Impacts of Deregulation on Property and Casualty Insurers' Pricing and Risk Taking: Empirical Evidence in Japan

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Abstract

The purpose of this paper is to examine empirically the effects of rate-deregulation on Japanese Property and Casualty (P/C) insurers' pricing and risk-taking behaviors. As long as we know, there is little empirical evidence of the determinants of risk-taking at P/C insurance companies in Japan. Applying the basic ideas from the field of banking, we investigate the factors affecting risk taking at P/C insurance companies. We find that the price setting at Japanese P/C insurers are decreased after the deregulation. In contrast, we find the risk levels of Japanese P/C insurers are generally increased after the rate-deregulation. However, franchise value that is measured by simple Q contributes adversely to P/C insurer risk-taking only before the deregulation. Lastly, we find that P/C insurers that belong to keiretsu groups have reduced the insurer rates but increased risk taking after the deregulation. In this sense, the impacts of deregulation are higher for P/C insurance companies that belong to the Keiretsu groups.

Keywords: Japanese P/C insurers, Rate-deregulation, Risk Taking, Franchise Value, Keiretsu affliation.

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1. Introduction

Traditionally, the Japanese Property and Casualty (P/C) industry has enjoyed a stable and profitable market condition under heavy regulations before the deregulation in the late 1990s (e.g., Hayakawa et al. 2000). The Japanese PC insurance industry has undergone remarkable changes, starting in 1996 when the Insurance Business Law was entirely revised. This is a part of the deregulation of Japanese Financial system that is known as Japanese version of "Big Bang". Among the deregulations, one of the most notable reforms is that the Japanese non-life insurance market has shifted from a tariff system to a prior approval system. This rate-deregulation has the huge impacts on the Japanese P/C insurance market and the pricing strategies of Japanese P/C insurers. Consequently, the number of P/C companies has dramatically decreased through consolidations due to sever competitions among them.

The purpose of this paper is to examine empirically the effects of rate-deregulation on Japanese P/C insurers' pricing and risk-taking behaviors. Although some previous research (e.g., Pope, 2004, Pope and Ma, 2005, Yin, 2008, Yanase, 2007, Chano, 2009) has already addressed the effects of deregulation in Japan by focusing on the cost structures and/or pricing behaviors, empirical evidence regarding the impacts on pricing or cost structure is generally mixed. For example, Pope (2004) shows empirically that deregulation in Japanese P/C insurance industry has little impact on the loss and expense ratios in the auto insurance market. In addition, Pope and Ma (2005) argue that despite formal deregulation, Japan`s regulatory body maintains significant control about the pricing behaviors. In contrast, Yin (2008) shows that the expense ratios of the insurers have decreased after the deregulation, which is the long-run period compared with Pope (2004). Hence, this study expands the sample periods by including the recent data compared with the previous research and investigate the effects on the pricing strategies at Japanese P/C insurance companies. By looking the effects of rate-deregulation on the net premiums in the long run perspective compared with Pope and Ma (2005), we revisit this old and new question in the insurance field (Joskow, 1973, Harrington, 1994, Cummins et al., 2004).

In addition, we explore the effects of deregulation on the risk taking at P/C insurance companies. To investigate the determinants of P/C insurer risk-taking, we use the capital market risk measures. Although some previous researches like Yanase et al. 2008 and Chano, 2009 examine the effects of deregulation on the efficiency at P/C insurers, there is little empirical evidence of the determinants of risk-taking at P/C insurance companies in Japan. Both of Yanase et al. (2008) and Chano (2009) empirically show that the efficiency of Japanese P/C insurance industry has been improved after the deregulation. However, when we evaluate the effects of deregulation on the P/C industry as a whole, the risk level or risk-taking behaviors at P/C insurers is also an important aspect for the evaluations of the deregulation. If the stability of P/C industry is damaged by the severe price competition, the efficiency gains might be in danger of being lost in the long run perspective. As long as we know, there is little empirical evidence of the determinants of risk-taking at P/C insurance companies in Japan. Applying the basic ideas from the field of banking, we investigate the factors affecting P/C insurer risk taking.

The main findings of this paper are as follows:

First, the price setting by Japanese P/C insurers are decreased after the deregulation. Second, the risk levels at Japanese P/C insurers are generally increased after the rate-deregulation. Third, Franchise value that is measured by simple Q contributes adversely to P/C insurer risk-taking only before the deregulation. Fourth, P/C insurers that belong to keiretsu groups have reduced the insurer rates but increased risk-taking after the deregulation. In this sense, the impacts of deregulation are higher for P/C insurance companies that belong to the Keiretsu groups.

