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A New Look at the Dynamic Interrelationship between Growth and Profitability in the Chinese Property Liability Insurance Industry

Vivian S.C. Jeng *
Department of Risk Management and Insurance
National Chengchi University

Sharon S. Yang
Department of Finance
National Central University

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* Correspondence: Vivian S.C. Jeng, Department of Risk Management and Insurance, National Chengchi University, Taipei 116, Taiwan. Tel: (02) 2939-3091 ext. 81231; Fax: (02) 2939-3864; E-mail: vjeng@nccu.edu.tw.

ABSTRACT

We examine the nexus between growth and profitability for the Chinese property liability insurance industry during the period 2000–2006. This study adopts a simultaneous equation framework to understand the link between growth and profit since they are competing and interdependent variables for managers. The inverse relationship between size and growth, found across different subsamples and time periods, provides a challenge to the Law of Proportionate Effects. Profit persistence in the overall sample disappears with the exclusion of the state-owned monopoly of the People's Insurance Company of China (PICC) and within the more competitive period 2003–2006 when growth persistence is found. Abnormal profits in the previous period prompt faster growth in the next period. Thus both contemporaneous and lagged profits are important and omitting these variables results in inconsistent parameter estimates to describe the relationships.

1. INTRODUCTION

The Chinese insurance industry is still developing compared with the insurance industry in most developed countries. However, China's rapid economic growth has increased public awareness about protections offered to its domestic insurance sectors, which has induced dramatic growth in the insurance market, with an average growth rate of 27% per annum since 1980. According to the China Insurance Regulatory Commission (CIRC), the total assets of the Chinese insurance industry have expanded from RMB 197.5 billion in 1996 to RMB 2,932.7 billion in 2007.

Although the development of the Chinese insurance market has drawn much attention from practitioners, the number of academic studies focused on this industry has apparently decreased. Early studies focused on the impact of China's entry into the World Trade Organization (WTO) on China's insurance industry. China's entry into the WTO significantly affects some aspects of the insurance sector such as productivity and efficiency of the constituent insurers, the degree of competition, and solvency regulations (Ma, 1999; Hu, 2001). Because the Chinese government took steps to alter regulations to meet international standards and foster a competitive environment, consistent with the WTO standards, foreign insurance companies now find it easier to enter the market and compete with domestic firms (D'Arcy and Xia, 2003). The removal of restrictions on licensing, business lines, and locations also means foreign insurers can start businesses quicker and easier than before (Sun, 2003).

Several relevant studies have recently concentrated on predicting growth in the Chinese insurance industry. For example, using the Benchmark Ratio of Insurance Penetration, Zheng et al. (2009) show that the insurance industry's growth rate in developed economies is faster than in developing economies, with the exception of emerging markets. In particular, Brazil, Russia, India, and China have enjoyed high levels of growth in the insurance industry. Zheng et al. (2008) propose a "world insurance growth curve," together with estimates of China's future gross domestic product (GDP), to predict growth in the Chinese insurance industry for 2006–2020, yet efficiency and profitability are also important issues for the industry. After examining the effects of China's accession to the WTO, Leverty et al. (2009) find that Chinese insurers have gained significant growth in total factor productivity, as well achieved structural improvement in efficiency. However, geographic and product market restrictions

imposed on foreign competitors offset such positive effects.

Another strand of research has focused on the determinants of corporate growth with numerous studies examining whether the corporate growth rate is independent of its size. This issue is first examined by Gibrat (1931), whose formulation is later referred to as Gibrat's Law or the Law of Proportionate Effect (LPE). Previous studies considered this issue for different industries, with mixed results (e.g., Alhadeff and Alhadeff, 1964; Yeats et al., 1975; Hardwick and Adams, 2002; Goddard et al., 2004). Mueller (1977, 1986) is perhaps the first to validate the convergence of profit rates. Specifically, the persistence of profit (POP) hypothesis states that entry and exit are sufficiently free to remove any abnormal profit swiftly, implying that all firms' profit rates should converge to the same value in a long-run equilibrium. Alternatively, some firms might have special knowledge, resources, or market power that enable them to inhibit replications or impede potential competitors. Therefore, they are able to keep earning excess profits for years.

Many empirical studies also find differences among firms in long-run equilibrium profit rates (e.g., Goddard and Wilson, 1999; McGahan and Porter, 1999; Berger et al., 2000; Goddard et al., 2004). In addition to the focus on LPE and POP, other studies have considered the relationship between a firm's performance and its market structure to explore the effect on profitability and focus on Structure-Conduct-Performance (SCP) hypothesis and efficient structure (ES) hypothesis (e.g., Chidambaran et al., 1997; Bajtelsmit and Bouzouita, 1998; Choi and Weiss, 2005; Pope and Ma, 2008). The SCP hypothesis asserts that greater firm concentration is likely beneficial due to greater market power. The ES hypothesis posits that more efficient firms charge lower prices than competitors, enabling them to capture a larger market share and economic rents, leading to increased concentration and higher profits. Chidambaran et al. (1997) and Bajtelsmit and Bouzouita (1998) examine the U.S. property liability insurance market and find support for SCP. Choi and Weiss (2005) examine the relationships among market structure and performance of U.S. property-liability insurers. They find that prices and profits are found to be higher for revenue-efficient firms and the results support for the ES hypothesis. Pope and Ma (2008) further test the applicability of the SCP hypothesis in the international nonlife insurance market place for 23 nations and reveal that the interaction of market liberalization and market concentration shares a complex relationship with market profitability. Other studies focus on performance effects of diversification according to two alternative hypotheses: strategic focus and conglomeration (Shim, 2011). Shim (2011) reviews the effects of diversification on the

insurance industry. Although the forgoing studies are important to understand markets and growth in the insurance industry, this article focuses instead on LPE, POP, and the coexistence of growth and profitability.

Using Chinese property liability insurance data from 2000–2006, [1] we examine the interrelationship between growth and profitability and thus attempt to unify growth and profit using previous studies. We attempt to ascertain whether the LPE and POP hypotheses jointly hold for Chinese property liability insurance markets in a dynamic context. Most previous tests of these hypotheses were performed under the framework of a single equation and used data from developed economies. Our study uses data from China, an emerging economy, in an effort to fill this gap in the literature.

Most previous studies on growth and profitability are conducted under the framework of a single equation, instead of simultaneous equations. Hence, the potential association between the two variables is overlooked. Because retained profits are an important source of capital that fuels a firm's expansion, regulation requires the insurer to meet to capital adequacy requirements in many countries. Thus, profit is a potential prerequisite for the expansion of the insurer's portfolio of risky assets and profitability should be able to improve a firm's growth.

For managers, growth and profit are competing and interdependent factors. A manager who pursues self-interested objectives, such as salary, non-pecuniary benefits, power, and prestige, may place more weight on the firm's growth than on profit, even as both growth and profit are a firm's pivotal objectives and must be selected concurrently. A model which does not consider this interdependence may suffer from misspecification, yet few researchers have tested the nexus of growth and profit in a simultaneous equation framework. We specifically focus on whether these two objectives are correlated with each other in a heavy regulated economy such as the insurance regulatory conditions in China.

