Competition, Market Power and the Stability of Insurance Markets

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Abstract

This study investigates the impact of market competition on the stability of global insurance markets. We calculate the P-R H-statistic that can gauges the ability of an insurer to adjust its outputs in response to changes of input prices, and use it as a better proxy measure of firm's market power to replace traditional market structure. We test whether high market competition curbs firm's profitability and hence drive the market to be fragile, or it conversely impels insurers to operate in a more efficient manner and hence stabilizes the market. By using the split population model (SPM), we find that P-R H-statistic is positively correlated with insurers' survival time with respect to crisis, and hence supports the competition-stability hypothesis. The policy implication of this study is that regulators should pay more attentions on the ability of insurers to adjust their outputs rather than market structure when regulating markets. Lastly, we examine the role of liberalization in influencing the relationship between competition and market stability. We find that insurers in countries permitting foreign insurers to enter markets, or permitting greater shares held by outsiders, tend to have lower survival probability and survival time, and hence support the view that deregulation has adverse impact on market stability.

Key words: property-liability insurance industry, market structure, competition, P-R H-statistic,

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1. Introduction

Understanding the impact of market competition on financial institutions, including banks and insurers, is important because it substantially influences firm's profitability and solvency. Two completion-performance hypotheses are widely tested. The first hypothesis posits that a low degree of market competition reduces collusion costs between firms, and hence may drive firms to adopt monopolistic pricing strategies. This is known as the structure-conduct-performance (SCP) hypothesis, which predicts a positive relationship between the market competition and product prices (or firm profitability). The second hypothesis, in contrast, posits that more efficient firms can operate at lower costs, and hence can gain greater market shares through selling products at lower prices and receiving higher profitability. This is known as the efficiency-structure (ES) hypothesis, predicting that greater firm efficiency, rather than market competitive power, has positive impact on firm profitability.

Aside from the rich research in banking, a large number of studies have devoted to investigate the relationship among market structure, competition and performance for property and liability (P-L) insurers, which are characterized by highly complicated line-of-business, over past decades. Among them, Choi and Weiss (2005) conduct an extensive study to examine whether market concentration or firm efficiency can impact the financial performance of P/L insurers. They find that insurers' cost efficiency is inversely correlated with policy prices and is positively correlated to insurers' profitability while revenue efficiency is positively correlated with insurance prices and insurer's profitability. Hence, their results suggest that U.S. P-L insurers overall operate in a relatively efficient manner.

Nearly all extant insurance studies investigating the relationship between market competition and firm performance use market structure-based variables, such as concentration ratio (CR) or Herfindall-Hirschman Index (HHI), to measure the magnitude of market competition or market power. However, a concern of using structure-based variables to measure market power is that the degree of market competition may not perfectly correlate with firm's market power. Claessens and Laeven (2004) find that structure-based measures, such as CR and HHI, are poor indicator of market competition in the banking industry. Instead of using structure-based variables, Panzar and Rosse (1987) propose a more direct measure of market power by estimating the ability of a bank or an insurer to adjust its outputs in response to changes of input prices. This non-structure-based measure for market competition proposed by Panzar and Rosse (1987) is known as the H-statistic (or P-R H statistic). The derivation of P-R H statistic can be conceptually done through estimating firms' product function at firm level. A noteworthy characteristic of s P-R H statistic is that it embeds important information associated with market contestability and revenue behavior which is not found in traditional structure-based variables (Bikker and Haaf, 2002). In addition, the P-R H statistic relies solely on information at firm-level rather than the information at market level in structure variables. It is intuitively a more direct and effective measure of firm's competitive market power. As such, using P-R H statistic instead of structure measures are expected to give authentic relation between competition and firm performance. Several banking studies (Claessens and Laeven, 2004; Bikker et al. 2007; Yildirim and Philippatos, 2007) find that the relationship between the P-R H statistic and traditional structure variables (CR and HHI) are fragile. This suggests that they encompass distinctive information pertaining to market competition. Therefore, it is not surprised to find that using concentration variables (CR and HHI) and P-R H-statistic to investigate the competition-performance relationship may give rise to inconsistent empirical results (Angelini and Cetorelli,1998; Bikker and Haaf, 2002).

Even though using non-structure competition variables is not new in the banking literature, very few insurance studies to date employ the non-structure based measures such as P-R H statistic to examine the competition-performance relationship or they do not focus on the U.S. P-L insurance industry.[4] If the structure-based variables are poor indicators of market competition, this may explain the conflicting results found in prior insurance studies when investigating the competition-performance relationship. For example, the studies by Chidambaran et al. (1997), Bajtelsmit and Bouzouit (1998), Cummins and Weiss (1999), Pope and Ma (2008) advocate the SCP hypothesis while other studies (e.g., Weiss,1974; Jung,1987; Carroll, 1993; Choi and Weiss, 2005) do not.

Concentration, Competition, Liberalization and Market stability

Another important research stem is to investigate to what extent market competition can impact the stability of financial institutions. Allen and Gale (2004) developed a theoretical model showing that the banking system tends to be more stable in a highly concentrated market because large banks have greater market power to increase their profitability in a monopolistic environment. Boot and Greenbaum (1993) also corroborate a similar concentration-stability relationship. They posit that the greater charter value arising from larger market power can drive banks to behave prudently, which is known as the "charter value" hypothesis. The "concentration-stability" relationship, on the other hand, may be induced by the diversification benefit from activities such as merge and acquisition. Boyd and de Nicoco (2005) support that greater market concentration can lead to a more volatile banking system because the greater

[4] Kasman and Turgutlu (2007)、Murat et al.（2002）are the only insurance studies employing the P-R H statistic. and they examine the competition of the Turkish and Australia insurance industry, respectively.

market power in a high-concentrated market may create the incentive of managers to engage in high-risk business in order to expropriate the values of debt products they sold. Similar results supporting the "concentration-fragility" hypothesis is also found in several studies (e.g., Mishkin, 1999; de Nicoco et. al., 2004).

Due to the mixed result of the concentration-stability relationship in the literature, Allen and Gale (2004), Boyd et. al. (2004) articulated that market stability is not solely affected by the degree of concentration. Other factors, such as inflation rate, may play roles in influencing the stability of a banking system. Schaeck et. al. (2009) contend that the conflicting results from the concentration-stability relationship in the banking studies may be due to the fact that the concentration variables (e.g., HHI or CRs) used in most studies are incorrect/inefficient measures of market competition (Claessen and Laeven, 2004) and hence mislead the competition-stability relationship. By using the P-R H-statistic to reflect market competition, Schaeck et. al. (2009) examined its relevance to the stability of banking systems. Their results unveiled that more competitive banking systems are less likely to experience systematic financial crisis and hence support the "competition-stability" hypothesis.

Besides, the liberalization policy adopted by a country may also affect the impact of market competition and consequently influence market stability. Pope and Ma (2008) examined the impact of the liberalization policies across countries on insurer's financial performance. Using 23 global countries' data, Pope and Ma (2008) find that the degree of liberalization in a country can greatly influence the impact of market concentration on insurers' profitability. In their study, the SCP hypothesis is only supported in the country with a low degree of liberalization. The low entry barrier to foreign insurers in a country will increase market competition and hence curbs firms' profitability. Pope and Ma (2008) use the market share of the top five insurers in a country as the proxy of competition to investigate the structure-performance relationship rather than the competition-stability relationship.

To assess the stability of baking insurance industries, most prior studies using the logit/probit model or the hazard/ survival time model, e.g., the Cox model (Kim et al., 1995; Lee and Urrutia, 1996, Schaeck et. al., 2009), to evaluate firm's ruin (survival) probability (stability/fragility). However, a concern of using the logit model or the Cox hazard model is that they implicitly assume that all firms will ultimately fail which is conflicting with the fact. Moreover, inconsistent results may arise if the logit model and the Cox hazard model are used concurrently to assess the determinants of firm's survival rate/time. Lee and Urrutia (1996) find that the hazard (Cox) model often gives rise to more significant explanatory variables in comparison with the results based on the logit model even though their predicting powers are similar. Hence, this study employs a more efficient survival model originally proposed by Schmidt and Witte (1989), namely, the split-population survival time model (SPM), to investigate the relationship between market competition and insurer stability. The SPM relieve the assumption that all firms must eventually fail. On the contrary, the SPM permits a cohort of insurers to be perpetually survived. As such, the SPM is more realistic than the logit model and the Cox model, and conceptually should produce more reliable results. The SPM to date is rarely applied in the insurance literature to estimate firm's survival rate/time.

While most prior insurance studies focus on the relationship between market structure (or competition) and performance, very few studies to date investigate the impact of market competition on the stability of the insurance industry. The present study contributes to the insurance literature by examining the relevance of market competition to the stability of U.S. P/L insurance market by using the P-R H-statistics, instead of structure measure, as competition proxy and using the SPM to estimate the survival rate. Finally, we also take into account the impact of liberalization policy. We collect the global insurance industry data from over 27 countries to improve our estimating efficiency. To the best of our understanding, we are the first to examine the competition-stability (fragility) relationship in the insurance literature. The policy implication of this study is that, if market competition increases the fragility of the insurance industry, then regulators should take prompt steps to hold deregulation acts.

The remainder of the paper is organized as follow. We present an exposition of our econometric approach, including calculation of the H-statistic, in section2. Section 3 provides an overview on the data set and summary statistics. We report the main results and a variety of robustness tests in Section 4. Section 5 offers concluding remarks.

