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The Relations among Organizational and Distribution Forms and Capital and Asset Risk Structures in the Life Insurance Industry

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Abstract

This article is the first step toward integrating in a single framework two previously separate lines of research on major structural decisions of life insurers. The literature has previously studied the relation between capital structure and asset risk on the one hand, and the relation between organizational form and distribution system on the other hand, without integrating them. Using life insurer data for 1993–1999, we model the four key insurer decisions of capital structure, asset risk, organizational form, and distribution system as endogenous choices in a single interrelated set of simultaneous equations. The model assesses the nature of the interactions among these decisions. The model also assesses the impact of insurers' fundamental business strategy (treated as predetermined) on these choices. The *business-strategy hypothesis* views other key decisions as jointly determined and driven by the fundamental business strategy, once the latter is set in motion. Confirming previous studies, we find a positive relation between capital ratios and asset risk. We also find an association in the simultaneous context between stock ownership and brokerage distribution, which was not found in prior studies. Stock ownership is related to greater financial and asset risk taking, whereas brokerage distribution is associated with lower risk taking. These and other results are interpreted in light of several theories, including transaction-cost economics (TCE), agency theory, and regulatory and bankruptcy cost avoidance. Deriving from these theories, the finite risk paradigm emerges as the most comprehensive interpretation of the results, as opposed to the risk-subsidy hypothesis of the impact of guarantee funds. We also find support for the notion that the business strategy drives the capital and distribution decisions, as predicted by TCE.

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INTRODUCTION

Motivation

This article is the first step toward integrating two separate strands of research. The relation between capital structure and asset risk has been examined previously in a simultaneous framework (Cummins and Sommer, 1996; Baranoff and Sager, 2002). Similarly, the relation between organizational form and distribution system has received attention (Regan and Tzeng, 1999).[1] But the four factors of capital structure, asset risk, organizational form, and distribution system have not previously been analyzed as a single integrated set of simultaneously determined decisions. It has also been proposed that the firm's selection of a business product logically precedes and strongly influences some of these factors (Regan and Tzeng, 1999; Williamson, 1985, 1988). In this study we undertake an analysis of the life insurance industry for the period 1993–1999 using a model that treats the major structural decisions as an interrelated process once the product has been determined. We use the phrase *business-strategy hypothesis* for the idea that the product decision underlies and affects the four strategic decisions mentioned above.

This study is an empirical expedition. To be sure, we interpret our results in light of various applicable theories. But we do not attempt to validate any theory. The theories used for this purpose include transaction-cost economics (TCE), agency theory, and bankruptcy and regulatory costs hypotheses, which underlie the finite risk paradigm. The idea that firms limit total risk lies at the heart of the finite risk framework. Both TCE and agency theory provide a foundation for finite risk: TCE through its core idea that firms exist to minimize transactional costs, and agency theory through its idea that owners, managers, and customers monitor each other's behaviors. We find that finite risk provides the most comprehensive framework for our results. An opposing theory is the *risk-subsidy hypothesis*, which maintains that the operation of guarantee funds provides consumer safeguards. These safeguards reduce incentive to limit risk taking, especially by marginally solvent insurers.

Our objectives are threefold: (1) to interpret the relations among capital structure, asset risk, organizational form, and distribution system in an integrated decision making context, (2) to investigate the empirical foundation for the business-strategy hypothesis in this simultaneous framework, and (3) to examine the effects of various canonical controls, such as firm size and regulatory pressure.

Prior Literature

Integrated treatment of the capital structure/asset risk decision has received extensive attention in the banking industry.[2] Such studies are relatively new to insurance. We

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[1] Regan and Tzeng (1999) provide a comprehensive survey of the literature that also includes Regan (1997), Regan and Tennyson (1996), and Marvel (1982) along with the insurance agency literature of Lamm-Tennant and Starks (1993), Mayers and Smith (1981, 1986, 1988, 1994), Kim, Mayers, and Smith (1996), Cummins and Sommer (1996), Pottier and Sommer (1997), and Sass and Gisser (1998), among others.

[2] For example, Shrieves and Dahl (1992) and Jacques and Nigro (1997), among others. Berger, Herring, and Szego (1995) survey capital structure studies in the banking industry. Many of the surveyed studies took an integrated approach to the capital/risk decision through simultaneous equation models.

mention Cummins and Sommer (1996) for property/casualty insurers and Baranoff and Sager (2002) for life insurers. Cummins and Sommer (1996) found a positive relation between capital ratio and market measure for a portfolio of a firm's asset and product risks.[3] Baranoff and Sager (2002) found a positive relation between a measure of regulated asset risk[4] and the capital-to-asset ratio for life insurers, but a negative relation between a measure of product risk[5] and the capital ratio. They also found a positive relation between product risk and regulated asset risk.

The relation between organizational form and distribution structure has received much attention in studies in the property/casualty area, but not as simultaneously integrated determined decisions prior to Regan and Tzeng (1999).[6] The latter authors thoroughly reviewed the literature on the reciprocal effects of organizational form and insurer distribution system. They also contributed a new model that analyzes organizational form and distribution system as simultaneously determined decisions. Using this model, Regan and Tzeng (1999) found that organizational form and distribution system were not significantly related in the simultaneous framework for property/casualty insurers. However, in a nonsimultaneous mode, the stock form of organization was associated with the independent agency distribution system.

The Model

To study the capital/risk/organization/distribution relations, we use a model that combines categorical and continuous endogenous variables in a single framework. Four structural equations that describe the capital (continuous variable), asset risk behavior (continuous variable), organizational form (categorical variable), and distribution system (categorical variable) of life insurers are estimated simultaneously in a limited-information approach based on the two-stage least squares paradigm. Capital and asset risk are modeled autoregressively; organization and distribution are modeled via probit regression.

To represent the business-focus driver of these relations, we used the proportions of an insurer's premiums in various product lines. Results show that a focus on annuities is associated with a low capital-to-asset ratio, low asset risk, and broker distribution; and a focus on group health business is associated with brokerage distribution and high capital-to-asset ratios, in line with theoretical expectations based on TCE as will be discussed in the next section.

The article is structured as follows. In the next section we develop the theoretical background for the strategic decision of the life insurance industry during the 1990s.

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[3] Cummins and Sommer's market measure is the standard deviation of a risk portfolio that combines returns on assets and loss ratios for each line of insurance.

[4] Their regulated asset risk is an approximation to the C-1 asset risk of the life risk-based capital formula.

[5] Baranoff and Sager's product risk measure is the ratio of health writings to total writings. They cite transaction-cost economics as a justification for this proxy. The life insurance data do not include the loss ratio for each line of business.

[6] The organizational forms and distribution systems of the banking industry are not comparable to that of the insurance industry. For example, there are no parallels to broker or agent systems to market banking services. Therefore, the available banking literature would not speak directly to the current application.

Next, we explain the data and the variables. This is followed by the development of the model and the analytical procedures. The "Empirical Analyses and Results" section provides the basic statistics and the results of the model followed by the discussion of the results. The article concludes with a summary.

THEORETICAL BACKGROUND

The Business-Strategy Aspect

Regan and Tzeng (1999) discussed the notion that an insurer first selects its business strategy (or product focus) and then decides jointly on the organizational form (stock or mutual) and distribution system (captive or independent agency). From this perspective, the organizational form/distribution system decisions are viewed as flowing from the basic business strategy. As noted above, we call this view the *business-strategy hypothesis.* In this article, we expand the scope of the business-strategy hypothesis to include the possibility that the capital/risk structure decisions are also consequences of the basic business strategy. To model the business-strategy hypothesis, we treat the business strategy/product focus as a predetermined[7] variable, and the four factors of capital structure, asset risk, organizational structure, and distribution system as endogenous.

