Advertising Intensity in the U.S Property and Liability Insurance Industry: Market Power or Profits?

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Abstract

This study aims to investigate the conduct of the U.S. Property and Liability insurers on the market in relation to the structure-conduct-performance (SCP) paradigm. Advertising activities constitute the conduct of the industry and the relationship between advertising intensity and market structure is empirically tested over 14-year period. The results indicate a positive and non-significant relation between concentration and advertising and a negative and significant relation between performance and advertising. Thus, the conduct as measured by advertising intensity does not provide an additional value to the performance of insurers in this highly competitive market. These results are consistent with all three different types of concentration measures in two different profit equations.

I. Introduction and Purpose

Insurance industry is one of the largest financial sectors with over $5 trillion in assets. Insurance companies use different marketing channels to attract their customers in this competitive market. The property and liability (P/L) insurance industry spent over $6 billion in advertising, and its ratio of advertising to premium accounts for 2.27% in year 2013 (SNL Financial, 2014). According to data compiled by SNL Financial, the lead advertiser spent $1.18 billion or $6.7 on advertising for every $100 of premium they wrote in year 2013.

The general concern about the advertising issue is whether insurers operate efficiently, profitably, and safely, and, whether they expose the industry to excessive risk. The never-ending advertising competition changes the market structure and the performance of the insurers in the P/L insurance market. Especially, an insurer would like to achieve its brand's long-run competitive position or short-run market share increase.

The structure-conduct-performance (SCP) paradigm suggests that performance of the industry is affected by the conduct of the participants in the market, which is influenced by the companies' market structure (Bain, 1951 and Stigler, 1964). That is, the SCP hypothesis suggests a positive relationship between performance and concentration. (Performance is typically measured as price or profit.) Weiss (1974) argues that market concentration may foster collusion among firms in the market since higher concentration lowers the cost of collusion, resulting in monopoly rents. In other words, market structure affects a firm's conduct and determines the profits of the firm. Consequently, the traditional SCP hypothesis and some existing structure-performance studies provide an argument for antitrust policy prohibiting actions leading to a reduced number of viable competitors.

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Advertising activities constitute the conduct of the industry and the relationship between advertising intensity and market structure had been a debate for long periods of time (Leahy, 1997, Lee, 2002, Nazari and Tajdini, 2011, and Hong and Li, 2017). Related to this issue, this study is interested in finding performance effect and market concentration in the U.S. property and liability insurance industry. That is, whether advertising generates profit by spending more or they take share from other competitors to grow in the market. Economic theory suggests that profit margins are higher in concentrated market (Ramaswamy et al., 1994, Berger, 1995, and Lipczynski and Wilson, 2001).

Insurers can increase their market share in two principal ways: by achieving superior efficiency and providing broader and higher quality services (efficient market structure), or by lowering prices below competitive levels, even at their own loss in order to attract new customers. Under the former strategy, consumers are likely to benefit from a wider set of products and more favorable prices. Under the latter approach, however, aggressive insurers would exercise price undercutting and would take unwarranted risks, in order to drive out their competitors. In this scenario, regulators must take steps to limit the insolvency risk faced by those insurers and to maintain a level playing field. Hence, it would be useful to determine which of these two strategies is the dominant mode of operation in the U.S. property and liability insurance industry and how the relative efficiency of those insurers enters the picture. To this end, the current study aims to investigate the conduct of the P/L insurers on the market. A study shows that advertising intensity do affect firm efficiency (Choi and Weiss, 2005).

The results of this paper are of interest to insurers, regulators, consumers, investors in insurance stocks, and academicians. Since there have been no prior studies on the impact of advertising of P/L insurers in the U.S. market structure, the findings here can shed new light on the relative performance and risk of these firms caused by advertising.

II. Data and Methodology

Performance data are from the National Association of Insurance Commissioners (NAIC). Annual Statements from NAIC are used to calculate the changes in the market shares of the P/L U.S. insurers. From this potential sample, insurers with negative values of surplus, assets, premiums, inputs, or outputs are deleted to conduct a meaningful empirical test. After applying the selection criteria, we have a sample with 24,788 firm-years of data for the 1999-2013 period. Insurers are allowed to enter and exit the U.S. market over the sample period in order to avoid problems associated with survivor bias for the regression test.