We adopt the simultaneous equation model proposed by Lewbel (2008) to explore the dynamic interrelationship between growth and profit using panel data, after controlling for various financial and macroeconomic conditions. One salient feature of Lewbel's approach is that it requires the generalized method of moments (GMM) approach to identify the structural parameters, rather than relying on the conventional rank (order) conditions to recognize the structural coefficients. The GMM is particularly preferable, because the lagged dependent variables enter the model as extra

[1] Considering the new accounting standards enforced in China as of 2007, we conduct our analysis using Chinese insurance data up to 2006, as we explain in the "Data and Sample Statistics" section.

explanatory variables in a panel data setting, forming a dynamic panel data model. Lewbel's approach identifies the structural parameters by relying on an assumption of heteroskedastic errors, which are easily satisfied in a panel data setting. When certain conditions are met, the GMM estimators can be proven to be consistent and efficient (Matyas, 1999).

Unlike many competitive market economies, the Chinese insurance market operates under a more regulated environment, which might hinder the generalization of the results of this study to competitive insurance markets. However, the methodologies used in this study can be applied elsewhere. The rest of this paper is organized as follows. Section II briefly reviews the literature. Section III describes the background of the Chinese insurance industry and its development. Section IV formulates the econometric model. Section V provides a concise data description. Section VI performs the empirical study and discusses the main results. Section VII conducts a sensitivity analysis, while Section VIII concludes the paper.

2. LITERATURE REVIEW: LPE AND POP HYPOTHESES

The LPE has been the subject of various studies, mainly in industrial economics, and empirical results regarding the validity of the LPE for manufacturing industries in the United States and Europe are mixed. Kumar (1985), Evans (1987a, 1987b), and Hall (1987) argue that small firms grow faster. Few studies test the applicability of the LPE to financial institutions. Yeats et al. (1975) use U.S. data to obtain an inverse size-growth relationship, whereas Tschoegl (1983) finds no evidence of mean reversion for a sample of international banks during the 1970s. By compiling data from the largest 100 banks in the world, Hameeteman and Scholtens (2000) verify that their growth rate is inversely related to their size. Hardwick and Adams (2002) cannot reject the LPE as a long-run tendency in the U.K. life insurance industry. Finally, Goddard et al. (2001) review the situation for European banks, but they also find little or no sign of mean reversion in bank sizes that would suggest larger banks grow faster than smaller ones (Goddard et al., 2004).

Studies of the POP hypothesis are prominent in the industrial organization studies (e.g., Mueller, 1977, 1986; Cubbin and Geroski, 1987; Waring, 1996), and many studies measure persistence as the average speed at which firm-level rents converge to the industry average. Goddard and Wilson (1999) and McGahan and Porter (1999)

find differences in firms' long-run equilibrium profit rates and speed of convergence. Berger et al. (2000) conclude that the sources of persistence in bank-level rents in the U.S. is from market power in output markets, derived from impediments to product market competition, and in input markets, obtained from informational opacity. Goddard et al. (2004) also find that profit persistence is higher for savings and co-operative banks than for commercial banks.[2] Agostino et al. (2005) test whether the ownership structure affects the persistence of profits in the banking industry. They conclude that abnormal profits increase if ownership is concentrated in banks and decrease if market forces are allowed to operate.

To some extent, growth and profit appear to be interdependent and might be competing objectives for a firm. For example, retained profits are a principal source of capital, and so profit is an important prerequisite for expanding a bank's portfolio of risky assets, which should lead to growth in assets (Goddard et al., 2004). Whittington (1980) claims that theoretically, higher profits increase the availability of finance from retained profits and a high rate of return for new investments. However, empirical evidence of the link between profitability and growth is somewhat ambiguous. In a study of U.K. manufacturing, Whittington (1980) notes an inverse relationship between average profitability and firm size/growth, in that managers trade current profits for future growth in order to engage in "empire building" and excessive consumption, such as luxurious offices (Hardwick and Adams, 2002).

Another viewpoint from Marris (1964) asserts that increased growth may cause a decrease in profitability. If managers of large firms are motivated by salaries, power, or prestige, then they may pursue growth at the expense of profitability. Goddard et al. (2004) unify growth and profit and conclude that current profit aids future growth, but excessive current growth harms future profits.

3. THE CHINESE INSURANCE INDUSTRY

The insurance industry in China has grown considerably in terms of its total assets, as shown in Table 1. The amount of total assets owned by the property liability insurance industry in 2000 was RMB 58.6 billion, reaching RMB 226.9 billion by 2006 for a

[2] This might reflect the fact that savings and co-operative banks are subject to various business and geographical restrictions that stifle competition. A conventional interpretation of the POP hypothesis would suggest that competition (measured by the speed at which abnormal profits above or below the norm tend to dissipate) is stronger for commercial than for savings and co-operative banks.

Table 1 Total Assets of the Chinese Property Liability Insurance Industry, 2000–2006 (Billions of RMB)

	2000	2001	2002	2003	2004	2005	2006
Total Assets	58.57	90.06	104.38	117.64	139.21	171.44	226.91

growth rate of 287% over six years. The number of firms in the industry has also increased substantially: whereas there were only 15 firms in 2000 in the industry, by 2006 the number had risen to 37.

The People's Insurance Company of China (PICC), established in 1949 by the PRC government, functioned as the sole state-owned, monopoly insurance company until 1982, when China Life Insurance Company was launched. These two firms gradually came to specialize in property liability or life insurance. In 1988 China's government then took steps to dissolve the huge state-owned monopoly. It allowed Ping An Insurance Company and multiple domestic insurers to enter the market. American International Group was the first foreign insurance company to acquire a license to operate in China in 1992. However, the market remains dominated by domestic insurers with significant market shares, especially PICC and China Life. In 2000 PICC had a market share of nearly 95%, but by the end of our sample period (2006) it held a market share close to 50%. In contrast, the market shares of foreign insurers in the property liability insurance market were as low as 2%.

The barriers to entry for foreign insurers in China changed only recently, mainly due to China's entry into the WTO. Restrictions on insurers in China have been well documented, but since 2003 they have gradually been removed.[3] For example, foreign insurers were previously restricted from running businesses in certain cities, but those geographic restrictions no longer exist. At the end of 2003, restrictions on business scope were largely eliminated, such that foreign insurers may offer nearly all types of property liability products. By the end of our sample period, China had removed most restrictions, though a few remain. For example, foreign insurers still cannot offer compulsory auto liability insurance, but the compulsory auto insurance market is one straightforward route to reach customers who must buy and who are more likely to purchase other types of insurance from the insurers that provide their auto policies. Therefore, this limitation strongly limits product expansion efforts by foreign insurers.

[3] Leverty et al. (2009) review the commitments China made to enter the WTO and the impacts on the development of foreign companies. The limitations mainly include geographic restrictions, reinsurance requirements, business scope, and ownership.