We now present a brief discussion of the theoretical foundation for the business-strategy hypothesis. Several theories have a hand in this, including transaction-cost economics (TCE), agency theory (monitoring hypothesis), bankruptcy cost avoidance, and regulatory cost. All of these are consistent with a finite risk framework since they predict constraints on overall risk taking. TCE provides an especially natural explanation for the impact of the business strategy on capital structure and distribution system. The other theories collaborate to explain the impact of business strategy on asset risk and organizational form.

TCE theory was first introduced by Coase (1937) and further expanded by Williamson (1975, 1985, 1988, 1990) and Klein, Crawford, and Alchian (1978), among others.[8] Under TCE, the level of transaction costs generated by the characteristics of the

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[7] Some econometricians distinguish between *exogenous* and *predetermined* variables, although the mathematical treatment is the same. The value of an exogenous variable is determined externally for the system under study. Predetermined variables include exogenous variables plus other variables not treated as endogenous for the purpose of the study. In this study, for example, the year indicator variables are clearly exogenous. The firm's business strategy just as clearly is not exogenous in this sense, since it is the firm that decides its own strategy. However, the business-strategy hypothesis views the four decisions (capital, asset risk, organization, distribution) under study in this article as consequences—indeed logical consequences—of the choice of what business to be in, even though in a temporal sense, all of these decisions may be made almost simultaneously. Therefore, in this article, we pick up the analysis of the firm after being conditioned upon its business-strategy decision. We thus treat the business strategy as predetermined, but not exogenous. Although our results are not inconsistent with the business-strategy hypothesis, we do not provide formal tests of business-strategy endogeneity.

[8] Monteverdi and Teece (1982), Grossman and Hart (1986), Joskow (1985, 1987), Milgrom and Roberts (1992), among others. Shelanske and Klein (1995) provide a broad overview of research in TCE, which led to the acceptance of the theory in the study of a variety of economic relations, including corporate finance.

products largely determines the degree of vertical integration (Williamson, 1985) and the form of capital structure (Williamson, 1988). These transaction costs derive chiefly from the uncertainties of contractual relationships for producing and distributing the products. Products that involve large contractual uncertainties are subject to opportunistic behavior and conflicts among the stakeholders, thus increasing the transaction costs. According to Williamson, firms seek to reduce or offset such costs by vertical integration (1985). Williamson (1988) notes that a firm with assets of greater specificity, complexity, and idiosyncrasies would have a higher proportion of equity than a firm specializing in assets with less specificity. Kochhar (1996) elaborates on Williamson's hypothesis and explains that in TCE, equity is considered the more powerful governance instrument. Kochhar indicates that since "information asymmetry cannot be reduced in the transaction cost logic, the result is failure of the market form of exchange (debt) for firms with assets of high specificity level." Thus, TCE speaks directly to the effect of the product on capital and distribution structures. TCE, however, does not speak directly to the influence of product on the organizational structure or asset risk. It should also be noted that agency theory can provide a complementary interpretation. When contracts create conflicts among the stakeholders, owners develop monitoring techniques to control management (Mayers and Smith, 1981).

To apply TCE and the other theories to the life insurance industry we need a clear appreciation of the risk characteristics of life insurance products and an evaluation of which life insurance products are riskiest. Life insurers market a wide variety of products, not just life insurance policies. From the standpoint of TCE (Williamson, 1985), the riskiest products involve *relational* contracts that are complex, incomplete, and uncertain. The least risky products involve *classical* contracts that are simpler, more explicit, and less uncertain. Based on this idea, Baranoff and Sager (2002) view health products as the riskiest line for life insurers. Carr, Cummins, and Regan (1999) consider annuities the least risky and view group insurance as less risky than individual contracts. Group business is the commercial line of the life industry. As in the property/casualty industry, commercial business is more complex and less uniform. Group contracts are customized through negotiation with employers and so are less standardized than policies sold to individuals. They are more incomplete and subject to opportunistic behavior. Thus we view group business as riskier than individual contracts in the life industry. Following Williamson (1988) and Kochhar (1996), it would be expected that an emphasis on riskier products such as health, life, and group business would be associated with capital financing rather than with debt. Costs of regulation and bankruptcy avoidance (the finite risk paradigm) add support to this expectation, since an orientation toward risky products could be offset by a less risky capital structure. The impact of risky products on the distribution system is more complex in its application to the life industry. Group products, especially group health, represent the greatest risk, both to insurer and insureds since the contracts are incomplete and relational. It would be expected that the contracting parties would seek to protect their interests by integrating the group products. Consistent with Regan (1997), commercial insureds seek to do this by selecting brokers, who legally represent them[9] and who can monitor insurer behavior on their behalf. An insurer may also prefer to have a broker as a third party to buffer conflicts. Thus,

[9] See Baranoff, Baranoff, and Sager (2000) for a detailed analysis of state-to-state variability in broker regulation and its impact.

TABLE 1
Summary of the Expected Relations per Business-Strategy Hypothesis

	Group Health	Group Life	Group Annuities	Individual Annuities and Pensions	Nongroup Health	Theory/Hypothesis
Capital	+	+	−	−	+	TCE—finite risk
Asset risk	−	−	+	+	−	Regulatory and bankruptcy cost—finite risk
Organization form: stock	+	+	−	−	+	Agency theory—finite risk
Distribution structure: broker	+	+	+	+	−	Complex group products monitoring by insureds—finite risk

we may expect that insurers emphasizing risky products would be associated with broker distribution systems.[10]

Conflicts are better monitored in the stock form of organization, where the owners oversee the managers more closely in order to achieve value maximization (for literature review see Regan and Tzeng, 1999). In the mutual form there is less monitoring and greater separation between the owners and the managers. Thus, riskier products are expected to be associated with the stock form, as was shown in the property/casualty studies summarized in Regan and Tzeng (1999).[11] Neither TCE, nor agency theories directly predict a relation between the product risk and asset risk. However, under the finite risk paradigm, regulatory cost and bankruptcy cost theories lead to the expectation that riskier products are associated with lower asset risk.

In this article, we represent the business products involved in the business-strategy hypothesis by five different product lines: group health, group life, group annuities, individual annuities and pensions, and nongroup health. Table 1 provides a summary of the expected sign of the relations between each of five product lines and the four endogenous factors.

Relations among the Endogenous Variables

As mentioned above, separate lines of research have examined the relation of capital with risk, on the one hand, and of organizational form with distribution system, on the other. But no studies directly bridge the two lines. Explanations for the relations among these four factors may be based on the business-strategy hypothesis along

[10] It is useful to split the life industry between insurers that use brokers and those that use agents. But the distinction is not clear-cut. Many states require the appointment of brokers as agents or do not allow brokers to conduct business as brokers; and many insurers use both systems. We use a classification based on A.M. Best data that will be described later.

[11] See footnote 1.

with the theories underlying the finite risk paradigm or the opposing risk-subsidy theory.