The following model is designed to examine the association between advertising intensity and market concentration and profitability, including insurer characteristics and three dummy variables:

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\begin{aligned}
\text{Advertising Intensity}_{it} = \alpha_0 &+ \beta_1 \text{Concentration}_{it} + \beta_2 \text{Profitability}_{it} + \beta_3 \text{Assets}_{it} + \beta_4 \text{Investment}_{it} \\
&+ \beta_5 \text{Leverage}_{it} + \beta_6 \text{Reinsurance Utilization}_{it} + \beta_7 \text{Personal Lines}_{it} \\
&+ \beta_8 \text{Business Diversification}_{it} + \beta_9 \text{Geographic Diversification}_{it} + \beta_{10} \text{Group Dummy}_{it} \\
&+ \beta_{11} \text{Stock Dummy}_{it} + \beta_{12} \text{Agent Dummy}_{it} + \beta_{13} \text{Hard Market Dummy}_{it} + \varepsilon_{it} \qquad (1)
\end{aligned}
$$

In this model, the *Advertising Intensity* is measured as a ratio of advertising expenses over premiums written, subscript *i* represents the *i*th insurance company, *t* is a time index, and ε_{it} is a random error term with zero mean and a constant variance. Two key independent variables are *Concentration* and *Profitability*. Consistent with many industrial organization studies, the Herfindahl index is used to measure market concentration in the P/L insurance industry.[1] The Herfindahl index is defined as the sum of the squared market share of each insurer in the US market. Market share is defined as the proportion of total premiums accounted for by insurer *i* in total market at time *t*, and is computed based on direct premiums written. Two other Concentration variables are used to check the robustness of the model. Market shares by top three insurers (Concentration Top3) and markets shares by the top five insurers (Concentration Top5) are analyzed in different models. A conventional return on equity (ROE) is used for the profit measure of insurers. In addition to this, *Profit Margin* is used in other set of models. *Profit Margin* is defined as one minus losses and loss expenses incurred over premiums earned[2].

The control variables follow the existing literature. They include asset size (Assets), Investment Ratio, Leverage, Reinsurance Utilization, Proportion of Personal Lines (Personal Lines), Business Diversification, Geographic Diversification, and dummies for membership in an insurance group (Group Dummy), stock vs. mutual organization (Stock Dummy), independent agency system vs. other distribution systems (Agent Dummy), and hard market vs. soft market (Hard Market Dummy).

Financial conditions of the firm are influenced by, among other factors, the size of the firm. Hence, total assets in logarithm form are used as a control variable in the model. Prior studies find that as size gets bigger scale economies decline (Cummins, and Weiss, 2000).

Investment ratio is defined as net investment income over premiums written. As it is the major business activities of insurance companies, investment income could impact on the advertising intensity and the testing model controls for the investment activities. It is expected that insurers with higher investment income are more likely spend on advertising. Since investment is one of the core business activities of insurers, it is essential to their overall financial performance. Insurers' asset portfolio and their ability and willingness to invest could affect the performance of the firm. It is expected to have a positive relationship between this variable and advertising if the insurers reflect increased investment as enhancing firm value. Otherwise, we expect a negative relationship if the market views the aggressive investment activities as a risky factor.

Next, we control for risk-taking behavior of insurers since risk is closely related to the decision of the level of capital holding. *Leverage* is used to identify the capital adequacy of an insurer and a Kenney ratio is obtained for this variable (Kenney, 1957, Cummins and Weiss, 1992, Cummins and Nini, 2002, Doherty and Phillips, 2002, and Klein et al., 2002). It is defined as the ratio of premiums written to surplus and is the most widely used leverage ratio in insurance. This ratio is used by the NAIC as an indicator of financial stability, where a higher value indicates that the insurer may have an insufficient cushion to absorb unexpected losses.

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[1] Stigler (1964) argues that the Herfindahl index is superior to the concentration ratio (e.g., four-firm concentration ratio) for measuring concentration to assess the likelihood of effective collusion.

[2] For more discussion and use of this price variable, refer to Winter (1994), Cummins and Danzon (1997), and Choi and Weiss (2005).

Therefore, as the Kenney ratio increases, the insurer's ability to cover unexpected losses is reduced. So, an increase in the Kenney ratio is associated with higher risk.