There are two strands of literature related to the current analysis. One is the determinants of the pricing strategies at P/C insurance companies. Insurance pricing is an important economic issue. The other strand of literature related to this paper is the determinants of the level of P/C insurance companies. In contrast to the case of the U.S. insurance market, where the regulation is based on the state level, there are some merits in testing the Japanese P/C markets. In addition, we can analyze individual P/C firms in detail by using both price and non-price firm level data, which is difficult on the state level analysis.

The remainder of this paper is organized as follows. Section 2 develops hypotheses. Section 3 describes data and empirical methodologies, and presents the empirical results. Section 4 summarizes the findings of this paper.

2. Hypotheses

In this paper, we are interested in the effects of the deregulation on P/C insurance companies. This section develops our testable hypotheses.

2-1. Impacts of the deregulation on the P/C insurer pricing strategies

Empirical evidence regarding the effects of rate regulation on pricing behaviors is mixed. Cummins (2001), Tennyson (1997), among others, have found price levels in regulated markets to be lower than would be found in an otherwise competitive market, which is known as the rate suppression hypothesis.

A different alternative view is that insurance price regulation facilitates collusive pricing behavior among market competitors, which is known as a cartel market. The cartel market implies that bureau rates are set relatively high and the regulator strictly force insurers to adhere those rates[2]. Thus, P/C insurers might have an incentive to deviate and lower the tariff price level to attract their customers. Market leaders gladly comply and enjoy associated high profitability. In contrast, small insurers attempt to undercut the bureau rate level to capture market share[3].

In right of the above discussion, how the rate-deregulation affects P/C insurer price setting behaviors is an empirical question.

[2] Harrington (1984) calls this as the excessive price hypothesis. He also suggests other hypotheses: the regulatory lag hypothesis, or the capture theory hypothesis.

[3] Pope and Ma (2005) applies Dazon (1983) hypothesis to the Japanese auto insurance Markets, and contends that the Japanese auto insurance market still operates much like a cartel. However, note that their sample periods are from1991 to 2000. Thus, we would like to look the Japanese P/C market in the long run perspective.

In Japanese context, under the tariff market system, insurers are required to user reference rates provided by the Property and Casualty Insurance Rating Organization (PCIRO). Reference rates are based on estimates of loss costs and form deviation was not allowed and allowable-underwriting criteria were limited. Hence, we support the latter view and expect P/C insurers undercut lower price level to attract their customers after the deregulation.

H1: The deregulation lowers price setting at P/C insurers.

2-2. Impacts of the deregulation on the P/C insurer risk-taking and franchise value

Generally speaking, the rate-deregulation of insurance markets is, other things being equal, generally expected to have a favorable impact on consumer welfare, often reducing costs and prices, or improving the quality of insurance services available to consumers. However, when we evaluate the effects of deregulation on the P/C industry, risk-taking behavior at P/C insurers is also an important aspect. If the stability of P/C industry as a whole is damaged by the severe price competition among them resulting in the high level of risk-taking, the efficiency gains might be offset by risk-taking by P/C insurers in the long run perspective.

In Japanese context, as we discussed in Hypothesis 1, Japanese P/C markets under the tariff system were a kind of cartel market, which implies that Japanese P/C insurers gained the rents before the deregulation. In other words, Japanese P/C insurers lost rents after the deregulation, mainly because of the sever price-cutting and/or cost-decreasing competitions among P/C insurers. Therefore, we expect that the risk level of P/C insurers is getting higher after the rate-deregulation

In addition, Intangible assets, also known as franchise or charter value in the field of banking (e.g., Keely, 1990), are generally expected to deter financial institutions from risk taking. The risk level of P/C insurance companies is expected to be associated with their Franchise value. Yu et al. (2008) theoretically and empirically shows that insurers` asset risk is inversely related to their intangible assets in the U.S.

H2: The deregulation increases P/C insurer risk taking.

H3: Franchise value reduces P/C insurer risk taking.

2-3. Impacts of the Keiretsu-affiliation on the PC insurer behaviors

The post-World War II Japanese corporate governance has been characterized as the Keiretsu (that means “a line affiliation”) or a main bank system at least until the end of the bubble economy in the early 1990s. Historically, the main bank system can be seen as being partly originated from the wartime system of credit allocation, which established a close relationship between banks and firms (Hoshi and Kashyap, 2001). A Keiretsu is comprised up to 20-40 firms, which are related to each other by product-client or other strong links and are organized around the same main bank.