China further requires a business license (known as the "532" requirement), imposing specific criteria on prospective foreign insurers. Foreign insurers must (1) have a parent company whose assets exceed US$5 billion in the year prior to application, (2) have at least 30 continuous years of experience in insurance underwriting, (3) operate a representative office in China for at least two years, and (4) come from a home country having a sound financial regulatory and supervisory system.

Despite these limitations, foreign insurers aspire to enter China's insurance markets. In 2000, eight foreign insurers functioned in the property liability insurance industry, and the number doubled by 2006. The exclusive characteristics of China's insurance markets make it worthwhile to investigate the interdependence of a Chinese insurer's growth and profitability after deregulation. We include variables as geographic diversification, product diversification, and ownership structure (foreign vs. domestic) in our simultaneous equation model to control for environmental differences and heterogeneity in managers' risk preferences.

4. METHODOLOGY

4.1 Simultaneous Regression Equations

Unlike the methodology used in most previous studies (e.g., fixed- and random-effects models of reduced-form equations), we apply the GMM to estimate a simultaneous equation model, which allows for the emergence of both lagged dependent variables and endogenous variables as part of the explanatory variables, in addition to fixed or random effects.

Prior studies that treat growth and profit independently face three key problems. First, these two variables of primary interest are likely to be interrelated, making a single-equation regression model suffer from the so-called simultaneous equation problem. Because current period profit influences current period growth, and vice versa, their appearance on the right-hand side of the regression equation should be correctly treated as endogenous variables, rather than exogenous variables. Second, the emergence of lagged dependent variables in a panel data setting frequently results in biased parameter estimates from fixed- or random-effects models. This is attributed to the correlation between these lags and the error term, further complicating the estimation procedure. Third, unobservable heterogeneity across insurers must be taken into account. These three problems demand more elaboration for the purpose of obtaining

consistent parameter estimates.

We solve these three problems by constructing a dynamic, two-equation, simultaneous equations model with panel data and estimate the parameters using the methodology developed by Lewbel (2008). His method assumes heteroskedastic error terms, such that conventional rank (order) conditions are not required to identify the parameters.[4] He thus suggests using GMM to estimate the model, which is advantageous because it can deal with the first and second problems mentioned above concurrently. This procedure elegantly accounts for all three issues at the same time. More important, it yields consistent parameter estimates that may also be efficient under certain required conditions by the GMM.

We now outline Lewbel's (2008) methodology as follows. Let Y_1 and Y_2 be endogenous variables, X be a vector of exogenous variables, and $\varepsilon = (\varepsilon_1, \varepsilon_2)$ represent error terms. A two-equation structural model is expressed as:

$$Y_1 = X'\beta_1 + Y_2\gamma_1 + \varepsilon_1, \tag{1}$$

$$Y_2 = X'\beta_2 + Y_1\gamma_2 + \varepsilon_2. \tag{2}$$

Here, $(\beta_1, \beta_2, \gamma_1, \gamma_2)$ are unknown parameters, and the errors of ε_1 and ε_2 are allowed to be correlated. Conventionally, identification can be achieved by imposing valid constraints on the coefficients or relying upon an instrumental variables approach.

Lewbel (2008) proposes a novel identification method that requires a heteroskedastic covariance restriction on error terms. Specifically, with $\mathrm{E}(X\varepsilon) = 0$, identification can be obtained by assuming that $\mathrm{Cov}(X, \varepsilon_j^2) \neq 0$ $(j = 1, 2)$ is a fully simultaneous system and that $\mathrm{Cov}(Z, \varepsilon_1\varepsilon_2) = 0$ for a vector of observed exogenous variables Z, where Z could be a subset of X or could equal X. He suggests using the GMM approach to identify and estimate the parameters in equations (1) and (2) simultaneously. For details, we refer readers to Lewbel (2008).

4.2 Growth and Profit Equations

Let the growth $(g_{i,t})$ and profit $(\pi_{i,t})$ variables correspond to Y_1 and Y_2 as the dependent variables for the ith firm in year t in our two-equation simultaneous model. The

[4] We test for the null effect of homoskedastic errors using the Breusch-Pagan test for both growth and profit equations. The null solution can be rejected for both equations and both industries, justifying the applicability of Lewbel's method.

growth rate of insurer i is measured in terms of its asset size between years $t-1$ and t and profit is calculated by the return on assets of insurer i in year t.[5] We reformulate our two-equation simultaneous model as:

$$g_{i,t} = \alpha_{1,0,i} + \alpha_{1,1} s_{i,t-1} + \alpha_{1,2} g_{i,t-1} + \alpha_{1,3} \pi_{i,t-1} + \alpha_{1,4} \pi_{i,t} + \beta_1' X_{i,t}^{g} + \varepsilon_{1,i,t}, \quad (3)$$

$$\pi_{i,t} = \alpha_{2,0,i} + \alpha_{2,1} \pi_{i,t-1} + \alpha_{2,2} g_{i,t-1} + \alpha_{2,3} g_{i,t} + \beta_2' X_{i,t}^{\pi} + \varepsilon_{2,i,t}. \quad (4)$$

where $s_{i,t-1}$ denotes the logarithmic of size, measured by total assets, of insurer i in year $t-1$, $g_{i,t}$ refers to the growth rate of insurer i in year t and $\pi_{i,t}$ is the profit of insurer i in year t. In addition to the profit and growth rate as the explanatory variables, we consider other eleven control variables in the growth and profit equation (see below the definition and description for each control variable). To simplify the expression of our two-equation simultaneous model, we set $X_{i,t}^{g}$ and $X_{i,t}^{\pi}$ as a 1×11 vector, representing the eleven control variables included in equations (3) and (4) separately and β_1' and β_2' are 11×1 vectors denoting the corresponding coefficient vectors for capturing the effect on each control variable in the growth and profit model, i.e. $\beta_1' = [\beta_{1,1}, \beta_{1,1} \cdots, \beta_{1,11}]$ and $\beta_2' = [\beta_{2,1}, \beta_{2,1} \cdots, \beta_{2,11}]$. Equations (3) and (4) are similar to Goddard et al. (2004), except for the contemporaneous, endogenous terms showing on the right-hand side. In other words, their model belongs to reduced-form regression equations.