For the capital/asset risk relation, the literature entertains a number of distinct and partly conflicting hypotheses. Under TCE theory (Williamson, 1988), agency theory, and the bankruptcy and regulatory costs hypotheses (Baranoff and Sager, 2002; Cummins and Sommer, 1996; Shrives and Dahl, 1992), adoption of a less risky strategy in capital (leverage risk) is associated with more asset risk. If these theories hold, then we anticipate an induced positive association between capital and asset risk. On the other hand, under the risk-subsidy hypothesis (Baranoff and Sager, 2002; Downs and Sommer, 1999; Lee, Mayers, and Smith, 1997; Cummins and Sommer, 1996; Cummins, 1988), a risky strategy leads directly to greater risk taking in the capital (leverage risk). If this theory holds, then we anticipate an induced negative association between capital and product and asset risk.

The literature survey described by Regan and Tzeng (1999) provides the foundation for an expected association between stock firms and the broker distribution system. There is a high level of monitoring under both the stock form and broker distribution. In stock firms, monitoring is to increase firm value; this encourages managers to seek the rewards of risky and complex products. Stock firms should therefore hold less capital and assume more asset risk than nonstock firms. Brokers predominate in risky and complex product lines as intermediaries through which insureds can monitor the financial viability and solvency of insurers. The business-strategy hypothesis therefore leads us to expect an induced association between stock firms and broker distribution—induced through the nature of the products they both deal with.

The signs of the expected relations among the endogenous variables with their applicable theories are summarized in Table 2. The signs in the table are based on the preceding discussion, in which the finite-risk paradigm plays a large role. In many cases, the operation of the opposing risk-subsidy hypothesis would lead to opposite signs.

DATA AND VARIABLES

Data

For this study 789 insurers were used. The observational unit is the individual firm in our study, whereas Regan and Tzeng (1999) combined firms into groups related by ownership.[12] Although our sample was some 40 percent larger than theirs, we had

[12] Some firms may be organized formally as stock companies but may be held by a mutual holding company. This may result in the firms exhibiting behavioral characteristics of mutual companies. This may happen, for example, when a mutual company sets up a stock subsidiary to provide access to the capital markets or for legal reasons to do business in a particular state or line of business. We examined the effect of potential misclassifications of such companies in two ways. We began by identifying all stock companies that are in an NAIC group with a mutual. Such firms constitute from 5 to 10 percent of industry assets and written premiums, depending on the year. First, we recoded such stock firms to be treated as though mutual and reran our models. Second, we deleted such stock firms from the data set and reran our models. In each case, the coefficient signs, patterns of significance, and explanatory power

TABLE 2
Signs of Expected Relationships among Capital Structure, Asset Risk, Organizational Structure, and Distribution System (Endogenous Variables)

	Capital	Asset Risk	Organization Form: Stock	Distribution Structure: Broker	Theory/Hypothesis
Capital		+	−	+	TCE, agency theory, and monitoring of stakeholders—finite risk. Owners prefer that managers take more risk whereas insureds prefer less risky insurers.
Asset risk	+		+	−	Regulatory and bankruptcy cost theory—finite risk
Organization form: stock	−	+		+	Monitoring by owners—finite risk
Distribution structure: broker	+	−	+		Monitoring by insureds—finite risk

significantly fewer mutual and broker firms.[13] Data were obtained from life insurers' annual statement filings with the NAIC for 1993–1999 and from A. M. Best Key Rating for the same period.

Our sample of 789 firms held about 85 percent of the life industry's assets over the 1993–1999 period and wrote about 79 percent of its premiums. Many small insurers, who do relatively more of the health business, are omitted since they are not included in the A. M. Best Key Rating data. We excluded insurers that changed the distribution system or organization forms during the study period. Of the firms with complete data for all 7 years, six changed the distribution system and 16 changed the organization form, the latter primarily by demutualization. These exclusions were necessary to meet the requirements of our model, which assigned each firm to one organizational form and one distribution system for the entire period. Other firms lacked marketing classifications or were missing from the database for one or more of the 7 years in this study.

Business-Strategy Variables

If we are to view business products as drivers for the business-strategy hypothesis, then we need quantifiable variables to represent them in our models. In this study, we

were essentially the same as reported below in this article, although the coefficient values differed modestly.

[13] The mutual and broker forms are more common in the property and casualty industry studied by Regan and Tzeng (1999) than in the life industry.

measure the life insurer's involvement with various life products by the proportions of total insurer premiums written in selected lines: group annuities (pGroupAnnuity), group life (pGroupLife), group health (pGroupHealth), individual annuities and pensions (pAnnuityIndiv_Pension), and other health (pHealthCredit_Other).[14] This assures inclusion of both the riskiest (health) and least risky (annuities) lines and allows control for group lines vis-à-vis nongroup lines.

Endogenous Variables

Empirically, we observe that firms' capital ratios and asset risk allocations change over time. But, in practice, firms do not fine tune their organizational/distribution choices as they do their capital/asset risk decisions. In principle, they can. But empirically we observe few changes of organizational form or distribution system over our 1993–1999 study period, as noted above. We treat organizational form and distribution system as stable decisions that are functions of longitudinal composites of firm characteristics over the 1993–1999 period. We therefore envision the endogenous variables C (capital-to-asset ratio) and A (asset risk) as time dependent, but D (distribution system) and O (organizational structure) as time independent. For the period of our study, 1993–1999, this means that C and A may vary from year to year, and may depend on the values of lagged variables, including themselves, but D and O are functions of data values that may be composites of the 7-year period.

Capital-to-Asset Ratio—C: CAP. Because most life insurers are not publicly traded, market valuations of their capital are not readily available. Therefore, we measure capital by the ratio of adjusted book value of capital to total assets.[15]

Asset Risk—A: RegARisk. The life insurance industry is in the business of investing the funds entrusted to it and therefore is part of the financial institutions industry. Regulators assess the credit, or default, riskiness of each asset in the asset risk (C-1) component of the life risk-based capital. In general, the C-1 risk is the sum of various risk loadings on the dollar book values of a firm's asset categories.[16] This asset risk measure represents an actuarial and regulatory perspective of asset risk, rather

[14] Because our measures of product involvement are proportions, not all business lines can be entered explicitly into the model equations, as an exact multicollinearity would then ensue, since the sum of proportions across all lines is 1.0. However, life insurance, together with some reinsurance, constitutes the main part of the omitted lines. Life insurance occupies a middle position in the spectrum of product risks.

[15] The adjusted capital formula is the sum of Capital and Surplus, Asset Valuation Reserve (AVR), Voluntary Investment Reserve, Dividends Apportioned for Payment, Dividends not yet Apportioned, and the Life Subsidiaries AVR, Voluntary Investment Reserves and Dividend Liability less Property/Casualty Subsidiaries Non-Tabular Discount. Source: page LR022 of the 1996 Life NAIC Risk Based Capital Report Including Overview and Instructions for Companies.

[16] C-1 risk includes a 30 percent risk loading for a company's lowest rated bonds, but zero risk loading for the highest rated bonds. The loading for mortgages depends on the delinquency potential of the mortgages. Unaffiliated preferred and common stocks receive a loading factor in the range of 2 to 30 percent of their value. Real estate has loadings of 10 and 15 percent, with foreclosed real estate receiving the higher loading. Other long-term assets also receive loadings up to 30 percent of value based on their credit ratings. Cash and short-term investments receive a 3 percent loading.

than a financial perspective. The relative importance of the regulatory and financial perspectives for financial institutions is the subject of research by Santomero and Babbel (1997) and Babbel and Santomero (1999). Regulatory-based measures of asset risk were used by Baranoff and Sager (2002) for life insurance, and Shrieves and Dahl (1992), Jacques and Nigro (1997), and Berger (1995) for banking. For this study, we adopt a similar proxy called *regulatory asset risk* (RegARisk) that is based on publicly available data from the companies' annual statements.[17]

Organizational Structure—O: IndStock. This categorical variable is coded 1 if the firm has stockholders, and 0 if not (from NAIC data). Among our sample of 789 insurers, 715 were stock insurers.