The main characteristics of this system are the long-term relationship between a bank and its client firms, and the stockholdings by the main bank (often including cross-shareholdings). The

aim of this cross-shareholdings pursed by companies by reciprocal holdings of each other`s equity is protect themselves from takeover threat. This is achieved in an implicit agreement between member companies by lining themselves to each other.

In addition, the main bank intervene its client firms when they become financially distressed. It is usually recognized that the main bank acts as a delegated monitor, and is implicitly expected to play a role of overcoming the agency problem between managers and the firm.

Japanese P/C insurers are also important players in the main bank system, they generally play a role of stable shareholders in each Keiretsu groups. Lai and Limpaphayom (2003) find that P/C insurers that belong to Keiretsu groups have lower expenses and lower levels of free cash flow than independent P/C insurers. Thus, if the Keiretsu-affiliation mitigates the agency problems as discussed above, then we expect that P/C insurers that belong to Keiretsu group have lower pricing due to the lower expenses.

H4: The Keiretsu-affiliation lowers price setting at P/C insurers.

On the other hand, empirical research of the effects of Keiretsu-affiliation on risk-taking behaviors is scarce. Thus, although our analysis is somewhat explanatory in nature, it provides important insight into the linkage between the Keiretsu effect and the characteristics of P/C insurers.

As we discuss before H4, if Keiretsu improves the conflict of interests between managers and stockholders of the firm, then, other thing being equal, P/C insurers might take more risks. In a different study, Yanase (2010) find that Japanese P/C insurers that belong to Keiretsu have lower reinsurance demand than independent P/C insurers. He argues that Keiretsu groups generally facilitate conventional mutual insurance (risk sharing system) among member firms and thus those firms have less incentive to demand costly (re)insurance.

On the basis of this discussion, we formulate our hypothesis as follows.

H5: The Keiretsu-affiliation increases P/C insurer risk taking.

3. Empirical Analysis

This section describes our data, methodology and presents our empirical results.

3-1. Data and Methodology

The data used in this paper were collected from two main sources. The data on P/C insurers` accounting for Japanese P/C insurers are collected from the Statistics of Japanese Non-Life Insurance Business published by the Insurance Research Institute of Japan. The rest data on P/C insurers` market characteristics are collected from the NIKKEI NEEDS Financial Quest database, a standard database used in recent empirical studies in Japan. We use an unbalanced panel data of Japanese P/C insurance companies covering the period from fiscal year 1991 to

2007[4]. Since we need to use the capital market risk measures as the risk metrics, sample P/C insurance companies should be listed on the Tokyo Stock Exchange during the sample period.

To test the hypotheses presented in section 2, we estimate the following regression model using panel data techniques:

1) $$Rate_{i,t} = \beta_0 + \beta_1 Dereg + \beta_2 Size_{i,t} + \beta_3 Yield_{i,t} + \beta_4 Econ_t + \beta_5 Keiretsu_{i,t} + \beta_6 Foregin_own_{i,t} + \beta_7 Fis_own_{i,t} + \varepsilon_{i,t}$$

The dependent variable is a proxy for the rate of insurance at P/C insurer i at time t (t=1991,…, 2008). We use two measure of pricing:
Rate_ total: The inverse of loss ratio where the loss ratio is defined as the ratio of net claims (including loss adjustment expenses) divided by the net premium written.
Rate_auto: An inverse of the loss ratio classified by the line of automobile.

One potential critique of using only *Rate_total* is that it does not consider non-price competition, or the differences of lines of insurances at each P/C insurer. Nonetheless, we follow the traditional commonly used proxy for insurer prices for comparisons with previous research. For the latter critique, we also estimate *Rate_auto*, which is narrowing our focus on the auto insurance market. However, note that the sample periods are from 1996 (FY1995) due to the data availability when we use *Rate_auto*. Following Pope and Ma (2005), we focus on the auto insurance industry to compare the results between *Rate_total* and *Rate_auto*.

We define the independent variables of equation 1) as follows:
Dereg: a dummy variable that takes the value one if the years after 1997 (Fiscal year 1998 to 2007), zero otherwise[5].
Size: log of total assets, or the share of automobile insurance across Japanese P/C insurance companies.
Yield: yield of financial assets invested at P/C insurer at time t.
Econ: Real GDP per capita at time t.
Keiretsu: a dummy variable that takes the value of one if P/C insurer is a member of Keiretsu affiliations at time t. We follow the classification from Yanase (2010).
Foregin_own: stock ownership by foreign investors at P/C insurer at time t.
Fis_own: stock ownership by financial institutions at P/C insurer at time t.