2. Data and Methodology

2.1 Data

To assess market competition and insurers' stability, we require data involving insurers' balance sheets, income statements, ownership structure, the liberalization policies and the shareholdings by foreign insurers across countries. Most of them can be obtained from the ISIS database. The input prices and macroeconomic indexes by countries can be recorded from the websites of the OECD. The data period is from 1995 to 2007 which is prior to the extreme financial crisis in 2008. A number of criteria are used to filter our sample. First, our samples are limited to the property-liability insurance industry and delete insurers reporting accounting information fewer than three consecutive years because we need at least three–year rolling windows to calculate P-R H statistic. Second, we drop observations that have missing values on any one of relevant variables and also delete observations with negative total admitted assets, gross (net) premium written and capital ratio. Finally, the total samples come out with 14336 insurer-year observations across 27 countries over 12 years. Subsequently, we remove outliers for growth rate of premium written, market growth rate, reinsurance ratio, and loss ratio at the 1 percent tail.

Our primarily research objective is to investigate the extent to which market competition can impact the stability of insurance markets. Most extant studies in this research area use structure-based variables (e,g, CR and HHI) as measures of market competition. However, the structure-based variables mainly assess the ability of firms to obtain greater profitability but not the perfect proxies of the contestability/competition of the market. Choi and Weiss (2005) find that HHI does not explain the cross-sectional variation of insurers' profitability. The insignificant structure-profitability relationship found in Choi and Weiss (2005) may be due to the poor association between market concentration and market competition. In this study, we calculate both of the structure-based measure (i.e., HHI) and the non-structural (P-R H statistic) measure to compare their impacts on insurers' survival rate/time. In the sequel, we briefly introduce the concepts of H-statistic in Section 2.2 and present an overview of split population duration analysis in Section 2.3.

2.2 The P-R H Statistic to Measure Market Power

By solving the optimal decisions of a profit-maximizing firm at the equilibrium output level under competitive and monopolistic market condition, characterizing by different freedom degrees of the market entry and exit, Panzar and Rosses (1987) derived the H-statistic from the reduced-form revenue function. They show that the H statistics is an intuitive and direct measure of market competition in comparison with traditional structure variables because it assesses firm's market power through estimating the capability of a firm to adjust its equilibrium revenues when input prices shift. To calculate the H statistic, the reduced forms of firm's revenue are derived to assess the degree of market competition by computing the comparative statics of the elasticity of firm's revenue to input prices. To show this, assuming that the product demand function is given by

$$y = (\theta^{-1} Z^{-\alpha} p)^{-e}$$

where y is the product demand, p is the vector of product prices, Z is a vector of exogenous variables of demand function, and α is the associated parameter to be estimated Also let the revenue function of an insurance firm be $R(y,Z)$, substitute price p into the demand function, we have

$$R(y,Z) = TR = P \times y$$
$$= (y^{-\frac{1}{e}} Z^{\alpha} \theta) y$$
$$= y^{(1-\frac{1}{e})} \theta Z^{\alpha}$$

Assuming the revenue function follows a fixed Cobb-Douglas form, then the cost function of the firm can be written as

$$C(y,W,X) = yX^{\beta} \prod_j w_j^{a_j} \quad \text{while} \quad a_j > 0 \text{，} \sum_j a_j = 1$$

Where w is the vector of industry input prices， a_j is the ratio of input factors, i.e., cost share, X is the vector of exogenous variables of cost function and β is the associated parameter. Finally, let $\pi = R - C$ be firm's profit and take the first order condition with respect to y to maximize firm profit, we have

$$\frac{\partial \pi}{\partial y} = y^{\frac{e-1}{e}} \theta Z^{\alpha} - yX\beta \prod_j w_j^{a_j} = 0$$
$$\Rightarrow \theta((e-1)/e) Z^{\alpha} y^{-1/e} - X^{\beta} \prod_j w_j^{a_j} = 0$$

We can obtain the equilibrium output $y*$

$$y^{*} = X^{\beta} \prod_j w_j^{a_j} \Big/ (\theta Z^{\alpha} (e-1)/e))^{-e}$$

Substitute $y*$ into the cost function

$$R = y^{\frac{e-1}{e}} \theta Z^{\alpha} = ((X^{\beta} \prod_j w_j^{a_j} \Big/ \frac{e-1}{e} \theta Z^{\alpha})^{-e})^{\frac{e-1}{e}} \theta Z^{\alpha}$$

Taking the natural logarithm and obtain the reduce form of revenue function

$$\ln R = (1-e)\beta \ln X - (1-e)\sum_j a_j \ln w_j + (1-e)\ln\frac{e}{e-1} + e\ln\theta + \alpha e \ln Z$$
$$= \gamma_0 + \alpha e \ln Z - (e-1)\beta \ln X - (e-1)a_1 \ln w_1 - (e-1)a_2 \ln w_2 - (e-1)a_3 \ln w_3$$

Let $\gamma_0 = (1-e)\ln\frac{e}{e-1} + e\ln\theta$

Finally, sum up the price elasticity and let $\sum_j a_j = 1$

$$\sum_{j-1}^{3}\frac{d\ \ln R}{d\ \ln w_j}=-(e-1)\sum_{j=1}^{3}a_j=1-e$$

The elasticity of firm revenue to input prices is given by

$$\frac{\partial \ln R}{\partial \ln w_j}=\frac{\partial R}{R}\bigg/\frac{\partial w_j}{w_j}=\frac{\partial R}{\partial w_j}\frac{w_j}{R}$$

Panzar and Rosses (1987) show that the H statistic can be expressed in terms of the sum of the elasticity of firm's revenue with respect to the prices of *k* inputs.

$$H=\sum_{j=1}^{k}\frac{\partial R}{\partial w_j}\frac{w_j}{R}$$

where w_i is the price of input *i* and *R* is the firm's equilibrium revenue. Panzar and Rosses (1987) show that, the H-statistic approach to one when the market is perfectly competitive in that all firms can freely assess the market. In this competitive scenario, an increase of input price will raise the average operating cost, consequently, it drives firms to increase their outputs and revenue. Particularly, in a purely competitive economy, the marginal percentage change of revenue exactly equals to the sum of the percentage changes of input prices since the demand curve is perfectly elastic to price changes. In contrast, in a monopolistic economy, firms will control their outputs when input prices are increasing and hence this can result into a decline in revenues. A characteristic of the monopolistic economy is that firms may curb outputs in order to maximize their profits because the demand curve appear to be inelastic because the barrier of market entrance is relatively high. As a result, the H statistic is negative in a monopolistic market. Panzar and Rosses (1987) also show that the market is monopolistically competitive if the H-statistic falls between zero and one. In this case, the percentage change of revenue is imperfectly and positively correlated with the percentage changes of input prices if the condition of free market entrance/exit sustains. The H-statistic for various scenarios of market competition is summarized as follows:

$$\begin{cases} H=1 & \textit{Perfect Competition} \\ H<0 & \textit{Monopolic Market} \\ 0<H<1 & \textit{Monopolistic Competition} \end{cases}$$

Estimating Panzar-Rosses H-Statistic:

Following Kasman and Turgutlu (2007), we select several input/output prices to estimate the H-statistic, which is a better measure of market power for insurers. The reduced-form of the revenue equations for a given country can be written as below:

$$\ln GPW_{it} = \alpha + \beta_1 \ln PL_{it} + \beta_2 \ln PBS_{it} + \beta_3 \ln FC_{it} + \beta_4 \ln TA_{it} + \varepsilon_{it}$$

where GPW_{it} is the gross premium written for the *ith* insurer at year *t*. PL_{it} is the ratio of personnel commission expenses to total assets that is used to proxy the labor price. PBS_{it} is the ratio of business administrative expenses to total assets that is to proxy the input price of business proving service. FC_{it} is the three-period moving average of return-of-equity (ROEs) that is used to proxy for the level of financial capital. Kasman and Turgutlu (2007) show that the *P-R H*-statistic can be obtained by summing up the regression coefficients of all input prices, i.e., $H = \beta_1 + \beta_2 + \beta_3$.

We also estimate the traditional Herfindale market concentration index as below,

$$HHI_{jt} = \sum_{i=1}^{n} (marketshare_{ijt})^2$$

where $marketshare_{ijt}$ is the ratio of the written premium of insurer *i* at year t over the total industry written premium of country *j*.

To compare with most prior studies that examined the competition-stability relationship in the insurance industry either in a single country or across countries, we also compute traditional competition indicators. The Panel A of Table 1 gives correlations between P-R H statistic and traditional concentration measures, including the number of insurers, market share, HHI and CR3 concentration ratio. We find that P-R H statistic is positively correlated with the number of insurers, but is negatively correlated with other concentration measures. This implies that the information embedded in the P-R H statistic encompasses other competition proxies. Hence, the P-R H statistic has broader information content in comparison with other competition proxies.

[Insert Table 1 about here]

2.3 Split-population Survival Model (SPM): An Overview

Prior studies frequently use the natural logarithm of the Z-score to proxy insurer's insolvency risk (e.g. Pope and Ma, 2008; Shim, 2011; Cheng, Elyasiani, and Jia, 2011) as it measures the distance from insolvency in terms of the standard deviation. A high Z-score indicated a low probability of insolvency because firm's return must be far below to wipe out all equity. While Z-score manifests the likelihood of insolvency, it does not reflect the survival time of insurer between two crises. It is of interest to know whether greater competition extends the survival time from at crisis to the next crisis. If greater competition increases the survival time, it also stabilizes the market. In this study, we employ the split-population time model (SPM) that can simultaneously estimate the survival probability and survival time to investigate the competition-stability relationship.