Distribution System—D: IndBroker. The essential legal difference between a *broker* and an *agent* is that a broker represents the insured, whereas an agent represents the insurer. But this distinction is clouded because some insurers use both systems and because many states require that brokers be appointed as agents by insurers as a condition of doing business.[18] An approximate classification can be based on A. M. Best Key Rating data, which indicates whether an insurer uses some form of brokerage to some extent. We followed Baranoff, Baranoff, and Sager (2000) in coding the organization variable based on A. M. Best Key Rating. IndBroker = 1 means the firm has a broker-oriented distribution system, IndBroker = 0 means it does not.[19] Among our sample of 789 insurers, 239 were thus classified as broker insurers.

Additional Exogenous/Predetermined Control Variables

Regan and Tzeng (1999) provide a number of theoretical arguments and empirical evidence for differentiation of the property/casualty industry by various factors. Their theoretical arguments apply broadly to the whole insurance industry and so are not repeated here. For the property and casualty industry, they find empirically in summary statistics that firm size is a critical factor. For our study, size is measured by the logarithm of total assets (LogATot). As noted in similar prior studies, membership in a group of affiliated companies (IndGroup = 1 if yes, = 0 if no) can be an important factor. Since retained earnings may be a major source for increase in capital,

[17] Regulatory Asset Risk for each insurer for each year (1993, 1994, 1995, 1996, 1997, 1998, 1999) $= \sum\{$total low quality bonds $*(0.30+0.20+0.09)/3$, total high quality bonds $*(0.04+0.01+0.003)/3$, total stocks $*(0.30+0.023)/2$, total mortgages $*\,0.03$ (an average between 0.001 and 0.06), total real estate $*(0.1+0.15+0.1)/3$, and total short term investments and cash $*\,0.003\}$—with the result then divided by total insurer assets.

[18] See Baranoff, Baranoff, and Sager (2000) for a detailed study of broker licensing requirements and their impacts.

[19] In A. M. Best Key Rating, the letter B under the Marketing Code indicates use of brokers; the letter A indicates a use of agents and D indicates direct marketing system. All companies with single letter code B were designated *broker-oriented*. In some cases, the combination BA, AB, BD, or DB may appear to indicate a mixed broker-agent or broker-direct distribution systems. This often reflects compliance with state regulation that brokers be appointed as agents. For the purpose of this study, companies with mixed codes that included the letter B were also designated *broker-oriented*. This is consistent with Baranoff, Baranoff, and Sager (2000).

the return on capital (RetOnCap = log (earnings/capital)) is included in logarithmic form. Regan and Tzeng (1999) emphasize the importance of diversification and concentration, which can be measured by the Herfindahl index. The part of the index attributable to an insurer is essentially the log of total premiums (LogWTot).[20] Regulatory influences on risk and capital are the cornerstone of many of these studies of the regulated financial institutions. The log of RBC ratio (logRBC) is used to indicate regulatory forbearance.[21] Finally, we added variables used by Regan and Tzeng (1999) and Baranoff, Baranoff, and Sager (2000) relevant to the distribution system: total commissions (log of total commissions is logCommissionRatio), advertising expense (Expense_AdsRatio), agency expense (Expense_AgencyRatio), and employee benefits for agents (Expense_AgentBenefits), where these quantities are taken from the NAIC annual statements. For the equations that involve time-dependent variables, we also include 0–1 indicators for each year in order to capture any other implicit annually varying effects. The endogenous and exogenous/predetermined variables are listed in the Appendix.

RESEARCH METHOD

As mentioned above, in this study, we adopt the working hypothesis that the business strategy drives the capital/asset risk/organization/distribution structure decisions, which are then made in an interrelated context. All of the firms in our data sample have unvarying organizational forms and distribution systems throughout the 1993–1999 study period. But the capital structure and asset risk can vary. We therefore envision the response variables C (capital-to-asset ratio) and A (asset risk) as time dependent, but D (distribution system) and O (organizational form) as time independent. For the period of our study, 1993–1999, this means that C and A may vary from year to year, and may depend on lagged variables, including themselves; but D and O are functions of data values that may be composites of the 7-year period.[22] Our structural model may therefore be expressed as

$$C_t = \beta_0^C + \beta_C^C C_{t-1} + \beta_A^C A_t + \beta_O^C O + \beta_D^C D + \beta_1^C X_{1t} + \cdots + \beta_k^C X_{kt} + \varepsilon_t^C \qquad (1)$$

$$A_t = \beta_0^A + \beta_A^A A_{t-1} + \beta_C^A C_t + \beta_O^A O + \beta_D^A D + \beta_1^A X_{1t} + \cdots + \beta_k^A X_{kt} + \varepsilon_t^A \qquad (2)$$

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[20] The Herfindahl index for a company is $(W/\sum W)^2$, where W is the company's sales in the market and $\sum W$ is the sum of all companies' sales in the market. So $\log(W/\sum W)^2 = 2\log(W) - 2\log(\sum W)$. In a regression, the term $-2\log(\sum W)$ is a constant that is absorbed into the intercept, and the other 2 is absorbed into the coefficient of $\log(W)$.

[21] The RBC ratio criterion is defined in the Risk-Based Capital law for life insurers (1993): RBC ratio = (Total Adjusted Capital $*$ 100)/(2 $*$ Authorized Control Level RBC).

[22] Of course, the organizational and distributional forms decisions for most firms predate the 1993–1999 period of this study. To say that O and D are functions of 1993–1999 composites therefore really means that the factors that led the firms to select their organizational and distributional forms exert an abiding impact on firms' subsequent behavior, which is manifested in these composites. Therefore, the composites may be examined for information about the factors that led to choices of O and D.

$$O = \beta_0^O + L_O(C_{93}, \ldots, C_{99}) + L_O(A_{93}, \ldots, A_{99}) + \beta_D^O D + \beta_1^O X_1 + \cdots + \beta_k^O X_k + \varepsilon^O \tag{3}$$

$$D = \beta_0^D + L_D(C_{93}, \ldots, C_{99}) + L_D(A_{93}, \ldots, A_{99}) + \beta_O^D O + \beta_1^D X_1 + \cdots + \beta_k^D X_k + \varepsilon^D \tag{4}$$

in which C_t and A_t are the endogenous capital-to-asset ratio and asset risk measures for year t, O and D are the endogenous indicators for ownership form and distribution system ($O=1$ for stock form, $D=1$ for broker distribution), $L(C_{93},\ldots,C_{99})$ and $L(A_{93},\ldots,A_{99})$ represent linear composites of capital ratios and asset risks for 1993–1999. Similarly, $X_1,\ldots,X_k$ in the equations for O and D (but not the equations for C and A) may represent composites. Also, $\Lambda(\beta_0^O + L_O(C_{93},\ldots,C_{99}) + L_O(A_{93},\ldots,A_{99}) + \beta_D^O D + \beta_1^O X_{1t} + \cdots + \beta_k^O X_{kt}) = \Pr(O=1)$, and $\Lambda(\beta_0^D + L_D(C_{93},\ldots,C_{99}) + L_D(A_{93},\ldots,A_{99}) + \beta_O^D O + \beta_1^D X_{1t} + \cdots + \beta_k^D X_{kt}) = \Pr(D=1)$, where Λ is the normal (probit) distribution function. The possibility of forcing one or more of the β coefficients to zero is permitted. Equations (1) and (2) may be recognized as "unwound" versions of the partial adjustment model,[23] in which the terms in the year-to-year adjustments $C_t - C_{t-1}$ and $A_t - A_{t-1}$ have been separated and the model reparameterized to facilitate estimation.