To examine the impacts of rate-deregulation on risk-taking behaviors at P/C insurers, the following equation is estimated;

2) $$\begin{aligned} Risk_{i,t+1} &= \beta_0 + \beta_1 Dereg + \beta_2 Franchise_{i,t} + \beta_3 Size_{i,t} \\ &+ \beta_4 Yield_{i,t} + \beta_5 Econ_t + +\beta_6 Keiretsu_{i,t} + \beta_7 Foreign_own_{i,t} + \beta_8 Fis_own_{i,t} + \beta_9 Reins_{i,t} + \varepsilon_{i,t} \end{aligned}$$

[4] When P/C insurance firm merged with other P/C insurers, we count it as a different P/C insurance company to smooth our data sets.Yin (2010) also treat each consolidated company as a separate unit of analysis.
[5] When we focus on the effects of the rate-deregulation, July 1of 1998 is the abolishing date, and thus we define *Dereg* as in text.

The dependent variable is a measure for the risk level of P/C insurer i risk at time t. We use three alternative market risk measures: total risk, firm-specific risk, systematic risk. Total risk is defined as the standard deviation of a P/C insurer`s daily stock returns $R_{i,t}$ for each fiscal year[6]. To estimate the rest of the risk measures for each fiscal year and for each P/C insurer, we use the Fama and French (1993) three factor model as a return generating process[7]:

3) $$R_{i,t} - R_f = \beta_0 + \beta_1 (R_{m,t} - R_f) + \beta_2 SMB_t + \beta_3 HML_t + \varepsilon_{i,t}$$

where R_f is the risk-free rate. The first factor controls for the excess return that is correlated with the market excess return. The second term represents the differences in returns between portfolios of small and large firms (SMB). The third term represents the differences in returns between portfolios of high and low book-to-market ratios (HML). These two factors are based on Fama and French (1993)[8]. Firm-specific risk is the standard deviation of the residual of equation 3) for each P/C insurer. Systematic risk is defined as the difference between total risk and firm-specific risk.

In addition to the independent variables of equation 1), we add one key variable and one control variables in equation 2):
Franchise: Franchise value as measured by Simple Q (Keely, 1990) and Simple Q is defined as the sum of the market value of equity plus the book value of liabilities divided by the book value of assets.
Reins: Ceded premiums divided by the sum of direct net premiums and reinsurance commissions paid.

By investigating the above equations, we would like to find some key empirical facts to evaluate the effects of rate-deregulation in Japan. Hopefully, the results should be generalizable to more broad implications of the deregulation of P/C insurance industry.

3-2. Empirical Results

3-2-1. Effects of the Deregulation on the Pricing at P/C Insurers

Table 1 provides summary statistics of our final data sample, and three sets of data are reported there: the full sample of the 1992-2008 period, the subsamples of the 1992-1998 and 1999-2008 period. The 1992-1998 and 1999-2008 period represent periods prior and subsequent to the abolition of duty for using the regulated pricing in 1998. We compare the mean statistics by the t-tests. Because of the univariate nature of the analysis, the results should be viewed as only suggestive. Several findings, however, are note worthy. A comparison of the sample means of the variables across subsamples-periods before the deregulation and periods after the deregulation. The proxies of pricing of insurance (*Rate_all*, or *Rate_auto*) are significantly

[6] Due to the infrequency of trading, Taiyo FIRE is excluded from our sample.
[7] There are some controversial arguments for using the model to P/C industry, or of using the daily data for estimating the model. See, Cummins and Phillips (2005). For Japanese case, Shirasu et al. (2009) estimates the cost of capital at P/C insurers by using the model.
[8] Now, we can use the data of Japanese version of Fama and French (1993) data from NIKKEI Database.

lower after the deregulation, which indicates that the rate-deregulation affects the pricing strategy at P/C insurers and lowers the unit of pricing. In contrast, Risk taking variables (total risk, firm-specific risk, or Systematic risk) are significantly higher after the deregulation, which implies that the risk levels of Japanese P/C insurers are generally increased after the rate-deregulation. The rest of other variables are generally different between two subsample periods. Thus, even from this simple summary data, we can confirm the huge impacts of the deregulation on the Japanese P/C insurance industry.

