

THE MARKET STRUCTURE–PERFORMANCE RELATIONSHIP IN THE INTERNATIONAL INSURANCE SECTOR

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ABSTRACT

This article tests the applicability of the structure–conduct–performance (SCP) hypothesis in the international nonlife insurance marketplace. We employ a panel data regression methodology that includes 23 nations (developed and developing countries) over the time period of 1996 to 2003. The results reveal that the interaction of market liberalization and market concentration shares a complex relationship with market profitability. Our results show that the expectations associated with the SCP hypothesis are supported when the levels of liberalization are low. However, for markets that are highly liberalized the presence of foreign insurers significantly alters the dynamics of nonlife insurance markets.

INTRODUCTION

The relationships shared by a market's structure and its performance have received significant attention in the international insurance literature in recent decades (e.g., Outreville, 1990, 1992; Hussels, Ward, and Zurbruegg, 2005). However, the specific relationship shared by an insurance market's concentration and its profitability has received far less attention and, when examined, is typically focused on the U.S. marketplace (e.g., Joskow, 1973; Carroll, 1993; Chidambaran, Pugel, and Saunders, 1997; Bajtelsmit and Bouzouita, 1998; Choi and Weiss, 2005). Although this relationship is certainly worthy of investigation at the domestic level, the continuing liberalization and deregulation of the global insurance marketplace (Swiss Re, 2000) accentuate the importance of understanding these same issues at the international level—a subject for which no literature exists.¹ This article addresses this gap by performing the first examination of the relationship shared by market concentration and profitability within the nonlife insurance sector at the international level.

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¹ At the international level, issues associated with barriers to market entry are generally related to liberalization measures. Thus, in the context of this article, the terms barriers to market entry and liberalization are used interchangeably.

We employ a panel data model structure that includes 23 countries whose observations span from 2 to 8 years from 1996 to 2003. The results reveal a complex relationship shared by a nation's level of liberalization, insurance market concentration, and profitability. Our results show that the effect of market concentration on insurance market profitability varies depending on the level of market liberalization. We also find support for the expectation that high barriers to entry for foreign competitors facilitate the ability of a concentrated marketplace to engage in collusive behavior and that the presence of foreign insurers may significantly alter the profitability of national nonlife insurance markets. The findings of this study will be of particular importance to national policymakers and regulators who seek a better understanding of the implications of changes in trade and regulatory policy. These findings will also be of interest to market competitors, both foreign and domestic, as they seek to better understand the relationships shared by market structure and profitability.

The remainder of this article is organized as follows. The next section presents a literature review, followed by an abbreviated presentation of the theory associated with the market structure–performance relationship. Variable hypotheses based on this theory are then discussed, followed by data and empirical models. The article concludes with the presentation of significant findings and a summary of the results.

LITERATURE REVIEW

The earliest efforts to identify the relationship between a market's concentration levels and its profitability can be attributed to Bain (1951), who developed the *concentration–profits hypothesis*. Drawing on conventional price theory, Bain hypothesized that a concentrated market structure encouraged oligopolistic behavior by competitors. A later variant of the hypothesis formalized by Stigler (1964) came to be known as the *collusion theory*, and Tsutsui, Satake, and Uchida (2006) noted that the body of the associated literature is now more commonly known as the *structure–conduct–performance* (SCP hypothesis). Simply stated, the SCP hypothesis expects dominant firms in more concentrated markets to set prices that are less favorable to consumers because of imperfect competition.² Subsequently, smaller competitors in the market are able to adopt similar excessive pricing strategies resulting in an overall increase in industry profitability. Much of the early research that focused on the U.S. markets found support for a positive relationship between market concentration and profitability (e.g., Collins and Preston, 1969; Weiss, 1974). Peltzman (1977) concluded, "With few exceptions, market concentration and industry profitability are positively correlated." Related research focusing on foreign manufacturing data also found support for the theorized positive relationship (Caves and Uekusa, 1976 [Japan]; Jenny and Weber, 1976 [France]; Neumann, Bobel, and Haid, 1985 [Germany]).

In the banking literature, Molyneux and Teppet (1993) found support for the SCP hypothesis using European data whereas Pilloff and Rhoades (2002) found similar support in the U.S. market using metropolitan statistical area data. Interestingly, a few studies that focused on the banking sector have even reported a negative relationship between market concentration and profitability (Jacquemin, de Ghellinck,

² See Feuerstein (2005) for a current survey of the associated body of literature using industrial sector data.

and Huveneers, 1980; Clarke, 1984). The insurance literature specifically addressing the concentration–profitability relationship is limited and is heavily focused on the U.S. market. Joskow (1973) examined the competitive market structure of the nonlife insurance marketplace and concluded that the combination of state regulation, pervasive cartel pricing, and other market peculiarities resulted in significant inefficiencies. Bajtelsmit and Bouzouita (1998) examined the market concentration–profitability relationship within the U.S. auto insurance lines and found a significant positive relationship, thus supporting SCP hypothesis expectations. Chidambaran, Pugel, and Saunders (1997) examined the relationship across various lines of nonlife insurance and found support for a positive relationship, concluding that the structure and characteristics of the marketplace contribute to a reduced level of competition among insurers. Carroll (1993), however, found no support for the relationship in her investigation of the U.S. workers’ compensation market. Focusing on the life insurance market, Cummins, Denenberg, and Scheel (1972) reported that market concentration and competition were inversely related in the U.S. market, implying a positive relationship between market concentration and profitability.³ Thus, the existing body of the insurance literature is still developing and lacks consensus.