The estimation of C and A is a two-stage procedure. In the first stage, reduced-form estimates of O and D are obtained from Equations (3) and (4) for use as instruments. Although O and D are 0–1 indicators, the first-stage estimates $\hat{O}$ and $\hat{D}$ that emerge from the probit model are continuous quantities between 0 and 1. In the second stage, with $\hat{O}$ and $\hat{D}$ as inputs in Equations (1) and (2), C and A are then estimated as in Kmenta (1986),[24] with correction for autocorrelated errors that result from use of lagged C and lagged A as predictors. Similarly, the estimation of O and D is two-stage. At stage 1, estimates of C and A are obtained from Equations (1) and (2). At stage 2, with $\hat{C}$ and $\hat{A}$ feeding into Equations (3) and (4), O and D are estimated as in Regan and Tzeng (1999). The complete model is a generalization of Regan and Tzeng (1999),[25] which in turn is based on Maddala (1983) and Nelson and Olsen (1978). The model enjoys the usual properties of two-stage simultaneous estimation procedures: Estimators are consistent and asymptotically normal but not efficient.

Imputation

The estimation method requires complete data for all 7 study years. Since many firms have almost complete data and since some of our study variables have more

[23] Cf. Gujarati (1995), Chapter 17, for an elementary discussion of the partial adjustment model.

[24] See pages 704-710.

[25] Regan and Tzeng (1999) focused on estimating O and D only, so their model had two equations, corresponding to our Equations (3) and (4). Their predictors for O and D were also composites, over an 11-year span, so there was no autocorrelation as is contemplated in our Equations (1) and (2).

TABLE 3
Correlations between Business-Strategy Variables and Continuous Endogenous Variables ($n = 789$)

Correlation (p-value)	Group Health	Group Life	Group Annuities	Individual Annuities	Nongroup Health
CAP	0.253	0.0952	−0.147	−0.426	0.146
	(<0.0001)	(0.0074)	(<0.0001)	(<0.0001)	(<0.0001)
RegARisk	−0.037	−0.029	−0.064	−0.127	0.083
	(0.2999)	(0.4139)	(0.0735)	(0.0003)	(0.0201)

missing values than other variables, we have attempted to maintain as many observational units as possible by imputing missing values for the time-dependent variables CAP, RegARisk, and several predictors. The imputation procedure was as follows: Given a variable Y and all firms with complete data for variable Y for years 199n and 199m, the Y values for 199n were regressed on the Y values for 199m, for all combinations of n and m from 3 to 9. Then, if firm A was missing Y for year 199n, the value of Y for firm A for the nearest nonmissing year m was substituted into the 199n-on-199m regression equation to give an estimate of Y for firm A for 199n.[26] That is, Y_{199n} was estimated by the regression $Y_{199n} = \alpha + \beta Y_{199m}$. We evaluated the efficacy of this procedure by randomly deleting *nonmissing* data for Y_{199n} and reconstructing them via the imputation. We found that the procedure very accurately estimated the deleted data, even if as many as half of the data had been deleted. We expected that imputation might increase the sample size substantially, but we found that only two variables retained imputed values in the analysis sample: RetOnCap and logRBC, which resulted in adding 65 and 73 firms, respectively, to the sample.

EMPIRICAL ANALYSES AND RESULTS

Simple Relations

Table 3 shows simple correlations (and p-values) between the business-strategy variables and our two continuous endogenous variables. The correlations are computed between temporal composites. For example, the correlation between CAP and Group Health is the correlation between 789 pairs. Each pair represents an insurer, for which the CAP value is the mean of the insurer's seven CAP values for 1993–1999, and the Group Health value is the mean of the insurer's seven Group Health values for 1993–1999. These simple correlations suggest some role for the business-strategy variables. The t-tests in Tables 4 and 5 suggest that these same business-strategy variables also have a role in the type of distribution system (Table 5), but no role in the organizational form (Table 4) (as discussed previously regarding TCE theory).

Table 4 highlights a number of significant differences between stock and nonstock firms. Stock firms tend to be smaller, have higher capital ratios and return on capital,

[26] For a detailed discussion of imputation methods, see Little and Rubin (1987).

TABLE 4
Summary Statistics for Stock and Nonstock Companies

Variables	Stock Mean ($n = 715$)	Nonstock Mean ($n = 74$)	t-statistic	Pr > |T|
CAP	0.2970	0.1908	5.28	<0.0001
RegARisk	0.0230	0.0288	−1.70	0.0912
pGroupHealth	0.1480	0.1703	−0.70	0.4880
pGroupAnnuity	0.0112	0.0170	−0.68	0.5005
pGroupLife	0.0514	0.0414	0.87	0.3856
pAnnuityIndiv_Pension	0.1841	0.1954	−0.38	0.7011
pHealthCredit_Other	0.1406	0.1466	−0.21	0.8349
Atotal	2,020,000,000	9,060,000,000	−2.05	0.0443
logATot	18.8160	20.4610	−5.85	<.0001
Wtotal	367,000,000	1,370,000,000	−2.28	0.0253
logWTot	17.4250	19.0300	−5.92	<.0001
RetOnCap	0.0854	0.0716	1.97	0.0495
RBCratio	2417.9000	390.0200	1.76	0.0787
logRBC	6.1096	5.7963	5.36	<.0001
IndGroup	0.8066	0.6602	2.75	0.0074
IndBroker	0.2979	0.3514	−0.91	0.3629
Arating	0.5538	0.7761	−4.33	<.0001
Brating	0.2501	0.1795	1.51	0.1340
Crating	0.0244	0.0135	0.74	0.4589
logCommissionRatio	−3.2050	−2.8110	−2.18	0.0313
Expense_AdsRatio	0.0581	0.0210	1.03	0.3032
Expense_AgencyRatio	0.0440	0.0377	0.24	0.8118
Expense_AgentBenefits	0.0055	0.0190	−4.51	<.0001
EstCAP	0.2976	0.1810	6.31	<.0001
EstRegARisk	0.0231	0.0254	−3.10	0.0024
PrStock	0.9211	0.7627	7.66	<.0001
PrBroker	0.3031	0.3119	−0.46	0.6432

less asset risk and less regulatory pressure, have lower A. M. Best ratings, are more likely to belong to an affiliated group, and have lower commission expenses and benefits to agents as a percentage of premiums. Table 5 similarly shows a number of differences between broker and nonbroker firms. Broker firms tend to be larger, have lower capital ratios and earn less on their capital, have less asset risk, have higher A. M. Best ratings, are more likely to belong to an affiliated group, have higher commission expenses as a percentage of premiums and lower benefits, and do much more group and individual annuity and pension business. The pension business is institutional investments for employers and is part of commercial business in the life industry. Thus stock and broker firms tend to have many opposite characteristics. We note that both types have less regulatory asset risk (one of our endogenous variables) than do nonstock and nonbrokers, respectively. It is also worth noting that these simple statistics show no significant differences between stock and nonstock firms in terms of our business-strategy variables. On the other hand, broker firms have significantly higher levels of most of our business-strategy variables.