Table 2 presents the time-series cross sectional (TSCS) regression results of equation 1) with the individual fixed effects. Columns 1and 2 show the results when *Rate_ total* is used as the dependent variable. Column 1 is our representative result for testing H1 and H4. Column 2 is an alternative estimation of Column 1 following a basic idea from Yin (2010), excluding samples of year 2000, 2001, and 2002 (FY 2001 to FY 2003) to get rid of the short-term effects of consolidations among P/C insurers. In other words, we expect that the true gains from consolidation only emerge after some time has passed.

Row 1 shows the estimated effects of the rate-deregulation on the pricing behaviors at Japanese P/C insurers. It shows that the rate at each P/C insurer is decreased after the deregulation, indicating that the rate-deregulation affects the pricing strategy at P/C insurers and lowers the unit of pricing. In other words, the loss ratio increases from 55% to 60% after the deregulation.

Row 2 presents the estimated effects of firm size of P/C insurers on the price setting. The specification in Column 1 is statistically positive and significant at the 1 % level, indicating that larger Japanese P/C insurers set their prices higher than small P/C insurers. This result might be consistent with the arguments of Pope and Ma (2004), but the rest of the other columns are generally weak or insignificant. In this sense, we might need to be cautious on the effects of firm size on the rate of P/C insurances, at least in the long run perspective[9]. Also, the result of column 2 that excludes the short term effects of consolidations, Size coefficient is insignificant, implying that the firm size at P/C insurers doesn`t affect the level of insurance pricing.

Row 3 shows the estimated yield effects on the pricing at P/C insurers, and the coefficients are generally insignificant. The results imply that the profitability of assets at P/C insurer does not affect their pricing strategy. Row 4 shows the estimated effects of GDP per capita on the price setting at P/C insurers. The coefficients are positive and statistically significant, implying that the economy conditions are good and thus demanding more insurances results in the higher price of P/C insurances.

Row 5 to Row 7 presents the results of governance related variables. Row 5 shows that the estimated effects of Keiretsu affiliation on the pricing at P/C insurers. In any specifications, the coefficients are negative and statistically significant at the 1 or 5 percent level. The result indicates that P/C insurers that belong to Keiretsu groups set the pricing level lower than independent P/C insurers. Column 2 of Row 6 only shows that the equity holding by foreign

[9] Of course, as Pope and Ma (2004) carefully argue in the paper, we need to care about how to measure the size of P/C insurer.

investors might be correlated with the level of pricing at P/C insurers. One possible interpretation is that P/C insurers that set their pricing relatively high might be more profitable and then foreign investors invest more on these P/C insurers. However, the rest of results do not support this possibility. Row 7 did not show any correlation between the share holding by Financial Institutions and the level of Price at P/C insurers.

Row 8 controls the difference of line concentration between P/C insurers by including the *Share_auto* variable. The results of Column 3 and 4 are almost the same, and the estimated effects of share of auto insurance at each P/C insurer indicate that P/C insures that concentrate on the auto insurance market generally set their auto insurance pricing higher than other P/C insurers.

Overall, the hypotheses 1 and 4 are generally supported, implying that the rate-deregulation affects the pricing strategy at each P/C insurers and P/C insurers generally set their rate of insurances lower than after the deregulation.

3-2-2. Effects on Risk-Taking at P/C Insurers of the Deregulation

Table 3 presents the TSCS regression results of Risk-taking at P/C insurers with the individual fixed effects. Column 1 shows the result of equation 2) when total risk is used as the dependent variable. Row 1 shows that the estimated effects of the rate-deregulation on risk taking at P/C insurers. It shows that total risk is increased about 1.4 % after the deregulation, and the results are similar for Column 2 and 3, but not for column 4. That is, Total risk and Firm specific risk are increased, but systematic risk is not affected by the regulation. One plausible interpretation is that Japanese P/C insurers lost rents after the deregulation and the sever price-cutting and/or cost-decreasing competitions among P/C insurers increase the equity risks. Overall, Hypothesis 2 is empirically supported.

Row 2 and Row 3 show the estimated effects of Franchise value on Risk taking at P/C insurers. Row 3 considers the possibility of nonlinear relation between franchise value and risk taking. Surprisingly, the results are not statistically significant at any specification in Table 3. Although the specifications are different from those of Yu et al. (2008), our results seem to be inconsistent with Hypothesis 3[10]. The results of Colum 3 and 4 are the same as Column 1, indicating that franchise value doesn`t affect firm-specific risk and systematic risk.

