Profit and Concentration in Commercial Automobile Insurance Lines

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Abstract: Pricing of commercial insurance has generally been thought to be more competitive than that of personal insurance. For this reason, there has been little academic interest in the impact of market structure on insurer profitability for these lines, despite findings of such a relationship in other lines. This study examines whether such a relationship exists for commercial automobile insurance and finds that states with higher levels of concentration have higher average profit margins. This is consistent with the results of Bajtelsmit and Bouzouita (1998) on market structure and performance in personal auto lines. Other variables that are important determinants of profitability include the direct writers' share of the market, state-wide productivity growth, and lagged interest rates.

INTRODUCTION

Despite the large number of insurers in the United States, there are often a relatively small number doing business in particular geographical markets[1] and many firms form strategic alliances with other insurers in order to improve their competitive position.[2] Markets with fewer producers are sometimes more heavily regulated to ensure adequancy of price, quality, and service to consumers. Although the McCarren-Ferguson Act exempts insurance companies from federal antitrust laws, there has been increasing support for repeal of this law in favor of the application of federal antitrust law to the business of insurance. Recent

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availability and affordability problems in certain lines of insurance have caused legislators to question the competitiveness of the marketplace, resulting in several Congressional proposals for repeal of the insurance antitrust exemption. Thus far, none of these initiatives have been successful, and the industry response to these allegations has emphasized the large number of insurers in the market. The purpose of this study is to examine the relationship between market concentration and profitability for commercial automobile insurance, which accounts for approximately seven percent of all property and casualty insurance premiums written. The results of this study should prove valuable to industry professionals and to state and federal policy-makers as they consider alternative legislative actions.

The next section of this paper reviews the relevant literature and the theoretical underpinnings of the relationship between market structure and performance. The third section describes the data and empirical methodology, followed by a summary of the results of the estimation. Conclusions and policy implications are provided in the final section of the paper.

THEORETICAL BACKGROUND

Oligopoly power is generally defined as the power of a few firms to control market prices or exclude competition. The number of firms that are necessary to ensure competitiveness of the market depends on many factors, including whether a market is national or local, whether there are significant economies of scale or scope, and whether there are substitute products. As the U.S. economy has developed, it has become easier for firms to advertise to wider audiences and for consumers to access information on financial products.

Due to the greater likelihood of "arms length" transactions in commercial markets, concerns about the relationship between market structure and performance in financial services have usually been directed at individual consumer products such as banking services and personal insurance lines. In contrast, commercial insurance has often been assumed to be more competitive, owing to the greater business knowledge of the buyers, and therefore the market has not been subject to as much scrutiny. Consistent with this line of reasoning, Carroll (1993) finds that in worker compensation lines, state market structure does not have a significant impact on prices. However, recent evidence of a positive relationship between concentration and profitability in personal lines suggests that closer examination of this issue is warranted (Bajtelsmit and Bouzouita, 1998).

The theory of industrial organization implies that higher levels of concentration will tend to imply greater profitability for firms in the

market. Although this has generally been the justification for antitrust legislation, there are two competing explanations for this relationship, only one of which implies anticompetitive behavior on the part of firms. The structure-conduct-performance (SCP) paradigm suggests that when the number of firms in a market is small, collusion among firms will be possible and oligopoly pricing will lead to higher profits. Although sharing of price information is illegal under federal antitrust law, insurers are not subject to this restriction.

An alternative explanation for the relationship between concentration and profit, termed the Efficient Structure (ES) Hypothesis (Demsetz, 1973), is that if large firms are more efficient (i.e., have lower costs), then concentration will be inevitable in a competitive market since lower prices charged by the larger firms will drive out the less efficient firms. Since greater efficiency also implies higher profit margins, unless all efficiency gains are passed on to consumers, this suggests that an observed positive relationship between concentration and profit is not necessarily evidence of collusive behavior. In fact, overly restrictive antitrust laws may reduce efficiency of the marketplace and result in higher prices for consumers.

The methodology outlined below is designed to determine whether the profit margin for commercial automobile insurance lines is affected by concentration in state product markets. If such a relationship exists, it may be evidence that large firms have cost advantages over small firms or it may be evidence of a non-competitive environment in the more concentrated states.

DATA AND METHODOLOGY

The theoretical relationship between state concentration and profitability, discussed in the previous section, can be written as:

$$\text{Profit Margin}_s = \alpha + \beta_1 (\text{Concentration}_s) + \Sigma_{j=2 \text{ to } n} \beta_j X_{sj} \qquad (1)$$

where $X_{s2} \ldots X_{sn}$ are control variables for market and state characteristics. Although some studies have examined this relationship using aggregated national data, this type of analysis is more appropriately done at the state level.[3] While it is true that commercial insurance is bought by both local and national companies, it is still likely that companies will purchase commercial automobile insurance locally to ensure adequacy of service in the event of accidents.