CONCEPTUAL AND THEORETICAL DEVELOPMENT

The *Harvard Paradigm* provides a conceptual framework from which the market structure–performance relationship can be assessed and has proven to be readily adaptable as a conceptual model of insurance market operations (Swiss Re, 1996).⁴ In his presentation of the Paradigm, Porter (1980) identified five forces (characteristics of market structure) that influence a market’s conduct, which in turn determines the market’s performance. Four of the forces can be considered external to the industry: the threat of entry, the threat of substitution, the bargaining power of consumers, and the bargaining power of suppliers. The fifth force, the level of market competition, is conceived of as an internal force and is generically described as the intensity of rivalry among current market competitors. Additionally, Porter (1991) later noted that these dynamics are subject to the influence of regulatory oversight, which may serve as a catalyst (or inhibitor) of innovation in the marketplace.⁵

Within the insurance market context, the roles of buyer and supplier of the product are uniquely intertwined. Conceptually speaking, the premiums paid by insureds are

³ It must be noted that the *efficient structure (ES) hypothesis* has evolved as a competing explanation for the positive relationship described by the SCP hypothesis. Demsetz (1973, 1974) and others suggested that higher profits are the results of firm’s specific advantages, such as greater efficiency, instead of higher market concentration. While the ES hypothesis has enjoyed significant support in the banking literature and to a lesser degree in the insurance literature (e.g., Choi and Weiss, 2005), such analyses require an examination at the firm level, which would be antithetical to our examination at the national market level. Thus, we limit our discussion of the debate in this article but recommend Brozen (1982) as a source for further investigation of the ES hypothesis.

⁴ The Harvard Paradigm is commonly associated with a collective body of research generated by the Harvard Business School during the 1950–1970 period and is sometimes more specifically associated with the work of Professors M. Porter and F. M. Scherer.

⁵ The role of government oversight within this context is more thoroughly examined within the VRIN theoretical framework; for a deeper discussion see Barney (1991).

pooled to create a fund from which qualified claims are paid. Therefore, within the insurance context, the insureds may be conceived of as being both the buyers for the products as well as the suppliers of the necessary capital to create a functioning insurance market.⁶ The insurance market is traditionally composed of a number of relatively small consumer entities having only weak negotiating power.⁷ The same is true in their role as suppliers of capital for the insurance mechanism. A decision on the part of even the largest commercially insured entity to withdraw from the insurance market would have little impact on the total capital available to the marketplace. Thus, within the context of the Paradigm suppliers and buyers have little actual influence on the industry's operations. The structural forces that remain to be considered are the level of market competition, the threat of entry, and the threat of substitution. Variables controlling for the effects of these remaining factors comprise the key elements of our empirical investigation, which is discussed below.

Although the Paradigm may provide a conceptual framework, Cowling and Waterson (1976) provided formal theoretical support for the key relationships under investigation in this article. They identify a positive relationship between the profit-margin ratio (a measure of market performance) and market concentration. An abbreviated presentation of their analysis is presented below. The profit function of firm i can be as

$$\pi_i = p(Q)q_i - c_i(q_i), \quad (1)$$

where π_i is profit for firm i ; p is the market price; q_i is output of firm i ; $p(Q)$ is the inverse demand function, where $Q = \sum_{i=1}^n q_i$; and c_i is the cost for insurer i . Profit maximization is defined by the first order condition:

$$\frac{d\pi_i}{dq_i} = p(Q) + p'(Q)(1 + \lambda_i)q_i - c'_i(q_i) = 0, \quad (2)$$

where λ_i is the conjectural variation term⁸ defined as

$$\lambda_i = d \sum_{j \neq i} q_j / dq_i. \quad (3)$$

If we multiply Equation (2) by q_i and sum over the N firms, we have

$$\sum p(Q)q_i + \sum p'(Q)(1 + \lambda_i)q_i^2 - \sum c'_i(q_i)q_i = 0. \quad (4)$$

⁶ Other sources of capital such as reinsurers and investment income also exist. However, insureds themselves are the dominant supplier of capital to fund insurance claims.

⁷ While the consolidation in the insurance brokerage market may distort the otherwise competitive operation of the market, Cummins and Doherty (2006) suggested that both the number of competing alternatives and the lack of similar concentration in those distribution channels, e.g., the independent and exclusive agency systems, regional brokers, etc., provide ample competition in the marketplace, thereby muting any potential distortion associated with the existence of mega-brokers.

⁸ Conjectural variation terms represent a firm's speculation of other competitors' reaction to changes to its output. Thus, subscript j in Equation (3) represents any firm that is different from firm i .

