# AN EMPIRICAL STUDY ON THE REINSURANCE DECISIONS OF KOREAN LIFE INSURANCE COMPANIES

By

**PARK, Hyunjee**

**THESIS**

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

For the Degree of

**MASTER OF PUBLIC POLICY**

**2020**

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**ABSTRACT**

**AN EMPIRICAL STUDY ON THE REINSURANCE DECISIONS OF**

**KOREAN LIFE INSURANCE COMPANIES**


By

Hyunjee Park

Drawing attention from academic field of finance and insurance industry, I test for determinants of reinsurance decision making in relation to company-specific features in Korean life insurance companies. Using a panel data design covering 372 firm-year observations for 8 consecutive years, from 2011 to 2018, I observe that high underwriting risk, low solvency ratio, small size, and highly concentrated portfolio tested to be determinants of reinsurance decision. In addition, I take the institutional background of the Korean life insurance industry into consideration and select two ownership structure variables to find their relationship with purchasing reinsurance behavior. Life insurance companies grouped in financial conglomerates buy more reinsurance while foreign-owned life insurers cede less risks. Despite meaningful findings, some of the selected company features were not statistically significant implicating further detailed research is required. This study hopes to become a cornerstone for future research in the field of life reinsurance in Korea and may have implications for policymakers and the management of life insurance companies.

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It has been a tough journey as a graduate student and having a full-time job in the insurance industry at the same time. I wish to acknowledge the support and great love of my family. Without their support, this work would not have been possible.

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# I. INTRODUCTION

People buy insurance to relieve financial burden from unexpected events. It is not different for companies. Insurance companies buying insurance, which is known as reinsurance, has more importance as it is a way of insurer risk control and capital management. Especially, life insurance companies are required to control retained risk and manage solid capital since most of the life insurance policies are long term contracts. Insurance premiums paid by insurance policyholders should be safely secured for long periods and returned as promised. Therefore, life insurance companies recognize the benefit of purchasing reinsurance: (1) reduced underwriting risk and improved underwriting capacity; (2) prudent solvency ratio; (3) valuable service provision.

All entrepreneurial organizations have different features and they affect managerial decision making. Decision making of purchasing reinsurance for insurance companies differs by firm-specific characteristics. These characteristics can be organizational factors such as ownership structure or financial aspects such as leverage, investment structures, and tax status (Mayers & Smith, 1990; Adams, 1996; Garven & Lamm-Tennant, 2003; Kader, Adams, & Mouratidis, 2010). Similar to non-life insurance companies, life insurance companies show reinsurance demand varied by firm-specific factors and correlations differ by each characteristics (Adams, 1996). I intend to build upon existing scholarship on demand in reinsurance; however, I intend to focus on Korean life insurance companies and their specific features.

Even though it has been over 50 years since the first life reinsurance transaction was made in Korea, there are limited studies on reinsurance treatments in Korean insurance industry (Kim, 2012; Cho, Kim, & Lee, 2014; Lee, 2017). Among several studies, Lee (2017) focused on the reinsurance structure decisions of life insurance companies in Korea. Kim (2012) attempted to show reinsurance demand can be driven by the purchasing cost under different regulatory

environment but he only made an/the analysis using models, not empirical data. I attempt to conduct an empirical test on how company-specific features of Korean life insurance companies correlate to their decision making on purchasing reinsurance for the first time.

Country specific features such as regulation change company managers' behavior in most industries. I believe Korea is not an exception; the Korean life insurance industry shows such a low reinsurance acceptance rate compared to prominent market share. Life insurance market share out of total insurance market in Korea in recent 10 years is 59.8% while the OCED average is 51.0% (OECD, 2018). In contrast, use of reinsurance in Korea is markedly lower than the OCED average. Computed with gross premium, the reinsurance acceptance rate of Korea in recent 10 years is 1.9% while the OCED average is 7.0% (OECD, 2018). I reviewed features of the Korean life insurance industry in various aspects in order to contribute to an expanding understanding of the Korean life insurance industry. I attempt to explain why some firm-specific factors correlate strongly with demand in reinsurance in Korea compared to previous research. Moreover, I draw attention by adding explanation in the context of Korean regulation, financial supervision, and the historical background of the industry.

I conducted an empirical study using panel data from Korean life insurance companies from 2001 to 2018. In 2018, use of reinsurance measured by ratio of reinsurance expense to gross risk premium vary between 2.2% to 59.1%.  It implies that reinsurance decisions vary by company-specific features. I attempt to choose firm-specific factors categorized into three main benefits of purchasing reinsurance. First, underwriting risk and improved underwriting capacity was measured by gross loss ratio. Second, I tested the relation between solvency prudency and reinsurance demand using RBC ratio and financial leverage ratio. Real-service efficiency was difficult to measure with certain index. Instead, I linked size and business concentration with

service provision because they are factors of insurance company requiring outsourced help for competitiveness (Mayers & Smith, 1990). Other organizational factors I set hypothesis include financial conglomerate and ownership, either foreign or domestic. For instance, I hypothesized foreign owned insurers in Korea tend to use less reinsurance and maintain a higher solvency ratio. My hypotheses are set to build on existing scholarship by previous researchers, such as Yanase and Limpaphayom (2017) and Ho (2016) who each conducted research based on Japan and China.

The results of this study either strengthen the findings of existing literature or require explanation for why the results are not consistent with what is hypothesized. This research paper attempts to find answers to results in relation with characteristics of Korean life insurance industry.

Participants including life insurance companies, reinsurance companies, and financial regulatory supervisors may obtain insights from the paper. Moreover, in 2022, the new accounting regime and statutory framework will be introduced in Korea. Analysis on linkage between firm characteristics and reinsurance demand can be used as indicators for anticipating how reinsurance strategy will change in the near future. This thesis continues by providing a literature review on previous research and the current background of the Korean life insurance market. A discussion of hypothesis development follows the background of information. The data and methodology are then described. A summary of statistical empirical statistical results is presented before the concluding section. s

## II. LITERATURE REVIEW AND INSTITUTIONAL BACKGROUND

### A. Literature Review

Mayers and Smith (1990) define reinsurance as a traditional form of corporate demand for insurance, only that it is within an insurance industry. Throughout this research paper, a reinsurance contract will be a set of insurance policies purchased by an insurance company from another insurance company, each known as insurer or ceding company and reinsurer. The term reinsurance will be broadly understood to mean reinsurance contracts, treaties, or business itself.