The profitability of commercial auto insurers π in state s and year t is estimated by applying the model in equation (1) to develop the following empirical specification:

$$\pi_{st} = \alpha + \beta_1 HERF_{st} + \beta_2 DWMS_{st} + \beta_3 DELAY_{st} + \beta_4 GSP_{st} + \beta_5 LAGINT_{st} + \beta_6 MCR_{st} + \beta_7 WAGE_{st} + \beta_8 RATEREG_{st} + \beta_9 NF_{st} + \varepsilon_{st} \quad (2)$$

where

π_{st}	=	profit margin in state s and year t, measured as the ratio of premiums earned (adjusted for policyholder dividends) minus losses incurred to premiums earned,
$HERF_{st}$	=	Herfindahl index of concentration measured as the sum of all insurers' squared market shares of premiums written in state s for year t,
$DWMS_{st}$	=	direct writers' market share of premiums written,
$DELAY_{st}$	=	the extent to which the firm is able to delay paying losses, measured as the ratio of losses unpaid to losses incurred,
GSP_{st}	=	growth in state domestic product from year t – 1 to year t,[4]
$LAGINT_{st}$	=	one-period lagged yield on intermediate-term government bonds,
MCR_{st}	=	minimum capital requirements for multiple line property-liability insurers,[5]
$WAGE_{st}$	=	average wage for employees in the industry in state s in year t,[6]
$RATEREG_{st}$	=	rate regulation, a binary variable equal to 1 if competitive, 0 if non-competitive,[7]
NF_{st}	=	no fault, a binary variable equal to 1 if the state has no-fault laws, 0 otherwise,
ε_{st}	=	error term for state s in year t, assumed to follow normal regression assumptions.

Descriptive statistics for all the variables used in this estimation are provided in Table 1. The dependent variable is state profit margin, defined as the ratio of aggregate premiums earned in the state, adjusted for policyholder dividends, minus losses incurred, divided by premiums earned. Measuring profit in this way, although common in insurance studies because of state-specific data limitations, does not account for expenses or investment income. This limitation necessitates inclusion of several control variables, discussed below, that proxy for hypothesized differences in these factors by state.

The independent variables include state-specific and market-specific factors. The Herfindahl index (HERF), which can range from 0 to 1, mea-

Table 1. Descriptive Statistics, Commercial Automobile Insurance Lines, 1984–1992

Variable	Mean	Std. dev.	Minimum	Maximum
Combined lines				
Profit	0.3489	0.1538	–0.2832	0.7416
Herfindahl Index	0.0835	0.0716	0.0207	0.5084
Direct writer share	0.2208	0.0527	0.0601	0.3588
Delay	1.4397	0.3934	0.3865	2.9437
Liability line				
Profit	0.2848	0.1897	–0.6176	0.9680
Herfindahl Index	0.0898	0.0757	0.0220	0.5070
Direct writer share	0.1897	0.0481	0.0540	0.3204
Delay	1.8263	0.5253	0.9348	7.3056
Physical damage line				
Profit	0.4932	0.1424	–0.0805	0.8269
Herfindahl Index	0.0878	0.0765	0.0220	0.6089
Direct writer share	0.2904	0.0844	0.0499	0.5995
Other control variables				
Min. capital req.	2316	1386	200	6000
Rate regulation	0.5200	0.5001	0	1.00
No-fault	0.4777	0.5000	0	1.00
Lagged interest rate	0.0942	0.0131	0.0814	0.1199
Wage	26941	5420	15138	52584
Δ Gross state product	6.4550	4.0557	–16.767	16.083

sures the extent of state concentration, with a higher index implying that fewer firms control the market in the state. The state concentration ratios for commercial automobile liability insurance range from .022 to .507, indicating fairly wide differences in competition by state.[8] The alternative three-firm, four-firm, or five-firm concentration ratios that are sometimes employed in studies of market structure, while requiring less data to calculate, are inferior to the Herfindahl Index in that they focus only on a few large firms in the state while ignoring other aspects of the market that may be important to the analysis. In the calculation of HERF variables for each state, groups of affiliated companies are treated as a single firm.

The minimum capital requirement in each state (MCR) is included to proxy for barriers to entry that are often associated with higher concentration levels. Significant barriers to entry can make it easier to sustain

abnormal profits in an industry since they make it more costly and difficult for other firms to enter and charge lower prices to capture market share. Barriers to entry are thus any costs borne by entrants but not by existing firms in the market, including regulatory requirements, economies of scale, and other cost advantages such as experience with vendors or product differentiation advantages.[9] The direct writer market share, the existence of no-fault laws, growth in state domestic product, and the average state wages are included as controls for state differences in expenses that might influence the dependent variable measurement of state insurer profitability. Since direct writers market their policies using a salaried sales force and generally have lower expense ratios than firms using an independent agency system,[10] the direct writers' share of the market (DWMS) is expected to be positively related to profit margin in the state.