We can rewrite Equation (4) as

$$\frac{\Pi}{R} = \frac{H}{\eta}(1 + \mu), \quad (5)$$

where market profit (Π) is related to revenue (R) as the industry average profit–cost margin (Π/R), H represents Herfindahl Index of market concentration, η represents the industry price elasticity of demand, and μ represents the weighted sum of conjectural variations.⁹ Thus, Cowling and Waterson established a theorized positive relationship between market concentration (H) and profitability (Π/R) in Equation (5). Additionally, they identify a theorized negative relationship between market profitability and the price elasticity of demand (η).

VARIABLE DEVELOPMENT

Carroll (1993) adapted Cowling and Waterson's (1976) theoretical estimation for the insurance mechanism and defines an insurer's profit margin (PM) as follows:

$$\begin{aligned} \frac{\Pi}{R} &= \frac{\text{Profit}}{\text{Revenue}} = \frac{\text{Premiums} - \text{Losses} - \text{Expenses} + \text{Investments}}{\text{Premiums}} \\ &= 1 - LR - ER + ROI, \end{aligned} \quad (6)$$

where LR is the loss ratio, ER is the expense ratio, and ROI is the return on investment. We adopt Carroll's measure of PM as our measure for market profitability. However, the general lack of insurance-specific data related to insurer expense and return on investment across national markets prevents us from including such information in the construction of the variable. Therefore, our measure of market profitability ($PROFIT$) is proxied by one minus the loss ratio and the variables that control for expenses and investments are included in the model as independent variables—a solution similarly employed by Carroll.^{10,11}

To control for the variation of market expense levels, we note the significantly differing role that loss-adjustment expenses play in various lines of insurance. Liability coverages traditionally include payment of defense costs, thereby significantly increasing

⁹ The Herfindahl Index of market concentration is $H = \sum(q_i/Q)^2$; the industry price elasticity of demand is $\eta = -[p(Q)/Q][dQ/dp(Q)]$ and the weighted sum of conjectural variations is $\mu = \sum \lambda_i q_i^2 / \sum q_i^2$.

¹⁰ Because international data on an earned premium and incurred loss basis are not available, we use gross premiums written and paid losses to construct LR . To control for the difference between net premiums and gross premiums, we also considered market retention ratio, as measured by the ratio of net premiums to gross premiums, as an independent variable in the models. However, when included in the empirical analysis the available observation pool was reduced by almost 50 percent due to data availability limitations. Additionally, the coefficient of this variable was not statistically significant. A possible explanation is that the retention ratio effect has already been captured by the size of the market as well as by the analysis control for the competitive structure of the market (Outreville, 2000). Thus, the retention ratio variable was dropped from the final version of the model.

¹¹ Bajtelsmit and Bouzouita (1998) employed a similar variation of this ratio as their proxy for the profit margin in their analysis of the U.S. auto insurance lines.

expenses associated with that line of business as compared to other lines. Thus, we expect higher expense structures in countries where liability coverage accounts for a significantly greater proportion of the nonlife insurance market.¹² Therefore, we include the ratio of general liability premiums to aggregate nonlife insurance premiums (*ER*) to control for variation in underwriting expenses in each national market. As for insurers' return on investment, given the lack of comprehensive data on insurers' investment activities across national markets, we proxy this variable using the real rate of return, as measured by the difference between the bank rate on savings deposits and inflation (*ROI*) in each country.

Level of Competition

A basic premise of the Paradigm is that the character and composition of competition in a given market influences its conduct. The SCP hypothesis theorizes that market concentration inhibits competition and results in higher than expected levels of profit. We control for this potential market distortion by including the ratio of the market shares held by the five largest firms in each national market. We expect this concentration ratio (*CR*) to share a positive relationship with market profitability. The use of concentration ratios as an assessment of market competition is well established in both the banking (e.g., Bourke, 1989; Berger and Hannan, 1989) and the insurance literature (e.g., Joskow, 1973; Ippolito, 1979; Appel and Gerofsky, 1985; Chidambaran, Pugel, and Saunders, 1997; Bajtelsmit and Bouzouita, 1998).¹³

In addition to the market concentration ratio, the number of competitors (*COMPETITORS*) in the marketplace also affects the level of market competitiveness (e.g., Cournot, 1897; Friedman, 1982). Everything else equal, higher numbers of insurers operating in the marketplace implies reduced competition, and consequently, lower market profitability. The relationship has been extensively addressed in the economic literature (e.g., Cowling and Waterson, 1976; Clarke and Davies, 1982) and discussed specifically with respect to the structure–performance relationship in the insurance markets by Joskow (1973).

Threat of New Entrants

The Paradigm identifies the threat of entry by new competitors as one of the major factors affecting market conduct. Support for this hypothesis in the insurance

¹² Support for this conclusion comes from an examination of U.S. data provided by various annual issues of *The III Insurance Fact Book* (Insurance Information Institute), which reveals that liability loss adjustment expenses (LAE) are approximately four times larger than similar expenses for property lines of insurance. Interestingly, a similar ratio is found when examining the same relationship in the Japanese marketplace—a nation exhibiting a far different pattern of litigious behavior (e.g., Haley, 1978; Ramseyer, 1988; Ginsburg, 2006), thereby providing evidence of relatively higher liability LAE ratios across national markets despite potentially significantly differing legal and cultural environments.