In equations (3) and (4), $\alpha_{1,0,i}$ and $\alpha_{2,0,i}$ represent fixed effects. In addition, $\alpha_{1,1}$ reflects the direction of the size-growth relationship and can equal 0 or be very close to 0 on either side, in accordance with the LPE. A negative value of $\alpha_{1,1}$ in equation (3) implies that smaller firms grow faster than larger ones, which is consistent with the convergence hypothesis, while the reverse is true for a positive value of $\alpha_{1,1}$. Following Goddard et al. (2002), we incorporate lagged growth, $g_{i,t-1}$, in the set of explanatory

[5] Regarding the asset size, there may be some exogenous variable affecting the change of asset size. For example, raising capital would increase asset size. Since we use asset size to measure firm growth, any change to the asset size is taken into account in this research. To measure the profit variable, Carroll (1993) defines an insurer's profit margin as (1 − loss ratio − expense ratio + return on investment). Limited to insurer expenses and return on investment data across national markets, Pope and Ma (2008) define market profitability as (1 − loss ratio). Choi and Weiss (2005) define the underwriting profit margin as (1 − present value of losses incurred/premiums earned − expenses/premiums written). The difficulties in acquiring investment return and other insurance-specific data in the Chinese market prompt us to define the insurer's profit margin as the combined ratio (1 − loss ratio − expense ratio). Following Goddard et al. (2004) and Shim (2011) and considering the potential effect of surplus drain due to statutory accounting, we use return on assets (ROA) as the measure of profitability, but the results using the combined ratio or ROE are not materially different from those using ROA. We thus focus on ROA results. In addition, as an alternative growth measure, we define the growth variable in terms of premiums. Since the results are similar, we do not provide them here.

variables to capture the persistence of growth. The coefficient $\alpha_{2,1}$ in equation (4) represents the speed at which abnormal profit converges toward the long-run average. If $\alpha_{2,1} = 0$, then excess profit converges immediately, whereas larger values of $\alpha_{2,1}$, before reaching unity, imply a higher persistence of supernormal profits.

We use $\alpha_{1,3}$ and $\alpha_{1,4}$ in equation (3) and $\alpha_{2,2}$ and $\alpha_{2,3}$ in equation (4) to examine the interrelationships between growth and profit. The presence of $\pi_{i,t}$ and $g_{i,t}$ as the explanatory variables forms a fully simultaneous equation model, and the coefficients $\alpha_{1,4}$ and $\alpha_{2,3}$ indicate the causal direction of the cotemporaneous effects. A positive value of $\alpha_{1,3}$ reveals the prevalence of profit's lagged effect on growth, whereas a positive value of $\alpha_{2,2}$ indicates growth's lagged effect on profit. The lags of the dependent variables, $g_{i,t-1}$ and $\pi_{i,t-1}$, must be regarded as additional endogenous variables in the panel data framework. Extra moment conditions are then required to account for the endogeneity for the two lagged dependent variables, in addition to those proposed by Lewbel (2008). One of the advantages of panel data is their flexibility in choosing valid instrumental variables, because lagged independent variables can serve as the instruments.

As for control variables, we choose the following eleven measures:

Bus_H = business diversification Herfindahl index.
Geo_H = geographic diversification Herfindahl index.
HERF = Herfindahl-Hirshman index in terms of written premiums.
MS = market share of the firm.
CAP = capital-to-assets ratio.
LIQ = liquidity ratio.
ΔGDP = annual growth rate of real gross domestic product (GDP).
AGE = the firm's age.
AGEQ = square of the firm's age.
RE = reinsurance ratio.
EF = technical efficiency score from data envelopment analysis (DEA).
FOR = dummy variable equaling unity if the insurer is foreign and 0 otherwise.

Among the eleven control variables, Bus_H, Geo_H, CAP, LIQ, ΔGDP, AGE, AGEQ, RE, EF and FOR appear in both the growth and profit equations. However, we only consider the control variable MS in growth equation and HERF in profit equation due to the multicollinearity between these two variables. We select these eleven variables according to prior studies. Hoyt and Trieschmann (1991) report that diver-

sified insurers have lower returns and higher risks than firms concentrating only on a single insurance product. Tombs and Hoyt (1994) also note that diversified insurers experience lower risk-adjusted returns. Liebenberg and Sommer (2008) find that undiversified firms outperform diversified firms, according to data from 914 firms spanning 10 years. Elango et al. (2008) also conclude that U.S. property liability insurers with higher product and geographic diversification tend to have lower levels of performance. In their study of China's insurance industry, Leverty et al. (2009) find that the imposition of geographic and product market restrictions on foreign insurers reduces the growth of their total factor productivity. Cummins et al. (2010) examine whether it is advantageous for insurers to offer both property liability and life insurance or focus on one or a few specialized areas, using data envelopment analysis (DEA) to evaluate the technical efficiency scores. Their results confirm that a strategic focus is a better strategy than conglomeration.

We select the business diversification Herfindahl index (Bus_H) and the geographic diversification Herfindahl index (Geo_H) to control for the impact of both forms of diversification on profit and growth. Bus_H is defined as the sum of all squared ratios of the amount of premiums written in a single line of insurance to the total amount of premiums for all lines of business for each firm and each year. Similarly, Geo_H is the sum of all squared ratios of the amounts of premiums in province j to the total amount of premiums for all provinces in China for each year.

According to the traditional SCP, the setting of prices tends to be more favorable to producers in a more concentrated market as a result of competitive imperfections in this market. Following Goddard et al. (2004), we calculate the standard Herfindahl-Hirshman index (HERF) used with respect to written premiums for each year, leading us to test the relationship between growth and market structure. Taking data from international non-life insurance markets, Pope and Ma (2008) identify the SCP hypothesis when the levels of liberalization are low, but Carroll (1993) fails to support a positive concentration-profitability relationship. The relative market power hypothesis instead argues that only firms with large market shares and well-differentiated products can apply market power when pricing their products and thereby pursue abnormal profits.

Choi and Weiss's (2005) examination of U.S. property liability insurers bolsters the efficient-structure hypothesis, which asserts that firms with superior managerial abilities have lower production costs and therefore earn higher profits. Berger (1995) and Berger and Mester (1997) verify the positive relationship between efficiency and profit in the U.S. banking industry. Thus, to test for the market power hypotheses,

including the SCP and efficiency-structure, we include market share (MS) in our profit equation (4). We also estimate technical efficiency scores (EF) for each insurer in each year using the DEA prior to the estimation of equations (3) and (4).[6]

To account for a firm's capacity to bear unforeseen shocks, we use the capital-to-assets ratio (CAP) and the liquidity ratio (LIQ) as proxies for risk exposure.[7] The LIQ is defined as the ratio of liquid assets to total assets. A firm with a low proportion of liquid assets exposes itself to more risk and likely earns higher profits (Rhoades, 1985; Bourke, 1989). Firms that are well capitalized have incentives to remain in that condition and engage in prudent business plans to achieve higher profits (Garcia-Herrero et al., 2009). However, the effects of the two proxies on profit are indeterminate. In addition, property liability insurers may encounter huge unexpected losses or catastrophes. To protect themselves from financial distress, they need help from reinsurance companies. We thus add the reinsurance ratio (RE) to the group of explanatory variables to manifest the financial soundness of property liability insurers.

Variable GDP growth provides a control for macroeconomic factors that may influence a firm's growth and profit. Outreville (1996) confirms that GDP growth is a key factor for growth in insurance markets. Moreover, a firm's age at least partially reflects the accumulated stock of knowledge capital from a learning-by-doing process, which can drive both growth and profit. To account for possible non-linear relationships, we enter both linear and quadratic terms of a firm's age (Age and AgeQ) as control variables.

