remaining risk variables, Liabsurp, Dpremium, and Dsurplus are not significant predictors of stock ownership form in either model.

The managerial discretion hypothesis argues that stock firms should be associated with a more complex mix of business, and this has been empirically supported (Mayers and Smith, 1988, 1994; Lamm-Tennant and Starks, 1993). Our results indicate that, when distribution system is controlled for, complex lines are not significant determinants of stock ownership form. COMMERCIAL is not significant in either treatment of the distribution system variable. It might be argued that this result is due to the formulation of the variable. If complexity is

measured as one minus the insurer's share of business in the personal lines though, there is no change in the results.

Furthermore, contrary to expectation, we find that stock firms are significantly more concentrated by line of business than non-stock firms are in either specification of the model. This conflicts with the managerial discretion hypothesis that mutuals should be more concentrated because managerial discretion is lower the fewer lines of business written, but is consistent with the findings of Mayers and Smith, 1994.

The results for the control variables are not surprising. We find that stock insurers tend to be larger in terms of assets than non-stock insurers, and that group membership is a significant predictor of ownership form at the 10% level when independent agency is treated as an exogenous variable. Our reinsurance variable is not significant in either specification of the model.

To summarize our results for the determinants of organizational form, we find that both concentration and complexity are more associated with distribution system than with ownership form. Three of our risk measures also are more associated with distribution system than with ownership form. However, in every specification of the model, the coefficient on VLR is insignificant for distribution system choice and significant for ownership form choice.

#### 4. Conclusion

Most of the theoretical research on the determinants of organizational form in the property-liability insurance industry has treated ownership form and distribution system separately. This paper is a first step at integrating these strands of research, and improving our understanding of the relationship between ownership form and distribution system.

We have found a significant relationship between ownership form and distribution systems for the property-liability industry. We find that, controlling for endogeneity, stock insurers are more likely to use independent agency, but that independent agency insurers are not more likely to be stockholder owned. This is consistent with the theory. However, several of our results are in contrast to the results of previous researchers. In particular, we find that independent agency insurers are not associated with higher variation in loss ratios than exclusive dealers are, after the risk associated with being a stockholder owned insurer is controlled for.

The results for ownership form choice are generally supportive of the managerial discretion hypothesis that stock insurers should be more risky than non-stock insurers. We do not find evidence to support other key predictions of the managerial discretion hypothesis for ownership structure, however. After controlling for independent agency, we find no significant relationship between complex lines of business and stock ownership form. Moreover, the line of business concentration variable is significant, but of the opposite sign than that predicted by the managerial discretion hypothesis. Stock insurers are more concentrated by line of business than non-stock insurers. This holds whether independent agency is treated as an independent variable, or as endogenously determined.

Our results must be interpreted with caution. One potential criticism of these results is that our sample selection is different from that used in earlier studies. The use of groups and unaffiliated insurers, rather than single firms within groups might have biased the results. Assume each individual firm within a group writes only one line of business. If each insurer writes the same line, then the results using individual insurers versus groups would be consistent for both concentration and complexity. If individual firms each write only one line, but each writes a different line, then the results at the individual level will show greater concentration across firms, but the group results will show less concentration. Thus, the optimal level of aggregation of the data is an interesting area for future research. Despite this though, we have found several interesting relationships between distribution system and ownership form that should be more fully explored.

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Table 1  
Association Between Distribution System and Ownership Form Across Lines  
1994

<u>Line of Business</u>	<u>Largest 50 Firms</u>	<u>Largest 25 firms</u>	<u>Firms 26-50</u>
All Lines	12.46*	11.06*	2.53
Private Passenger Auto Damage	14.75*	6.99*	9.03*
Private Passenger Auto Liability	14.25*	8.77*	4.36*
Homeowners Multiperil	12.16*	8.36*	4.17*
All Personal Lines	14.26*	8.86*	5.29*
Commercial Multiperil	6.49*	12.33*	4.81*
Fire	14.84*	11.84*	4.0*
Allied Lines	17.62*	16.07*	3.75*
Workers Compensation	11.52*	14.4*	1.14
Ocean Marine	9.43*	4.64*	4.36*
Inland Marine	9.72*	16.06*	0.329
General Liability	26.49*	4.13*	19.15*
All Commercial Lines	7.22*	6.63*	1.42

The value shown for each cell is the  $X^2$  statistic for the hypothesis that there is no significant correlation between distribution system and ownership form. \* indicates significance at the 5% level. Note that total observations for some lines are 49 firms. This is because we were unable to identify the ownership form for two firms, Fortis Group, and American Premium Underwriters Group. The classification tables are shown in the appendix available from the authors.