TABLE 5
Summary Statistics for Broker and Nonbroker Companies

Variables	Broker Mean ($n = 239$)	Nonbroker Mean ($n = 550$)	t-statistic	Pr > |T|
CAP	0.2381	0.3082	−4.11	<0.0001
RegARisk	0.0176	0.0261	−3.52	0.0005
pGroupHealth	0.2323	0.1144	5.19	<0.0001
pGroupAnnuity	0.0174	0.0093	1.62	0.1064
pGroupLife	0.0739	0.0403	3.03	0.0026
pAnnuityIndiv_Pension	0.2579	0.1535	4.32	<0.0001
pHealthCredit_Other	0.1173	0.1515	−1.87	0.0619
Atotal	3,160,000,000	2,470,000,000	0.91	0.3647
logATot	19.5590	18.7150	4.65	<0.0001
Wtotal	638,000,000	385,000,000	2.14	0.0332
logWTot	18.3270	17.2480	6.20	<0.0001
RetOnCap	0.0706	0.0900	−1.82	0.0694
RBCratio	588.66	2939.9000	−1.57	0.1169
logRBC	5.8786	6.1679	−5.24	<0.0001
IndGroup	0.8458	0.7699	2.85	0.0046
IndStock	0.8912	0.9127	−0.92	0.3606
Arating	0.7041	0.5184	5.20	<0.0001
Brating	0.2206	0.2535	−1.04	0.2975
Crating	0.0209	0.0244	−0.31	0.7550
logCommissionRatio	−2.6870	−3.3770	5.63	<0.0001
Expense_AdsRatio	0.1226	0.0251	0.92	0.3589
Expense_AgencyRatio	0.1003	0.0187	1.04	0.2988
Expense_AgentBenefits	0.0054	0.0074	−1.69	0.0922
EstCAP	0.2463	0.3042	−4.35	<0.0001
EstRegARisk	0.0222	0.0238	−2.33	0.0199
PrStock	0.9007	0.9087	−0.89	0.3761
PrBroker	0.4198	0.2535	12.35	<0.0001

Table 6 shows simple correlations (and p-values) among the four endogenous variables. As in Table 3, the correlation is calculated between the 1993–1999 insurer means of each variable pair, for 789 insurers. In most cases, these simple correlations suggest statistically significant relations among these variables. A notable exception is the insignificant correlation between stock and broker. There are 715 stock insurers and 239 broker insurers in our sample of 789 firms, of which 213 have both the stock form and broker system. For these raw count data, the usual statistical tests (chi-square test, etc.) fail to reject the independence of ownership form and distribution type.[27] However, important relations may be masked by simple analyses unless factors that may differentiate the industry are controlled for.

[27] Regan and Tzeng (1999) did not report the corresponding tests and did not include the cross-count data necessary to calculate those tests. They also used stable O and D.

TABLE 6
Correlations among Endogenous Variables ($n = 789$)

Correlation (*p*-value)	CAP	RegARisk	Stock
RegARisk	0.40439		
	(<0.0001)		
Stock	0.13005	−0.04401	
	(0.0002)	(0.2168)	
Broker	−0.13532	−0.10104	−0.034
	(0.0001)	(0.0045)	(0.3415)

Results for Structural Equations Models

The results for the estimation of the four structural equations (1)–(4) of our model are displayed in Tables 7–10, respectively. Our discussion of these results is structured as follows: First, we examine the overall evidence for the business-strategy hypothesis. Second, we discuss the relations among the endogenous variables. Finally, we scrutinize the impact of external control variables.

In our models, business-strategy effects are represented by the coefficients of the product-mix variables. These five variables are the proportions of premiums written in three group lines (health, annuities, and life), in individual annuities and pensions that are mostly the institutional investments of employers' pension funds, and in nongroup health lines. Table 11 conveniently displays the signs of significant business-strategy coefficients in the four equations.

The results show selective support for the business-strategy hypothesis. The business-strategy variables are most involved with capital structure (Table 7) and distribution form (Table 10), less involved with asset risk (Table 8), and not at all involved with organization form (Table 9). These results roughly correspond with the simple relations noted above, although the significance is often not as strong as in the simple analyses. The pattern of involvement of the business-strategy variables with capital-asset ratios is consistent with TCE theory. As we discussed in the second section, TCE predicts that an emphasis on risky products will lead to higher capital ratios. In Table 7, we interpret the coefficient pattern as saying that firms focusing on relatively less risky annuity business (group, individual, and pensions) tend to have relatively lower capital-to-asset ratios; and firms focusing on relatively riskier group health and life products have relatively higher capital-to-asset ratios. These results are consistent with the notion of finite risk: Insurers balance a relatively less risky business focus on annuity products by accepting, or seeking, the riskier consequences of lower capital ratios.

For distribution form (Table 10) the coefficients of three of the business-strategy variables are significant and positive. As noted earlier, this is best understood in terms of the nature of the life insurance industry along with TCE and agency theories. First, broker-oriented insurers tend to write more group business in general

TABLE 7
Equation for CAP

Parameters	Estimate	Standard Error	t-statistic	Pr > |T|
Intercept	1.3530	0.1045	12.9481	0.0000
RegARisk	1.1307	0.5366	2.1072	0.0352
lag1CAP	0.0134	0.0275	0.4849	0.6277
PrStock	−0.2609	0.0634	−4.1174	0.0000
PrBroker	0.1203	0.0419	2.8716	0.0041
pGroupHealth	0.0777	0.0186	4.1812	0.0000
pGroupAnnuity	−0.1242	0.0457	−2.7192	0.0066
pGroupLife	0.0846	0.0273	3.1039	0.0019
pAnnuityIndiv_Pension	−0.0390	0.0157	−2.4939	0.0127
pHealthCredit_Other	0.0031	0.0159	0.1980	0.8430
logATot	-0.0648	0.0051	−12.6979	0.0000
logWTot	-0.0038	0.0035	−1.0940	0.2740
RetOnCap	0.0371	0.0057	6.5156	0.0000
logRBC	0.0603	0.0045	13.2664	0.0000
IndGroup	0.0391	0.0092	4.2650	0.0000
Arating	−0.0045	0.0162	−0.2792	0.7801
Brating	−0.0432	0.0146	−2.9625	0.0031
Crating	−0.0733	0.0291	−2.5237	0.0116
Year95	0.0061	0.0034	1.8264	0.0679
Year96	0.0076	0.0046	1.6383	0.1014
Year97	0.0073	0.0055	1.3361	0.1816
Year98	0.0125	0.0062	2.0277	0.0427
Year99	0.0229	0.0067	3.4137	0.0006

$R^2 = 0.4878$, root MSE $= 0.1851$.

than nonbroker firms because the clients for group business are firms that obtain group health, life, annuities, and pensions for their employees. As explained earlier, in order to reduce the uncertainty (hence costs) of acquiring and maintaining coverage, these sophisticated consumers prefer brokers that legally represent them and provide important monitoring functions for the insureds. These functions include screening insurers for appropriate coverages, low prices, and financial stability.