Mayers and Smith (1990) were the first to focus on the corporate demand for insurance involving firm-specific characteristics. They used property and casualty insurance company data of 1,276 firms regardless of countries, across a broad range of ownership structures – stocks, mutuals, reciprocals. The thesis provided evidence that ownership structure matters to reinsurance purchase. Not only ownership structure, but other firm-specific features such as size, credit rating, line-of-business concentration, etc. but also play either a neutral or important role in reinsurance contracts. Following studies adopted a similar approach to Mayers and Smith's finding, but conducted research using different country data taking difference on market regulation and condition of each countries. Adams (1996) empirically tested risk-bearing hypothesis which is the most prominent explanation on reinsurance decision making in insurance firms using New Zealand life insurance company panel data. Considering New Zealand's relatively unregulated market, the article focused on five main features: organizational factor, firm size, product concentration, leverage, and underwriting risk. Moreover, Ho (2016) discusses ownership structure and characteristics of firms on reinsurance decisions in the Chinese non-life insurance industry. The study contrasts with other studies by shedding light on the impact of regulation, Chinese compulsory reinsurance ratio, and the demand on reinsurance. The study emphasizes how

regulation change is related to firm-specific features and reinsurance. There exists further research on the topic, using empirical data of different jurisdictions, insurance industries, and eras. Each choose similar though not the same features of companies which can be more significant (Garven & Lamm-Tennant, 2003; Cole & McCullough, 2006; Lian-can, Shu-guang, & Liang, 2010).

All previous research agrees on the statement: Company-specific features do materially impact the reinsurance demand. As an example, firm size negatively relates to reinsurance demand while product or line-of-business concentration have weak evidence on reinsurance demand (Mayers & Smith, 1990; Adams, 1996; Kader, Adams, & Mouratidis, 2010). However, not all features show strong evidence for relationship to reinsurance purchase decision.

Some of the existing literature cross over on findings. For instance, Mayer and Smith (1990) show that the less diversified the owner's portfolios, the greater the reinsurance purchase. In contrast, Ho (2016) finds a positive relationship between product diversification and reinsurance. There are studies that conclude ownership structure, either stock companies or mutual companies, do not have a material relationship to reinsurance demand (Adams, 1996; Cole & McCullough, 2006) while other studies suggest types of organizational structure statistically relate to reinsurance demand (Mayers & Smith, 1990). These findings suggest that empirical evidence on company characteristics and reinsurance decisions is inconclusive. It implies that defining the context of the market that data is collected in is important. Next, this section is followed by the institutional background of life reinsurance in Korea.

**B. Institutional Background**

In this thesis, I empirically examine the determinants of reinsurance purchases for Korean life insurance companies. The Enforcement Decree of the Insurance Business Act in

Korea defines life insurance as contracts made in coverage of mortality or morbidity risk. As of December 31st, 2018, there are 24 life insurance companies and 6 mutual companies. Although mutual companies are allowed to write life insurance policies and they purchase reinsurance, this paper will exclude mutual companies since their financial results are not public information.

As of December 31st, 2018, 24 life insurance companies in Korea are licensed operatives varying in ownership structure, size, product mix, and financial solvency condition, which currently generate approximately KRW 111 trillion (US$ 98 billion) in gross annual premiums (Korea Life Insurance Association, 2018). Lina Life Insurance Company was the first foreign life insurance company to open a branch in Korea in 1987. Since then, several foreign capital life insurance companies have been established and operated(Shin, 2006). Financial conglomerates in Korea is a unique feature. The government enacted the *Financial Holding Company Act* in October 2000, and since then, several large life insurance companies are under a holding company structure. Not all the financial conglomerates are in the structure of a financial holding company. There are other structures, such as parent-subsidiary model or mixed conglomerates(Hahm & Kim, 2006).

There are eight professional reinsurance companies in Korea. Of these the only local company is Korean Reinsurance Company. There is no state reinsurance company in Korea. It is required for a foreign reinsurer to operate as a branch if it wishes to reinsure business within the Korean market, unless it incorporates a local company. There are two insurance supervisors in Korea, the Financial Service Commission (FSC) and the Financial Supervisory Services (FSS).

In July 2002, various forms of reinsurance transactions were permitted. Article 63 of the Enforcement Decree of the Insurance Business Act requires reinsurance to have transfer of insurance risk; potential for loss to reinsurer; and reinsurer shall have satisfied the standards for

financial soundness prescribed by supervisory authorities or its credit ratings. Reinsurance that does not satisfy the requirements for reinsurance under Article 63 of the Enforcement Decree of the Insurance Business Act shall be treated as a deposit for accounting purposes (Insurance Business Supervisory Regulations 2014, Article 7-13). There exists a grey area on whether the reinsurer can assume timing, operational, and credit risk in addition to insurance risk. The laws in Korea do not explicitly prohibit ceding risk other than insurance risk, which is pure mortality and morbidity risk, in practice, however, the regulators have recognized only yearly renewable term(YRT) reinsurance based on transfer of risk premium as reinsurance explaining it is to prevent abuse of reinsurance. For further information, there are other types of life reinsurance already utilized globally. For instance, in coinsurance, a ceding company pays a reinsurer all policyholder premiums or considerations and in return, a reinsurer pays ceding companies all benefits paid to policyholders, not limited to mortality and morbidity risk but also surrender benefits, interest credited, etc. In other words, coinsurance allows transfer of all types of risks, not only insurance risk which expands the scope of reinsurance. International Association of Insurance Supervision (IAIS) (2006) characterizes finite reinsurance as a generic term, insurance risk transfer and financing combined form of reinsurance. A reinsurer assumes limited risks and ceding company transfers volatility. Depending on needs and objectives of ceding company and regulatory and supervisory means, various structures of reinsurance could be contracted. Thus, compared to other jurisdictions, Korea's relatively conservative reinsurance market may be an interesting environment in which to examine reinsurance decisions in the life insurance firms.

Korean life insurance reinsurance purchase has been restrictive due to regulation therefore as only insurance risk can be transferred from ceding company to reinsurer, it may have limited the decision making of ceding companies as if there were compulsory reinsurance

requirements. Having discussed the main concepts setting the boundaries of this paper and reviewed the institutional background of life reinsurance in Korea, let us now turn to setting the hypothesis.

## III. HYPOTHESIS DEVELOPMENT

This section first develops five hypotheses for all companies on firm-specific characteristics and demand in reinsurance. Further, two hypotheses regarding ownership structure of companies are put forward.