Ownership differences may also be important determinants in the growth-profit nexus. State-owned insurers have received protection from China's government, which granted them abundant resources for a long time until China entered the WTO. To meet the WTO criteria, China removed restrictions on geographical locations, product lines, reinsurance, and ownership (Leverty et al., 2009) at a slow pace, which should, more or less, stimulate the growth of foreign insurers. Conversely, existing regulations and cultural heterogeneity may impede foreign insurers' ability to increase their market share (Wu and Strange, 2000). We thus add a dummy variable (FOR) to the equations, which is equal to unity for a foreign firm and 0 otherwise.

[6] Following Leverty et al. (2009), we define four outputs and three inputs to estimate EF for each firm-year sample point. For property liability insurers, the outputs are the premiums of short-tail personal lines, short-tail commercial lines, long-tail lines, and amounts of real invested assets. For life insurers, they are the premiums of group lines, personal lines, accident/health lines, and amounts of real invested assets. The inputs for both industries are business expenses, financial equity capital, and debt capital. All inputs/outputs are deflated by the consumer price index of China with a base year of 2006.

[7] We follow Goddard et al. (2004) using the capital-assets and liquidity ratios as proxies for risk.

5. DATA AND SAMPLE STATISTICS

We examine the nexus of growth and profit for the property liability insurance industry in China, using the data drawn from Chinese Insurance Yearbook, complied by the CIRC, as well as annual statements filed by insurers with the CIRC. Because all insurers must document their financial statements to the CIRC, our dataset encompasses virtually the entire industry.

The sample period spans from 2000 to 2006 because the Chinese Insurance Yearbook began providing the amount of premiums by province and business types from 2000. Information about the amount of premiums in different provinces and insurance products enables us to address the issues on geographic and business diversification. Moreover, new accounting standards were enacted in 2007 in China, some of which applied specifically to insurance industries. These new standards stress the importance of the fair value concept. We therefore cannot appropriately combine pre-2007 data with post-2007 data.[8]

Table 2 provides the summary statistics for the unbalanced panel data of China's property liability insurance industry. Its average growth rate is close to 25% per annum, whereas the average profit rate, measured by ROA, is slightly less than 0 (equaling -0.0072). Earning profits seem to be challengeable for the sample insurers. Moreover, business and geographic diversification Herfindahl indices (Bus_H and Geo_H) show a high concentration in business lines and in a geographic area. For example, the median of Geo_H index is equal to 0.9294, which is very close to one.[9] The average capital-to-asset ratio (CAP) is 46%, much higher than that found in developed countries. The average liquidity ratio (LIQ) reaches as high as 73%, due to the stringent limitation on insurers' investment items imposed by Chinese governments. Finally, 48% of our

[8] For example, the total assets of the property liability industry in the 2006 Chinese Insurance Yearbook were RMB 226.91 billion; the amount of the same item (for the year 2006) changed to RMB 240.52 billion in the 2007 version. Inconsistency in accounting standards could have detrimental impacts on the model.

[9] Up to the end of 2006, auto insurance accounts for 70% of the business in the Chinese property liability industry, and enterprise property insurance accounts for 10% and other insurance accounts for 6% (including household property insurance). For the geographic concentration, most of the business stay in the coastal area, with GuangDong, JiangSu, ZheJiang and Shanghai, the top four concentrated cities/provinces with a total of 31% market share. However, due to license restrictions on foreign firms, the level of Geo_H for foreign firms is much higher than for domestic firms.

Table 2 Summary Statistics of the Property Liability Insurance Industry

	Mean	Median	Minimum	Maximum	Std Dev
Size	6.8291	6.2706	2.9897	11.3877	1.8307
Growth	0.2522	0.1757	−0.4404	1.5344	0.3080
ROA	−0.0072	0.0094	−0.3539	0.1419	0.0836
LgGrowth	0.2906	0.1653	−0.4404	1.8394	0.3658
LgROA	−0.0002	0.0124	−0.4975	0.1600	0.0833
Bus_H	0.4424	0.4224	0.2093	1.0000	0.1540
Geo_H	0.5949	0.9294	0.0402	1.0000	0.4254
MS	0.0418	0.0020	0.0000	0.6709	0.1290
CAP	0.4646	0.5097	0.0357	0.9166	0.2353
LIQ	0.7258	0.7616	0.2487	0.9895	0.1717
ΔGDP	0.1407	0.1459	0.0973	0.1771	0.0265
AGE	11.0666	8.5000	1.0000	58.0000	11.2636
AGEQ	248.2833	72.5000	1.0000	3,364.0000	661.6126
EF	0.8427	0.9820	0.0160	1.0000	0.2254
RE	0.3244	0.2608	0.0000	1.0000	0.2278
FOR	0.4833	0.0000	0.0000	1.0000	0.5018
Number of observations		94			

sample firms are foreign insurers, as the mean value of the ownership dummy variable (FOR) is equal to 0.4833. Our sample consists of 94 firm-year observations for the property liability insurance industry.[10]

6. EMPIRICAL RESULTS

6.1 Analysis of the Property Liability Insurance Industry

Table 3 reports the estimation results for the simultaneous system of equations (3) and (4), using the GMM approach.[11] The fixed effects of each firm are considered

[10] The number of domestic firms from 2001 to 2006 are 6, 6, 8, 9, 10, 10, respectively, and the number of foreign firms are 3, 6, 8, 9, 9, 10, respectively, both gradually increase by year. The number of year 2000 is not included in the final sample due to the calculation of lag variables (e.g. Lggrowth). We thank a referee's suggestion for this.

[11] The instruments used in the GMM estimation procedure include lags of profit, size, and the interaction terms of some control variables. The J-statistic is insignificantly different from 0, and so the instruments appear valid. The J-statistics in the remaining tables are all insignificant, as required by the GMM.

Table 3 Simultaneous GMM Estimates of the Property Liability Insurance Industry

	Growth Equation		Profit Equation
Intercept	−0.0075 (−0.3705)	Intercept	0.0015 (0.3475)
Lgsize	−0.3238** (−2.2225)	Lgroa	0.7870*** (4.0874)
Lggrowth	0.0613 (0.2624)	Lggrowth	0.0202 (1.0213)
Lgroa	2.2031*** (4.7641)	Growth	−0.0453 (−1.1926)
ROA	2.9208** (2.2756)	Bus_H	0.1436* (1.7175)
Bus_H	−0.8085* (−1.8486)	Geo_H	0.0757** (1.9886)
Geo_H	−0.7204*** (−3.5863)	MS	−0.5567** (−2.1058)
HERF	0.5418 (0.7817)	CAP	−0.1419* (−1.9284)
CAP	−1.4900*** (−4.7671)	LIQ	−0.0461 (−0.9929)
LIQ	0.5260 (1.1529)	ΔGDP	0.3500 (1.1960)
ΔGDP	−0.5169 (−0.5300)	AGE	0.0079 (1.3426)
AGE	0.0959** (2.0704)	AGEQ	−0.0003** (−2.4007)
AGEQ	0.0000 (−0.1461)	EF	−0.0079 (−0.1909)
EF	−0.2830 (−1.6150)	RE	−0.0284 (−0.4591)
RE	0.1816 (0.7776)	FOR	−0.0017 (−0.2151)
FOR	0.0227 (0.7346)		
J-statistic	6.4079		
[p-value]	[0.698]{d.f. = 9}		
N	94		