The absence of the effect of the business-strategy variables on organizational form (Table 9) is somewhat surprising in light of the major findings in the agency literature summarized by Regan and Tzeng (1999), but comports with TCE theory. Agency theory, and, in particular, the monitoring hypothesis suggests that managers of stock insurers are more likely than managers of mutuals to sell riskier products like health insurance in order to achieve higher returns and maximize value for shareholders. To be sure, the direction of the relation shown in Table 9 runs from business activity to organizational form, whereas the direction specified by the monitoring hypothesis is the reverse. However, the t-tests of Table 4 also show no difference between stock and nonstock firms in terms of business-strategy variables. In

TABLE 8
Equation for RegARisk

Parameters	Estimate	Standard Error	*t*-statistic	Pr > |T|
Intercept	−0.0094	0.0321	−0.2937	0.7690
CAP	0.0079	0.0168	0.4714	0.6374
lag1RegARisk	0.3881	0.0672	5.7740	0.0000
PrStock	0.0231	0.0134	1.7256	0.0845
PrBroker	−0.0199	0.0081	−2.4465	0.0145
pGroupHealth	−0.0014	0.0031	−0.4393	0.6604
pGroupAnnuity	−0.0113	0.0074	−1.5185	0.1290
pGroupLife	0.0035	0.0047	0.7584	0.4482
pAnnuityIndiv_Pension	−0.0073	0.0024	−3.0014	0.0027
pHealthCredit_Other	0.0030	0.0026	1.1744	0.2403
logATot	0.0045	0.0013	3.4614	0.0005
logWTot	−0.0020	0.0005	−4.3454	0.0000
RetOnCap	−0.0033	0.0010	−3.3553	0.0008
logRBC	−0.0058	0.0010	−6.0495	0.0000
IndGroup	−0.0003	0.0015	−0.1790	0.8580
Arating	−0.0096	0.0023	−4.1447	0.0000
Brating	−0.0098	0.0023	−4.2934	0.0000
Crating	−0.0095	0.0049	−1.9150	0.0556
Year95	0.0005	0.0005	0.8909	0.3730
Year96	0.0007	0.0007	0.9521	0.3411
Year97	0.0006	0.0009	0.6980	0.4852
Year98	0.0004	0.0010	0.3456	0.7296
Year99	0.0001	0.0012	0.0741	0.9409

$R^2 = 0.1776$, root MSE $= 0.0371$.

their study of property and casualty insurers, Regan and Tzeng (1999) also found no relation between their business-strategy variables and organizational form in their simultaneous model. This lack of empirical support for the business-strategy impact on organization structure is consistent with TCE theory, as noted in "Theoretical Background."

The only product mix variable affecting asset risk (Table 8) is individual annuities and pensions. Its negative sign does not appear to be a consequence of any of the theories surveyed.

When we turn to the endogenous variables, we find that most of the possible relations that are modeled in Equations (1)–(4) are statistically significant. Moreover, the finite-risk paradigm shown in Table 2 can provide a comprehensive explanation. When we compare the theoretical expectations summarized in Table 2 with the empirical results of the simultaneous model summarized in Table 12, we find a strong correspondence between expectations and results. The signs of all statistically significant terms agree with theory. At a general level, another noteworthy aspect of the findings is the symmetry in signs of the coefficients. Although a structural equation does not necessarily describe a bilateral relation between response and endogenous predictor—in every

TABLE 9
Equation for STOCK

Parameters	Estimate	Standard Error	Wald Chi-Square	Pr > Chi Square
Intercept	16.8927	4.5351	13.8746	0.0002
EstCAP	−13.8427	5.1405	7.2515	0.0071
EstRegARisk	52.6158	18.7743	7.8543	0.0051
PrBroker	1.8078	0.8425	4.6047	0.0319
pGroupHealth	0.8206	0.8638	0.9024	0.3421
pGroupAnnuity	−1.5932	1.2822	1.5441	0.2140
pGroupLife	1.2757	0.9723	1.7214	0.1895
pAnnuityIndiv_Pension	0.2056	0.4890	0.1768	0.6741
pHealthCredit_Other	−0.5241	0.3391	2.3899	0.1221
logATot	−1.2155	0.3123	15.1483	<0.0001
RetOnCap	1.8614	0.6360	8.5671	0.0034
logRBC	1.3803	0.4415	9.7721	0.0018
IndGroup	1.7312	0.2984	33.6616	<0.0001

Pseudo $R^2 = 0.2151$.

TABLE 10
Equation for BROKER

Parameters	Estimate	Standard Error	Wald Chi-Square	Pr > Chi Square
Intercept	−2.9286	3.2215	0.8264	0.3633
EstCAP	2.5303	3.3272	0.5784	0.4470
EstRegARisk	−23.4541	12.0029	3.8183	0.0507
PrStock	−0.0305	0.9848	0.0010	0.9753
pGroupHealth	0.9242	0.5076	3.3145	0.0687
pGroupAnnuity	0.6442	0.9169	0.4936	0.4823
pGroupLife	1.3392	0.5291	6.4077	0.0114
pAnnuityIndiv_Pension	1.0590	0.2832	13.9808	0.0002
pHealthCredit_Other	0.3114	0.2626	1.4063	0.2357
logATot	0.2275	0.1993	1.3029	0.2537
RetOnCap	−0.4124	0.4158	0.9839	0.3212
logRBC	−0.3608	0.2764	1.7039	0.1918
IndGroup	0.1505	0.2658	0.3205	0.5713
logCommissionRatio	0.1522	0.0367	17.1704	<0.0001
Expense_AdsRatio	−0.3987	0.4552	0.7672	0.3811
Expense_AgencyRatio	0.6709	0.6127	1.1988	0.2736
Expense_AgentBenefits	−7.6407	4.3828	3.0392	0.0813

Pseudo $R^2 = 0.1515$.

case but one, the sign of the coefficient for Y_i as a function of Y_j is the same as the sign of the coefficient for Y_j as a function of Y_i. That is, the signs in Table 12 are symmetric around its main diagonal—the only exception is the positive Broker coefficient in Equation (3), which does not match the negative Stock coefficient in Equation (4).

TABLE 11
Signs of Significant Business-Strategy Variables (from Tables 7 to 10)

	Health Group	Group Life	Group Annuities	Individual Annuities	Nongroup Health
Eq. (1) (Table 7): CAP	+	+	−	−	
Eq. (2) (Table 8): RegARisk			−	−	
Eq. (3) (Table 9): Stock					
Eq. (4) (Table 10): Broker	+	+		+	

TABLE 12
Signs of Significant Relations among the Endogenous Variables (from Tables 7 to 10)

	CAP	RegARisk	Stock	Broker	Theory/Hypothesis
Eq. (1) (Table 7): CAP		+	−	+	TCE—finite risk, agency theory and monitoring of stakeholders (managers are monitored by owners and brokers)
Eq. (2) (Table 8): RegARisk	NS		+	−	Regulatory and bankruptcy costs—finite risk
Eq. (3) (Table 9): Stock	−	+		+	Agency theory and monitoring of stakeholders—finite risk
Eq. (4) (Table 10): Broker	NS	−	NS		Indirectly explained by the association of brokers with group products

NS = Not significant at 0.1 level.

We first discuss the capital and asset risk portions of the analysis, and then the organizational form and distribution system. The most notable results are for the capital ratio (Table 7) and the organizational form (Table 9).