**Underwriting risk**

Life insurance companies purchase reinsurance to reduce underwriting risk and improve underwriting capacity. It is the main purpose of purchasing reinsurance. Firms with higher underwriting risks indicate that they tend to engage in more risky business activities than firms with lower underwriting risks. For example, life insurance companies establishing liberal underwriting standards will provide higher capacity compared to companies holding conservative underwriting guidelines (e.g., whole-life insurance written on the lives of smokers or the elderly at higher maximum policy limit). Companies having an aggressive sales strategy will sell products at a lower margin. These companies have higher probability of actuarially mispriced loss or higher volatility of loss in future as life insurance is a long-tailed business. In other words, firms with higher underwriting risk are likely to have uncertain future net cash flows (Lamm-Tennant & Starks, 1993).

To prevent policy losses and the cost of financial distress, insurance companies choose to reinsure (Hoerger, Sloan, & Hassan, 1990). By purchasing reinsurance, insurance companies can insure at greater frequency and magnitude of risk and stay safe under statutory minimum levels of solvency and minimize the risk and cost of bankruptcy (Adams, 1996). Moreover, Mayers and Smith (1990) explain firms engaging in more risky lines of business purchase reinsurance to alleviate the risk of adverse financial effects of mispriced policies and negative effects on earnings statements. Mayer and Smith (1990) also add that reinsurance can mitigate agency problems arising from managerial control as well as reduce the risk of information asymmetries in the underwriting process. Therefore, Hypothesis 1 is as follows:

*Hypothesis 1. The amount of reinsurance purchased by companies with a high underwriting risk is likely to be greater than that by companies with a low underwriting risk (ceteris paribus)*


**Solvency Ratio (RBC)**

Prudent solvency ratio is obligatory for on-going business of life insurance companies. Each country holds solvency regulations, including possibly in regulatory centralization and harmonization within the United States (U.S.) and the European Union (E.U.). Solvency ratio can be defined briefly as the minimum capital and surplus that an insurance company has to maintain. In the U.S., the NAIC (National Association of Insurance Commissioners) developed RBC (Risk Based Capital) standards followed by recognition of limitation of controlling insolvency of insurance companies only by asset size.

The RBC standard became effective for life insurance companies in 1994. Similarly, the E.U. introduced Solvency II. Korea, in order to regulate solvency of insurance companies,

modified RBC standards of U.S. reflecting domestic insurance industry and introduced the standards in April,2009. The life insurer RBC formula includes components for insurance risk, interest and credit risk, asset risk (which focus on financial market volatility impact on asset value), operation risk, and miscellaneous business risk. In other words, solvency regulations take various risks an insurer can face into consideration and prevent dilution in the value of policyholders' claims in whichever worst scenarios. Since reinsurance is a risk-carrying device, asset and liabilities transferred to reinsurer can be thought as a way to reduce RBC charges otherwise retained soley by them for the ceding companies. However, the reinsurance transaction has occurred less frequently than predicted in the United States when RBC standard became effective (Hill, 1996). Cho, Kim, and Lee (2014) claimed that the current Korean RBC formula somehow reflects the risk transfer by reinsurance but failed to fully measure additional risk charge on retained risk. Kim (2012) claimed that under the current Korean RBC scheme, because the maximum reinsurance credit ceding companies can benefit from is 50% and scope of reinsurance is limited to insurance risk, companies are reluctant to utilize reinsurance. Because of the limitation, insurance companies may not have enough incentive to use reinsurance as a risk reduction vehicle to minimize the amount of RBC risk charges. Therefore, Hypothesis 2 is as follows:

*Hypothesis 2. The amount of reinsurance is likely to have a very weak negative relationship or no relationship with RBC ratio. (ceteris paribus)*


**Financial Leverage**

Adams (1996), Cole and McCullough (2006), and Kader, Adams, and Mouratidis (2010) suggest that firms have optimal level of ratio constrained either by internal actuarial rules or external regulations. Hoerger, Sloan, and Hassan (1990), Mayers and Smith (1990), and Kader,

Adams, and Mouratidis (2010), among others, contend that given costly regulatory intervention to prevent bankruptcy of insurance companies, insurers instead choose to pay for reinsurance. Reinsurance helps insurance companies to alleviate the risk of insolvency in several ways since purchase of reinsurance shifts a portion of assumed risk from a ceding company's book to reinsurance companies in exchange of annual reinsurance premiums and commissions. Reinsurance (1) prevents the potential claim dilution problem in which policy holders may receive less than the insurance companies are obligated to due to a lack of assets by writing high-risk-exposure business; (2) shifts a portion of liabilities from a ceding company's book, thereby alleviating financial strain on retained financial capital; (3) depending on reinsurance structure, up front commission provided by the reinsurer at the beginning of the treaty term helps ceding companies reduce cashflow restrain. Therefore, Hypothesis 3 is as follows:

*Hypothesis 3. The amount of reinsurance is likely to be purchased greater by highly financially leveraged insurance companies than by relatively less financially leveraged insurance companies (ceteris paribus).*

**Firm Size**

Hoerger, Sloan, and Hassan (1990), Mayers and Smith (1990) and Adams (1996) contend that the size of the insurer is highly significant in demand of reinsurance. In most cases, reinsurers have a comparative advantage in real service provision to insurers due to specialized knowledge, investment in research and development, and economies of scale. Not only in terms of service, because reinsurers are less concentrated in terms of business mix or geographic concentration and also use retrocession, they have incentive to alleviate financial strains (Hoerger et al., 1990).

Economies of scale resulting from growth of a company allows insurance companies to reduce bankruptcy costs and produce efficient services such as new product development, claims handling and underwriting high-risk cases on their own. Large insurance companies are expected to employ experts on assessing retained risk portfolio and purchase optimal reinsurance to reduce the reinsurance transaction cost. They tend to retain a relatively low-risk portfolio and reinsure high-risk policies. They also increase propensity to self-insure or use different reinsurance structures not only traditional YRT but also several non-proportional techniques or facultative reinsurance on large cases. In contrast, smaller insurance companies, due to lack of resources or experience, require value-added-service. Mayer and Smith (1990) report that the private information provided by reinsurance companies on pricing and claims adjustment service is particularly beneficial to small insurance companies. In recent years, the scope of value-added service has changed. Life insurance companies value consulting service on regulation or taxation, business strategy, or co-developing trendy underwriting platforms. Though the scope of value-added service may vary, smaller companies are demanding more real service in return for purchasing relatively large amounts of reinsurance, in other words, paying a reinsurance premium as the price. Moreover, small-sized insurance companies are also more likely to purchase reinsurance in purpose of improving risk-bearing efficiency and make cash-flow less volatile (Adams, 1996). Therefore, Hypothesis 4 is as follows:

*Hypothesis 4. Small-sized insurance companies are likely to purchase more reinsurance than large-sized insurance companies (ceteris paribus)*

**Product Concentration**

Product diversification enables firms to hedge against business risks. Diversification can be a natural hedging mechanism for a firm, therefore reducing the insurer's needs for other hedging mechanisms such as reinsurance, options, financial futures, etc. In other words, when business is more diversified, needs for reinsurance decrease. In fact, previous studies using property and casualty insurance company data showed that firms with less concentrated business buy more reinsurance (Adams, 1996; Mayers & Smith, 1990). For life insurance companies, products can be grouped into ones related to mortality risk, morbidity risk, and longevity risk. Life insurance companies retaining mortality risk and longevity risk can benefit from natural hedging, and this is also considered a way to lower solvency in some regulations, such as Solvency II in Europe. Life insurance companies with diverse lines of products can also produce economies of scale and scope which can be related to efficiency of various services, such as asset management and risk management (Huberman, Mayers, & Smith, 1983). Therefore, benefits in consequence of product diversification are expected to reduce the corporate demand for reinsurance. Therefore, Hypothesis 5 is as follows:

*Hypothesis 5: The amount of reinsurance is likely to be higher for companies with concentrated business than companies with diversified business (ceteris paribus).*

**Ownership Structure**

Previous studies have focused on organization structure by stock companies and mutuals and assist that ownership structure has a relationship with reinsurance demand (Adams, 1996; Garven & Lamm-Tennant, 2003; Cole & McCullough, 2006). In Korea, among 24 life insurance companies as of year-end 2018, only 5 are publicly listed in the stock market. Others are private.

Also, mutuals in Korea are rather unions, cooperatives, or posts which are not obligated to provide public information.

Rather than using categorization of stock and mutual companies, this study reflects the unique feature of Korean financial companies: the financial conglomerates. Since the 1997 financial crisis, financial consolidation through mergers and acquisitions as well as financial conglomeration among banks and non-bank financial institutions – typically life insurance companies, non-life insurance companies, banks, and securities – has been a common scene in Korea. There are known to be three types of financial conglomerates[1] in Korea: parent-subsidiary model, financial concentration through financial holding companies, and mixed conglomerates which are predominantly commercially oriented, but contain at least one regulated non-bank financial institution (Hahm & Kim, 2006). In this thesis, all the life insurance companies belonging to any type of financial conglomerate will be defined as part of a financial conglomerate. One most unique feature of financial conglomerates is that members of a group are linked together through mutual shareholding. Since often these conglomerates are owned by Chaebol[2], the largest shareholder happens to be the owner family of the financial conglomerates.

Hahm and Kim (2006) point out that large financial conglomerates have challenging tasks: (1) management of operation risk due to increased complexity in operation and incentive to take

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[1] Initially stated by the Tripartite Group of bank, securities, and insurance regulators which includes Basel Committee on Banking Supervision (BCBS), the International Organization of Securities of Commissions (IOSCO) and the International Association of Insurance Supervision (IAIS), the term financial conglomerate indicates any group of companies predominantly engaged in two or more financial sectors (i.e., banking, insurance, securities) controlled by common ownership. (Joint Forum on Financial Conglomerates, "Supervision of Financial Conglomerates', 1999)

[2] Chaebols are involved in various types of business not limited to single industry. There are several large, powerful groups of companies in South Korea known as Chaebols. (Cambridge Dictionary).

aggressive actions based upon moral hazard; (2) management of increased systemic risk potential because of similarities in characteristics in business portfolios and asset structures of individual institutions of financial conglomerates.

Reinsurance enables life insurance companies to write more insurance business and limit their exposure to heavy losses (Adams, 1996). Moreover, reinsurance provides financial terms which is an alternative cash resources as a source of capital for business growth (Mayers & Smith, 1982). It is at the same time, the source which diversifies asset structures without violating the minimum capital requirement. In consequence, reinsurance could play a significant role in alleviating the systemic risk potential. Another categorization of companies is by capital and/or management ownership, domestic or foreign. Skipper (1997) suggests that led by liberalization of markets, foreign insurance companies' entrance in emerging markets have the potentials to play constructive role in more efficient resource allocation.

By fostering greater competition, more valuable customer service is introduced to the market as well as more advanced technical (e.g., loss control and actuarial) skills and managerial knowhow are transferred to the developing market. The quality of domestic insurance regulation improves because often foreign insurance company involvements accompany de-regulation and this leads to liberalization of market. Market growth tends to result when markets are liberalized according to economic theory. Skipper (1997) proposes that domestic spillovers let the emerging market industry to grow what economists call positive externalities.

They Korea life insurance industry is not an exception. After the financial crisis of 1997, government driven restructure of financial institutions, deregulation, managerial improvement, and prudent supervisory control transformed the life insurance market of Korea. Foreign insurance companies expanded market share led by technical efficiency and scale efficiency, which in turn

resulted in higher productivity (Shin, 2006) Foreign insurers have advantage in terms of financial strength, technology, real-service provision, and managerial experience. It can be translated to them already possessing the main benefits reinsurance provide, therefore having less needs for reinsurance. Therefore, Hypothesis 6.1 and 6.2 are proposed as follows:

*Hypothesis 6.1: The amount of reinsurance is likely to be higher for the life insurance companies of financial conglomerates than independent companies (ceteris paribus).*

*Hypothesis 6.2: The amount of reinsurance is likely to be higher for domestic life insurance companies than foreign-owned (ceteris paribus).*

# IV. RESEARCH DESIGN

This section shows the model selected for the study. Defining how each variable is measured is explained followed by how sample data is selected.

## A. Model

The following random effects panel data model is applied to examine six hypotheses regarding company-specific features and reinsurance relationship and analyzes life insurers' reinsurance purchasing behavior.

$$REINS_{it} = f(UWRISK_{it}, \quad RBC_{it}, \quad FLEV_{it}, \quad lnSIZE_{it}, \quad LINE_{it}, \quad CONG_{it},$$
$$FOR_{it}, \quad Year\ Dummies) + \mu_i + \varepsilon_{it}$$

In this study, random effect model is used. Random effect model takes heterogeneity of data into consideration. The advantage of random effects model is that time invariant variables can be included. It is a GLS version of Pooled OLS model, accounting for the fact that errors are

serially correlated. Random effect model can be more efficient than fixed effect model because it uses the cross sectional and between variations while fixed effect model only uses the between variables. Moreover, in this study, CONG and FOR are categorial variables which are represented by dummy variables, 0 and 1. When a fixed effect model is used, it is challenging to avoid the dummy variable trap. Because of multicollinearity in dummy variables, in a fixed-effect model, the researcher often has to drop the categorical variables. Hence, the random variable model is considered more appropriate for the study.