Row 4 presents the estimated effect of firm size at P/C insurers on risk-taking. Except column 1, the coefficients are negative, and weakly significant at the 10% level. It weakly indicates that larger P/C insurers tend to have lower level of risk-taking than smaller ones.Row 5 shows the estimated yield effects on risk taking and the coefficients are generally insignificant. The results indicate that the profitability of assets at P/C insurer does not affect the level of risk-taking.

[10] However, one potential problem in the analysis comes from our data. Note that after March 2000, Fare value accounting has started. Thus, even the definition of Franchise value is still the same as before, the number is presumably affected by the change of accounting standard. We will discuss this problem in Table 4. See, Inoue et al. (2007).

However, only in column 3, the coefficient is positive and statistically significant at the 5% level, which is consistent with the argument that the high profitability for asset investments implies high firm-specific risk. Row 6 shows the estimated effects of GDP per capita on risk taking at P/C insurers. The coefficients are positive and statistically significant, implying that the economy conditions adversely affect P/C insurer risk taking.

Row 7 presents the estimated effects of Keiretsu affiliation on the pricing at P/C insurers. The coefficients are generally positive and statistically significant at the 1% or 5% level. These results indicate that P/C insurers that belong to Keiretsu groups take more risks compared with independent P/C insurers. This is consistent with the arguments of Yanase (2010). He argues that Keiretsu groups generally facilitate conventional mutual insurance (risk sharing system) among member firms and thus those firms have less incentive to demand costly (re)insurance. We find empirical evidence on this aspect by looking the capital market risk measures. Note also that Row 10 controls the different demand for reinsurance among P/C insurers. Thus, our results imply that risk-taking incentives of Keiretsu P/C insurer is generally high even after controlling the different demand for reinsurances. Thus, combined with the arguments in Section 3-2-1, the impacts of deregulation seem to be higher for P/C insurance companies that belong to the Keiretsu groups.

Row 8 shows that the equity holding by foreign investors don`t affect risk taking at P/C insurers. Row 9 also did not show any correlation between the share holding by Financial Institutions and P/C insurer risk taking. These results indicate that the shareholding structures do not affect the risk taking behaviors at Japanese P/C insurers.

Row 10 shows the effects of reinsurance demand by P/C insurers on risk taking. It shows that the coefficient is positive and significant, which is consistent with the view that having more reinsurance generally gives P/C insurers room for taking more risks.

Table 4 presents the TSCS regression results of equation 2) with the individual fixed effects at Japanese P/C insurers for two sub-periods: 1992-1998 (FY1991-FY1997) and 1999-2008 (FY1998-FY2007). One presumable reason that is not based on the deregulation for dividing our samples is that the changes of accounting rules prevent us from investigating correctly what is happing in Japanese P/C insurance industry. Note that after March 2000, Fare value accounting starts. Thus, even the definition of Franchise value is the same, the number is affected by the change of accounting standard. However, our first sub-sample period is under the same accounting rule, and we can exactly compare among them in the period.

As shown in column 1, the coefficient on franchise value is negative, and the coefficient on franchise value squared is positive. In contrast to the result of column 2 of Table 3, both coefficients are statistically significant at the 1% level. These results imply a U-shaped relationship between franchise value and total risk. From the estimated number of coefficients, the turning of point is at 1.12. In our samples, P/C insurers of 80 % of the sample are with franchise values are smaller than 1.12. Thus, Hypothesis 3 is true only before the rate deregulation. Interestingly, in Column 4, the coefficients on franchise values after the deregulation are insignificant, indicating that franchise value doesn`t affect P/C insurer risk taking. These results seem to be consistent the view that the Japanese P/C industry has enjoyed

a stable and profitable market condition under heavy regulations before the deregulation in the late 1990s

To further investigate and test the robustness, we split the sample of column 1 of Table 4 into low and high franchise value at each P/C insurers by year. P/C insurers with low franchise value are defined as those with below the mean value of 1.12. High franchise value P/C insurers are defined as those with above the mean value of 1.12. One possible advantage of these spitted specifications is that it allows the coefficients to differ across subsamples. Column 2 and 3 of Table 4 presents the estimated effects of franchise value on risk taking based on subsamples of low and high franchise value at P/C insurers, respectively. Column 2 shows that the coefficient on franchise value is negative, indicating that an increase of franchise value gives Japanese P/C insurer an incentive to reduce risk taking. In contrast, Column 3 shows that the coefficient on franchise value is positive, indicating that an increase of franchise value motivates high franchise P/C insurers to increase risk taking. Note that we confirm the consistent with those reported in Column 1.