Note: 1. Numbers in parentheses are t-statistics.
2. *** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level.

in equations (3) and (4). The parameter estimate of lagged size (Lgsize) is found to be significantly negative, which implies that smaller firms tend to grow faster than larger ones. This contradicts the LPE, and the growth of our sample insurers is found to count on their initial sizes. Kumar (1985), Evans (1987a, 1987b), and Hall (1987) offer similar results for manufacturing industries, and Rhoades and Yeats (1974), Yeats et al. (1975), and Hameeteman and Scholtens (2000) offer the same conclusion for the banking industries. On the contrary, Goddard et al. (2004) obtain a positive size-growth relationship. The insignificant estimate of the lagged growth indicates that the growth of an average Chinese property liability insurance firm does not persist. Current period growth does not repeat in the next year, which is inconsistent with Goddard et al. (2004).

Because the coefficient estimate of $\pi_{i,t-1}$ (Lgroa) in equation (3) is significantly positive, firms with abnormal profit in the previous period appear to experience faster growth in the next period. We also find that current period profit, $\pi_{i,t}$ (ROA), significantly and positively affects growth. This is in line with Goddard et al. (2004), who claim that profit is an important prerequisite for expanding a firm's portfolio of risky assets. Both contemporaneous and lagged profits matter, and the omission of either result in inconsistent parameter estimates.

The coefficient estimates of the business and geographic indices (Bus_H and Geo_H) are both significantly negative, implying that more specialized firms tend to grow slower in the Chinese market. We suspect that restrictions on business scope and geographic areas in China impede insurers' development. This is confirmed by Leverty et al. (2009), who claim that China's imposition of market restrictions has effectively reduced the speed of a firm's growth. An inverse relationship between an insurer's CAP ratio and its growth is detected (also see Goddard et al., 2004). Prudent managers appear to be willing to sacrifice growth for a high CAP ratio. The coefficient estimate of age is significantly positive, with older insurers growing at a faster rate than younger ones do.

Turning to the profit equation, we find evidence consistent with the non-simultaneous regression models proposed by Goddard et al. (2004). The parameter estimate of lagged profit (Lgroa) is positive and significant, which verifies the persistence of abnormal profit above or below the norm and contrasts with the POP hypothesis. The forces of entry and exit seem insufficiently strong to quickly purge supernormal profit, if at all. We thus conclude that the insurance industry under consideration is operating under imperfect competition. Goddard and Wilson (1999), McGahan and Porter

(1999), and Berger et al. (2000) reach similar conclusions. Note that the coefficients for the lagged growth and current period growth variables are not significant.

Both diversification measures, geographical diversification (Geo_H) and business diversification (Bus_H), exert positive effects on profit. This outcome suggests that a profit-seeking insurer concentrate on some specific areas and specialize in specific business lines, instead of devoting itself to diversifying across geographical areas or an array of insurance products. Although specialization tends to limit a firm's growth, it prompts a firm's profit. A specialized insurer with scarce resources may be more competent to offer high-quality insurance products and services and to take the advantage of labor division and scale economies. As a result, the average production costs can be lowered. Likewise, Hoyt and Trieschmann (1991), Tombs and Hoyt (1994), Liebenberg and Sommer (2008), Pope and Ma (2008), and Cummins et al. (2010) all recommend a focused strategy rather than a diversified one. Combining the results of the geographic index on growth and profit equations, we find that more geographically diversified firms tend to grow faster but have lower profitability. This is possibly because the diversified firms, mostly some domestic firms, have higher growth rates by expanding their businesses into mainland provinces but not necessarily creating better profits. We believe most of these firms are domestic firms because foreign firms are mostly located in coastal areas and are not able to diversify themselves geographically even if they intend to due to regulatory restrictions.[12] Similar to Carroll (1993), our results do not offer support for the SCP hypothesis, because variable market share has a significantly negative impact on profit.

Finally, a firm with a high capital to assets ratio is, as expected, apt to earn lower profits, which is consistent with Rhoades (1985) and Bourke (1989). However, the GDP growth rate, technical efficiency scores, and ownership all fail to exert significant effects on either growth or profit. Contrary to Goddard et al. (2004), we do not find that macroeconomic performance is a key determinant of growth and profit. The efficient-structure hypothesis is not supported by our results.

6.2 Analysis after Excluding PICC from the Sample

The Chinese property liability insurance industry represents a unique set of firms consisting of small and large enterprises with heterogeneous ownership. Among them,

[12] Our data show that the number of branches for foreign firms is few, and most of the branches are located in Shanghai by the end of 2006.

the single insurer PICC alone accounts for 50% of the market share in the year of 2006. This dominant firm likely exerts a strong influence on our analysis. For example, its large size may limit its future expansion. In addition, since PICC is the dominant state-owned insurer, China's government may enforce fewer regulations on it or provide some incentives for it to expand. As for the market structure, the Chinese insurance market is much less competitive than developed nations' markets, because barriers to entry and stringent regulations are imposed to hinder competition. Thus, the preclusion of the huge company PICC from the data may alter the results to some extent.

Table 4 summarizes the results for the simultaneous equations after excluding PICC from the sample. We still find that smaller firms grow faster than large ones, i.e., the removal of insurer PICC does not change the outcome obtained in Table 3. We also find that the coefficient estimate of $\pi_{i,t-1}$ (Lgroa) in the growth equation is significantly positive, but the effect is partially offset by current period profit π_{it} (ROA), because the coefficient estimate is negative and marginally significant. Our results seem to suggest that, for the remaining domestic and foreign insurers, excess profit in the previous period supports expansion, but the current period's abnormal profit induces managers to trade it for future growth by engaging in excessive consumption (Whittington, 1980; Hardwick and Adams, 2002).

The age-related results of Table 4 are worth mentioning. Unlike the results shown in Table 3, we find a non-significant coefficient estimate for the age variable in Table 4. The finding that older firms grow faster than younger firms in Table 3 might result from the presence of PICC, the oldest insurer in China. If PICC is excluded, then the age variable is no longer an important determinant of a Chinese insurer's growth. The remaining parameter estimates are similar to those in Table 3.

For the profit equation, we find that the coefficient for lagged profit is not significant. After excluding PICC, the evidence supports the POP hypothesis, i.e., the entry and exit into China's insurance market are sufficient to eliminate abnormal profits. Thus a giant insurer, PICC, enjoys a persistent profit, possibly due to its monopoly power, while the remaining relatively small domestic and foreign insurers make at most normal profits. In other words, the market without PICC operates nearly competitively. It is interesting to note that the profit measures of PICC are positive in six out of the seven years and higher than the average profit of the entire sample (-0.0072, Table 2).