The SPM, first proposed by Schmidt and Witte (1989), integrate the survival time and the survival rate models concurrently without the need of assuming all firms must eventually fail. Hence, the SPM is conceptually more realistic than the logit (probit) model and the hazard (Cox) model. Both failure dummy and survival time is concurrently assessed in the split-population time model (SPM) to examining the relationship between competition and stability. We use the method of Goussian Maximum Likelihood Classifier to estimate parameters of survival time and probability, i.e.$\alpha, \beta, \delta, \lambda, and\ p$, concurrently, where$\lambda = e^{\beta' X}$ is a parameter associated with survival time of insurer and $\delta = 1/\left(1 + e^{\alpha' X}\right)$ is a parameter associated with the probability of insurer failure. The SPM concurrently estimates two sets of coefficients associated with the survival probability and the survival time (α and β), respectively. Moreover, because the SPM can estimate coefficients with greater consistency and efficiency, our conclusions are mainly based upon the results of the SPM. To elaborate the SPM, assuming the survival function $S(t)$ follows a log-logistic distribution with parameters λ and p, i.e.,

$$\mathrm{S}(t) = \frac{1}{1 + (\lambda t)^P} = \frac{1}{1 + \left(\left(e^{\beta' X}\right)t\right)^P}$$

The hazard rate of the insurer can be written as:

$$h(t) = \frac{f(t)}{1 - F(t)} = \frac{f(t)}{S(t)} = \frac{\lambda P(\lambda t)^{P-1}}{1 + (\lambda t)^P} = \frac{e^{\beta' X} P\left(e^{\beta' X} t\right)^{p-1}}{1 + \left(\left(e^{\beta' X}\right)t\right)^P}$$

Where $f(t)$ and $F(t)$ denote the probability density function and the cumulative probability function of a firm's failure, respectively. Let X denotes a vector of explanatory variables that are relevant to firm's survival probability and survival time.

or in a linear form

$$\ln h(t) = \ln\left[\frac{f(t)}{S(t)}\right] = \ln\left[\frac{\lambda P(\lambda t)^{P-1}}{1 + (\lambda t)^P}\right] = \ln\left[\frac{e^{\beta' X} P\left(e^{\beta' X} t\right)^{p-1}}{1 + \left(\left(e^{\beta' X}\right)t\right)^P}\right]$$

$$\ln h(t) = \ln\left[e^{\beta' X} P\left(e^{\beta' X} t\right)^{p-1}\right] - \ln\left[1 + \left(\left(e^{\beta' X}\right)t\right)^P\right]$$

$$\ln h(t) = \beta' \mathrm{X} + \ln P + (P-1)(\beta' \mathrm{X} + \ln t) - \ln\left[1 + \left(\left(e^{\beta' X}\right)t\right)^P\right]$$

We use the firm-year level data from 27 countries over the period of 1995-2007. The crisis duration of a country to proxy the survival time is measured by the number of years it remains. The minimum value of crisis duration is $\mathrm{t} = 1$ if the crisis incurred in the first year and the maximum value of duration is $\mathrm{t} = 12$ if crisis incurred in 2007 or if the country does not experience any crisis over the sample period. In other words, the duration is right-censored if there is no crisis during the sample period. In addition, we also calculate the current year minus the startup year of an insurer to measure its survival duration. The Panel B of Table 1 gives the correlations between P-R H statistic and various stability indicators, including the Z-score, the standard deviation of ROA, failure dummy, crisis duration and survival Duration. The result shows that P-R H statistic is positively correlated with crisis duration and Z-score, but is negatively correlated with the standard deviation of ROA. This suggests that insurers survive to a longer time if the degree of competition increases. We also find that the survival time and competition (PRH) relationship are robust if other stability proxies are used.

[Insert Panel B of Table 1 about here]

Table 2 gives the descriptive statistics of P-R H competition statistic, failure probability and time to crisis by countries. The largest country sample is from the United States which accounts for over 56% of the total sample firms. The P-R H statistics of most countries fall between zero and one, indicating the monopolistically competitive market is mostly prevalent. However, the P-R H statistics of Korea, Norway, Poland and Romania appear to be negative, indicating the prevalence of monopolistic markets in these countries. The average survival time to crisis by countries is from 4.3 years to 10.5 years during the 12 year duration while the average survival time, in terms of current reporting year minus start-up year, is from 9.0 years to 94.8 years.

[Insert Table 2 about here]

2.4 Empirical Models and Variables

First, we include both structural HHI and the non-structural P-R H statistic measures for competition concurrently in Model (1) to compare their effects on firm survival rate/time. The "competition-fragility" hypothesis posits that greater market competition curtails insurers' profits and consequently weakens firms' financial strength if firms lack of the ability to improve their operating efficiency against the increasing competition. As such, we predict the P-R H statistic (the concentration index, HHI) is positively (negatively) correlated with insurers' survival rate (time/probability). In contrast, the 'competition-stability" hypothesis posits that, a high degree of competition impels insurers to operate in a more efficient manner, and hence strengthens insurers' survival rate. We also examine if the relationship between competition and stability/fragility differ between countries with different degrees of liberalization as found in Pope and Ma (2008).

In contrast, the efficiency structure (ES) hypothesis posits that efficient firms are more competitive in the market because they can operate at lower costs and hence have higher survival rate. Choi and Weiss (2005) found that operating efficiency does give positive impact on insurers' profit. To estimate insurer efficiency, following Cooper et al. (2000), the output elements used in this study include incurred losses and investment incomes while input elements include the number of employee, debts and equity. The input prices include labor price, administrative cost and financial capital. Specifically, we use the data envelop method (DEA) to estimate the cost efficiency (*CE*) and scale efficiency (*SE*), respectively.

It is important to control the possible effect of several important firm characteristics on insurer survival rate/time. First, larger firms may receive greater benefits from the efficiency of diversification that can attain the target safety level using lower level of capital. We use the logarithm of firm assets ($\ln(TA)$) to control for the effect of economic scale on firm risk. Besides, we also use the growth rate of premium written ($\ln(GPWGWR)$) to control for the effect of liquidity risk, the market growth rate ($\ln(MKGPWGWR)$) to control for the effect of business risk, the reinsurance ratio ($REINSR$) to control for the effect of risk transfer through reinsurers, the debt ratio ($LEVG$) to control for the financial leverage risk, and the loss ratio $(LOSSR$) to control for the effect of the underwriting risk, the GDP ($\ln(GDP)$ to control for the impact of macroeconomic condition on firm risk. Finally, we add year-dummy variables (1998-2007) to control for the effect of omitted macroeconomic factors. Our primary empirical model can written as below,

$$
\begin{aligned}
failure\ (time)_{ijt} = {} & \beta_0 + \beta_1 PRH_{ijt} + \beta_2 HHI_{ijt} + \beta_3 \left(PRH_{ijt} \times HHI_{ijt}\right) + \beta_4 \ln\left(TA_{ijt}\right) \\
& + \beta_5 LEVG_{ijt} + \beta_6 REINSR_{ijt} + \beta_7 LOSSR_{ijt} + \beta_8 CE_{ijt} + \beta_9 SE_{ijt} \\
& + \beta_{10} \ln(GPWGWR_{ijt}) + \beta_{11} \ln\left(MKGPWGWR_{ijt}\right) + \beta_{12} \ln\left(GDP_{ijt}\right) \\
& + \sum \delta_k DYR_k + \varepsilon_{ijt}
\end{aligned}
\qquad (1)
$$

The Impact of Liberalization on the Stability of the Insurance Industry

An important research objective of this study is to examine to what extent the liberalization policy adopted by a county can affect the interdependence between market competition and market stability. Fischer and Chenard (1997) find that deregulation and liberalization can exacerbate the contestability of the banking sector through increasing the systemic risk. In contrast, Barthe et. al., (2004) find that the banking systems with high entry barriers or/and activity constraints tend to have lower stability. Pope and Ma (2008) investigate whether the liberalization policy adopted by a country can impact the competitive structure and hence influence insurers’ profitability. They find that the SCP hypothesis is only supported in countries with a low degree of liberalization. To the best of our understanding, we are the first concurrently examining the relationship among market competition, liberalization policy and the stability of the insurance industry. Keely (1990) finds that the permission of foreign insurers to enter insurance markets increases market competition, and consequently diminish the franchise value of domestic insurers. As such, insurers may raise business risk against the threat of competition, and ultimately the market fragility increases. In contrast, Claessens and Laeven (2004) contend that domestic insurers can operate with greater efficiency when the insurance market is liberalized. As a result, the high firm efficiency improves the stability of the insurance industry. The empirical model to test the impact of liberalization on insurers' fragility is given as below.

$$\begin{aligned} failure\ (time)_{ijt} &= \beta_0 + \beta_1 PRH_{ijt} + \beta_2 HHI_{ijt} + \beta_3 (PRH_{ijt} \times HHI_{ijt}) + \beta_4 LIBER_{ijt} \\ &+ \beta_5 (LIBER_{ijt} \times PRH_{ijt}) + \beta_6 (LIBER_{ijt} \times HHI_{ijt}) \\ &+ \beta_7 (LIBER_{ijt} \times PRH_{ijt} \times HHI_{ijt}) + \beta_8 \ln(TA_{ijt}) \\ &+ \beta_9 LEVG_{ijt} + \beta_{10} REINSR_{ijt} + \beta_{11} LOSSR_{ijt} + \beta_{12} CE_{ijt} + \beta_{13} SE_{ijt} \\ &+ \beta_{14} \ln(GPWGWR_{ijt}) + \beta_{15} \ln(MKGPWGWR_{ijt}) + \beta_{16} \ln(GDP_{ijt}) \\ &+ \sum \delta_k DYR_k + \varepsilon_{ijt} \end{aligned} \quad (2)$$

Three dummy variables are used to measure the degree of liberalization ($LIBER$). The first dummy indicates whether foreign insurers are permitted to enter the domestic insurance market ($FENTRY$), the second indicates if an insurer has over 50% shares hold by foreign insurers ($FOWNER$), and the last dummy indicates whether an insurer has over 50% shares hold by outside stockholder ($OWNER$). Moreover, to investigate the impact of liberalization policies adopt by a country on market competition/stability, we employ a global data (over 50 counties), which is much broader than that used in Pope and Ma (2008). Following Pope and Ma (2008), we anticipate that the extent of liberalization adopted by a country can considerably impact market stability through the channel of altering the degree of competition.