**B. Variables**

In the model, *REINS* indicates the dependent variable, reinsurance ratio. Previous researchers, Mayers and Smith (1990), Adams (1996), Garven and Lamm-Tennant (2003), Cole and McCullough (2006) and Ho (2016), all calculated reinsurance ratio as the reinsurance ceded premium divided by the total business premiums. Here, the total business premium is the sum of the direct premiums written and reinsurance assumed. This study however used the reinsurance ratio calculated as the ceded premium divided by risk premium. It reflects the reinsurance purchasing tendency of Korean life insurance companies due to Korean regulations on reinsurance who currently utilize risk-only traditional reinsurance.

UWRISK, RBC, FLEV, lnSIZE, LINE, CONG, FOR represent the underwriting risk, solvency ratio, financial leverage, (log) firm size, product concentration, financial conglomerate/independent status, and foreign/domestic ownership respectively. In order to control for any time-related effects (e.g., regulation, supervision, changes in external economic conditions) on the reinsurance decision of ceding companies, year dummies are added to the regression model. Each independent variable is explained as below.

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(1) Underwriting risk (UWRISK): Similar to Adams (1996) and Kader, Adams, and Mouratidis (2010), this variable represents the total amount of annual gross claims divided by annual gross premiums earned during the fiscal year. Gross claim amounts include all of the cash outflows paid to policy holders including death benefit, cash surrender value, and dividends both in a general account and separate special account. Gross annual premium is total premium inflow both in general account and separate special account.

(2) Solvency Ratio (RBC): RBC ratio represents solvency regulation in Korea. Financial Supervisory introduced RBC scheme in April,2009 and data became available after 2012. Therefore, in the sample, RBC is available for year-end 2012 to 2018.

(3) Financial Leverage (FLEV): Financial leverage is defined as total liability divided by total asset. It is a similar approach to the one Garven and Lamm-Tennant (2003) and Ho (2016) took. This measure is the simplest term measuring financial leverage.

(4) Firm Size (lnSIZE): This variable is measured as the natural logarithm of annual total assets. Previous studies have used total asset as proxy for firm size. Taking logarithm reduces skewness and helps make extreme data more interpretable (Mayers & Smith, 1990; Adams, 1996; Kader et al., 2010). Inflation adjustment was not applied.

(5) Product Concentration (LINE): Herfindahl concentration index is computed using seven major types of products sold by life insurers in Korea. It is recommended to report sales in seven types in the annual report. Each type represent coverage provided and can be categorized by group or individual. Individual product categories are life, pure endowment, endowment, pension, and variable insurance. Group products are group life and retirement insurance [3] . The

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[3] For further information on products in Korean life insurance industry, see Insurance Product Change and Development: Life Insurance Products (Kim, Kim, & Lee, 2018)

categorization is what is required by the financial supervisors. The Herfindahl index is computed for each company as:

$$H = \sum_{l=1}^{7} S_l^2$$

where $l$ = types of products $(1, 2, \ldots, 7)$; $S_l = PI_l/TPI$; $PI_l$ is the amount of annual premium income written in particular type of insurance; and $TPI$ is the total value of annual premium income for all seven business. The maximum value of Herfindahl index is 1, the closer the index is to 1, the more concentrated the product portfolio of the company is.

(6) Financial Conglomerate/Independent (CONG): It is a dummy variable labeled one for a life insurance company belonging to a financial conglomerate and zero for a company not belonging to a financial conglomerate. In this study, life insurers not belonging to any financial conglomerates are called 'independent'. To note, financial conglomerates are all domestic companies, since foreign capital or managed companies do not meet the unique features of Korean financial conglomerates. In case of a change in a company's status, it is labeled based on the status of the year.

(7) Foreign/Domestic (FOR): Foreign/domestic status is a dummy variable labeled one for a company managed by a foreign headquarter and zero for a domestic life insurance company. In case a company's status changes, it is labeled based on the status of the year. For instance, Tongyang Life Insurance Company was sold to Anbang Group of China in September 2015. The name of the company remained the same. In the study, the company is considered as a domestic company until 2015 and a foreign company since 2016.

**C. Data**

Data used in this study consists of 36 life insurance companies which existed from financial year 2001 to 2018. All the data in this study is based on financial years, which was from April 1st to March 31st before the financial year of 2013 and from January 1st to December 31st starting from the financial year of 2013. Therefore, the financial year 2013 only consists of 9 months. Because most of the variables used here are mostly ratios which periodic difference are erased off or balance sheet components rather than income statements, there is no adjustment to figures of year 2013. Insurance companies which changed the name of the company, but nothing else is different, are considered as the same company. Other than this, companies are counted separately. The panel is unbalanced because not all companies exists for the entire sample period. In this study, reinsurers are excluded from the sample to capture the reinsurance demand. Mutuals are also excluded from the study. Four firm-years observations with reinsurance ratio, ceded premium over risk premium, higher than 200% considering them as incomplete data.

The selection of the above criteria resulted in an unbalanced panel of 474 firm-year observations for thirty-six primary life insurance companies that operated in Korea. 372 firm-year observations were valid to be used in the model. The data for all of the variables are obtained from Korea Life Insurance Association (KLIA) and Financial Statistics Information System serviced by Korea Financial Supervisory Service (FSS). All the data relates to independently operating and reporting life insurance companies licensed by the FSS to conduct life insurance and pensions business in Korea.

## V. EMPIRICAL RESULTS

In this section, I provide statistical results arising from the study followed by discussion.