¹³ Gilbert (1984) provides an extensive survey-related banking sector investigations that have used variations of market concentration as a measure of market structure. Outreville (1990) notes that *k*-firm concentration ratios and the Herfindahl Index are most frequently employed to assess market concentration, but he does not suggest that a specific concentration ratio is more or less representative of the information provided by the Herfindahl Index.

literature has been significant (e.g., Bain, 1956; Joskow, 1973; Harris, 1986; Berger et al., 2000; Clark and Speaker, 1992). New competitors to the marketplace are likely to possess what they believe to be competitive advantages within that particular market, e.g., superior underwriting capabilities, economies of scale, name recognition, etc. The arrival of such competitors may change the competitive dynamics of the marketplace, and thus, current insurers in the marketplace must adjust their strategies and resource allocations accordingly. For example, given the knowledge of impending liberalization/deregulation of their marketplace, insurers presently operating in that market may allocate resources to tie up distribution channels, create synergistic networks, etc. Conversely, the degree to which a market is relatively protected from such incursion allows already-present competitors the freedom to allocate those resources to endeavors more focused on the immediate environment.

Unique to foreign competitors is the fact that they must not only overcome potential regulatory barriers but also potential national level trade barriers. Thus, the potential arrival of foreign competitors holds acute implications for current market competitors, and the viability of foreign entry is heavily influenced by government policies on market liberalization (Skipper, 1998). However, only limited investigation of the impact of liberalization on the market concentration–profitability relationship has been undertaken as of yet (e.g., Mann, 1966; Qualls, 1972; Jenny and Weber, 1976; Caves, Porter, and Spence, 1980).

Following Ma and Pope (2003), we control for the threat of entry by foreign insurers by including the International Business Climate (IBC) Index (*LIBERAL*).¹⁴ The IBC is based on a number of factors that evaluate a nation's business environment for international firms. The factors considered include barriers to trade, restrictions on equity and operation by foreign entities such as repatriation control and currency exchange control, and tax discrimination against foreign business. The variable assesses the national market on a scale of 0–100, where higher values indicate a more liberalized environment. We expect that a more liberalized market environment will allow for, and encourage, more foreign involvement, contributing to a more competitive marketplace and reduce profitability at the aggregate market level. Indeed, Choi (2005) found that foreign insurers operating in the U.S. nonlife insurance market employed a price-competition strategy that differentiated them from their domestic competitors. These foreign competitors were willing to sacrifice profitability in the short term in exchange for market share growth. This kind of competition creates smaller profit margins for insurers attempting to maintain competitive pricing structures. Therefore, we anticipate this variable to share a negative relationship with the dependent variable.

Bain (1956) discussed the role that market entry barriers occupy with respect to a market's performance, and made explicit note of the need to empirically control for the interactive relationship of such barriers and market concentration. He theorized that the hypothesized character of the market concentration–performance relationship would be mitigated with free market entry. Subsequent to Bain's admonition, Weiss (1971) noted that few researchers actually pursued his recommendation to

¹⁴ The IBC rating is obtained from the Political Risk Services Group (<http://www.prsgroup.com/>).

control for the interaction of these two variables and for those who did, the results have been mixed. Using industrial sector data, a few authors found support for a positive relationship between profitability and the interaction of market concentration and barriers to market entry (Mann, 1966; Qualls, 1972; Jenny and Weber, 1976). However, Orr (1974) and Caves, Porter, and Spence (1980) found only marginal evidence that interactive specification provided superior results when compared with independent specification. While not formally interacting with the terms, Clark and Speaker (1992) found that the impact of market concentration on bank profitability is greater when entry conditions are less favorable. These findings mirror the findings of Harris (1986), who found price-cost margins in the industrial sector to be positively related to the existence of entry barriers. Berger et al. (2000) found that market concentration and impediments to competition are associated with high profits in the banking industry. With respect to the insurance literature, Ma and Pope (2003) found a significant relationship between the interaction variable (market concentration and liberalization) and the presence of foreign insurers. Their results suggest that although the presence of foreign insurers is negatively related with highly concentrated national markets, a highly liberalized market environment significantly mitigated this negative relationship. Given these findings we include a variable interacting market concentration and market liberalization ($CR*LIBERAL$) to control for these effects.

Threat of Substitution

Intraindustry competition within the financial services industry has traditionally been muted due to historical regulation.¹⁵ Although recent trends toward less regulation now allow for increased intraindustry competition, substitutes for the insurance product itself remain limited.¹⁶ Thus, with respect to the insurance product, the *threat of substitution* can be better thought of as a binary purchasing decision—one either buys insurance (transfers the financial risk) or retains the financial responsibility for losses themselves. As is the case in most purchasing decisions, price is likely to play a central role. Cowling and Waterson (1976) identifies an inverse relationship between the price elasticity of demand and market profitability in their theoretical model, as seen in Equation (5). Price elasticity of demand is defined as the change in demand as it relates to the change in price ($ELASTICITY$), i.e., $\delta Demand / \delta Price$. To control for this effect we proxy the demand for insurance using a national market's insurance density and proxy the market price using the inverse of loss ratio.^{17,18}

¹⁵ One example of such regulation in the United States was the Glass-Steagall Act (1933) that had inhibited intra-industry competition in the financial marketplace.