4. Conclusion

We examined in this paper the effects of rate-deregulation on the price setting and risk taking at Japanese P/C insurers. We find the following empirical evidences:

(1) The rates at P/C insurers are decreased after the deregulation.

(2) The risk levels at P/C insurers are generally increased after the rate-deregulation.

(3) Franchise value adversely reduces P/C insurer risk-taking only before the deregulation.

(4) Japanese P/C insurers that belong to Keiretsu groups have reduced the insurer rates but increased risk-taking after the deregulation.

How much the Japanese economy more broadly benefited from the deregulation is beyond the scope of our study. But our estimates suggest that there might be both positive and negative aspects of the deregulation at P/C insurers. On the narrower issue of whether the aims of deregulation are achieved or not, our estimates suggest that the lower price setting by Japanese P/C insurers after the deregulation are generally beneficial for consumers. But, On the other hand, Japanese P/C insurers seem to be compelled to compete severely among the P/C insurers and be damaged by the competition, resulting in the higher equity risks even after the consolidations.

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Table 1
Descriptive Statistics

	(1)1992-2008[a] (FY1991-2007)	(2)1992-1998[b] (FY1991-1997)	(3)1999-2008 (FY1998-2007)	Test Statistics
Dependent variables				
1 Rate_total				
Average	1.76	1.83	1.70	-8.25 ***
Standard deviation	0.14	0.12	0.13	
2 Rate_Auto				
Average	1.58	1.67	1.54	-8.22 ***
Standard deviation	0.11	0.09	0.91	
3 Total risk(%)				
Average	2.23	2.11	2.37	2.75 **
Standard deviation	0.65	0.46	0.80	
4 Firm_specific risk(%)				
Average	1.88	1.80	1.98	1.91 *
Standard deviation	0.66	0.40	0.85	
5 Systematic risk(%)				
Average	0.35	0.32	0.39	2.52 **
Standard deviation	0.21	0.17	0.25	
6 Securites_Ratio(%)				
Average	0.83	0.86	0.81	-3.98 ***
Standard deviation	0.10	0.08	0.10	
Independent variables				
7 Franchise				
Average	1.05	1.09	1.00	-7.25 ***
Standard deviation	0.09	0.07	0.10	
8 Size				
Average	14.10	13.92	14.26	2.48 **
Standard deviation	1.05	0.98	1.08	
9 Yield(%)				
Average	3.31	4.38	2.32	-19.47 ***
Standard deviation	1.31	1.06	0.45	
10 Econ(Thousand Yen)				
Average	3418	3529	3312	-4.48 ***
Standard deviation	393	392	365	
11 Foreign_own(%)				
Average	15.13	11.33	18.61	2.36 **
Standard deviation	23.92	18.61	28.22	
12 Fis_own(%)				
Average	43.86	42.18	45.39	0.86
Standard deviation	28.59	26.43	30.47	
13 Reins(%)				
Average	7.57	8.13	7.03	-3.21 ***
Standard deviation	2.74	2.63	2.74	

Note: Test statistics are t-tests for difference of means.
[a] For Rate_auto, the data limitation exists and the sample period from 1996 to 2008 (FY1995 to FY2007).
[b] For Share_auto , the data limitation exists and the sample period from 1996 to 2008 (FY1995 to FY2007).
*** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 5% level.

Table 2
Effects of Deregulation on Pricing at PC Insurers

	Independent Variable	1992:03-2008:03 (FY1991-FY2007)		1996:03-2008:03 (FY1995-FY2007)	
		Rate_total (1)	Rate_total (2)	Rate_auto (3)	Rate_auto (4)
1	Dereg	-0.148	-0.203	-0.190	-0.146
		(-2.57) ***	(-4.43) ***	(-5.59) ***	(-4.05) ***
2	Size	0.163	-0.036	0.076	0.099
		(2.62) ***	(-0.52)	(1.35)	(1.80) *
3	Yield	0.230	-0.020	1.396	1.623
		(0.13)	(-1.43)	(0.55)	(0.66)
4	Econ(×10000)	0.00897	0.005	0.003	0.003
		(3.97) ***	(1.90) **	(1.69) *	(1.64) *
5	Keiretsu	-0.076746	-0.066	-0.122	-0.112
		(-2.58) ***	(-1.99) **	(-5.27) ***	(-4.97) ***
6	Foregin_own	-0.011	0.044	0.005	0.004
		(-0.42)	(2.04) **	(0.19)	(0.15)
7	Fis_own	-0.009	-0.016	0.028	0.027
		(-0.38)	(-0.91)	(1.30)	(1.28)
8	Share_auto				-0.491
					(-2.89) ***
	Year_dum	Yes	Yes	Yes	Yes
	F-statistic	23.59	33.94	16.92	15.88
	Adjusted R^2	0.79	0.89	0.82	0.81
	Observations	202	168	144	144

Note: Each regression includes year dummies.F statistics test the null hypothesis that an individual effect dnoes not exist. t-ratios are in parentheses below estimated coefficinets.
*** Significant at the 1% level.** Significant at the 5% level. * Significant at the 10% level.