For the capital ratio (Table 7) and asset risk (Table 8), as in other studies noted previously (Cummins and Sommer, 1996; Baranoff and Sager, 2002), rising levels of asset risk are associated with increasing capital ratios. A high capital ratio represents low leverage risk. Thus, insurers appear to offset increasing risk in one key decision with lower risk in another. In addition, stock firms are associated with low capital ratios and high asset risk. This also agrees with other empirical studies that have found higher risk-taking among stock firms, and is consistent with the monitoring hypothesis and finite risk. Tighter controls in stock firms may allow or encourage the assumption of more risk. Brokers are associated with high capital ratios and low asset risk. We infer that insureds use brokers to monitor the selection of insurers with lower risk attributes such as leverage and asset risk. Thus our study of the integrated effects of these endogenous variables confirms previous studies of their effects in isolation of each other.

For the organizational form (Table 9) and distribution system (Table 10), as noted at the beginning of this section, the effects of capital and asset risk in Equations (3) and (4) reciprocate the effects of organizational form and distribution system in Equations (1) and (2): At higher capital levels proportionately fewer insurers elect the stock form; at higher levels of asset risk proportionately more firms elect stock organization (Table 9) and fewer firms select broker distribution (Table 10). Explanations may be provided by the theories cited previously. A new finding in the simultaneous context is the association of broker distribution with stock organization (Table 9). In their study of the property/casualty industry, Regan and Tzeng (1999) did not find a significant relation between organizational form and distribution system in their simultaneous model. A potential explanation may be found in the nature of the group business. A decision to operate in this line means the insurer will feel pressure to adopt broker distribution in order to satisfy business clients, who seek monitoring of insurers. There also will be an incentive to organize as a stock firm to exercise more control over the greater risks of group products. However, in our results, although distribution is significant in the organization equation (Table 9), organizational form is not significant in the distribution equation (Table 10).

Finally, it is worth commenting on the effects of some of the control variables in the structural model. Size is proxied by the log of total assets, which was significant in three of the model equations. Larger firms tended to have lower capital ratios (Table 7) and higher-risk asset portfolios (Table 8) than smaller firms. In Table 9, we also find smaller firms associated with the stock form. The log of the risk-based capital ratio (logRBC) is our proxy for regulatory pressure. It was significant in three of the model equations, with a positive coefficient in the capital and stock equations, and negative in the asset-risk equation. The lower the RBC ratio, the higher the pressure. So our results show that insurers that feel significant regulatory pressures are associated with low capital ratios and risky asset portfolios, and are more likely to be nonstock companies. Return on capital (RetOnCap) is also significant in the same three model equations, with the same signs as logRBC. In the CAP equation, RetOnCap impacts the capital ratio positively and significantly. This is consistent with some of the results in Baranoff and Sager (2002) for the life industry during the 1993–1999 period. The Herfindahl market-concentration variable, log of total premiums, had a significant negative impact on asset risk (Table 8). This was unexpected from the finite-risk viewpoint. But total premiums also can be viewed as another proxy for size. Since the model already includes total assets, then logWTot actually captures a secondary effect: Given insurers with the same total assets, those insurers with more of the market have less risky asset portfolios. A. M. Best Key Ratings were significant only in the capital equation, in which low ratings were associated with low capital ratios, as might be expected. All but one of the year indicators that we entered to capture annual effects not otherwise represented in our model were significant, but only in the capital equation.

SUMMARY

In this article we analyze four key life insurer choices as integrated decisions in a single simultaneous-equations model. The choices are the capital structure, asset risk, organizational form, and distribution system. Two of these decisions are static: the selection of an organizational form (stock or nonstock) and the selection of a distribution form (broker or nonbroker). Two are dynamic: the capital structure (capital-to-asset ratio) and asset risk (regulatory/actuarial asset portfolio risk). We investigate the relations among these four variables. We also investigate the *business-strategy hypothesis*, which views key structural decisions for the firm as flowing from its fundamental business strategy, represented here by the firm's product mix. The levels of involvement in annuity, health, and other industry products are therefore treated as predetermined in the model. Once the business strategy is set in motion, other key decisions are viewed as being made jointly and flowing from the strategy. The decision by an insurer to emphasize a particular product line involves an assumption of risk that differs by product line. We have argued that group lines may be riskier than individual lines, and that annuities are less risky than life products, which are less risky than health and accident lines.

The model provides a single framework for studying capital/risk/organization/distribution structures simultaneously. A novel feature is the combination of categorical and continuous endogenous variables in the simultaneous setting. Four structural equations that describe the capital and asset risk behavior (continuous) and organization and distribution choices (categorical) of life insurers are estimated simultaneously in a two-stage limited information approach. Capital and asset risk are modeled autoregressively; organization and distribution are described via a probit relationship. The model therefore extends Regan and Tzeng (1999), Cummins and Sommer (1996), and Baranoff and Sager (2002).

The results of our analyses are interpreted in light of several major theories, including transaction-cost economics, agency theory, regulatory and bankruptcy cost avoidance, on the one hand, and the risk-subsidy hypothesis, on the other. The finite-risk paradigm is based on the first-mentioned set of theories; risk-subsidy is based on the subsidizing effect of guarantee funds. Finite risk and risk-subsidy predict different firm behaviors, regarding which the empirical literature has varying findings. In the main, our findings are consistent with the predictions of the major theories underlying the finite-risk framework. Confirming previous studies, we find a positive relation between capital ratios and asset risk. Unlike Regan and Tzeng (1999), we find organization form and distribution system significantly related in the simultaneous form of our model. In our expanded four-way simultaneous choice model, we provide new findings. Stock ownership is related to greater financial and asset risk taking, whereas brokerage distribution is associated with lower risk taking. Of the four major decisions that we examined, the insurer's business strategy (as represented by its product mix) is a significant factor only in the capital structure and distribution system decisions—the two decisions directly regarded by TCE.

APPENDIX

Variable Descriptions

Variables	Description
CAP	Adjusted book capital/total assets
Lag1CAP	Previous year's CAP
RegARisk	RBC authorized capital/total assets
Lag1RegARisk	Previous year's RegARisk
pGroupHealth	Group health premiums/total premiums
pGroupAnnuity	Group annuity premiums/total premiums
pGroupLife	Group life premiums/total premiums
pAnnuityIndiv_Pension	Individual annuity and pension premiums/total premiums
pHealthCredit_Other	Credit and other health premiums/total premiums
Atotal	Total assets
logATot	log(total assets)
Wtotal	Total premiums (writings)
logWTot	Herfindahl proxy: log(total premiums)
RetOnCap	Return on capital = income/adjusted book capital
RBCratio	100 ∗ Adjusted book capital/(2 ∗ RBC authorized capital)
logRBC	log of RBC ratio
IndGroup	Member of group (1 = Yes, 0 = No)
IndStock	Organization form (1 = stock, 0 = not stock)
IndBroker	Distribution system (1 = broker, 0 = not broker)
Arating	0–1 indicator for Best rating = A (1 = Yes, 0 = No)
Brating	0–1 indicator for Best rating = B (1 = Yes, 0 = No)
Crating	0–1 indicator for Best rating = C (1 = Yes, 0 = No)
logCommissionRatio	Log of (commissions/total premiums)
Expense_AdsRatio	Advertising expense/total general expense incurred
Expense_AgencyRatio	Agency expense/total general expense incurred
Expense_AgentBenefits	Agents' benefits/total general expense incurred
Year9*n*	0–1 indicator for year 199*n*, *n* = 3,4,5,6,7,8,9
EstCAP	Estimated CAP (from stage 1 of estimation)
EstRegARisk	Estimated RegARisk (from stage 1 of estimation)
PrStock	Estimated probability of stock organization
PrStock	(from stage 1 of estimation)
PrBroker	Estimated probability of broker distribution
PrBroker	(from stage 1 of estimation)

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