Table 4 Simultaneous GMM Estimates of the Property Liability Insurance Industry, Excluding PICC

	Growth Equation		Profit Equation
Intercept	−0.0151 (−0.5548)	Intercept	0.0046 (0.9757)
Lgsize	−0.3105** (−2.0570)	Lgroa	0.4868 (1.3557)
Lggrowth	−0.0488 (−0.3030)	Lggrowth	0.0543*** (3.3268)
Lgroa	2.7819*** (5.8940)	Growth	0.0852*** (2.7989)
ROA	−2.2660* (−1.6148)	Bus_H	0.1925* (1.8489)
Bus_H	−0.5811 (−1.0888)	Geo_H	0.0900** (2.5764)
Geo_H	−0.4286* (−1.6935)	MS	−0.5539 (−0.7186)
Herf	0.3006 (0.3722)	CAP	0.0165 (0.2064)
CAP	−1.0542*** (−3.1923)	LIQ	−0.1500*** (−3.6942)
LIQ	0.7414 (1.6412)	ΔGDP	0.2136 (0.9563)
ΔGDP	0.4766 (0.3962)	AGE	0.0131 (1.4851)
AGE	0.0667 (1.2697)	AGEQ	−0.0005 (−1.4111)
AGEQ	0.0008 (0.5188)	EF	0.0191 (0.4600)
EF	−0.3263 (−1.6213)	RE	−0.0528 (−1.0335)
RE	0.2385 (1.0164)	FOR	−0.0077 (−1.0618)
FOR	0.0167 (0.4963)		
J-statistic	6.8666		
[p-value]	[0.651]{d.f. = 9}		
N	89		

Note: Refer to Table 3.

Both lagged and current period growth rates are significantly positive in the profit equation. In conjunction with the growth equation, we identify a bidirectional, positive causal relationship between growth and profit when we exclude PICC. This result can be derived readily using Lewbel's (2008) methodology and without relying on the rank (order) conditions. The results of the other variables in the profit equation are similar to those shown in Table 3.

For another test of robustness, we re-estimate simultaneous equations (3) and (4) using only the data for foreign insurers. The results are very similar to the results shown in Table 4 and are not presented here. Therefore, PICC acts as if it is an outlier, exerting its unique position granted by the government to compete with other insurance firms.

6.3 Results for 2003−2006 Period

China's insurance industry has grown substantially, especially from 2003 to 2006. The average growth rate ranged from 4% to 17% for 2000–2002 and from 20% to 33% for 2003–2006, showing a large shift.[13] A possible reason for this shift is the removal of a few regulations starting from 2003, as mentioned previously. Therefore, we investigate whether our results are affected by these regulatory changes.

Table 5 presents the results, with some estimates nearly the same as the results shown in Table 3. For example, smaller firms grow faster than larger ones, and firms with abnormal profit in the previous period experience faster growth in the next period. We also find some other differences. The coefficient for Lggrowth (lagged growth) is significantly positive, which implies that growth persistence exists during the deregulation period of 2003–2006. The government of China changed its attitude toward insurance market expansion by deleting some restrictions specifically imposed on foreign insurers, stimulating the persistence of growth in these firms.[14] In the growth equation, the coefficient estimates of diversification indices (Bus_H and Geo_H) become insignificant owing to the regulatory changes.

For the profit equation, our results are analogous to those in Table 4. Profit does not persist during 2003–2006, because the market becomes more competitive.

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[13] The exact average growth rates for 2000–2006 are respectively 17%, 17%, 4%, 26%, 33%, 32%, and 20%.

[14] Most of the restrictions are imposed on the foreign insurers. Unfortunately, due to data limitations, we cannot estimate the simultaneous equations (3) and (4) using the data of foreign insurers only during 2003–2006.

Table 5 Simultaneous GMM Estimates of the Property Liability Insurance Industry, 2003–2006

	Growth Equation		Profit Equation
Intercept	−0.0194 (−0.6793)	Intercept	−0.0085 (−1.1889)
Lgsize	−0.5919*** (−3.8965)	Lgroa	0.1061 (0.3496)
Lggrowth	0.4385** (2.5236)	Lggrowth	0.0377*** (3.3165)
Lgroa	3.0539*** (6.5753)	Growth	−0.0049 (−0.0931)
ROA	0.4364 (0.3100)	Bus_H	0.2020** (1.9955)
Bus_H	−0.7594 (−1.2847)	Geo_H	−0.0569 (−1.3207)
Geo_H	−0.7661 (−1.5983)	MS	−0.8410* (−1.8255)
Herf	−0.1071 (−0.1408)	CAP	0.0019 (0.0220)
CAP	−1.7249*** (−6.3989)	LIQ	−0.0469 (−0.7418)
LIQ	0.4215 (1.5722)	ΔGDP	0.3772* (1.8215)
ΔGDP	−1.0046 (−0.8686)	AGE	0.0145** (1.9887)
AGE	0.1129 (1.4881)	AGEQ	−0.0005* (−1.8462)
AGEQ	−0.0006 (−1.4488)	EF	−0.0580 (−0.8479)
EF	−0.6362 (−1.4882)	RE	−0.0299 (−0.5984)
RE	−0.0119 (−0.0480)	FOR	0.0071 (0.9105)
FOR	0.0416 (1.2657)		
J-statistic	6.9748		
[p-value]	[0.640]{d.f. = 9}		
N	73		

Note: Refer to Table 3.

7. SENSITIVITY ANALYSIS

We finally perform two sensitivity analyses. First, we validate whether contemporaneous profit and growth are key determinants in equations (3) and (4). If that is the case, then our structural equations (3) and (4) should be advantageous over conventional reduced-form models, such as the vector auto-regression (VAR), in which only lagged dependent variables are legitimate explanatory variables, together with some exogenous variables. Once the contemporaneous endogenous variables are taken out of the right-hand sides of (3) and (4), they become a system regression model, instead of a simultaneous system. The model can be estimated equation by equation. The parameter estimates remain consistent, although possibly inefficient. Second, to inspect whether the control variables are relevant, we perform a joint test of $\beta_1 = 0$ and $\beta_2 = 0$ in equations (3) and (4), respectively.

Table 6 summarizes the results. The removal of current period profit from the growth equation results in a downward bias (in absolute values) for the parameter estimate of Lgsize, as compared with Table 3, which is now insignificant and hence supports the LPE. Insurers' growth in our sample is independent of their initial sizes. Excluding the current period profit also rejects variables such as Bus_H and AGE from being relevant, which is inconsistent with our previous conclusions.

In the profit equation, the same downward bias appears and no persistence of profit is observed. This contradicts the findings shown in Table 3, using the same data. Moreover, excluding the current period growth results in a change in the coefficient of lagged growth (Lggrowth) to a significant one, overestimating the effect of profit growth. These findings bolster our assertion that modeling the interrelationship between growth and profit is necessary. We do not analyze the remaining parameter estimates, because the underlying regression model in Table 6 is inclined to be misspecified.

Table 7 presents the estimation results for the simultaneous equations (3) and (4) precluding all of the control variables. The coefficient of Lgsize becomes positive, indicating that larger firms grow faster, in contrast with the results shown in Table 3. The approach used here might result in a downward bias in the parameter estimate for ROA, because the coefficient becomes non-significant. For the profit equation, the POP hypothesis cannot be rejected, and Lggrowth significantly and positively affects

Table 6 Single Equation GMM Estimates of the Property Liability Insurance Industry

	Growth Equation		Profit Equation
Intercept	−0.0039 (−0.1576)	Intercept	0.0021 (0.6014)
Lgsize	−0.4789 (−1.5109)	Lgroa	0.1266 (0.9724)
Lggrowth	0.1007 (0.7668)	Lggrowth	0.0314** (2.5567)
Lgroa	2.2500*** (4.0077)	Bus_H	0.0368 (0.4771)
Bus_H	−0.7586 (−1.2961)	Geo_H	0.0547* (1.7527)
Geo_H	−0.4940** (−2.5155)	MS	−0.2363 (−1.0521)
HERF	1.9742 (0.9294)	CAP	0.0087 (0.2205)
CAP	−1.3256*** (−4.2788)	LIQ	−0.0490 (−1.3469)
LIQ	0.3596 (1.4163)	ΔGDP	0.3142* (1.9247)
ΔGDP	0.2653 (0.2030)	AGE	0.0049 (1.1284)
AGE	0.0806 (1.1203)	AGEQ	−0.0002* (−1.7799)
AGEQ	0.0005 (0.7308)	EF	−0.0300 (−0.8161)
EF	−0.2773 (−1.5269)	RE	0.0080 (0.1817)
RE	0.4196* (1.8500)	FOR	−0.0029 (−0.5670)
FOR	0.0192 (0.6387)		
J-statistic	1.4991	J-statistic	1.8930
[p-value]	[0.682]{d.f. = 3}	[p-value]	[0.595]{d.f. = 3}
N	94	N	94

Note: Refer to Table 3.

Table 7 Simultaneous GMM Estimates of the Property Liability Insurance Industry, Excluding Control Variables

	Growth Equation		Profit Equation
Intercept	−0.0302 (−0.9109)	Intercept	0.0001 (0.0324)
Lgsize	0.4779*** (3.1290)	Lgroa	−0.2769 (−0.9527)
Lggrowth	−0.9316 (−1.6136)	Lggrowth	0.0308*** (3.1510)
Lgroa	1.8437** (2.3729)	Growth	0.0195 (0.7637)
ROA	0.0723 (0.0478)		
J-statistic	2.2471		
[p-value]	[0.987]{d.f. = 9}		
N	94		

Note: Refer to Table 3.

profit, as opposed to Table 3, where none of these growth measures is relevant. Based on Table 3, we perform a joint test for the null hypothesis that all coefficients of the control variables are equal to 0. The hypothesis is decisively rejected, which suggests that the selected control variables are appropriate. If these variables are incorporated, biased parameter estimates result due to misspecification.

8. CONCLUDING REMARKS

We examined the nexus of growth and profitability in the Chinese property liability insurance sector during the period 2000–2006, and found a significant inverse relationship between size and growth and rejected the LPE hypothesis and supported the hypothesis that smaller firms grow faster than larger ones. This result is robust when we exclude the dominant firm, PICC. We do not find growth persistence for the full sample period. However, growth persistence is shown for the period 2003-2006, when it was easier for insurers to expand their operation scales due to the liberalization of the insurance sector. Despite the fact that moderate profit persistence is found for the overall sample, it disappears if we exclude the giant, state-owned PICC or focus on the more competitive period of 2003–2006.

Our results also show that profit is an important prerequisite for enlarging a firm's portfolio of risky assets. Because contemporaneous profit significantly influences growth, we recommend using a structural equation model, like equations (3) and (4), to undertake similar studies. Reduced-form models are not recommended. Using the data without PICC, managers are found to trade profit for future growth, yet the overall profit effect on growth remains positive. In addition, contemporaneous growth influences profit significantly. Finally, we show that it is necessary to incorporate control variables in the simultaneous equation system in order to avoid any possible specification error.

Chinese property liability insurers are apt to converge in their sizes over time. This implies that smaller insurers catch up with larger ones, irrespective of whether or not we preclude PICC from the data and the sample period. Our findings fill a gap in previous studies using data compiled from developed countries. Although we cannot verify the POP hypothesis using the entire data set, the hypothesis is not rejected if PICC is excluded and the sample is confined to 2003–2006. The market tends to be more competitive without regards to PICC and during 2003 to 2006, when growth and profit showed a positive, bidirectional causal relationship. Thus, managers should devote themselves to pursuing both targets at the same time.

Some research constraints should be mentioned. First, according to statutory accounting, premium income should be gradually recognized, but policy acquisition costs or incurred expenses must be charged before income is earned, resulting in a surplus drain for insurance firms. This could specifically affect the profitability or growth of young or growing firms. Though proxies of either profitability or growth are tested in our analysis and the results do not appear different for the sample of Chinese property liability insurance industry, caution is needed before applying our results to other sectors. Second, our current sample period is 2000–2006 while the Chinese insurance industry data are available through 2011. Though it is interesting to compare differences in results between pre- and post-2007 data, it is difficult to verify what causes any differences because both the accounting change and financial crisis occurred in the second time period. We believe that a data set including a longer time period can help future research. Third, this study considers the control variables based on results from previous studies. Some alternative variables would also be worth investigating. For example, to measure the capacity of the insurer, we follow Goddard et al. (2004) and use capital-assets and liquidity ratios as proxies for risk. Premium-to-surplus and reserves-to-surplus ratios could also represent the ability of the insurer to

meet their obligation. Using these two variables may affect the firm growth and profit from the insurer's solvency perspective.

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成長與績效間的交互關係 －以中國產險業為例

鄭士卿 *
國立政治大學風險管理與保險學系

楊曉文
國立中央大學財務金融學系

關鍵詞: 產險業、公司成長、利潤持續
JEL **分類代號**: C33, G22, L11

* 聯繫作者: 鄭士卿, 國立政治大學風險管理與保險學系, 台北市 116 文山區指南路二段 64 號。電話: (02) 2939-3091 分機 81231; 傳真: (02) 2939-3864; E-mail: vjeng@nccu.edu.tw。本文承國科會補助（計畫編號: NSC 99-2410-H-004-060-MY3）, 謹誌謝忱。

摘　要

本文利用中國產險業自2000年至2006年的資料,探討其成長及績效間的關係。此研究之目的是希望了解在開發中國家如中國,是否吉布萊法則(Gibrat's Law)及利潤持續假說(Persistency of Profit, POP)依然存在;而此研究也使用聯立方程式來解釋成長與績效間的關係。研究結果發現與多數已開發國家類似,小公司通常成長較快,違反吉布萊法則。另外,去年度的超額利潤在今年度仍持續存在。最後,本期與前期的利潤都將影響本期的公司成長,表示出考量本期變數之重要性。