Table 3
Effects on P/C Insuer Risk Taking of Deregulation

Independent Variable	1992:03-2008:03 (FY1991-FY2007)			
	Total Risk (1)	Total Risk (2)	Firms-specific Risk (3)	Systematic Risk (4)
1 Dereg	1.380	1.551	1.354	0.026
	(2.54) ***	(2.79) ***	(2.54) ***	(0.21)
2 Franchise	1.350	12.251	1.150	0.200
	(1.27)	(1.53)	(1.10)	(0.83)
3 Franchise^2		-4.231		
		(-1.38)		
4 Size	1.350	-1.212	-1.079	-0.413
	(1.27)	(-1.71) *	(-1.62)	(-2.69) **
5 Yield	0.146	0.102	0.085	0.061
	(0.83)	(0.57)	(0.49) **	(1.54)
6 Econ(×10000)	-0.444	-0.475	-0.391	-0.005
	(-1.96) **	(-2.10) **	(-1.76) *	(-1.03)
7 Keiretsu	0.882	0.913	0.907	-0.026
	(2.15) **	(2.23) ***	(2.25) ***	(0.05)
8 Foreign_own	0.150	0.142	0.117	0.033
	(0.65)	(0.62)	(0.52)	(0.63)
9 Fis_own	0.046	0.071	0.105	0.029
	(0.23)	(0.36)	(0.09)	(0.66)
10 Reins	0.149	0.144	0.149	0.000
	(4.26) ***	(4.11) ***	(4.33) ***	(0.05)
Year_dum	Yes	Yes	Yes	Yes
F-statistic	6.42	6.28	5.97	11.46
Adjusted R^2	0.48	0.49	0.51	0.75
Observations	177	177	177	177

Note: Each regression includes year dummies.F statistics test the null hypothesis that an individual effect dnoes not exist. t-ratios are in parentheses below estimated coefficinets. *** Significant at the 1% level.** Significant at the 5% level. * Significant at the 10% level.

Table 4
Effects of Franchise Value on P/C Insurer Risk Taking

	1992:03-1998:03 (FY1991-FY1997)	1992:03-1998:03 (FY1991-FY1997)		1999:03-2008:03 (FY1998-FY2007)
Independent		Low_Franchise_value	High_Franchise_value	
Variable	Total Risk (1)	Total Risk (2)	Total Risk (3)	Total Risk (4)
1 Franchise	-54.368	-5.873	6.122	10.716
	(-2.73) ***	(-1.99) **	(6.09) ***	(0.69)
2 Franchise^2	24.260			-3.783
	(2.92) ***			(-0.67)
3 Size	-2.518	-2.288	-8.872	-2.095
	(-2.99) ***	(-2.74) ***	(-2.27) **	(-1.06)
4 Yield	0.334	0.301	-0.038	-0.190
	(2.56) **	(2.44) **	(-0.05)	(-0.25)
5 Econ(×10000)	-0.167	-0.28	0.121	-0.389
	(-0.69)	(-1.19)	(0.09)	(-0.94)
6 Keiretsu	n.a.	n.a.	n.a.	n.a.
7 Foreign_own	0.116	0.127	-0.805	0.455
	(0.52)	(0.65)	(-1.39)	(0.97)
8 Fis_own	0.105	0.217	-0.797	0.614
	(0.75)	(1.47)	(-2.35) **	(1.24)
9 Reins	0.050	-0.061	0.550	0.175
	(0.67)	(-0.72)	(2.40) **	(2.66) ***
Year_dum	Yes	Yes	Yes	Yes
F-statistic	14.05	11.05	21.79	2.05
Adjusted R^2	0.71	0.69	0.97	0.42
Observations	93	74	19	84

Note: Each regression includes year dummies.F statistics test the null hypothesis that an individual effect dnoes not exist. t-ratios are in parentheses below estimated coefficinets. *** Significant at the 1% level.** Significant at the 5% level. * Significant at the 10% level.