3. Empirical Results

3.1 Descriptive Statistics

Table 3 gives the descriptive statistics for all explanatory variables of our empirical models. The results show that the average insurer failure rate is as low as 4.8% during our sample period. The average survival duration of insurers is 49.67 years, hence most insurers in our sample can sustain for nearly half century since they establish. The average survival time to a crisis ranges from 3 to 12 years. The average ratio of reinsurance ceded is 0.36, i.e., insurer concurrently purchases \$0.36 reinsurance when insurer underwrites \$1 premium. The average loss ratio is around 70% while the average leverage ratio is 0.63. The average cost efficiency and scale efficiency are 0.35 and 0.70, respectively. The average growth rate of insurer premium written (insurance market) in the logarithmic form is 0.008 (0.62). The countries permitting foreign insurers to enter the domestic market are about one fifth of total insurers. Moreover, the average ratio of insurers having over 50% shares hold by foreign insurers is 22.6%. Finally, about half of the insurers have over 50% shares hold by outside stockholders.

Next, we classify samples into four categories according to the degree of market competition (i.e., P-R H statistic) and compare the means of relevant variables between quartiles. Table 3 reports the results of testing mean difference between the lowest H quartile and the highest H quartile. We find that insurers with the high H statistic, on average, tend to have lower failure rate, longer survival time (to a crisis), lower concentration rate and leverage ratio, larger firm size, higher reinsurance and loss ratios, less cost and scale efficiency, lower growth rate of premium written, lower proportions of foreign insurer entering insurance market and hold over 50% shares, higher proportion of insurer has over 50% shares hold by outside stockholder. Overall, the preliminary results suggest that insurers with higher P-R H statistic seem to be more stable.

[Insert Table 3 about here]

3.2 Concentration, Competition and Insurer Survival Rate/Time

3.2.1 Main Results

To examine the impact of market competition on insurer survival rate/time, differ from prior studies, we employ the split population model (SPM) to examine the impact of market competition on insurer failure rate and survival time to crisis concurrently. Tables 4 report the main empirical results. It is noteworthy that the SPM simultaneously estimates two sets of coefficients, in which the first one is associated with survival probability, and the second one is associated with survival time. Model 1 includes the H-statistic. Model 2 is based on traditional concentration ratio (HHI) while Model 3 include both of the H-statistic and the HHI because they may reflect information content of market competition. Model 4 adds the interaction term of the H-statistic and the HHI to catch the possible nonlinear effect. The negative coefficients of the interaction terms in the survival time equations imply a high degree of market competition (H-statistic) may curb the impact from market concentration (HHI) on the timing to crises. Similarly, the negative coefficients of the interaction terms in the survival probability equation indicate that a high degree of market competition (H-statistic) may curb the impact of concentration (HHI) on the survival probability from a crisis to a crisis.

We find that the coefficients of H-statistic are significantly positive in the survival time equation. As greater competition can increase the survival time of an insurer to a crisis, this supports the view that larger competitive power in terms of H statistic can stabilize insurance system. This result is robust even after controlling for the partial effect of traditional competition measure (HHI), which gives rise to a significantly positive effect on survival time. A possible explanation is that some insurers in a highly concentrated environment are “too big to fail” and hence receive government bailouts before a systematic distress. Next, the H-statistic and HHI remain statistically significant even the interaction terms are included. The negative coefficient of the interaction term suggests that the impact of competitive power (H-statistic) on survival time to crises is lower in a highly concentrated market. Next, we find that market power (H-statistic) has positive impact on the survival probability but traditional concentration measure (HHI) has negative effect. This indicates that insurer's survival rate is increasing in a highly competitive or low concentration environment.

Several firm characteristics can also explain on the variations of the survival probability and survival time to crisis. We find that the cost efficiency, scale efficiency and reinsurance ratio are positively correlated with the survival time to crisis while gross domestic product and debt ratio are negatively correlated with firm's survival time to crisis. Next, we find the debt ratio and loss ratio and growth ratio of premium written are positively correlated with insurer's survival probability. Instead, assets size, cost efficiency, growth rate of premium written, gross domestic product are negatively correlated with insurer survival probability. Overall, the results suggest that the impact from firm's competitive power (H statistic) and the impact from firm's concentration (HHI) on both the survival time to crisis and the survival probability are not confounded. Our empirical results do not support that competition increases the fragile of insurance system.

[Insert Table 4 about here]

3.2.2 Robustness Tests

Even though our empirical result based upon the new P-R H statistic support the competition-stability hypothesis, a possible bias due to the influence of economic development may arise because over 80% of our sample insurers located in the highly developed G7 countries. As such, we perform a robustness test to examine the impact of economic development. We partition our sample into G7 countries or non-G7 countries and examine if they behave differently. Next, we calculated firm's survival time using the traditional method, i.e., current year minus the year of firm establishment, to verify our results. The results are reported in Table 5. We find that the H-statistic and HHI of both G7 and non-G7 countries have positive impacts on firm's survival time to crisis. The interaction terms of H-statistic and HHI have negative impact on insurers' survival time to crisis. We also find that both of the H-statistic and HHI remain positively correlated with firm's survival time and the interaction term of H-statistic and HHI remain negatively correlated with the survival time to crisis even if traditional measure of survival time is used.

[Insert Table 5 about here]

Finally, we calculate insurers Z-score to assess their insolvency risk and compare with the results from prior studies. By using the paneled regression with controlling year effect and cluster year effect, we find that (Table 6) the PRH and HHI have significantly positive impact on insurers' Z-score. As such, the competition-stability relationship is robust under different risk measures.

[Insert Table 6 about here]

3.3.3 Do the Liberalization Impact the Competition-Stability Relationship?

In this study, we conjecture that the regulatory and institutional environment can play a role in influencing the impact of market competition on insurer's survival rate/time. We use three proxies to reflect the degree of liberalization adopt by a country. The first is the dummy variables indicating if the country permits foreign insurers to enter (FENTRY). The second is if an insurer permits foreign insurers (FOWNER) or outside outsiders (OWNER) holding over 50% of its shares. We also add the interaction term of PRH and HHI to examine if they can affect the impact of market power on insurer stability. The empirical results based on the SPM are reported in Table 7-9.

After including the liberalization dummy variables, i.e., restrictions for foreign insurer entry, restrictions for foreign insurers (50%) shareholdings, restrictions for outside investors (50%) shareholding, the results reveals that the PRH-statistic and HHI concentration ratio remain positively correlated with the survival time to crisis. The results show that all liberalization dummies are negatively correlated with insurer's survival rate. The interaction terms of H-statistic/(HHI) and all liberalization variables are negatively correlated with insurer's survival time to crisis, suggesting that a high degree of liberalization can make insurance market fragile in a highly competitive environment. As such, we conclude that the adoption of liberalization policy may to some extent risk the stability of the insurance industry.

[Insert Table 7 about here]

[Insert Table 8 about here]

[Insert Table 9 about here]

4. Conclusion

The increasing volatility of the insurance industry has been a big concern for regulators. While economists and policymakers continue to engage in finding strategies to stabilize markets, this study examines an important empirical question concerning to what extent market competition can impact the stability of the U.S. P/L insurance industry. Differ from most prior studies using market structure variables such as concentration ratios as the proxy of market competition/power when investigating its relevance to firm's performance/profitability. This study employs the P-R H-statistic, a non-structural measure to assess the ability of an insurer to modify its output price in response to changes of input prices, as the proxy measure of competition. This study then investigate whether a high degree of market competition can lower the insurers' profitability and consequently can lead to a fragile insurance industry, or it may conversely impel insurers to operate in a more efficient paradigm and as a result stabilize the market.

We find that greater competitive power (H-statistic) can increase insurer survival time under various stability measures. Hence, our results support the competition-stability hypothesis. Moreover, traditional competitive measure (HHI) also impact insurer survival time to crisis through a different channel. This suggests that H-statistic and market structure encompass distinct competition information. The policy implication of this study is that regulators should pay more attentions on the ability of insurers to adjust their output rather than market structure when monitoring insurer solvency. We also examine if the liberalization can lead to greater competition and hence curtails market stability. The empirical result suggests that the adoption of liberalization policies, including permitting foreign insurers to enter the market, permitting foreign/outside shareholders to hold larger shares in insurance firms will reduce insurers' survival rate or their survival time to crisis. Finally, we also find that the degree of liberalization have greater impact on market stability in a highly competitive environment.

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Table 1 Correlations between Various Competition and Stability Measures

Panel A reports correlations between various insurer competition and market structure proxies. Competition and market structure measures are displayed in a manner that greater value indicates greater market power or concentration. The PRH statistic to measure competitive power is calculated based on three year rolling windows. We also use the number of insurers to reflect the degree of market competition. Market share is defined as the average market share of an insurer of a country in a given year, based on the total gross premium written. CR3 is an alternative concentration measure, which is defined as the market share of the three largest insurers of a country. The HHI, i.e., the Hirschmann-Herfindahl index of concentration based on the total gross premiums written, is calculated by aggregating the squares of the market shares of all insurers in a country. Panel B reports correlations between P-R H statistic and various stability proxies. ln(Z-score) is calculated by return-on-asset (ROA) plus the ratio of equity to asset divided by the standard deviation of ROA, which is based on three-year rolling time window in order to reflect the effect of time variation of Z-score. Failure Dummy is dummy variable, which is equal to one if the insurer becomes insolvent. Survival time to crises (time to crisis) is defined as the survival time of an insurer from current crisis to next crisis, which has the minimum duration $t = 1$ if the crisis was experienced in the first year and has the maximum duration $t = 12$ if crisis occurred in 2007. If a country does not experience any crisis over the sample period; its duration is right-censored. Survival time is equal to reporting year minus the firm's start year. * indicates the 10% significance level, ** indicates the 5% significance level，*** indicates the 1% significance level.