The existence of a no-fault law in the state (NF) is expected to be negatively related to pre-expense profit. No-fault has been shown to result in reduced litigation and lower operating expenses for insurers, particularly where the law restricts pain and suffering damages (Cummins and Weiss, 1991; Johnson et al., 1992). Growth in state domestic product (GSP) is a proxy for unobservable demand factors. In states that have been experiencing economic growth, there will be more new businesses and therefore more new policyholders. To the extent that it is more difficult to correctly rate new policies, insurers will be more likely to experience adverse selection–related losses in the early years of their customer relationships. It is therefore expected that higher growth will be associated with smaller underwriting profits.

State cost differentials may also impact operating expenses. For example, since the insurance industry is labor intensive, the average wage for insurance company workers in the state (WAGE) is included to control for differences in marginal costs across states. The impact of higher wages is not entirely obvious since the dependent profit margin variable is pre-expenses. Since all firms would be subject to these costs, it is possible that wage differentials would be passed on to customers, which would imply that pre-expense profit would be higher in that state. However, if higher wages are simply a proxy for overall cost factors in the state, both premiums and losses may be elevated in that state and the ultimate impact on profit margin is uncertain.

As in the case of expenses, investment income is not considered in the profit measure due to the lack of availability of this information by state. Underwriting profit is expected to be negatively related to the lagged interest rate (LAGINT) because of present-value effects. When interest rates are high, the present value of expected losses declines and insurers are able to charge lower premiums. Although underwriting profits (premi-

ums minus losses) in the following year will be lower, this difference will be made up in higher investment income. Another factor that may cause underwriting profits to appear larger is related to the time between incurring losses and payment of claims. Delay of claims payment (DELAY) is most likely to result from an inefficient state judicial system or a highly litigious environment, but it also can be due to intentional acts on the part of state insurers. In either case, the delay should have a positive impact on profitability because of the lower present value of the expected loss.

Theoretically, the effect of rate regulation (RATEREG) depends on whether the state political environment favors insurers or consumers. If the insurance industry lobby is more powerful, Stigler's (1971) "capture theory" implies that regulators will be pressured to set rates at levels that favor the industry, indicating higher profit margins. Alternatively, if commercial insurance purchasers have greater legislative clout, Peltzman's (1976) "political support theory" suggests that rates would be set at lower levels and insurer profit margins would be lower. Although previous research on personal auto lines did not find rate regulation to have a significant impact on profitability (Bajtelsmit and Bouzouita, 1998), the analogy to commercial lines is not clear. Purchasers of commercial insurance are generally better informed and more likely to shop for the best rates than are individuals. Thus, since pricing is of critical importance in a more competitive market, insurers may have more to gain by lobbying for rate increases in those lines.

Equation (2) is estimated for the pooled cross-section and time-series data set (50 states over the period 1984–1992) using an error components model where the error term for state s in year t is of the form $\varepsilon_{st} = \mu_s + \upsilon_{st}$.[11] Although equation (2) is estimated separately for commercial auto liability and for commercial auto physical damage lines, it is also estimated with aggregated data to account for the possibility of cross-subsidization between lines.

RESULTS

The estimation results reported in Table 2 provide evidence of a strong positive relationship between state concentration and profitability in commercial automobile insurance for both liability and physical damage lines. Most of the control variables used in the estimation are significant and have the expected sign. States with larger percentages of direct writers have higher average profit margins. However, since profit margin is measured before expenses, this does not necessarily imply that direct writers produce cost advantages. The change in gross state product has a negative effect.

Table 2. Random Effects Estimates of Profit Concentration Relationship Commercial Automobile Insurance Lines, 1984–1992

Dependent variable = [premiums earned (adjusted for dividends) – losses incurred] / premiums earned

Independent Variables	Liability parameter estimates (t-statistics)	Physical damage parameter estimates (t-statistics)	Combined lines parameter estimates (t-statistics)
Intercept	0.4523	0.8245	0.4566
	(4.258)[c]	(8.571)[c]	(4.433)[c]
Herfindahl Index	0.3582	0.2837	0.3539
	(3.267)[c]	(3.016)[b]	(3.630)[c]
Direct writers' share	0.7046	0.1960	0.7415
	(3.533)[c]	(2.062)[b]	(4.490)[c]
Delay	0.1428	N.A.	0.1076
	(9.939)[c]		(5.301)[c]
Δ Gross state product	–0.0094	–0.0088	–0.0091
	–(5.774)[c]	(–5.933)[c]	(–6.723)[c]
Lagged interest rate	–4.7257	–4.2843	–3.6619
	(–7.888)[c]	(–7.564)[c]	(–6.743)[c]
Min. capital req.	-0.362×10^{-5}	0.7124×10^{-5}	0.2425×10^{5}
	(–0.042)	(1.153)	(0.3065)
Wage	-0.3416×10^{-5}	0.1232×10^{-5}	-0.2097×10^{-5}
	(–1.773)[a]	(0.791)	(–1.279)
Rate regulation	0.0449	–0.0044	0.0274
	(1.746)[a]	(–0.255)	(1.137)
No–fault	–0.0385	N.A.	–0.0317
	(–1.577)		(–1.401)
Adjusted R^2	0.4431	0.2893	0.4105
Hausman test	19.1688	14.2255	17.8408
Probability	0.014	0.0272	0.0225