Table 2  
Specialization and Risk by Line  
1994 Net Premiums Written

<u>Line of Business</u>	<u>CVLR</u>	Specialization	
		<u>Stock</u>	<u>Independent Agency</u>
Private Passenger Auto Damage	6.0%	16.24%*	13.13%
Private Passenger Auto Liability	6.0	10.44*	8.96
Homeowners Multiperil	18.5	10.51*	7.88
Commercial Multiperil	16.5	9.42	11.08
Fire	10.8	2.62	3.12
Allied Lines	53.5	1.51	1.73*
Workers Compensation	11.4	14.35	17.77*
Ocean Marine	7.7	1.05	1.20
Inland Marine	12.8	2.69	2.80
General Liability	15.6	9.28	11.24
All Lines	5.2		

Specialization is measured as the organization type's share of business in a line relative to all business written by that organization type. Data are from Best's Aggregates and Averages P&C editions, 1981 through 1995. Note that the figures do not sum to 100% because all lines are not included.

\* indicates significantly different means for specialization between independent agency and stock insurers at the 5% level for the two-tailed test.

Table 3

Summary Statistics for Numerical Variables

<u>Variable Name</u>	<u>Mean</u>	<u>Standard Deviation</u>
Commercial	0.35398	0.27902
VLR	0.03399	0.19828
Liabsurp	2.8133	1.53494
Concentration	0.35274	0.24166
Advertise	0.00276	0.00993
Reinsurance	0.95198	0.70993
Log(assets)	19.64575	1.74033

Sums for Indicator Variables

Agency =	1 if insurer is classified as independent agency	n= 188
Stock =	1 if insurer is classified as stockholder owned	113
Group =	1 if the insurer is a group	176
Dpremium =	1 if premium growth rate is between 5 and 15 percent	119
Dsurplus =	1 if surplus growth rate is greater than 5 percent	45

Table 4

## Distribution System Regression Results

Dependent Variable = 1 if Independent Agency

	Model 1	Model 2	Model 3	Model 4
Intercept	4.578*** (2.302)	10.85*** (2.33)	7.615*** (1.452)	6.5693*** (1.2786)
Stock			1.024*** (0.2451)	1.1428*** (0.2355)
Stockhat	0.7406 (1.3267)	2.67** (0.8524)		
Commercial	0.895** (0.4903)	1.3298*** (0.4117)	0.6632* (0.4126)	0.9588*** (0.3598)
VLR	0.7406 (1.136)		0.1794 (.9574)	
Dpremium	-0.9539*** (0.2556)		-0.8315*** (0.2177)	
Dsurplus	-0.5286* (0.2914)		-0.3522 (0.2599)	
Liabsurp	0.1429* (0.0846)		0.1147 (0.0797)	
Concentration	-2.318*** (0.655)	-2.906*** (0.6072)	-2.8908*** (0.5992)	-2.364*** (0.5271)
Advertise	-134.7*** (38.05)	-128.4*** (35.86)	-122.0*** (40.038)	-114.7*** (37.606)
Log(assets)	-0.185* (0.1109)	-0.3944*** (0.088)	-0.3376*** (0.0773)	-0.3056*** (0.0661)
Reinsurance	0.2893* (0.1515)	0.2396* (0.1435)	0.2986 (0.1575)	0.2261 (0.1459)
$X^2$	80.085	62.48	102.69	81.49
Match Rate	82.5%	88.4%	89.8%	82.6%

Estimated coefficients and standard errors are shown.

\*\*\* significant at the 1% level, \*\* significant at the 5% level, \* significant at the 10% level

Table 5  
Ownership Form Regression Results

Dependent Variable = 1 if Stockholder Owned		
	Model 1	Model 2
Intercept	-5.807*** (1.3081)	-7.1206*** (1.2575)
Agency		1.205*** (0.2504)
Agencyhat	1.4203** (0.7085)	
Commercial	0.0761 (0.3911)	0.1445 (0.3645)
VLR	9.7354*** (3.315)	11.19*** (3.53)
Dpremium	-0.0287 (0.2334)	-0.112 (0.1806)
Dsurplus	-0.228** (0.2455)	-0.2141 (0.239)
Liabsurp	0.0281 (0.693)	0.0405 (0.0664)
Concentration	1.5441** (0.6591)	1.4363*** (0.5279)
Log(Assets)	0.2694*** (0.077)	0.447*** (0.123)
Reinsurance	-0.1842 (0.2735)	-0.0523 (0.2845)
Group	0.2654 (0.2203)	0.3384* (0.2013)
$X^2$	56.35	78.49
Match Rate	77.4%	81.8

Estimated coefficients and standard errors are shown.

\*\*\* significant at the 1% level, \*\* significant at the 5% level, \* significant at the 10% level