Reinsurance utilization (the ratio of reinsurance ceded to the sum of reinsurance assumed and direct premiums written) may affect the overall riskiness and efficiency of the insurer because it effectively expands the capacity of the firm to offer insurance services, stabilizes loss experience, and protects the firm from catastrophe. Effective use of reinsurance transaction can affect the revenues and costs due to better management and/or scale economies. Thus, reinsurance transactions are related to underwriting risk and capacity, and could affect advertising behavior.

The model also controls for the lines of business. Proportion of personal lines is defined as the proportion of personal lines to total insurance business written. This measure shows whether the insurer's focus is on a more standardized set of personal lines of products (less complexity), or in commercial line products (high complexity). The complexity variable reflects the effect of specialization in personal lines of business on advertising intensity. We expect to have a positive relation between this variable and advertising intensity since insurers tend to advertise more on personal lines than commercial lines.

We have two business diversification variables as control variables. First, the lines of business an insurer writes can affect the overall risk, performance of the firm, and advertising behavior. *Business Diversification* is measured using a Herfindahl index which is defined as

$$\sum_{i=1}^{34}\left(\frac{PW_i}{TPW}\right)^2 \qquad (2)$$

where PW_i is the value of premiums written in each line of business in the insurer's annual statement and *TPW* represents the insurer's total premiums written[3].

A higher value of the Herfindahl index indicates a more specialized (less diversified) company. The highest level of diversification (i.e., lower value) would indicate that the insurer's operation is well spread over various lines of business, while the lowest level of diversification (i.e., higher score) indicates the insurer's operation is fully devoted to single line of business. Insurers that specialize in a few lines may gain greater expertise in administering these lines leading to a positive relationship between diversification and advertising. On the other hand, it may be more difficult to achieve economies of scope or cross-sell business so that advertising intensity might be reduced for such an insurer. We used data on the lines of business in which the insurers were active to develop a measure of their product line concentration.

Another control variable related to the insurers' diversification strategy is the Herfindahl index of geographical operations (*Geographic Diversification*). This variable is calculated as follows:

$$\sum_{i=1}^{58}\left(\frac{PW_i}{TPW}\right)^2 \qquad (3)$$

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[3] We use the data in the NAIC annual statement – Underwriting and Investment Exhibit, Part 1B-Premiums Written.

where PW_i is the value of premiums written in each state and *TPW* represents the insurer's total premiums written. As in the line of business diversification, the higher value indicates that firms operate in one state or small number of states, while the lower value indicates higher diversification in terms of geographical operations. Insurers with greater diversification in product mixes or geographic mixes are expected to have a more diversified revenue flow and thus a greater stability in capital inflow from premiums.

Binary variables for group membership, organizational form, and agency, control for the effect of affiliation with an insurance group, mutual vs stock ownership, and agency character (independent agency vs direct writer system) on efficiency. They take the unit value if a company is a member of an insurance group, is a stock organization, or is an independent agent. Controlling for group membership allows for the differential efficiencies between group members and non-group members in insurance operations and marketing strategy.

Each organizational form is effective in solving specific incentive conflicts among the contractual parties (Mayers and Smith, 1994). In mutual organizations the conflicts between policyholders and owners are eliminated while the conflict between owners and managers is greater, since, among other things, managers of a mutual firm are monitored less than those of stock firms (Baranoff and Sager, 2003). Controlling for organizational form allows for the possibility of differing levels of advertising impact among stock and mutual firms. Insurance distribution systems are generally divided into two types; independent agency system, and direct writer system (e.g., Regan, 1997 and Seog, 1999).

Lastly, to reflect the business cyclical economic fluctuation, a cyclical variable is included in the testing model. The model controls for the underwriting cycle which exists in the property and liability insurance industry. The property-liability insurance industry is notorious for its underwriting cycles. An underwriting cycle is associated with several periods of increasing profitability followed by declines in profitability (e.g., Cummins and Danzon, 1997 and Weiss and Chung, 2004). It is expected to be negatively related to the dependent variable since insurance is relatively less available during the hard market period. It is also expected that this variable captures the riskiness of the firm at different points in the business cycle (see Bassett and Brady, 2002). Years 2000 ~ 2003 are assigned to a hard market and all other years are deemed to be a soft market (Hartwig, 2016).

III. Empirical Results

Table 1 presents summary statistics for our sample of insurers used for the regression model. Table 2 contains the information to test the hypothesis as in Equation (1) for the entire sample period with a profit variable (ROE). To capture the effects of different concentration variables, further testing models are estimated with Herfindahl Index (Model 1), Concentration Top 3 (Model 2), Concentration Top 5 (Model 3), and Market Share (Model 4). Results with the second profit variable (Profit Margin) are reported in Table 3 for the same models. No evidence of multicollinearity among variables is found. However, testing for heteroscedasticity shows that it exists in this sample, and so heteroscedastic-consistent estimators following the method of White (1980) are used.

Table 1 shows that U.S. property and liability insurance industry is highly competitive market with the Herfindahl index of 0.00866 on average during the sample period. In addition,

the three largest insurers own 12 percent of the market and the five largest firms control about 14.7 percent of the market, on average. So, overall, U.S. P/L insurance industry represents a relatively unconcentrated and fairly competitive market[4]. On average, the sample insurers return 2.68 percent on equity (ROE), while the mean of the profit margin (0.232) shows that every \$1 of premium sample insurers spend \$0.768 on losses and loss adjustment expenses. On average, insurers transfer their risks to reinsurers 42.5 percent of their total premiums written.

Table 1 also presents that sample insurers write about 38 percent in the personal lines and 62 percent in the commercial lines. Sample insurers are more likely members of a group (71.3 percent), are in stock form of ownership (71.7 percent) and utilize independent agency system, which is generally consistent with previous studies.

Table 1. Summary Statistics for Variables

Variables	Mean	Standard Deviation	Minimum	Maximum
Advertising Intensity	0.0086	0.0404	0.0001	1.2321
Herfindahl Index	0.0087	0.0008	0.0078	0.0106
Concentraion Top3[1]	0.1200	0.0098	0.1074	0.1420
Concentraion Top5[2]	0.1467	0.0109	0.1329	0.1698
Market Share	0.0005	0.0022	0.0000	0.0736
ROE	0.0268	0.3036	-9.9579	8.7867
Profit Margin	0.2319	1.2259	-61.5477	0.9999
Asset (log)	18.4018	1.9279	11.9440	25.7466
Investment Ratio	0.0356	0.0528	-0.6223	3.3865
Leverage	1.0368	1.0275	0.0000	39.8246
Reinsurance Utilization	0.4251	0.3075	0.0000	8.4612
Proportion of Personal Lines	0.3800	0.3763	0	1
Business Diversification	0.4774	0.3013	0.0840	1
Geographic Diversification	0.5546	0.3859	0.0307	1
Group Dummy	0.7131	0.4523	0	1
Stock Dummy	0.7167	0.4506	0	1
Agent Dummy	0.7877	0.4090	0	1
Observation	24,788			

[1]Market concentration ratio by the top three insurers

[2]Market concentration ratio by the top five insurers

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[4] E.g., top four market shares of the concentrated industries such as Search Engines, Wireless Telecommunications Carriers, and Tire Manufacturing are over 90 percent.

The results in Table 2 indicate that the coefficients on three concentration variables are not significant and that they are positive in Models 1~3. Thus, these results do not support the long-debated economic theory on the relationship between conduct and performance (see Leahy, 1997, Lee, 2002, Nazari and Tajdini, 2011, and Acar and Temiz, 2017 for more discussion).

The coefficients on Profit (ROE) are all significantly and negatively related to advertising intensity. These results indicate that insurers spending more on advertising do not gain additional advantages in this market. Those insurers spending more on advertising are negatively affected by the additional expenses on their financial statements.