[a]significant at the 10% level
[b]significant at the 5% level
[c]significant at the 1% level

As in the case of workers' compensation, rate regulation and no fault laws are not significant factors in profit margin for commercial auto insurers. This result is contrary to the results for personal auto lines found in Bajtelsmit and Bouzouita (1998). The time value of money is seen in the positive effect of delaying claims payment and the negative effect of higher interest rates.

CONCLUSIONS AND POLICY IMPLICATIONS

Pricing of commercial insurance has generally been thought to be more competitive than that of personal insurance. For this reason, there has been little academic interest in the impact of market structure on insurer profitability for these lines, despite findings of such a relationship in other financial services. This study examines whether such a relationship exists for commercial automobile insurance and finds that states with higher levels of concentration have higher average profit margins, measured as premiums earned (adjusted for policyholder dividends) less losses incurred divided by premiums earned. This is in accord with Bajtelsmit and Bouzouita's (1998) study of market structure and performance in personal auto lines.

The profit-concentration relationship is consistent with either of two explanations. If large insurers have significant cost advantages over small insurers, because of economies of scale or scope, capacity, service provision, or other factors, the efficient structure hypothesis suggests that these efficiencies would tend to increase the optimal size of financial intermediaries. The trend in the last two decades, possibly due to competition from large global institutions, has been to increase the size and product offerings of financial institutions in the United States. The empirical relationship observed in this market is consistent with a natural-selection process leading to a smaller number of efficient firms.

The alternative explanation for these results is that the observed relationship between profit and concentration is evidence of a non-competitive business environment. Such a finding could imply that stricter antitrust restrictions on insurers, whether at the state or federal level, would be justified. Further investigation of insurance prices will be necessary to determine whether higher underwriting profits in more concentrated states reflect lower costs or higher premiums.

NOTES

[1] More than half of all auto insurance is sold by only ten companies (I.I.I., 1997). In less populous states, such as Alaska, there are fewer companies doing business, and a larger

percentage of the market is controlled by a small number of insurers.

[2]In 1995, there were more than three thousand property and casualty insurers in the United States, according to the Insurance Information Institute (1997), but the number of affiliated groups was about half that number. For a discussion of the reasons for forming strategic alliances, see Graves (1994).

[3]Chidambaran et al. (1997) and Joskow and McLaughlin (1991) suggest that the more appropriate unit of measurement for insurance studies is the national rather than state market. However, this argument is more convincing for purely financial contracts such as life insurance and annuities, or where the proof of loss is not in question. In such cases, it could be argued that consumers would be more concerned with price and less with service aspects of the contract, such as claims adjusting.

[4]Data are taken from the National Economic, Social, and Environmental Data Bank, U.S. Department of Commerce (August 1995).

[5]Information on minimum capital requirements by state was obtained from the National Association of Insurance Commissioners.

[6]The WAGE data represent the reported average wage by state for SIC classification 6331 (fire, marine, and casualty insurance) from County Business Patterns for the years in question.

[7]States with file-and-use, use-and-file, or no regulation of commercial automobile insurance rates are classified as competitive regulatory environments. Non-competitive regulation includes prior approval, modified prior approval, and file-and-use with bureau adherence. The data were obtained from the National Association of Insurance Commissioners.

[8]The inverse of the ratio provides an estimate of the number of equal-sized firms that would produce an equivalent ratio. For example, a Herfindahl of .022 would imply 45 equal-sized insurers (not very concentrated), whereas a Herfindahl of .507 would be equivalent to two equal-sized insurers in the state (very concentrated). The range of state Herfindahls in the personal automobile insurance study as reported by Bajtelsmit and Bouzouita (1998) was from .049 to .914.

[9]See Tirole (1990) and Scherer and Ross (1990) for a general discussion.

[10]For further discussion, see Cummins and VanDerhei (1979) and Barrese and Nelson (1992).

[11]Variance inflation factor tests for multicollinearity were negative. Tests for outliers indicated only one observation with a high residual. Elimination of this observation did not significantly alter the results of the model. The Hausman test was used to test for cross-sectional effects. For all three models, we reject the null hypothesis that var (μ_s) = 0, indicating that there are state-specific effects.

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