Table 1. Descriptive Statistics

| Variable | Mean | Median | Std. Dev | Min | Max |
|---|---|---|---|---|---|
| REINS | 0.3213 | 0.2782 | 0.2581 | 0 | 1.0356 |
| UWRISK | 0.5437 | 0.5362 | 0.3268 | 0 | 3.4104 |
| RBC(%) | 178.47 | 0 | 825.07 | 0 | 11353.72 |
| RBC(2012~,%) | 416.08 | 232.76 | 1221.91 | 0 | 11353.72 |
| FLEV | 0.9151 | 0.9316 | 0.1526 | 0.0367 | 2.4822 |
| FLEV* | 0.6847 | 0.7313 | 0.1965 | 0.0007 | 1.4582 |
| lnSIZE | 15.96093 | 15.7184 | 1.8133 | 7.7196 | 19.3847 |
| LINE | 0.3967 | 0.3391 | 0.1808 | 0.1448 | 1 |
| CONG | 0.5711 | 1 | 0.4956 | 0 | 1 |
| FOR | 0.3850 | 0 | 0.4872 | 0 | 1 |

Table 1 gives the descriptive statistics for the dependent and independent variables used in this study. On average, life insurers in the data set reinsured 32.13 percent of annual risk premium income. There were companies not utilizing reinsurance at all in certain years. The maximum REINS is 1.0356 which is assumed that in a certain year, ceded premiums from previous years were accounted for in the later years. Because the size of this one company is small and will not affect overall results, the data is not excluded. Because the measure of reinsurance ratio is different from previous studies (Adams, 1996; Kader et al., 2010; Ho, 2016) is difficult to compare the use of reinsurance with empirical studies using other country data.

The average UWRISK for the sample of Korean life insurers is 0.5437. UWRISK can be translated to gross loss ratio. Life insurance companies spend about half of gross premium income to payout for annual claims (i.e., maturities, mortalities, surrenders, etc.). Given that the standard

deviation of UWRISK is 0.3268, the loss ratio differs by companies quite substantially. However, as the mean and median value is similar, it is interpreted the data set is symmetric.

RBC ratio was provided in annual reports of each life insurance company since year 2012. To show a clearer view, Table 1 shows descriptive statistics of RBC ratios excluding years before 2012. On average, life insurance companies have 416.08% more capital than required risk-based capital. The median value is 232.76%, however, suggesting an extreme variation in the solvency ratio in the sample. Such large standard variation, 1221.91% also shows RBC ratio of insurers varies much depending on companies and years. Such extreme variation is due to a single company, Kyobo Lifeplanet, which was established in 2013 as a digital insurance company. RBC ratio of Kyobo Lifeplanet has been changed from 11353.72% to 2.28 recently. Excluding Kyobo Lifeplanet, average RBC ratio is 245.93% and standard deviation is 99.35%. Hence, on average, all life insurance companies maintain a RBC ratio higher than the statutory minimum guideline, 150%.

FLEV is a proxy for financial leverage. Korean life insurers on average utilize 91.52% of total assets as liability. The remaining 8.48% would be total equity. Mean and median do not differ much from each other and the standard deviation is 0.0367 which is relatively small compared to other variables, indicating this variable is somewhat stabilized. Liability of Korean insurers consists of reserve, policyholders' equity adjustment, other liabilities and special liabilities account. Reserve is set to protect the insurance company from losses and help policy holders to receive claims and annuities after extended periods of time. Therefore, reserve is the essential component of a life insurance company. To see if the FLEV variable reflects the importance of reserve, FLEV*, calculated as reserve amount over asset, is measured and shown in Table 1. From the table, it is seen that most liability consists of reserve and mean and median value differs in similar gap

between FLEV and FLEV*. Standard deviation differs between FLEV and FLEV* but as the standard deviation of FLEV is smaller than FLEV's, FLEV is less volatile than FLEV*. Due to choosing a more comprehensive and less volatile measure, this study uses FLEV as the single proxy for financial leverage.

On average, the natural logarithm of assets of Korean life insurers is 15.6094 which is translated into 14.912 trillion won. It is approximately 13 billion USD. The median value of lnSIZE is 15.7184 which indicates Korean life insurance companies are dispersed in the market in terms of asset size. In fact, as of December 31st, 2018, the top 3 largest life insurance companies (Samsung, Kyobo, and Hanwha) occupy 56% of the total market (Financial Services Commission of Korea, 2019). However, measured as of March 31st, 2002, the end of fiscal year 2001, the top 3 largest companies occupied 85% of the total market. The top 3 largest companies have not changed between 2001 and 2018, so it is assumed that Korean life insurance industry has been more competitive and more dispersed over time.

According to how the equation of Herfindahl-Hirschman Index (HHI), the smaller the LINE value is, the more dispersed the product lines of a company are. It can range between 0 to 1. LINE in Table 1 suggests that Korean life insurance companies have quite dispersed product portfolios compared to a reported average of 0.62 of U.K. life insurance companies between 1992-2004 and an average of 0.52 of New Zealand life insurance companies between 1988-1993 (Adams, 1996; Kader et al., 2010). The maximum value of LINE is 1, indicating that companies having a single business line exist in the sample data of the current study.

The average value of 0.5711 of CONG describes there are more companies which are part of financial conglomerates than those that are not in the Korean life insurance industry during

2001-2018. Less than half of the life insurance companies are owned or managed by foreign capital or management during the time.

Table 2. Correlation coefficient matrix

|  | REINS | UWRISK | RBC | FLEV | lnSIZE | LINE | CONG | FOR |
|---|---|---|---|---|---|---|---|---|
| REINS | 1.000 | | | | | | | |
| UWRISK | 0.0873 | 1.000 | | | | | | |
| RBC | -0.098 | -0.128* | 1.000 | | | | | |
| FLEV | 0.153** | 0.396** | -0.489** | 1.000 | | | | |
| lnSIZE | -0.275** | 0.218** | -0.192** | 0.146** | 1.000 | | | |
| LINE | -0.215** | -0.283** | 0.107* | -0.380** | -0.550** | 1.000 | | |
| CONG | 0.293** | 0.107* | 0.069 | 0.193** | 0.249** | -0.458** | 1.000 | |
| FOR | -0.274** | -0.127* | -0.052 | -0.220** | -0.260** | 0.506** | -0.913** | 1.000 |

Note: **,*statistically significant at the 1 percent, 5 percent levels

Table 3. Variance inflation factors

|  | VIF |
|---|---|
| UWRISK | 1.47 |
| RBC | 1.68 |
| FLEV | 1.90 |
| lnSIZE | 2.14 |
| LINE | 2.16 |
| CONG | 8.10 |
| FOR | 8.52 |
| Mean VIF | 2.81 |

The Pearson pairwise correlation coefficient shown in Table 2 indicates that all the independent variables have expected relationships with REINS. Except for UWRISK and RBC, all the other independent variables have statistically significant associations with REINS. The positive association between UWRISK and FLEV and lnSIZE suggests that companies which tend to engage in risky business and have likelihood of financial distress have leveraged highly and

large companies are more of the kind bearing the risk. The negative relationship between UWRISK and RBC and LINE is also in align with the expectations. Companies controlling the underwriting risk and financial distress tend to keep a higher solvency ratio and controlling risk can be related with diversification of a portfolio. FLEV and lnSIZE have statistically significant negative association with RBC. It indicates that companies with higher financial leverage ratio and sizable companies tend to have lower solvency ratio, which means having less cushion capital for emergency. Companies in the group of financial conglomerates tend to bear higher UWRISK, maintain higher RBC, utilize higher financial leverage, and tend to be sizable companies. They also more likely have a diversified portfolio. Table 2 also indicates that FOR have significantly negative relationship with UWRISK, FLEV, lnSIZE, and CONG. Foreign companies prefer to take lower underwriting risk, keep sizable free asset, are usually small in volume, and focus on the small number of lines. They are not likely to be part of conglomerates, as conglomerates are a unique feature of Korean companies.