Panel A. Correlations between Competition Measures

Variable	PRH		No. of insurers		Market shares		CR3	
PRH	1.000							
Number of insurers	0.074	***	1.000					
Market shares	-0.104	***	-0.350	***	1.000			
CR3	-0.108	***	-0.779	***	0.571	***	1.000	
HHI	-0.115	***	-0.677	***	0.501	***	0.821	***

Panel B. Correlations between Competition and Market Stability

Variable	PRH		ln(Z-score)		ln(sd(ROA))		Failure Dummy		Survival suration between crises (time to crisis)
PRH	1.000								
ln(Z-score)	0.072	***	1.000						
ln(sd(ROA))	-0.039	***	-0.833	***	1.000				
Failure Dummy	0.003		-0.091	***	0.031	***	1.000		
Survival Duration between crises (time to crisis)	0.033	***	0.065	***	-0.034	***	-0.175	***	1.000
Survival Duration	-0.011		0.024	**	-0.027	***	-0.010		-0.010

Table 2 P-R H Statistic, Failure Probability and Survival Time to Crisis by Countries

The Panzar-Ross H statistic to measure competitive power is calculated based on three year rolling windows. We also use the number of insurers to reflect the degree of market competition. Failure Dummy is dummy variable, which is equal to one if the insurer becomes insolvent. Survival time to crises (time to crisis) is defined as the survival time of an insurer from current crisis to next crisis, which has the minimum duration $t = 1$ if the crisis was experienced in the first year and has the maximum duration $t = 12$ if crisis occurred in 2007. If a country does not experience any crisis over the sample period; its duration is right-censored. Survival time is equal to reporting year minus the firm's start year.

Country	Obs.	Ratio	P-R H-statistic	Insurer failure rate	Avg. survival time	Avg. survival time between crises (time to crisis)
Australia	40	0.277	0.929	0.325	66.824	4.325
Brazil	313	2.166	0.916	0.003	46.476	8.776
Switzerland	15	0.104	0.487	0.333	85.000	6.733
Chile	126	0.872	0.489	0.087	94.762	8.492
Colombia	69	0.478	0.485	0.000	55.400	10.362
Czech Republic	20	0.138	0.228	0.100	10.353	8.250
Germany	1662	11.503	0.933	0.114	71.885	7.084
Denmark	165	1.142	0.526	0.079	88.352	7.370
Spain	381	2.637	0.440	0.066	42.206	7.916
France	600	4.153	0.906	0.055	56.301	7.178
United Kingdom	865	5.987	0.783	0.105	44.312	7.162
Indonesia	96	0.664	0.597	0.021	27.045	6.896
Ireland	153	1.059	0.778	0.007	10.506	7.320
India	50	0.346	0.022	0.000	39.857	7.640
Italy	266	1.841	0.608	0.090	61.991	7.466
Japan	65	0.450	0.468	0.123	66.517	8.262
Korea	36	0.249	-0.716	0.000	49.588	8.278
Luxembourg	51	0.353	0.697	0.137	39.280	6.922
Mexico	148	1.024	0.441	0.007	66.000	10.297
Malaysia	175	1.211	0.811	0.126	31.860	7.371
Nigeria	9	0.062	0.741	0.000	34.000	7.111
Netherlands	153	1.059	0.630	0.111	63.446	7.183
Norway	83	0.574	-0.108	0.096	77.241	6.843
New Zealand	39	0.270	0.745	0.308	52.056	7.128
Peru	53	0.367	0.302	0.094	56.214	7.245
Philippinrd	69	0.478	0.749	0.029	46.915	7.101
Pakistan	21	0.145	0.417	0.000	49.800	10.476
Poland	40	0.277	-0.266	0.100	28.367	8.125
Portugal	83	0.574	0.777	0.024	18.235	7.241
Romania	1	0.007	-1.142	0.000	9.000	5.000
Sweden	67	0.464	0.690	0.060	73.205	7.239
Thailand	236	1.633	0.572	0.000	46.855	7.263
Turkey	50	0.346	0.129	0.020	40.425	6.080
Taiwan	51	0.353	0.661	0.059	41.650	5.843
United States	8188	56.672	0.741	0.022	49.459	7.618
South Africa	9	0.062	0.876	0.222	36.833	4.556

Table 3 Descriptive and Quantile Statistics

Failure Dummy is dummy variable, which is equal to one if the insurer becomes insolvent. Survival time to crises (time to crisis) is defined as the survival time of an insurer from current crisis to next crisis, which has the minimum duration $t = 1$ if the crisis was experienced in the first year and has the maximum duration $t = 12$ if crisis occurred in 2007. If a country does not experience any crisis over the sample period; its duration is right-censored. Survival time is equal to reporting year minus the firm's start year. The PRH statistic to measure competitive power is calculated based on three year rolling windows. The HHI, i.e., the Hirschmann-Herfindahl index of concentration based on the total gross premiums written, is calculated by aggregating the squares of the market shares of all insurers in a country. Firm size (ln(TA)) is measured by the natural logarithm of firm's total assets. LEVG is firm's debt ratio, which is calculated by total debts divided by total assets. LOSSR is the loss ratio of an insurer, which is defined as the incurred losses over earned premiums. REINSR is the reinsurance ratio, which is defined as the total reinsurance ceded over gross premiums written. *CE* is the cost efficiency and *SE* is the scale efficiency of an insurer. ln(GPWGWR) is the natural logrithem of the growth rate of insurer's gross premiums written. ln(MKGPWGWR) is the natural logarithm of the growth rate of insurer's gross premiums written in the insurance industry. ln(GDP) is the natural logarithm of the gross domestic production of a country. FENTRY is a dummy variable indicating if foreign insurers are permitted to enter the domestic market. FOWNER is a dummy variable indicating if an insurer has over 50% shares hold by foreign insurers. OWNER is a dummy variable indicating if an insurer has over 50% shares hold by outside stockholders. * indicates the 10% significance level, ** indicates the 5% significance level，*** indicates the 1% significance level.

	All Sample				Quantile of P-R H statistic					
					First Quantile	Second Quantile	Third Quantile	Fourth Quantile	t value (1)-(4)	
Variables	Mean	Std	Max	Min	(1)	(2)	(3)	(4)		
Failure dummy	0.0477	0.2131	1.0000	0.0000	0.0742	0.0916	0.0421	0.0282	8.67	***
Survival Time to Crisis	7.5353	2.8986	12.0000	3.0000	7.4564	7.2233	7.3341	7.6745	-3.22	***
Survival Time	49.6683	42.5897	331.0000	-5.0000	50.3512	51.4192	50.8972	49.1552	0.93	
ln(Survival Time)	3.7586	0.7285	5.8201	0.0000	3.7359	3.7390	3.7997	3.7603	-1.08	
PRH	0.7332	0.6466	1.0000	-3.5249	0.4706	0.9448	-0.7518	0.9975	-50.35	***
HHI	0.0423	0.0599	0.7609	0.0075	0.1156	0.0613	0.0298	0.0148	67.39	***
ln(TA)	12.3413	1.7225	18.5401	6.1696	12.0199	11.9503	12.3278	12.5532	-13.86	***
LEVG	0.6265	0.1694	0.9980	-0.2307	0.6402	0.6460	0.6494	0.6132	6.86	***
REINSR	0.3605	0.2723	0.9628	0.0004	0.2964	0.3238	0.3732	0.3895	-16.66	***
LOSSR	0.7091	0.2389	1.6719	0.0696	0.6723	0.6868	0.7451	0.7217	-9.37	***
CE	0.3520	0.2892	1.0000	0.0000	0.5907	0.4635	0.2374	0.2608	52.50	***
SE	0.6987	0.2890	1.0000	0.0040	0.8440	0.8247	0.5114	0.6462	38.41	***
ln(GPWGWR)	0.0080	0.0041	0.0340	0.0000	0.0086	0.0076	0.0088	0.0078	7.29	***
ln(MKGPWGWR)	0.6262	0.1646	1.4387	0.0000	0.6018	0.6811	0.6192	0.6211	-4.15	***
ln(GDP)	8.1957	1.4867	9.5282	2.9124	6.2900	7.1943	8.3790	9.0676	-115.78	***
FENTRY	0.2086	0.4063	1.0000	0.0000	0.3228	0.2860	0.1690	0.1562	17.08	***
FOWNER	0.2256	0.4180	1.0000	0.0000	0.3308	0.2930	0.1893	0.1784	15.40	***
OWNER	0.4935	0.5000	1.0000	0.0000	0.3670	0.4884	0.5000	0.5362	-15.83	***
Observations	14436				2763	2150	1284	8239		

Table 4 Impact of Market Competition on Insurer Survival Rate/Time

Dependent variable is a binary variable indicating if an insurer suffered from insolvency and survival time to crises (time to crisis). Survival time to crises (time to crisis) is defined as the survival time of an insurer from current crisis to next crisis, which has the minimum duration $t = 1$ if the crisis was experienced in the first year and has the maximum duration $t = 12$ if crisis occurred in 2007. If a country does not experience any crisis over the sample period; its duration is right-censored. Survival time is equal to reporting year minus the firm's start year. The PRH statistic to measure competitive power is calculated based on three year rolling windows. The HHI, i.e., the Hirschmann-Herfindahl index of concentration based on the total gross premiums written, is calculated by aggregating the squares of the market shares of all insurers in a country. ln(Z-score) is calculated by return-on-asset (ROA) plus the ratio of equity to asset divided by the standard deviation of ROA, which is based on three-year rolling time window to reflect the effect of time variation of Z-score. Firm size (ln(TA)) is measured by the natural logarithm of firm's total assets. LEVG is firm's debt ratio, which is calculated by total debts divided by total assets. LOSSR is the loss ratio of an insurer, which is defined as the incurred losses over earned premiums. REINSR is the reinsurance ratio, which is defined as the total reinsurance ceded over gross premiums written. *CE* is the cost efficiency and *SE* is the scale efficiency of an insurer. ln(GPWGWR) is the natural logrithem of the growth rate of insurer's gross premiums written. ln(MKGPWGWR) is the natural logarithm of the growth rate of insurer's gross premiums written in the insurance industry. ln(GDP) is the natural logarithm of the gross domestic production of a country. * indicates the 1% significance level, ** indicates the 5% significance level，*** indicates the 1% significance level. The values in parentheses are standard errors.