Table 2. Advertising Intensity Regressions: ROE

Independent Variable	Model 1 Coeff.	Std. Err.		Model 2 Coeff.	Std. Err.		Model 3 Coeff.	Std. Err.		Model 4 Coeff.	Std. Err.	
Intercept	-0.0065	0.0050		-0.0060	0.0053		-0.0069	0.0056		-0.0070	0.0037	*
Herfindahl	0.1765	0.3803										
Concentration Top3				0.0088	0.0309							
ConcentrationTop5							0.0130	0.0279				
Market Share										-0.2719	0.1298	**
ROE	-0.0021	0.0009	**	-0.0021	0.0009	**	-0.0021	0.0009	**	-0.0021	0.0009	**
Asset (log)	0.0007	0.0002	***	0.0007	0.0002	***	0.0007	0.0002	***	0.0008	0.0002	***
Investment Ratio	0.0057	0.0049		0.0058	0.0049		0.0057	0.0049		0.0059	0.0049	
Leverage	-0.0006	0.0003	**	-0.0006	0.0003	**	-0.0006	0.0003	**	-0.0006	0.0003	**
Reinsurance Utilization	-0.0145	0.0009	***	-0.0145	0.0009	***	-0.0145	0.0009	***	-0.0144	0.0009	***
Personal Lines	0.0049	0.0008	***	0.0049	0.0008	***	0.0049	0.0008	***	0.0051	0.0008	***
Business Diversification	-0.0011	0.0010		-0.0011	0.0010		-0.0011	0.0010		-0.0011	0.0010	
Geographic Diversification	0.0062	0.0008	***	0.0062	0.0008	***	0.0062	0.0008	***	0.0061	0.0008	***
Group Dummy	0.0030	0.0007	***	0.0030	0.0007	***	0.0030	0.0007	***	0.0030	0.0007	***
Stock Dummy	0.0066	0.0006	***	0.0066	0.0006	***	0.0066	0.0006	***	0.0065	0.0006	***
Agent Dummy	-0.0041	0.0007	***	-0.0041	0.0007	***	-0.0041	0.0007	***	-0.0042	0.0007	***
Hard Market Dummy	-0.0013	0.0007	**	-0.0013	0.0007	*	-0.0013	0.0007	**	-0.0011	0.0006	*
Observations	24,788			24,788			24,788			24,788		
Adjusted R^2	0.0236			0.0236			0.0236			0.0238		

*** significant at 1% level, ** significant at 5% level, and * significant at 10% level.

Note: Standard Errors are heteroscedastic-consistent estimators following the method of White (1980).

The results from Table 3 show a similar outcome on three concentration variables. The relation between advertising intensity and market structure is positive but it is not significant.

Moreover, the results on the Profit Margin variable are turned out to have a negative and significant relation with advertising as well in Table 3. Thus, U.S. P/L insurers are not getting benefits from advertising in terms of underwriting profits during the sample period. Advertising may impact on the barriers to entry, but it was not statistically significant. Insurers in the U.S. market could not take an advantage of advertising in this highly competitive market.

Both Table 2 and Table 3 present that the coefficients on the Market Share variable are negatively related to advertising intensity. That is, insurers with higher market share tend to spend relatively less on advertising, while insurers with smaller market share spend relatively more on advertising to attract their customers.

Table 3. Advertising Intensity Regressions: Profit Margin

Independent Variable	Model 1 Coeff.	Std. Err.		Model 2 Coeff.	Std. Err.		Model 3 Coeff.	Std. Err.		Model 4 Coeff.	Std. Err.	
Intercept	-0.0049	0.0050		-0.0042	0.0053		-0.0051	0.0056		-0.0055	0.0037	
Herfindahl	0.1548	0.3800										
Concentration Top3				0.0063	0.0308							
Concentration Top5							0.0109	0.0279				
Market Share										-0.2711	0.1297	*
Profit Margin	-0.0013	0.0002	***	-0.0013	0.0002	***	-0.0013	0.0002	***	-0.0013	0.0002	***
Asset (log)	0.0006	0.0002	***	0.0006	0.0002	***	0.0006	0.0002	***	0.0007	0.0002	***
Investment Ratio	0.0047	0.0049		0.0048	0.0049		0.0047	0.0049		0.0049	0.0049	
Leverage	-0.0004	0.0003	*	-0.0004	0.0003	*	-0.0004	0.0003	*	-0.0004	0.0003	*
Reinsurance Utilization	-0.0148	0.0009	***	-0.0148	0.0009	***	-0.0148	0.0009	***	-0.0147	0.0009	***
Personal Lines	0.0049	0.0008	***	0.0049	0.0008	***	0.0049	0.0008	***	0.0051	0.0008	***
Business Diversification	-0.0013	0.0010		-0.0013	0.0010		-0.0013	0.0010		-0.0013	0.0010	
Geographic Diversification	0.0060	0.0008	***	0.0060	0.0008	***	0.0060	0.0008	***	0.0059	0.0008	***
Group Dummy	0.0029	0.0007	***	0.0029	0.0007	***	0.0029	0.0007	***	0.0028	0.0007	***
Stock Dummy	0.0065	0.0006	***	0.0065	0.0006	***	0.0065	0.0006	***	0.0065	0.0006	***
Agent Dummy	-0.0041	0.0007	***	-0.0041	0.0007	***	-0.0041	0.0007	***	-0.0042	0.0007	***
Hard Market Dummy	-0.0014	0.0007	**	-0.0013	0.0007	*	-0.0014	0.0007	**	-0.0012	0.0006	**
Observations	24,788			24,788			24,788			24,788		
Adjusted R²	0.0250			0.0250			0.0250			0.0251		

*** significant at 1% level, ** significant at 5% level, and * significant at 10% level.

Note: Standard Errors are heteroscedastic-consistent estimators following the method of White (1980).

Similar results are found on other control variables in Tables 2 and 3. Assets size is positively and significantly related to advertising intensity in all models. Thus, for the insurance

industry, the larger size of firms spend relatively more advertising. Investment ratio shows no significant relation to advertising.

Leverage is negatively related to advertising for the all groups, indicating that insurers faced with higher risks tend to have less advertising, as expected.   The coefficients on reinsurance utilization are negative and significant for models. That is, insurers who transfer their risks to reinsurers more tend to spend less on advertising. P/L insurers who write more on personal lines, as opposed to commercial lines, of business are more likely to utilize advertising. So, this result implicates that advertising is more important to penetrate in the personal insurance market. In the commercial insurance, insurers are more connected with brokers to place their businesses. Further, maintaining relationship with brokers is important to keep their business and grow in the market due to the fact that the risks for large commercial insurance buyers are complex and that brokers provide an important role in terms of the coverage design, pricing and evaluating the risk (Cummins and Doherty, 2006).

Diversification variables present a mixed result. Insurers who diversified in terms of line of business do not show significant relationship with advertising. However, the results from the empirical tests indicate that geographic diversification variable is positively and significantly correlated with advertising intensity. That is, more diversified insurers in terms of regional operation tend to spend less on advertising. In other word, it is more likely that insurers who focus on a smaller number of state markets utilize advertising more to reach out to their customers.

Group and stock dummy variables are positively related to adverting intensity. So, firms that are affiliated with a group tend to use more advertising expenses. Stock companies relatively use more advertising than mutual companies. Insurers using an exclusive agency system, compared to the independent agency system, are more likely to spend on advertising, which is consistent with previous studies (e.g., Marvel, 1982, Grossman and Hart, 1986, and Sass and Gisser, 1989, and Regan, 1997).

To check time varying effect and underwriting cycle impact, we include hard market dummy. The results show that this variable is negatively correlated to advertising intensity. So, insurers tend to use less advertising during the hard market period, as expected.

IV. Conclusions

The purpose of this paper is to examine the impact of advertising intensity on the profitability as measured by accounting profit (ROE) and typical insurers profit (Profit Margin), and market structure as measured by market concentrations. Since the literature shows inconclusive and conflicting empirical results, our paper adds value to the existing literature by providing new information on the relationship between advertising and market structure in the U.S. P/L insurance industry.

The results show a positive and non-significant relation between concentration and advertising and a negative and significant relation between performance and advertising, indicating that advertising does not provide an additional value to the performance of insurers in

this highly competitive market. These results are consistent with all three different types of concentration measures in two different profit equations.

The relationship between performance and advertising empirically tested by this study shows that additional spending on advertising does not generate benefits to the insurers in terms of profitability. The results from this study suggest that U.S. P/L insurance market exhibits a highly unconcentrated and competitive market and that there are low barriers to entry into this market.

This study also suggests that insurers with lower market share tend to use more advertising to penetrate in the U.S. P/L insurance market, while advertising appears to be an important tool for large companies' marketing channel. Insurers operating with relatively higher risks are less likely to have the availability of adequate budgets to invest in advertising. In addition, P/L insurance companies that do more business in personal lines rely more on advertising.

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