Variance-inflation factors (VIFs) are computed to use as a reasonable and intuitive indication of multicollinearity. Rule of 10, the most commonly used rule of thumb regarding VIF, intuitively interprets VIF values exceeding 10 as sign of severe multicollinearity (Kennedy, 2003; O'brien, 2007). The highest values of VIFs in the regression model of this study 8.10 and 8.52, CONG and FOR respectively, are because they are time-invariant values. Mean VIF is 2.81 and other variables have VIFs less than 3. Hence, no independent variables used in the model are excluded from the study.

Table 4. Random-Effects GLS Regression, Korean Life Insurers, 2001-2018

| Dependent Variable: REINS | | | | | |
|---|---|---|---|---|---|
| Independent Variables | Predicted Sign (+/-) | Coefficient | Std. Err | z | P>\|z\| |
| UWRISK | + | 0.1063 | 0.0376 | 2.83* | 0.005 |
| RBC | - | -0.0035 | 0.0016 | -2.13* | 0.033 |
| FLEV | + | -0.5150 | 0.0953 | -0.54 | 0.589 |
| lnSIZE | - | -0.0348 | 0.0128 | -2.72* | 0.006 |
| LINE | - | -0.3719 | 0.1056 | -3.52* | 0.000 |
| CONG | + | 0.1258 | 0.0835 | 1.51 | 0.132 |
| FOR | - | -0.0019 | 0.0825 | -0.02 | 0.982 |
| Constant | | 1.0039 | 0.2349 | 4.27* | 0.000 |
| Year dummies | | yes | | | |
| Overall $R^2$ | | 0.3591 | | | |
| BP LM test $\chi^2$(d.f=1) | | 145.00* | | | |
| $\sigma_\mu^2$ | | 0.0862 | | | |
| $\sigma_\varepsilon^2$ | | 0.1577 | | | |
| Number of obs. | | 372 | | | |

Note: * statistically significant at 5 percent level
*Variables Definitions:*
REINS = reinsurance ratio, the annual ceded premium÷the annual risk premium;
UWRISK = gross underwriting risk, the annual gross claim÷the annual gross premium; annual gross claim and premium both in general account and separate special account;
RBC = statutory solvency ratio;
FLEV = financial leverage, that is, total liability year-end÷total asset year-end
lnSIZE = natural log of the total assets;
LINE = product mix, measured by Herfindahl concentration index;
CONG = one for life insurers in financial conglomerates, zero for life insurers independent; independent indicate life insurers not belonging to any financial conglomerates
FOR = one for foreign capital owned or managed life insurers, zero for domestic capital owned or managed life insurance companies;


Table 4 shows that all independent variables have the expected sign, though not all are

statistically significant. Year dummies are added to capture the aggregate time-series trends.

Empirical evidence indicating that Korean life insurers undertaking higher underwriting risk have

a tendency to demand more reinsurance is in align with what is predicted as statistically significant at 0.05 level. They use reinsurance to reduce the volatility of returns and increase profitability of products. The result supports findings from previous studies: Mayers and Smith (1990) in their study of reinsurance in the US property-casualty insurance industry, Adams (1996) in his study of reinsurance in New Zealand life insurance companies, and Kader, Adams, and Mouratidis (2010) in their study of reinsurance in U.K life insurance firms. Hypothesis 1 is therefore consistent.

The estimated coefficient for solvency ratio (RBC) is negative and statistically significant. Purchasing reinsurance is not an attractive option for life insurance company management on raising RBC ratio, which supports Hypothesis 2. Rather than purchasing reinsurance, life insurance companies whose RBC ratio is at a dangerous level near 150% choose other options to raise the solvency ratio. Such options include issuance of subordinated security bonds. Low interest rate economic conditions also make issuance of subordinated security bond a cost saving option for raising capital for insurance companies. As Kim (2012) pointed out the limitation of current Korean RBC scheme, without change in scheme, reinsurance will not be used as a way to adjust RBC ratio. However, as the Korean life insurance industry is expecting the introduction of IFRS-17 in 2022, the current tendency may change.

The parameter coefficient for financial leverage (FLEV) is negative and not statistically significant, which does not support Hypothesis 3. It is consistent with the finding of Ho (2016) who finds that financial leverage is not significantly related to reinsurance demand. I find an insignificant relationship between financial leverage and demand in reinsurance in narrow scope of reinsurance in Korea. Financial leverage, which is measured total liability divided by total asset, involves overall business results and the financial condition of the company. Among the risks a life insurer faces, such as mortality and morbidity risk, lapse or surrender risk, and investment risk,

credit risk, and more, the currently allowed reinsurance structure in Korea only allows life insurance to transfer mortality and morbidity risk to a reinsurer. Korean life insurers could not take full advantage of reinsurance due to the narrow definition of reinsurance. In other nations, for example, in the US, life insurance companies utilize reinsurance to relieve financial stress in various purposes. New business financing, increasing capital through transferring inforce block, reducing concentration of risk using reinsurer's lower cost of capital are examples of the ways life insurers can benefit financially from purchasing reinsurance (Tiller & Tiller, 2005).When the scope of reinsurance widens in Korea, life insurance companies may re-think the usefulness of reinsurance and create various structures of reinsurance which are already existing in many foreign markets.

lnSIZE reflect the preponderance of large insurance companies in the Korean life insurance industry. Statistically significant, lnSIZE shows a negative relationship with REINS. Coherent with findings from previous studies (e.g., Hoerger, Sloan, & Hassan, 1990; Mayers & Smith, 1990; Adams, 1996;), Hypothesis 4 is supported by the empirical results of this study. Over the past two decades, the number of life insurers decreased due to mergers and acquisitions. 29 companies operated in 2001, but 24 companies operated in 2018. Due to recent and expected changes in statutory regimes globally, such as Solvency II in Europe and IFRS-17 and K-ICS in Korea, life insurers are offered for sale. In fact, in 2018, PCA Life Insurance Company was merged to Mireasset Life Insurance Company and Orange Life Insurance Company was merged to Shinhan Life Insurance in 2019. As of year-end 2019, Prudential Life Insurance Company and KDB Life Insurance Company are waiting to be sold, possibly to one of the Korean financial conglomerates. As M&As accelerates, there will be more large companies and less small companies. Based on the empirical finding of this study, reinsurance will be less demanded by larger life insurers in Korea.