¹⁶ Substitutes for insurance might be found in unique circumstance, e.g., catastrophic bonds floated in the capital markets, weather derivatives, etc., but these alternatives still represent a limited set of substitutes for traditional insurance mechanisms. For a deeper discussion of the current state of industry alternative risk transfer mechanisms, please see Swiss Re (2003).

¹⁷ Insurance density is a standard measure of insurance demand within a national market and is calculated by dividing aggregate gross premium by national population.

¹⁸ The price of insurance is commonly proxied using the inverse-of-loss ratio (e.g., Tennyson, 1997; Cummins et al., 2001; Pope and Ma, 2005). Thus, $Price_t = 1 / \text{industry loss ratio}_t$ and $\delta Demand / \delta Price = [(Demand_{t+1} - Demand_t) / Demand_t] / [(Price_{t+1} - Price_t) / Price_t]$.

Regulatory Oversight

Porter (1991) noted the potential influence of regulatory oversight on marketplace competition. Significant support exists in the literature for Porter's expectations with specific respect to the market concentration–profitability relationship (Demsetz, 1973, 1974; Phillips, 1976; Peltzman, 1977; Gale and Branch, 1982; Rhoades, 1982; Shepherd, 1982; Gilbert, 1984; Smirlock, 1985; Berger and Hannon, 1989; Jackson, 1992). Given the fiduciary nature of the insurance mechanism, its activities are traditionally heavily monitored. The relationship rate regulation shares with an insurance market's price structure and/or its profitability is a subject of significant debate.¹⁹ The spectrum of rate regulation systems is bounded by tariff regulation on one end and open competition on the other. Tariff regulation refers to the formal establishment of bureau rates by regulators to which insurers must adhere. Conversely, open competition implies the freedom for insurers to use whatever rates they choose. Between the two extremes there exist a number of regulatory schemes that typically represent variations on a theme, e.g., file-and-use, use-and-file subject to 90-day review, etc. The pricing/profitability implications associated with rate regulation is difficult to assess, however. Some have found evidence that significant regulatory involvement in rate regulation has resulted in relatively higher market insurance rates, as promoted in the *excessive rate hypothesis* (Joskow, 1973; Saba, 1978; Ippolito, 1979; Samprone, 1979; Frech and Samprone, 1980). On the other hand, the *rate suppression hypothesis* theorizes that regulatory involvement leads to relatively lower market insurance price levels (e.g., Muir, 1968; Ancipink, 1980; Cummins, Phillips, and Tennyson, 2001). In their examination of the market structure–performance relationship in the U.S. insurance industry, both Bajtelsmit and Bouzouita (1998) and Carroll (1993) explicitly controlled for the market's rate regulatory structure but they did not find a significant relationship.

Following these earlier studies on the subject, we control for a market's insurance rate regulation by identifying whether the market employs tariff regulation (*REG*).²⁰ Given the ongoing debate as to the relationship rate regulation shares with market profitability, we do not hypothesize an expected relationship with the dependent variable.

Although not specifically delineated in the Harvard Paradigm, two additional variables have been found to affect the insurance market structure–performance relationship in other examinations of the topic: the national market economy and the composition of the industry's book-of-business.

Economy

Studies have consistently found that the strength of a nation's economy is highly correlated with demand for property–liability insurance products (e.g., Outreville, 1990, 1992; Beenstock, Dickinson, and Khajuria, 1988; Browne, Chung, and Frees, 2000; Ma and Pope, 2003). Demand is a key component, along with supply, in classic pricing

¹⁹ See Harrington (1984) for a deeper discussion of the competing hypotheses.

²⁰ Controlling for market rate regulation using a binary variable that identifies competitive (nontariff) and noncompetitive (tariff) markets has been a common practice in the insurance literature. See Harrington (1984) for similar examples.

equilibrium theory (e.g., Nicholson, 1995). Increases in demand, prior to adjustments in supply, may be accompanied by increases in price leading to higher market profitability in the short term. However, subsequent to supply-side adjustments, such profitability is expected to disappear due to competition in the marketplace. This scenario would be particularly acute during periods of rapid economic growth. The converse would also be true during periods of contraction in market demand. Thus, the impact of economy on profitability may be either positive or negative, depending on market conditions and how quickly supply is able to adjust. To control for this potential effect we include the per capita gross national product as a proxy for the health of a nation's economy (*ECON*).

Book-of-Business

Profitability may also vary significantly across various lines of insurance (Cummins, Denenberg, and Scheel, 1972; Cummins and Weiss, 1992; Chidambaran, Pugel, and Saunders, 1997). Although detailed data on an international basis do not allow for a line-by-line analysis, sufficient data associated with the auto insurance lines (traditionally the dominant line of insurance in terms of market share) allow us to control for a market's emphasis on that particular line of insurance.²¹ We include the auto lines market share (*LINE*) to control for the relationship this line of business shares with overall profitability. Given its role as a general control variable, we do not hypothesize a specific relationship with the dependent variable.