Variables	Model (1)		Model (2)		Model (3)		Model (4)	
	Survival α	Survival β	Survival α	Survival β	Survival α	Survival β	Survival α	Survival β
	Estimates (1)	Estimates (2)	Estimates. (3)	Estimates. (4)	Estimates (5)	Estimates (6)	Estimates (7)	Estimates (8)
Intercept	-3.812 ***		-3.350 ***		-3.372 ***		-3.327 ***	
	(0.782)		(0.892)		(0.915)		(0.908)	
PRH	**0.112**	**0.168** *			**0.035**	**0.224** ***	**0.052**	**0.321** ***
	(0.156)	**(0.081)**			**(0.165)**	**(0.082)**	**(0.229)**	**(0.099)**
HHI			**-0.934**	**1.027**	**-1.283**	**1.503** ***	**-0.405**	**2.159** ***
			(1.418)	**(0.589)**	**(1.432)**	**(0.578)**	**(1.795)**	**(0.667)**
PRH ∗HHI							**-1.780**	**-0.929**
							(1.871)	**(0.522)**
ln(TA)	-0.159 ***	0.059	-0.178 ***	0.060	-0.149 ***	0.052	-0.144 ***	0.052
	(0.053)	(0.025)	(0.053)	(0.024)	(0.053)	(0.025)	(0.053)	(0.025)
LEVG	5.176 ***	-1.157 ***	5.264 ***	-1.206 ***	5.117 ***	-1.093 ***	5.109 ***	-1.038 ***
	(0.575)	(0.249)	(0.573)	(0.249)	(0.574)	(0.249)	(0.576)	(0.25)
REINSR	-0.437	0.390 ***	-0.365	0.370 ***	-0.424	0.391 ***	-0.442	0.378 ***
	(0.312)	(0.142)	(0.309)	(0.143)	(0.311)	(0.141)	(0.311)	(0.141)
LOSSR	1.258 ***	0.031	1.309 ***	-0.013	1.266 ***	0.020	1.227 ***	0.036
	(0.337)	(0.149)	(0.335)	(0.149)	(0.337)	(0.148)	(0.337)	(0.148)
CE	-1.829 ***	0.769 ***	-1.766 ***	0.800 ***	-1.832 ***	0.760 ***	-1.903 ***	0.711 ***
	(0.332)	(0.146)	(0.331)	(0.147)	(0.332)	(0.145)	(0.336)	(0.147)
SE	-0.838	0.450 ***	-0.669	0.507 ***	-0.826	0.421	-0.890	0.389
	(0.362)	(0.172)	(0.357)	(0.174)	(0.359)	(0.171)	(0.361)	(0.172)
ln(GPWGWR)	-68.513 ***	-19.375	-67.684 ***	-19.782	-68.844 ***	-20.136	-69.823 ***	-19.797
	(21.745)	(9.395)	(21.712)	(9.417)	(21.851)	(9.385)	(22.066)	(9.377)
ln(MKGPWGWR)	1.855 ***	0.035	1.859 ***	0.067	1.643 ***	0.117	1.669 ***	0.101
	(0.355)	(0.162)	(0.353)	(0.162)	(0.348)	(0.163)	(0.347)	(0.163)
ln(GDP)	-0.299 ***	-0.091 ***	-0.348 ***	-0.034	-0.326 ***	-0.057	-0.332 ***	-0.064
	(0.071)	(0.033)	(0.081)	(0.035)	(0.081)	(0.035)	(0.081)	(0.036)
Scale		1.931 ***		2.064 ***		2.054 ***		2.062 ***
		(0.129)		(0.138)		(0.135)		(0.135)
Shape		0.349 ***		0.350 ***		0.348 ***		0.347 ***
		(0.01)		(0.01)		(0.01)		(0.01)
Global test LR								
Psudo R2								
-2 Log Likelihood								
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 5 Robustness Tests : G7 Countries Effect and Using Traditional Survival Measure

Dependent variable is a binary variable indicating if an insurer suffered from insolvency and survival time to crises (time to crisis). Survival time to crises (time to crisis) is defined as the survival time of an insurer from current crisis to next crisis, which has the minimum duration $t = 1$ if the crisis was experienced in the first year and has the maximum duration $t = 12$ if crisis occurred in 2007. If a country does not experience any crisis over the sample period; its duration is right-censored. Survival time is equal to reporting year minus the firm's start year. Traditional survival time is measured as the financial report year minus the start year of an insurer. The PRH statistic to measure competitive power is calculated based on three year rolling windows. The HHI, i.e., the Hirschmann-Herfindahl index of concentration based on the total gross premiums written, is calculated by aggregating the squares of the market shares of all insurers in a country. Firm size (ln(TA)) is measured by the natural logarithm of firm's total assets. LEVG is firm's debt ratio, which is calculated by total debts divided by total assets. LOSSR is the loss ratio of an insurer, which is defined as the incurred losses over earned premiums. REINSR is the reinsurance ratio, which is defined as the total reinsurance ceded over gross premiums written. *CE* is the cost efficiency and *SE* is the scale efficiency of an insurer. ln(GPWGWR) is the natural logrithem of the growth rate of insurer's gross premiums written. ln(MKGPWGWR) is the natural logarithm of the growth rate of insurer's gross premiums written in the insurance industry. ln(GDP) is the natural logarithm of the gross domestic production of a country. * indicates the 1% significance level, ** indicates the 5% significance level, *** indicates the 1% significance level. The values in parentheses are standard errors.

Variables	G7 countries				Non-G7 countries				Traditional survival time measure			
	Survival α Estimates (1)		Survival β Estimates (2)		Survival α Estimates. (3)		Survival β Estimates. (4)		Survival α Estimates (5)		Survival β Estimates (6)	
Intercept	3.651	*			2.468				-3.321	***		
	(2.135)				(2.066)				(0.909)			
PRH	-0.291		0.369	***	-0.274		0.563	**	0.052		0.321	***
	(0.265)		(0.126)		(0.673)		(0.271)		(0.229)		(0.099)	
HHI	-2.337		5.228	***	-1.733		1.729		-0.412		2.161	***
	(2.693)		(1.521)		(2.773)		(1.402)		(1.795)		(0.667)	
PRH ∗HHI	-1.740		-4.620	***	-2.031		-1.826	*	-1.781		-0.930	*
	(2.759)		(1.613)		(3.135)		(0.946)		(1.87)		(0.521)	
ln(TA)	-0.141	**	0.049	*	-0.381	***	0.169	**	-0.144	***	0.052	**
	(0.066)		(0.029)		(0.132)		(0.066)		(0.053)		(0.025)	
LEVG	4.603	***	-0.859	***	5.658	***	-1.920	***	5.111	***	-1.038	***
	(0.761)		(0.302)		(1.029)		(0.473)		(0.576)		(0.25)	
REINSR	0.272		0.312	*	-1.227		0.266		-0.444		0.378	***
	(0.398)		(0.17)		(0.754)		(0.368)		(0.311)		(0.141)	
LOSSR	1.772	***	-0.199		-1.187		1.330	***	1.229	***	0.035	
	(0.418)		(0.16)		(0.901)		(0.469)		(0.337)		(0.148)	
CE	-1.521	***	0.816	***	-2.863	***	0.682	**	-1.905	***	0.711	***
	(0.45)		(0.181)		(0.572)		(0.266)		(0.336)		(0.147)	
SE	-0.848	*	0.294		-0.956		0.109		-0.891	**	0.389	**
	(0.446)		(0.219)		(0.869)		(0.434)		(0.362)		(0.172)	
ln(GPWGWR)	-78.074	***	-14.094		-61.937		-53.796	*	-69.823	***	-19.798	**
	(25.812)		(10.11)		(56.036)		(29.978)		(22.07)		(9.376)	
ln(MKGPWGWR)	1.790	***	-0.005		-0.390		0.174		1.669	***	0.100	
	(0.472)		(0.194)		(0.69)		(0.352)		(0.347)		(0.163)	
ln(GDP)	-1.238	***	-0.024		-0.060		-0.331	***	-0.332	***	-0.064	*
	(0.192)		(0.078)		(0.188)		(0.094)		(0.082)		(0.036)	
Scale			2.127	***			1.961	***			2.062	***
			(0.284)				(0.3)				(0.135)	
Shape			0.355	***			0.297	***			0.347	***
			(0.012)				(0.018)				(0.01)	
Global LR test												
Psudo R2												
-2 Log Likelihood												
Year Effect	Yes		Yes		Yes		Yes		Yes		Yes	

Table 6. Robustness Test – Using Z- score to Measure Insurer Risk

Dependent variable is *ln(Z-score)*, which is calculated by return-on-asset (ROA) plus the ratio of equity to asset divided by the standard deviation of ROA, which is based on three-year rolling time window to reflect the effect of time variation of Z-score. The PRH statistic to measure competitive power is calculated based on three year rolling windows. The HHI, i.e., the Hirschmann-Herfindahl index of concentration based on the total gross premiums written, is calculated by aggregating the squares of the market shares of all insurers in a country. Firm size (ln(TA)) is measured by the natural logarithm of firm's total assets. LEVG is firm's debt ratio, which is calculated by total debts divided by total assets. LOSSR is the loss ratio of an insurer, which is defined as the incurred losses over earned premiums. REINSR is the reinsurance ratio, which is defined as the total reinsurance ceded over gross premiums written. *CE* is the cost efficiency and *SE* is the scale efficiency of an insurer. ln(GPWGWR) is the natural logrithem of the growth rate of insurer's gross premiums written. ln(MKGPWGWR) is the natural logarithm of the growth rate of insurer's gross premiums written in the insurance industry. ln(GDP) is the natural logarithm of the gross domestic production of a country. * indicates the 1% significance level, ** indicates the 5% significance level，*** indicates the 1% significance level. The values in parentheses are standard errors.