Turning to next result of variable, the estimated coefficient of LINE is negative and statistically significant at 0.05 level, suggesting that, as predicted, life insurance companies with a diversified product portfolio tend to purchase less reinsurance. Life insurers' product diversification is more limited than property and casualty insurers. Although Korean life insurers only report the financial results of products by what is required  by the financial supervisory, all the products derive from mortality, morbidity, and longevity risk.   Although it is not realistic for a life insurer to fully hedge mortality and morbidity risk with longevity risk, natural hedging at some degree helps an insurer lower its price all else equal or reduce financial burden (Cox & Lin, 2007). Insurance companies who takes advantage of natural hedging, economies of scale, and stabilization of cashflow, therefore, tend to retain more risks than companies who focus on single business. The results support previous findings (e.g., Adams (1996); Mayers and Smith (1990))

As predicted, the estimated variable for CONG is found to be positively related to reinsurance purchasing behavior. Financial conglomerates in Korea are often compared to horizontal financial keiretsu in Japan. Both have common characteristics of extensive cross-shareholding among its member companies. Yanase and Limpaphayom (2017, 599) found Japanese keiretsu non-life insurance companies utilize less reinsurance than independent non-life insurance companies in Japan. Yanase and Limpaphayom (2017) explain "the keiretsu have relatively low bankruptcy costs, low agency conflicts, low information asymmetry, and low effective taxes" and these characteristics alleviate what can be gained from reinsurance purchase. Their finding conflicts with what is found in this thesis. The reason could be inferred as a difference between Korean and Japanese historical background, more detailed characteristics between Korean financial conglomerates and Japanese keiretsu, or life insurance and non-life insurance. Moreover, as the coefficient of CONG is statistically insignificant, it would be difficult to confirm

that life insurance companies in Korea tend to mitigate systematic risks with reinsurance purchase. Therefore, further research could be done regarding financial conglomerates and risk management by the use of insurance.

Lastly, foreign owned/managed company variable, FOR is negatively related to reinsurance purchase. The result does not deny that foreign insurance companies spread out benefits of market liberalization and possess know-how in risk management, real-service provision, and efficiencies in various operations which put off reinsurance as a risk management method. Moreover, as seen in Table 2, foreign life insurance companies maintain low financial leverage, encourage low underwriting risk, and diversify product portfolio. Such tendencies influence low preference to reinsurance. However, due to the marginal value of coefficient (-0.0019) and sizable P>|z|, it is difficult to conclude the result from the empirical study is what is expected. Further research on foreign life insurance company influence on the market and how they behave in reinsurance decision making is required.

## VI. Conclusion

Using unbalanced panel data for a sample of Korean life insurance firms between the financial years 2001 and 2018, this thesis empirically investigates how selected characteristics of life insurance companies connect with inevitable risk management tool, the reinsurance. Selected firm-specific factors include risk-bearing tendency in underwriting, level of financial leverage, managing solvency ratio, size, concentration of product portfolio, and two ownership forms.

Generally, the more underwriting risk a life insurance management decides to take, the more reinsurance they demand. Solvency ratio has a slight impact on reinsurance purchase as

reinsurance allows insurance companies to take reinsurance credit which helps maintaining above minimum RBC level. Taking advantage of reinsurance, companies with higher financial leverage are more likely to purchase more reinsurance. Moreover, the bigger the company asset size is, and the more diversified lines of business a company owns, the more demand for reinsurance management requires. Members of financial conglomerates, due to their complex holding structure and therefore need of additional source of risk hedging, purchased more reinsurance. Domestic life insurance companies purchased more reinsurance than foreign capital owned or managed companies. Such findings from this study confirms what is found in previous studies done with samples of different countries and different eras in broad fact that company-specific features have definite relationship with demand in reinsurance.

I acknowledge that this study has inherent limitations. For example, due to changes in company ownership and accounting requirement, data used in this study may be imperfect. Other major limitations mostly come from unpublished detailed data. If underwriting risk is measured as pure mortality and morbidity payouts divided by risk premium, it will sync with reinsurance ratio measured in this thesis, hence more appropriately examine the underwriting capacity linked to reinsurance. In addition, as companies do not publish detailed actuarial values of reserves and fund, default risk was measured roughly by financial leverage ratio, total liability over total asset. RBC ratio was published after 2012, so it was difficult to measure the exact solvency ratio before 2012. Moreover, although Korean life insurance companies sell much more diversified products, as financial results of each product are confidential, discovering detailed product portfolio was impossible.

Conservative regulations on the scope of reinsurance also cut the possibility of establishing a more evident correlation between company features and reinsurance. Nevertheless,

despite the limitations, this study provides some new insights into motivation for reinsurance in Korean life insurance firms and also could have potentially important policymaking implications. Predictions on impacts from a new accounting scheme and solvency framework, known as K-IFRS17 and K-ICS respectively, are under investigation. January 2020, the FSC announced introduction of coinsurance to Korean insurance industry in April 2020 at the earliest. The decision was made based on concerns of life insurance companies' increased capital burden after introduction of K-IFRS17 and K-ICS. The life insurance industry as a whole, including life insurance companies, reinsurance companies, FSS, and FSC contend extension of definition in reinsurance inevitable for business persistency of the industry. The linkage between company-specific features and demand in reinsurance discovered in this thesis could be used when establishing detailed boundaries of the coinsurance in Korea. Reinsurance managers of each company may also utilize the results when setting the company reinsurance strategies.

This thesis, as the first study to empirically study demand in reinsurance to Korean life insurance companies, may be a foundation for future research. Such research could be finding trade-offs between company characteristics on how reinsurance decision is conjointly determined, comparison on demand in reinsurance before and after introduction of coinsurance, or comparison with non-life insurance companies.

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