DATA AND EMPIRICAL METHODOLOGY

We obtain data from various sources. Premium and loss data are obtained from AXCO's *Global Statistics*, as well as collected from individual countries. Data on market share concentration and rate regulatory information are obtained from individual countries' regulatory bodies and/or insurance associations. IBC Index is provided by Political Risk Services. Data on the number of competitors are obtained from the OECD's *Insurance Statistics Yearbook*, as well as collected from the regulatory bodies and various insurance associations of individual countries. Interest rate, gross domestic product (GDP), and population data are from the *World Development Indicators*, published by the World Bank. Table 1 reports the basic statistics and summarizes the hypothesized relationships the independent variables share with market profitability.

Our sample contains unbalanced panel data covering 23 countries over the time period 1996–2003.²² The number of years included for each country ranges from 2 to 8, depending on data availability. Countries in our analysis include both developed and developing countries for a total of 116 observations. Figure 1 plots the relative market concentration–liberalization relationship for these 23 countries using 2002 data.²³

²¹ As reported by Swiss Re (1998), auto lines of insurance typically dominate national insurance markets in terms of market share.

²² The countries in our sample include: Australia, Bulgaria, Chile, Czech Republic, Denmark, Germany, Hong Kong, Hungary, Ireland, Italy, Japan, Malaysia, Mexico, Norway, Peru, Poland, Slovakia, South Africa, South Korea, Spain, Switzerland, United States, and Venezuela.

²³ We use 2002 data because they include data for each of the 23 countries included in the analysis (other years lack the data for one or more countries).

TABLE 1
Descriptive Statistics and Hypothesized Relationship of Variables

Variable	Expected Signs	Mean	Standard Deviation	Minimum	Maximum
<i>PROFIT</i>		0.377	0.157	−0.273	0.714
<i>CR</i>	+	0.598	0.208	0.222	0.920
<i>COMPETITORS</i>	−	128.224	456.684	8.000	3764.000
<i>LIBERAL</i>	−	80.026	8.697	53.000	97.000
<i>REG</i>	±	0.353	0.480	0.000	1.000
<i>ELASTICITY</i>	−	−0.664	4.385	−22.588	10.489
<i>ECON</i>	±	9.067	1.034	7.341	10.582
<i>ER</i>	±	0.052	0.041	0.006	0.228
<i>ROI</i>	±	0.006	0.086	−0.723	0.127
<i>LINE</i>	±	0.465	0.136	0.200	0.750

Quadrant I comprises relatively open but noncompetitive markets. This quadrant is dominated by the presence of European nations, including a significant number of Eastern European markets. Quadrant II is less sparsely populated and includes four nations (Spain, Hong Kong, Germany, and the United States) that may be said to possess relatively open and highly competitive insurance markets. Quadrant III includes markets that may be described as being relatively protected and are noncompetitive. These markets represent an eclectic group of nations, lacking any overt overarching characteristics that might better explain their shared profile in this matrix. Among the countries included in this analysis, Malaysia is the lone representative of Quadrant IV. The Malaysian market may be described as being relatively closed but possessing a fair degree of competition. Although Figure 1 is limited to those nations that are included in our sample, a similar examination of a broader sampling of national markets reveals that the concentration–liberalization characteristics of those markets place most nations in either Quadrant I or III, a pattern also observed in Figure 1, suggesting that high levels of concentration is a frequently occurring characteristic. The least populated quadrant remains Quadrant IV; few national markets may be described as being competitive and relatively closed.

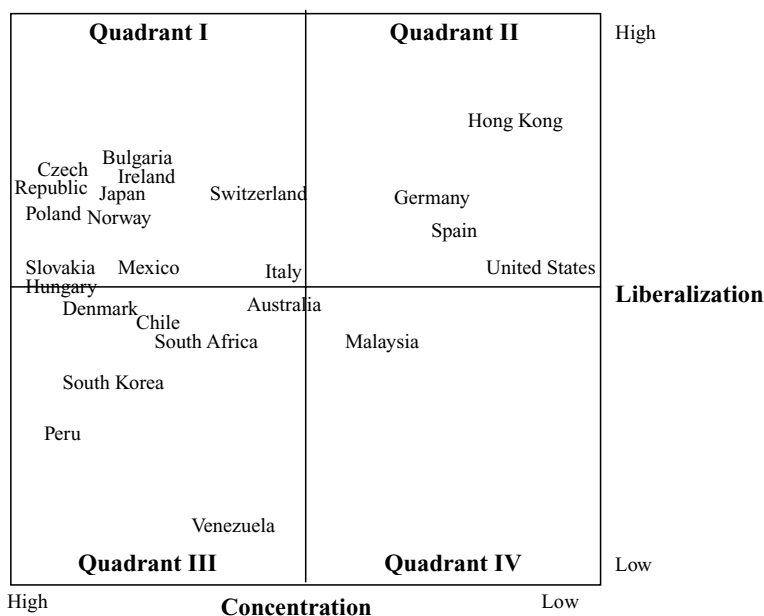
Given the cross-sectional and time-series data structure, we use two-way fixed-effect panel data models that control for country- and time-specific effects.²⁴ We estimate the models using White's (1980) consistent covariance matrix estimation to adjust for heteroskedasticity. It is reasonable to expect premiums from year to year to be correlated, and such correlations decline exponentially with time. Therefore, the covariance structure is assumed to follow a first-order autoregressive process $AR(1)$. The specification of a basic two-way fixed-effect models can be written as follows:

$$\begin{aligned}
 PROFIT_{i,t} = & \alpha_i + \lambda_t + \beta_1(CR)_{i,t} + \beta_2(COMPETITORS)_{i,t} + \beta_3(LIBERAL)_{i,t} \\
 & + \beta_4(CR*LIBERAL)_{i,t} + \beta_4(REG)_{i,t} + \beta_5(ELASTICITY)_{i,t} \\
 & + \beta_6(ER)_{i,t} + \beta_7(ROI)_{i,t} + \beta_8(ECON)_{i,t} + \beta_9(LINE)_{i,t} + \varepsilon_{i,t}, \quad (7)
 \end{aligned}$$

²⁴ Hausman's test rejects the null hypothesis of nonfixed effects. Partial F -test confirms that two-way fixed-effect models are superior to one-way fixed-effect models.

FIGURE 1

Market Concentration and Liberalization Matrix



where *PROFIT* is one minus the market average loss ratio of nonlife lines;²⁵ *CR* is market concentration, as measured by the percentage of premiums written by top five nonlife insurers; *COMPETITORS* is the number of market competitors; *LIBERAL* is the barriers to market entry, as measured by the IBC Index; *REG* is rate regulation, which equals 1 if tariff market, 0 otherwise; *ELASTICITY* is the price elasticity of demand, as measured by the percentage change in insurance density upon 1 percentage change in insurance price; *ER* is the expense ratio, as measured by the percentage of market premiums in liability lines; *ROI* is the market interest rate; *ECON* is natural log transformation of GDP per capita; *LINE* is the percentage of market premiums in auto lines; α_i are country-specific intercept terms; λ_t are year control terms; and $\varepsilon_{i,t}$ are random error terms.

In the model that assumes *AR*(1) for the error structure, the random error terms $\varepsilon_{i,t}$ are defined as $\rho\varepsilon_{i,t-1} + e_{i,t}$, where ρ represents first-order correlation and e represents random error terms.

EMPIRICAL RESULTS

The results of the empirical analysis are reported in Table 2 where two models are presented. Model 2 assumes an *AR*(1) as a covariance structure of error terms whereas Model 1 does not make that assumption. Both models incorporate White's (1980) robust estimations, and the key results using different model structures are consistent

²⁵ This measurement is best suitable for measuring underwriting profitability.

TABLE 2
Parameter Estimates from Fixed-Effects Panel Data Models

Variable	Model 1		Model 2	
	Two-Way Fixed Effects		Two-Way Fixed Effects With AR(1) Error Structure	
	Coefficient	Standard Errors	Coefficient	Standard Errors
<i>INTERCEPT</i>	−2.632***	0.995	−2.751***	1.157
<i>CR</i>	2.869***	0.827	3.173***	1.195
<i>LIBERAL</i>	0.021***	0.007	0.023***	0.007
<i>CR*LIBERAL</i>	−0.034***	0.010	−0.038***	0.013
<i>COMPETITORS</i>	−0.001	< 0.001	−0.001**	< 0.001
<i>REG</i>	0.061	0.073	0.063	0.044
<i>ELASTICITY</i>	0.001	0.002	0.001	0.002
<i>ECON</i>	0.258**	0.105	0.252***	0.098
<i>ER</i>	−0.119	0.892	−0.200	0.445
<i>ROI</i>	−0.266**	0.133	−0.277**	0.113
<i>LINE</i>	−1.115***	0.340	−1.153***	0.337
<i>R</i> ²	0.746		0.746	
−2 Log likelihood	−260.1		−262.0	

Note: Time- and country-specific intercepts are omitted from the table. Standard errors are included in the parentheses below coefficients. ** and *** indicate statistical significance at the 5% and 1% levels, respectively.

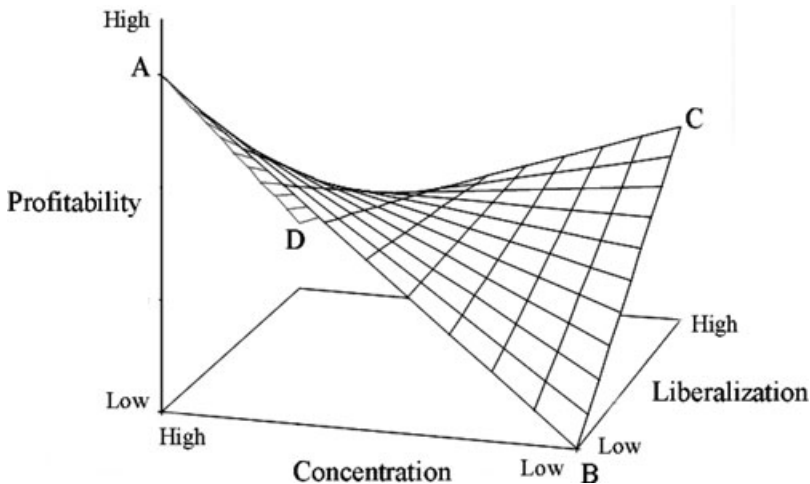
with one another. The coefficients of key variables, *CR* and *LIBERAL*, are both statistically significant with positive signs, and the interaction terms of these two variables are negatively significant in both models.

Pursuing these results, we use the coefficients from Model 1 to illustrate the marginal effects of market concentration (*CR*) and liberalization (*LIBERAL*) on market profitability (Figure 2). The figure relates national market's profitability with its competitive profile (as defined by a coordinate location on the concentration–liberalization plane).²⁶ This 3D graph allows us to visualize the changing relationship between market concentration and profitability at various levels of market liberalization. In interpreting Figure 2, it is important to note that the results are derived from static data, and therefore, these results do not associate *changes* in market's profitability with *changes* in a market's competitive profile; the analysis does not account for the numerous factors that might be associated with a change in a national market's profile, e.g., the costs associated with changing a market's location on the concentration–liberalization plane. Rather, the figure is derived from “snapshots” of country competitive profiles and their associated levels of profitability.

²⁶ Corner A represents a market profile where the liberalization level is low and market concentration is high. Corner B represents a market profile where both market concentration and the level of liberalization are low. Corner C represents a market with high level of liberalization and low level of market concentration, and Corner D represents a market profile where both liberalization and market concentration are high.

FIGURE 2

Marginal Effects of Concentration and Liberalization on Market Profitability



Examining the relationship shared by market concentration and profitability, in light of differing degrees of liberalization, we found that the relationship is not consistent across varying levels of liberalization. When a country has low level of liberalization, concentration and profitability share a positive relationship, a finding that supports the *SCP hypothesis*. The axis that is defined by Corners A and B in Figure 2, where levels of liberalization are the lowest, most clearly reflects such relationships. However, as levels of liberalization increase, the strong positive relationship between market concentration and profitability weakens (as predicted by Bain, 1956, and Stigler, 1964)—as evidenced by the gradual flattening of the slope of the profitability plane in Figure 2 as one moves from the front edge of the figure to the back. A major implication that can be derived from these findings is that higher levels of foreign insurer presence, associated with higher levels of market liberalization, creates a significantly differing set of market dynamics—dynamics that contradict traditional SCP hypothesis expectations. At the highest levels of liberalization (the axis defined by Corners D and C) the relationship shared by market concentration and profitability has actually become slightly negative, agreeing with the findings of Jacquemin, de Ghellinck, and Huveneers (1980) and Clarke (1984) in their investigations using manufacturing sector data. Thus, although a positive relationship is found between market concentration and profitability when the level of liberalization is low, at high levels of liberalization the relationship is reversed. Choi's (2005) findings that foreign insurers operating in the U.S. marketplace employ a strategy of price competition (thereby sacrificing profitability) in order to grow market share may be a possible explanation for this relationship.²⁷ If his findings can be extrapolated to the broader international markets and foreign insurers participate in highly concentrated markets as leaders, one could expect reduced overall market profitability, such as that associated with Corner D.

²⁷ Similar findings in the U.S. banking sector were found by Seth (1992), Nolle (1995), and DeYoung and Nolle (1996).

With respect to the remaining control variables, the number of competitors in the marketplace (*COMPETITORS*) was found to be negatively related to market profitability in Model 2, which is consistent with the hypothesis. The implication of the negative sign is that more competition drives down market profitability. The coefficients associated with the strength of the economy (*ECON*) were positively significant in both models. These results may be explained by the significant economic expansion on a global basis during the time frame in which this analysis was performed (World Bank, 2007). We also found the coefficients of return on investment (*ROI*) to be negatively significant. These results support the irrational markets hypothesis (Venezian, 1985) that expects a negative relationship between underwriting profitability and rates of return in the marketplace when insurers engage in cash flow underwriting.²⁸ The book-of-business distribution variable (*LINE*) was also found to be negatively significant, which suggests that countries with a greater percentage of market premiums in auto lines have lower profitability. The three remaining control variables, rate regulation (*REG*), price elasticity of demand variables (*ELASTIC*), and the expense ratio (*ER*), were not found to be statistically significant.

SUMMARY

This research investigates the market concentration–profitability relationship within the international nonlife insurance marketplace. The analysis takes place at the national market level, and special attention was given to the interactive relationship shared by market concentration and liberalization as it relates to market profitability. Our results show that the effect of market concentration on insurance market profitability varies depending on the level of market liberalization. We found support for the expectation that high barriers to entry for foreign competitors facilitate the ability of a concentrated marketplace to engage in collusive behavior.

These findings will have special significance for both national policymakers and market competitors. Although the implications associated with short-term change in market structure have not been explicitly controlled in this analysis, policymakers can use these findings to develop long-term policy strategies for market development. After a shift in market structure has been institutionalized and the short-term disruption costs absorbed by the market, it is reasonable to expect profitability levels similar to those predicted by this analysis. Similarly, once formal policies have been revealed, market competitors (both domestic and foreign) can anticipate the future competitive character of the marketplace and develop strategic plans accordingly. As more detailed international data becomes available, especially when related to the character of foreign insurer participation in national markets, significant additional investigation will be possible and warranted.

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²⁸ The topic of cash flow underwriting has been extensively addressed in the literature (e.g., Cummins and Outreville, 1987; Lamm-Tenant and Weiss, 1997).

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