Variables	Model (1) Estimates (1)		Model (2) Estimates (2)		Model (3) Estimates. (3)		Model (4) Estimates. (4)	
PRH	0.088	***			0.095	**	0.090	***
	(0.027)				(0.034)		(0.025)	
HHI			1.424	***	1.474	***	1.431	***
			(0.327)		(0.326)		(0.403)	
*PRH*HHI*							0.079	
							(0.34)	
ln(TA)	0.128	***	0.120	***	0.122	***	0.122	***
	(0.014)		(0.012)		(0.013)		(0.012)	
LEVG	-1.869	***	-1.879	***	-1.875	***	-1.876	***
	(0.103)		(0.103)		(0.1)		(0.102)	
REINSR	0.203	***	0.190	***	0.181	***	0.181	***
	(0.047)		(0.046)		(0.046)		(0.045)	
LOSSR	-0.742	***	-0.755	***	-0.750	***	-0.750	***
	(0.139)		(0.138)		(0.137)		(0.137)	
CE	0.282	***	0.228	***	0.211	**	0.213	**
	(0.072)		(0.07)		(0.075)		(0.076)	
SE	0.358	***	0.367	***	0.318	***	0.320	***
	(0.097)		-0.071		(0.092)		(0.087)	
ln(GPWGWR)	-1.251		-2.233		-2.754		-2.730	
	(4.722)		(4.983)		(4.768)		(4.787)	
ln(MKGPWGWR)	0.488	***	0.457	***	0.438	***	0.438	***
	(0.089)		(0.084)		(0.082)		(0.082)	
ln(GDP)	0.271	***	0.288	***	0.283	***	0.284	***
	(0.019)		(0.02)		(0.021)		(0.021)	
G7 dummy	-0.634	***	-0.552	***	-0.572	***	-0.572	***
	(0.088)		(0.087)		(0.094)		(0.094)	
F-value	35917.32	***	50974.47	***	19495.90	***	17060.11	***
R-square	0.8668		0.8672		0.8675		0.8675	
Year Effect	Yes		Yes		Yes		Yes	
Cluster Year	Yes		Yes		Yes		Yes	

Table 7 Impact of Permitting Foreign Insurers Entry on Insurer Survival Rate/Time

Dependent variable is a binary variable indicating if an insurer suffered from insolvency and survival time to crises (time to crisis). Survival time to crises (time to crisis) is defined as the survival time of an insurer from current crisis to next crisis, which has the minimum duration $t = 1$ if the crisis was experienced in the first year and has the maximum duration $t = 12$ if crisis occurred in 2007. If a country does not experience any crisis over the sample period; its duration is right-censored. Survival time is equal to reporting year minus the firm's start year. The PRH statistic to measure competitive power is calculated based on three year rolling windows. The HHI, i.e., the Hirschmann-Herfindahl index of concentration based on the total gross premiums written, is calculated by aggregating the squares of the market shares of all insurers in a country. Firm size (ln(TA)) is measured by the natural logarithm of firm's total assets. LEVG is firm's debt ratio, which is calculated by total debts divided by total assets. LOSSR is the loss ratio of an insurer, which is defined as the incurred losses over earned premiums. REINSR is the reinsurance ratio, which is defined as the total reinsurance ceded over gross premiums written. *CE* is the cost efficiency and *SE* is the scale efficiency of an insurer. ln(GPWGWR) is the natural logrithem of the growth rate of insurer's gross premiums written. ln(MKGPWGWR) is the natural logarithm of the growth rate of insurer's gross premiums written in the insurance industry. ln(GDP) is the natural logarithm of the gross domestic production of a country. FENTRY is a dummy variable indicating if foreign insurers are permitted to enter the domestic market. * indicates the 1% significance level, ** indicates the 5% significance level, *** indicates the 1% significance level. The values in parentheses are standard errors.

Variable	Model (1)		Model (2)		Model (3)		Model (4)	
	Survival α	Survival β	Survival α	Survival β	Survival α	Survival β	Survival α	Survival β
	Estimates (1)	Estimates (2)	Estimates. (3)	Estimates. (4)	Estimates (5)	Estimates (6)	Estimates (7)	Estimates (8)
Intercept	-3.456 ***		-3.071 ***		-3.137 ***		-3.269 ***	
	(0.794)		(0.9)		(0.935)		(0.91)	
PRH	0.048	0.248 ***			-0.018	0.296 ***	-0.038	0.406 ***
	(0.175)	(0.084)			(0.184)	(0.084)	(0.245)	(0.098)
HHI			-0.558	1.162	-0.703	1.725 ***	0.253	2.472 ***
			(1.473)	(0.605)	(1.492)	(0.582)	(1.883)	(0.687)
*PRH*HHI*							-1.661	-1.138
							(2.09)	(0.554)
FENTRY	-2.631 ***	0.367	-2.000 ***	-0.386	-2.908 ***	0.323	-2.906 ***	0.825
	(0.497)	(0.237)	(0.513)	(0.236)	(0.711)	(0.353)	(0.747)	(0.814)
*PRH*FENTRY*	1.230	-0.965 ***			1.320	-0.941 ***	1.299	-1.553
	(0.582)	(0.272)			(0.6)	(0.273)	(0.795)	(0.853)
*HHI*FENTRY*			1.924	0.930	2.265	-0.018	1.034	-4.238
			(4.139)	(1.939)	(4.446)	(2.332)	(7.245)	(6.836)
ln(TA)	-0.115	0.060	-0.131	0.061	-0.106	0.053	-0.098	0.053
	(0.054)	(0.025)	(0.053)	(0.025)	(0.054)	(0.025)	(0.054)	(0.025)
LEVG	5.295 ***	-1.025 ***	5.373 ***	-1.122 ***	5.205 ***	-0.953 ***	5.159 ***	-0.882 ***
	(0.577)	(0.249)	(0.571)	(0.247)	(0.575)	(0.249)	(0.578)	(0.252)
REINSR	-0.218	0.440 ***	-0.077	0.385 ***	-0.194	0.431 ***	-0.197	0.414 ***
	(0.32)	(0.143)	(0.314)	(0.144)	(0.319)	(0.142)	(0.318)	(0.141)
LOSSR	1.386 ***	0.012	1.340 ***	0.011	1.362 ***	0.015	1.313 ***	0.036
	(0.342)	(0.149)	(0.334)	(0.148)	(0.342)	(0.149)	(0.341)	(0.149)
CE	-2.005 ***	0.716 ***	-1.965 ***	0.766 ***	-2.028 ***	0.701 ***	-2.052 ***	0.641 ***
	(0.339)	(0.148)	(0.337)	(0.148)	(0.339)	(0.147)	(0.344)	(0.149)
SE	-0.912	0.401	-0.751	0.509 ***	-0.874	0.359	-0.882	0.310
	(0.37)	(0.173)	(0.362)	(0.175)	(0.367)	(0.171)	(0.369)	(0.172)
ln(GPWGWR)	-64.220 ***	-21.113	-63.026 ***	-21.324	-64.986 ***	-21.265	-66.437 ***	-21.111
	(22.371)	(9.54)	(22.161)	(9.579)	(22.444)	(9.546)	(22.506)	(9.467)
ln(MKGPWGWR)	1.985 ***	0.070	2.034 ***	0.097	1.793 ***	0.152	1.799 ***	0.136
	(0.37)	(0.163)	(0.363)	(0.164)	(0.363)	(0.164)	(0.362)	(0.165)
ln(GDP)	-0.409 ***	-0.118 ***	-0.457 ***	-0.047	-0.419 ***	-0.078	-0.405 ***	-0.087
	(0.074)	(0.033)	(0.082)	(0.035)	(0.083)	(0.036)	(0.084)	(0.036)
scale		1.883 ***		2.039 ***		2.024 ***		2.024 ***
		(0.129)		(0.139)		(0.135)		(0.134)
shape		0.348 ***		0.350 ***		0.347 ***		0.346 ***
		(0.01)		(0.01)		(0.01)		(0.01)
Global LR test								
Psudo R2								
-2 Log Likelihood								
Year Effect	Yes		Yes		Yes		Yes	

Table 8. Impact of Permitting Foreign Insurers Hold Over 50% Shares

Dependent variable is a binary variable indicating if an insurer suffered from insolvency and survival time to crises (time to crisis). Survival time to crises (time to crisis) is defined as the survival time of an insurer from current crisis to next crisis, which has the minimum duration $t = 1$ if the crisis was experienced in the first year and has the maximum duration $t = 12$ if crisis occurred in 2007. If a country does not experience any crisis over the sample period; its duration is right-censored. Survival time is equal to reporting year minus the firm's start year. The PRH statistic to measure competitive power is calculated based on three year rolling windows. The HHI, i.e., the Hirschmann-Herfindahl index of concentration based on the total gross premiums written, is calculated by aggregating the squares of the market shares of all insurers in a country. Firm size (ln(TA)) is measured by the natural logarithm of firm's total assets. LEVG is firm's debt ratio, which is calculated by total debts divided by total assets. LOSSR is the loss ratio of an insurer, which is defined as the incurred losses over earned premiums. REINSR is the reinsurance ratio, which is defined as the total reinsurance ceded over gross premiums written. *CE* is the cost efficiency and *SE* is the scale efficiency of an insurer. ln(GPWGWR) is the natural logrithem of the growth rate of insurer's gross premiums written. ln(MKGPWGWR) is the natural logarithm of the growth rate of insurer's gross premiums written in the insurance industry. ln(GDP) is the natural logarithm of the gross domestic production of a country. FOWNER is a dummy variable indicating if an insurer has over 50% shares hold by foreign insurers. * indicates the 1% significance level, ** indicates the 5% significance level, *** indicates the 1% significance level. The values in parentheses are standard errors.

Variable	Model (1)		Model (2)		Model (3)		Model (4)	
	Survival α Estimates (1)	Survival β Estimates (2)	Survival α Estimates. (3)	Survival β Estimates. (4)	Survival α Estimates (5)	Survival β Estimates (6)	Survival α Estimates (7)	Survival β Estimates (8)
Intercept	-3.809 ***		-3.069 ***		-3.171 ***		-3.303 ***	
	(0.776)		(0.903)		(0.936)		(0.906)	
PRH	0.048	0.249 ***			-0.004	0.296 ***	-0.037	0.408 ***
	(0.176)	(0.084)			(0.184)	(0.084)	(0.247)	(0.098)
HHI			-0.462	1.140	-0.611	1.741 ***	0.345	2.456 ***
			(1.475)	(0.612)	(1.493)	(0.59)	(1.905)	(0.696)
*PRH*HHI*							-1.557	-1.152
							(2.149)	(0.56)
FOWNER	-2.739 ***	0.370	-2.005 ***	-0.408	-2.903 ***	0.301	-2.919 ***	0.825
	(0.525)	(0.245)	(0.501)	(0.222)	(0.687)	(0.328)	(0.737)	(0.801)
*PRHF*OWNER*	1.321	-0.990 ***			1.305	-0.948 ***	1.306	-1.579
	(0.618)	(0.281)			(0.599)	(0.271)	(0.782)	(0.842)
*HHI*FOWNER*			1.552	1.036	1.862	0.155	0.760	-4.178
			(4.013)	(1.756)	(4.191)	(2.026)	(7.238)	(6.714)
ln(TA)	-0.112	0.062	-0.128	0.061	-0.102	0.054	-0.095	0.054
	(0.054)	(0.025)	(0.053)	(0.025)	(0.054)	(0.025)	(0.054)	(0.025)
LEVG	5.307 ***	-1.059 ***	5.314 ***	-1.132 ***	5.139 ***	-0.957 ***	5.105 ***	-0.899 ***
	(0.582)	(0.252)	(0.572)	(0.248)	(0.574)	(0.248)	(0.577)	(0.251)
REINSR	-0.165	0.419 ***	-0.109	0.391 ***	-0.218	0.433 ***	-0.212	0.412 ***
	(0.321)	(0.143)	(0.314)	(0.144)	(0.319)	(0.142)	(0.318)	(0.141)
LOSSR	1.381 ***	0.012	1.327 ***	0.012	1.345 ***	0.015	1.301 ***	0.037
	(0.346)	(0.15)	(0.335)	(0.148)	(0.342)	(0.149)	(0.342)	(0.149)
VCE	-1.981 ***	0.708 ***	-1.977 ***	0.767 ***	-2.036 ***	0.697 ***	-2.061 ***	0.641 ***
	(0.34)	(0.148)	(0.338)	(0.149)	(0.34)	(0.147)	(0.345)	(0.149)
SE	-0.760	0.352	-0.745	0.511 ***	-0.858	0.351	-0.865	0.302
	(0.37)	(0.173)	(0.363)	(0.175)	(0.367)	(0.172)	(0.37)	(0.173)
ln(GPWGWR)	-65.409 ***	-21.155	-63.991 ***	-21.316	-66.206 ***	-21.258	-67.592 ***	-21.105
	(22.567)	(9.545)	(22.27)	(9.569)	(22.564)	(9.535)	(22.639)	(9.464)
ln(MKGPWGWR)	1.996 ***	0.090	2.069 ***	0.099	1.828 ***	0.152	1.829 ***	0.136
	(0.371)	(0.163)	(0.364)	(0.163)	(0.365)	(0.164)	(0.364)	(0.165)
ln(GDP)	-0.391 ***	-0.124 ***	-0.455 ***	-0.048	-0.416 ***	-0.078	-0.401 ***	-0.088
	(0.074)	(0.033)	(0.082)	(0.035)	(0.083)	(0.036)	(0.084)	(0.036)
Scale		1.853 ***		2.037 ***		2.024 ***		2.021 ***
		(0.128)		(0.139)		(0.135)		(0.134)
Shape		0.348 ***		0.350 ***		0.347 ***		0.346 ***
		(0.01)		(0.01)		(0.01)		(0.01)
Global test LR								
Psudo R2								
-2 Log Likelihood								
Year Effect	Yes		Yes		Yes		Yes	

Table 9 Impact of Permitting Outside Insurers Hold Over 50% Shares

Dependent variable is a binary variable indicating if an insurer suffered from insolvency and survival time to crises (time to crisis). Survival time to crises (time to crisis) is defined as the survival time of an insurer from current crisis to next crisis, which has the minimum duration $t = 1$ if the crisis was experienced in the first year and has the maximum duration $t = 12$ if crisis occurred in 2007. If a country does not experience any crisis over the sample period; its duration is right-censored. Survival time is equal to reporting year minus the firm's start year. The PRH statistic to measure competitive power is calculated based on three year rolling windows. The HHI, i.e., the Hirschmann-Herfindahl index of concentration based on the total gross premiums written, is calculated by aggregating the squares of the market shares of all insurers in a country. Firm size (ln(TA)) is measured by the natural logarithm of firm's total assets. LEVG is firm's debt ratio, which is calculated by total debts divided by total assets. LOSSR is the loss ratio of an insurer, which is defined as the incurred losses over earned premiums. REINSR is the reinsurance ratio, which is defined as the total reinsurance ceded over gross premiums written. *CE* is the cost efficiency and *SE* is the scale efficiency of an insurer. ln(GPWGWR) is the natural logrithem of the growth rate of insurer's gross premiums written. ln(MKGPWGWR) is the natural logarithm of the growth rate of insurer's gross premiums written in the insurance industry. ln(GDP) is the natural logarithm of the gross domestic production of a country. OWNER is a dummy variable indicating if an insurer has over 50% shares hold by outside stockholders. * indicates the 1% significance level, ** indicates the 5% significance level，*** indicates the 1% significance level. The values in parentheses are standard errors.

	Model (1)		Model (2)		Model (3)	
	Survival α	Survival β	Survival α	Survival β	Survival α	Survival β
Variables	Estimates (1)	Estimates (2)	Estimates. (3)	Estimates. (4)	Estimates (5)	Estimates (6)
Intercept	-5.381 ***		-4.817 ***		-4.539 ***	
	(0.807)		(0.91)		(1.03)	
PRH	0.043	0.280 ***			-0.050	0.330 ***
	(0.189)	(0.082)			(0.204)	(0.083)
HHI			-1.607	0.441	-3.937	1.627 ***
			(1.583)	(0.647)	(1.688)	(0.609)
OWNER	-2.910 ***	0.186	-2.820 ***	-0.765 ***	-3.667 ***	-0.090
	(0.343)	(0.201)	(0.379)	(0.156)	(0.492)	(0.229)
*PRH*OWNER*	0.959	-0.993 ***			1.104 ***	-0.873 ***
	(0.386)	(0.215)			(0.425)	(0.21)
*HHI*OWNER*			8.289 ***	3.153 ***	10.022 ***	2.021
			(2.749)	(1.114)	(2.824)	(1.115)
ln(TA)	-0.055	0.069 ***	-0.085	0.077 ***	-0.032	0.061
	(0.056)	(0.025)	(0.056)	(0.025)	(0.056)	(0.025)
LEVG	5.366 ***	-0.940 ***	5.507 ***	-1.191 ***	5.217 ***	-0.901 ***
	(0.601)	(0.26)	(0.593)	(0.254)	(0.591)	(0.252)
REINSR	-0.212	0.502 ***	-0.058	0.487 ***	-0.115	0.507 ***
	(0.334)	(0.142)	(0.328)	(0.145)	(0.332)	(0.141)
LOSSR	1.352 ***	-0.100	1.250 ***	-0.110	1.268 ***	-0.111
	(0.357)	(0.149)	(0.348)	(0.149)	(0.355)	(0.147)
VCE	-1.923 ***	0.668 ***	-1.850 ***	0.787 ***	-1.877 ***	0.678 ***
	(0.354)	(0.151)	(0.345)	(0.15)	(0.352)	(0.149)
SE	-0.733	0.453 ***	-0.638	0.642 ***	-0.735	0.452 ***
	(0.387)	(0.17)	(0.387)	(0.175)	(0.386)	(0.17)
ln(GPWGWR)	-62.789 ***	-19.740	-62.016 ***	-20.273	-63.941 ***	-19.727
	(23.218)	(9.346)	(22.799)	(9.432)	(23.105)	(9.329)
ln(MKGPWGWR)	1.811 ***	0.107	2.002 ***	0.062	1.732 ***	0.147
	(0.381)	(0.162)	(0.377)	(0.164)	(0.374)	(0.161)
ln(GDP)	-0.238 ***	-0.081	-0.292 ***	-0.014	-0.302 ***	-0.031
	(0.077)	(0.033)	(0.084)	(0.035)	(0.087)	(0.036)
Scale		2.021 ***		2.155 ***		2.177 ***
		(0.13)		(0.142)		(0.137)
Shape		0.352 ***		0.353 ***		0.351 ***
		(0.01)		(0.01)		(0.01)
Global LR test						
Psudo R2						
-2 Log Likelihood						
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes