Globalization of the Life Insurance Industry: Blessing or Curse?

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Abstract

A central matter of dispute in international business is the existence of a systematic relationship between internationalization and performance (I-P relationship) and if there is, how the relationship looks like. This paper provides a first analysis of globalization strategies' impact on life insurers' performance. In contrast to common beliefs, we find the impact is negative on life insurers' profitability. Moreover, we introduce frontier efficiency measurement into the I-P relationship studies and find that cost efficiency mediates the relationship between globalization and profitability. The expected benefits of globalization are thus difficult to translate into profits and the costs of foreignness can easily endanger cost efficiency. Our results also highlight the importance of industry dependency in internationalization research.

Keywords: Data Envelopment Analysis, Internationalization, Insurance, Geographical Diversification, Cost Efficiency

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I. Introduction

The core of life insurance business is to provide risk transfer and investment facilities to its private and corporate clients. USD 2.6 trillion in premium income and USD 22 trillion in managed assets (about 10% of global financial assets, Swiss Re, 2010) in 2012 underline the economic importance of the global life insurance industry (Swiss Re, 2014). Life insurers thus constitute reliable sources of capital and suppliers of risk transfer facilities to the global economy, making the industry relevant also outside its own market domain.

Internationalization[1] has increased dramatically in many industries during the past decades (Hitt, Tihanyi, Miller, & Connelly, 2006), even though a domestic asset bias exists (Heathcote & Perry, 2013). The economic globalization has not only materialized in manufacturing industries but also in financial services (Outreville, 2010). Academic research on internationalization has increased concurrently during the past 40 years with a particular interest in the I-P relationship. The empirical findings are, however, far away from conclusive and raising more questions than answers (Contractor, 2007; Glaum & Oesterle, 2007). One of the central explanations for the inconsistent empirical I-P relationship is the industry dependency (Capar & Kotabe, 2003; Contractor, Kundu, & Hsu, 2003). Early studies of internationalization tend to use samples comprising multiple industries and to generalize the evidence from some industries to other industries. However, synthesis studies have pointed out the industry-specific differences in I-P relationship and emphasize the necessity of industry-specific studies (Glaum & Oesterle, 2007; Hitt et al., 2006).

Following this line of argument, we provide the first piece of evidence for the life insurance industry regarding the globalization-performance nexus. Life insurance is a persuasive context to analyze globalization, because regulatory changes in the 1990s in many important economies led to a great variety of corporate strategic changes, including globalization.[2] Revolutions in IT and communication technology have also created new transaction opportunities via worldwide communication networks (Sadhak, 2005). The benefits of risk pooling as well as the intangible and regulated nature also make life insurance a particular

[1] Studies using such labels as globalization, internationalization, geographical diversification, international expansion or diversification, and multinationality usually refer to the same strategic management construct (Hitt et al., 2006). In this paper, we use two terms as internationalization and globalization. Globalization refers to the high, inter-continent, or inter-regional level of internationalization, whereas internationalization refers to the general cross-boarder expansion or multinationality.

[2] For example, in 1994, the European insurance markets were deregulated to create a single market. The deregulation led to a wave of acquisitions and geographical expansion in the late 1990s. Klarner and Raisch (2013) discuss in detail the European insurance deregulation and its impact on corporate strategy change and on performance.

interesting field to study globalization. The risk pooling principle of insurance provides arguments in favor of diversification. The intangible nature of insurance product maybe a two-edged sword, which, on one hand, saves the costs of storage and transportation, but on the other hand, innovations are easy to copy by others thus limiting the internationalization demand. The regulated nature of many markets may create entry barriers, thus limiting the diversification options. Moreover, Lee and Chang (2012) highlight the importance of cultural and social dimensions of globalization, which may also serve as a globalization barrier.

Empirical internationalization studies can be classified into two major streams (Hitt et al., 2006). The first stream focuses on antecedents of internationalization explaining why firms decide to internationalize and what kind of firms in what kind of environment are more likely to internationalize (Autio, Sapienza, & Almeida, 2000; Eriksson, Johanson, Majkgard, & Sharma, 1997). The second stream focuses on the outcome and impact of internationalization on performance, on operational cost efficiency, and on other indicators (Capar & Kotabe, 2003; Venkatraman & Ramanujam, 1986). We focus on the latter question, i.e., the impact of globalization on life insurers' performance and operational cost efficiency.

Insurance academics started to pay attention to internationalization issues in recent years. The focus of extant studies is on nonlife insurance (Altuntas & Gössmann, 2012; Elango, Ma, & Pope, 2008; Liebenberg & Sommer, 2008), on reinsurance (Cole, Ferguson, Lee, & McCullough, 2012; Outreville, 2012) and on insurance and financial groups (Outreville, 2008; 2010). To our knowledge, however, the I-P relationship has not been the subject of comprehensive empirical examination for the life insurance industry.[3] The lack of empirical research in the life insurance industry is partially due to the relatively low level of internationalization, as compared to the nonlife and the reinsurance industries; and partially due to the data availability to measure life insurers' internationalization.

In addition to the I-P relationship in life insurance, we shed light on the channels through which internationalization influences performance. We show that cost efficiency mediates the I-P relationship, and thus contributes to the ongoing discussion regarding I-P mediators (Venkatraman & Ramanujam, 1986; Green & Segal, 2004; Wagner, 2004). Moreover, we support the argument that the I-P relationship is industry dependent, as suggested by Hitt et al. (2006) and Glaum and Oesterle (2007), even when industries appear to be close and have

[3] Cummins, Tennyson, and Weiss (1999) shed light on the geographical diversification of US life insurers among the states of US. Biener, Eling, and Wirfs (2015) discuss the internationalization-efficiency relationship in the Swiss life insurance.

similar characteristics, such as life and nonlife insurance.[4] Thus, the application of multiple industry samples and cross-industry generalization in internationalization studies must be questioned. Last but not least, we challenge the conventional wisdom that internationalization (geographical diversification) reduces the volatility (risk) of performance and thus support the doubts raised by Eckert and Trautnitz (2010).

We contribute to the international business research by providing the first piece of evidence regarding the globalization-performance relationship in the life insurance industry. The results illustrate the tradeoff between diversification benefits and costs of foreignness, which is relevant for management decisions not only in this industry, but also in other globalizing industries. We highlight the industry dependency of internationalization studies by comparing our results with those from nonlife insurers. We also introduce the data envelopment analysis (DEA) frontier efficiency measurement into the I-P relationship studies, which enriches the basket of performance measurements and emphasizes an alternative direction to potential internationalization impact, i.e. cost efficiency.

The remainder of this paper is organized as follows. In Section II, we develop our hypotheses. Section III is a summary of our data and variables. Section IV presents our empirical analyses. In Section V, we discuss the robustness of our results. Section VI shows the difference between nonlife and life insurance industries. Finally, we conclude in Section VII.

II. Hypothesis Development

Internationalization has become an increasingly important strategic option available to firms seeking sustainable competitive advantages (Nachum & Zaheer, 2005). However, the "costs of foreignness" are a considerable disadvantage (Glaum & Oesterle, 2007). As early as the internationalization research emerged, Hymer (1976) theorizes the trade-off between potential returns and costs from internationalization, following by a large stream of empirical studies. The costs of foreignness are especially relevant in life insurance, since it is a product of trust, where the premium is paid-upfront and the benefits are paid with a substantial time delay. Moreover, the national culture plays an important role in life insurance consumptions (Chui & Kwok, 2008), which further increases the costs of foreignness.

[4] In this context, we replicate our empirical analyses for the nonlife insurance industry. The results suggest different I-P relationship patterns, as compared to the life insurance industry, that is, internationalization is less destructive in nonlife insurance than in life insurance. Amongst other reasons, we attribute this result to the different nature of risks covered under life and nonlife insurance. Due to natural catastrophes, nonlife firms are more prone to high claim volatility than life insurers, making internationalization (geographical diversification) more attractive for nonlife insurers.

Firms internationalize both intra-regionally and inter-regionally (Qian, Khoury, Peng, & Qian, 2010; Rugman & Verbeke, 2007). The internationalization investigated in this paper falls into the category of inter-regional internationalization, and more specifically, inter-continental globalization. We focus on the globalization aspect, because inter-continental diversification is controversial in life insurance, considering the large cultural, economic, regulatory, and legal differences across continents. For example, Chui and Kwok (2008) argue that the cultural differences may significantly influence the consumption of life insurance, whereas the cultural differences across continents are much more significant than within continents. The level of economic development also differs from continent to continent, whereas Europe, North America, Australia, and New Zealand are mostly matured and developed markets; Asia, Africa, and Latin America are largely emerging and developing markets. The regulatory and legal gaps are also more pronounced across continents. European insurance markets are largely regulated under a unified scheme; Canada and the US have similar regulations, which is also true for Australia and New Zealand (ANZ). However, the regulatory differences become significant across continents.[5] From the positive perspective, inter-continental globalization is more effective in diversifying across different business cycles than an expansion to neighboring countries, where the economic development maybe highly correlated with the development of the home market. The decision to focus on inter-continental globalization is also driven by the fact that the premium split on country level is not available in existing life insurance databases.

The I-P relationship has received much attention in the international management literature, the results of which, however, are mixed and inconclusive (Hitt et al. 2006; Glaum & Oesterle, 2007). Starting in 1980s, researchers continuously argue for a linear and positive I-P relationship resulting from economies of scale and scope, expanded market opportunities, and risk diversification (Delios & Beamish, 1999; Errunza & Senbet, 1984; Kim, Hwang, & Burger, 1993), whereas several studies find evidence for a negative association (Kumar, 1984; Siddharthan & Lall, 1982). Researchers also made efforts to identify the "internationalization threshold," i.e., the level of internationalization at which the costs of coordination or governance between diverse operating units exceed its potential benefit (Gomes & Ramaswamy, 1999; Hitt, Hoskisson, & Kim, 1997). Thus, they argue for an inverted U

[5] As we emphasized before, regulation is of special relevance for life insurers. The long-term contract nature and asymmetric information leading to moral hazard risk require a strict regulation to life insurers, in order to protect the policyholders and to ensure a safe and sound insurance market.

shaped relationship. Starting from the 21st century, a new S shaped functional form arises in the literature, aiming to reconcile previous models. The S shaped model allows for an initial negative relationship at low levels of internationalization, a subsequent positive relationship at intermediate levels, and a negative relationship again for "over-internationalization" (Contractor et al., 2003; Lu & Beamish, 2004).

All of the suggested I-P shapes (i.e., positive and negative linear, U, inverted U, and S) are grounded in theory and have been empirically tested. A few synthesis and meta studies have made efforts to reconcile the results; however, yielding different or even opposing conclusions. For example, Hitt et al. (2006) see evidence in favor of the inverted U shape; Hennart (2007) argues for no systemic relationship; Contractor (2007) supports the S shape, and Kirca et al. (2011) and Bausch and Krist (2007) conclude on a positive relationship based on meta studies. This paper does not aim to reconcile the existing theoretical and empirical inconsistencies, but to investigate the impact of globalization on a particular interesting industry -- life insurance. The motivation to perform this analysis lies in the relevance of the life insurance industry to the global economy and in its distinct characteristics that make transfers from other industries and even other types of insurance virtually impossible. Among these distinct characteristics are the intangible nature of the product, the high degree of regulation, the long duration contracts and investments, and the different use and perception of life insurance in different cultures. We thus believe that the impact of globalization on life insurance operations may well be different from that observed in other industries.

Rugman and Verbeke (2007) suggest that the costs of inter-regional foreignness are higher than those of intra-regional diversification. Qian et al. (2010) argue that inter-regional internationalization may limit the transferability of knowledge and increase the costs and riskiness of operations as compared to intra-regional diversification[6]. The disadvantages of inter-regional internationalization may be explained by the increased cultural and physical distance that is accompanied with locations outside of the domestic region. Other research also documents an inverted U shape[7] at high levels of internationalization due to the increased costs of coordination (e.g., Hitt et al., 1997; Contractor, 2007). Thus given that costs of over-internationalization might exceed the potential benefits, we expect an inverted U shape of the globalization-performance relationship in the life insurance industry.

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[6] The border between inter-region and intra-region is usually defined at the continent level, e.g., Qian et al. (2010) define four regions as (1) Africa, (2) Asia and Pacific, (3) Europe, and (4) the Americas.

[7] Contractor (2007) argues for an S shaped I-P relationship. The right tail of S shape corresponds to an inverted U shape.

Hypotheses 1: The relationship between globalization and performance in the life insurance industry exhibits an inverted U shape.

To locate the channels through which internationalization influences performance, we investigate the mediating factor mostly discussed in literature – operational cost efficiency (Han, Lee, & Suk, 1998; Venkatraman & Ramanujam, 1986; Wagner, 2004).[8] We look at operational cost efficiency because profitability of a life insurer is paramount to its operations, and cost inefficiency affects profits through a negative effect of wasted resources on earnings and cash flows, for example, through over-paying for underwriters and/or sales or over-employing a technologically inferior operating process (Greene and Segal, 2004). Greene and Segal (2004) decompose life insurance profitability into two attributors, that are, operating activities and financial activities, and argue that operating aspects are critical since the financial investment gains are limited for life insurers due to investment risk considerations. This argument maybe particularly pronounced in a low-interest rate environment. Furthermore, they argue that the life insurance industry is highly competitive, few financial inventions can be patented, and most innovations are copied shortly after their introduction. Consequently, success in this industry depends on the insurer's ability to control costs among others. Therefore, we expect that cost efficiency explains a significant portion of the variation in the profitability of life insurers.

Moreover, Wagner (2004) suggest that the operational cost efficiency is an important mediator between internationalization and financial performance; in support of this argument, he shows that cost-efficiency is gained from low to moderate levels of internationalization, but high levels of internationalization can have adverse effects on cost-efficiency. Thus, an inverted U shape is implied regarding the globalization-operational cost efficiency relationship. Cummins, Tennyson and Weiss (1999) also look at the geographical diversification of life insurers, as a control variable, among the states of the US and show that geographical diversification positively correlates with operational cost efficiency. Biener, Eling, and Wirfs (2015) investigate the internationalization of Swiss life insurers (largely within Europe), and conclude that internationalization positively correlates with operational cost efficiency. These two papers demonstrate the positive impact of intra-regional diversification on operational cost efficiency in the life insurance industry. We aim to

[8] There are other mediating factors mentioned in Hitt et al. (2006), e.g., innovation, learning, organizational characteristics, organizational structure, debt, product diversification, TMT experience and diversity, and risk. We control them in the risk adjusted performance regressions by various means.

complement their findings by filling the gap of inter-regional internationalization. While Cummins et al. (1999) and Biener et al. (2015) illustrate the left hand side of the inverted U shape and thus a positive impact, we expect to see also the right hand side of the inverted-U shape and thus a negative link with over-internationalized firms.

Hypotheses 2: The relationship between globalization and operational cost efficiency in the life insurance industry exhibits an inverted U shape.

Hitt et al.'s (2006) literature review suggests that the I-P relationship is industry dependent and highlights the opportunity for more empirical research regarding industry-specific differences of the I-P relationship. Different from earlier studies on manufacturing firms, Capar and Kotabe (2003) study the effect of international diversification of German service firms on their performance, finding an inverted-U shaped relationship. Hitt, Bierman, Uhlenbruck, and Shimizu (2006) support this finding with US professional service firms. Contractor et al. (2003) further distinguish between knowledge based and capital-intensive service firms. They argue that the knowledge-based service firms shall reach an international threshold that capital-intensive service firms do not experience, because of the tendency to over expand, i.e., knowledge-based firms may result in an S shaped I-P relationship. The extant literature seems to have already concluded that the I-P relationship is indeed industry dependent. However, how sensitive is the I-P relationship to industries remain unanswered. It is fundamentally an empirical issue that to what level of categorization, the industry dependency exists. Does the industry sensitivity stop at manufacturers vs. service firms level, or it extends to knowledge-based vs. capital-intensive service firms level, or it further extends? How close the two industry segments should be enough to eliminate the industry sensitivity of I-P relationship?

The insurance industry consists of two major sub-industries, i.e., life and nonlife, and in most markets, these two sectors are operated by separating firms (entities). This is because these two sectors are very different from each other in terms of contract duration, structure of assets and liabilities, benefits from risk pooling, and regulations among others. Thus following the rationale of industry dependency of I-P relationship, we hypothesize that the shape of I-P relationship between life and nonlife industry shall be different.

Hypothesis 3 The shape of I-P relationship in the life insurance industry is different from that in the nonlife insurance industry.

III. Data and Variable Constructs

Our sample is extracted from the Best's Insurance Reports, Non-US version (A.M. Best, 2003-2013). It contains 11-year data from 2003 to 2013. We require life insurers to be operating companies that only underwrite life and health insurance, and thus drop entities such as branches, special purpose vehicles, captives, composite insurers doing both life and nonlife business, and firms that operate insurance as minor business, e.g., banks, manufacturers, and health care providers. The Best's Insurance Reports capture insurers' internationalization by the continental distribution of gross premiums written, i.e., by Europe, Latin America, North America, Australia and New Zealand, Asia, Africa, and Rest of the World[9]. Due to different disclosure requirements in different economies, some life insurers (largely domiciled in Europe, ANZ, Asia, and Africa) report their premium geographical distribution, but others (including all Latin American firms) do not.[10]

We follow Kanagaretnam, Lim, and Lobo (2011) to trim the life insurers' key ratios at 1% and 99% percentiles, thus to reduce the bias driven by outliers. The key ratios are return on assets (ROA), return on equity (ROE), return on net premiums written (ROP), benefits ratio (Benefits paid divided by net premiums written), expense ratio (underwriting expense divided by gross premiums written), investment ratio (total investments divided by total liabilities), leverage ratio (total liabilities divided by total capital and surplus), liquidity ratio (liquidity assets divided by total liabilities), reinsurance ratio (net premiums written divided by gross premiums written), reserve ratio (net technical reserves divided by total capital and surplus), and yearly real asset growth. Thus, our final sample is an unbalanced panel consisting of 350 life insurers and 1,690 firm-year observations[11], in which 51 insurers (15%) and 226 firm-year observations (13%) are globalized, i.e., operating in more than one continent. Table 1 presents the summary statistics of our sample.

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[9] As A. M. Best said, Rest of the World is "a catch all for where a company reports perhaps key countries or country they do business in and then group the rest together as 'rest of the world'. So this classification can be varied." We assume Rest of the World as one standalone continent, e.g., if a life insurer reports sales in two continents and group all other operations in Rest of the World, we then assume it operates in three continents.

[10] We notice that our sample insurers (350) represent 17.1% of all life insurers outside the Americas (2,045) due to the lack of premium distribution information for some insurers; unsurprisingly various firm characteristics differ between our sample insurers and those outside our sample. We address this issue by conducting a robustness test, in which we assume all out-of-sample insurers to be not globalized, i.e., operating only in the home continent, the results of which support our H1 and H2.

[11] Missing values are present in A.M. Best dataset. We fill in these missing information using predicted values from an empirical model based on observed data. Similar approaches can be found in Lederman (2010) and Fenton-O'Creevy, Gooderham, and Nordhaug (2008). We perform a robustness test by using only observed data, i.e., excluding observations with missing values, the results of which are consistent with our conclusions. The observations containing estimated values are less than 10% of our sample.

We introduce an entropy measure of *globalization* defined in Equation (1) (Qian et al., 2010), where $share_{i,t,j}$ represents the portion of gross premiums written of firm *i* in year *t* from continent *j* to firm i's total gross premiums written in year *t*. Alternatively, we use the modified globalization Herfindahl index, *globalHHI* (Cummins et al., 1999), defined in Equation (2) and the number of operating continents, *globalcount*, as robustness tests.

$$globalization_{i,t} = \sum_{j=1}^{7} share_{i,t,j} \times \ln(\frac{1}{share_{i,t,j}}) \quad (1)$$

$$globalHHI_{i,t} = 1 - \sum_{j=1}^{7} Share_{i,j,t}^2 \quad (2)$$

We measure an insurer's performance by its risk adjusted performance, i.e., the respective performance indicator (ROA, ROE, ROP) of each year divided by its standard deviation over years (Browne, Carson, & Hoyt, 2001; Elango, et al., 2008; Outreville, 2010) as shown below. We shift all the performance indicators by adding their respective minimum values to ensure all values are positive (Ma & Elango, 2008).[12] We measure the risk of a life insurer by its overall business volatility, i.e., the standard deviation of a firm's performance indicator over all available years (Eling & Marek, 2014; Lamm-Tennant & Starks, 1993). A minimum of five-year's performance indicators is required to calculate the standard deviations (Pasiouras & Gaganis, 2013). Alternatively, we conduct robustness tests, using (1) risk adjusted returns without shifting the negative return values, (2) non-risk-adjusted actual returns, and (3) five-year rolling window moving standard deviations to adjust the returns, the results of which are consistent with our conclusions.

$$Risk\ Adjusted\ ROA_{i,t} = \frac{ROA_{i,t}+0.3}{Std.Dev.ROA_i},$$

$$Risk\ Adjusted\ ROE_{i,t} = \frac{ROE_{i,t}+1.7}{Std.Dev.ROE_i},$$

$$Risk\ Adjusted\ ROP_{i,t} = \frac{ROP_{i,t}+4.5}{Std.Dev.ROP_i}.$$

We measure insurers' operational cost efficiency by their relative cost efficiency scores obtained from data envelopment analysis (DEA), which is widely used in management research (Anokhin & Wincent, 2012; Bunyaratavej, Hahn, & Doh, 2008). We assume constant (CRS) and variable (VRS) returns to scales to estimate cost and production frontiers separately for each year between 2003 and 2013, as well as for each region of Continental Europe, UK and Ireland, and Others (including Asia, Africa, ANZ, and Offshore). One of the important assumptions for DEA efficiency estimates is that firms are employing similar

[12] The calculation of risk adjusted ROA requires a positive ROA value, in order to keep the risk adjustments for all observations in the same direction. Otherwise, the adjustments for negative and positive ROA may have different effect, particularly when the standard deviations vary from firm to firm.

technologies. It would be a strong assumption that all life insurers employ similar technologies worldwide. Therefore, we group life insurers in our sample into three regions according to their domiciliary countries. The region categories are different from the premium distribution continents, because here we consider the operational similarities among life insurers according to their headquarter locations and the balance of observations in each group, while the continental premium distribution is pure geographical consideration. We perform T (Cummins, Rubio-Misas, & Zi, 2004) and Kolmogorov-Smirnov equality-of-distributions tests for regional frontiers versus a single global frontier. Both tests suggest significant differences between the regional frontiers and the global frontier. Therefore, the regional frontiers are adopted and the cost efficiency measures relative to the global frontier are used as a robustness test, the results of which are consistent with our conclusions.

The model applied allows to compute the Shephard (1970) input-oriented distance functions, which are reported in terms of their reciprocal Farrell (1957) input efficiency measures. The resulting measures of cost (CE), allocative (AE), pure technical (PTE), and scale (SE) efficiency are the representations of the firm distances to the respective best-practice efficient frontiers and bounded between 0 and 1. Bootstrapped bias-corrected efficiency scores are used to account for the sensitivity of efficiency measures to sampling variation (Simar & Wilson, 2000). The inputs, outputs, and prices used to obtain the efficiency scores follow common practice of DEA analyses in insurance (see Eling & Luhnen, 2010; Cummins & Weiss, 2013 for reviews), which are summarized in detail in Appendix 1.

It has been shown that a proper measurement and sufficient control over moderators are critical for the I-P relationship research (Li, 2007). We control for the following firm-specific characteristics in our empirical models: level of product diversification (number of lines of business written by the life insurer), firm size (natural logarithm of firm assets in real values), growth (yearly real asset growth), reinsurance ratio, leverage ratio, and liquidity ratio. We also control for two country-specific characteristics: life insurance density (life insurance premiums per capita) to capture the maturity level of firms' home markets, and real GDP growth to capture the economic environment in firms' home markets. There are other firm- and country-specific factors that may influence the globalization-performance and globalization-efficiency relationship (Carpenter & Fredrickson, 2001; Wan & Hoskisson, 2003) such as firm culture, international experience of the management team, R&D strength, and culture and competition in the home market, for which we are not able to control due to data limitations. We implicitly account for the firm-specific factors by firm fixed-effects. We also use year fixed-effects to capture the performance and efficiency dynamics over time.

Table 1 Summary Statistics

	Unit	N	Mean	Std. Dev.	Min.	10th PCTL	Median	90th PCTL	Max.
Panel A: Globalization									
Global (1 if operate in two or more continents)	dummy	1,690	0.13	0.34	0	0	0	1	1
Globalization (entropy)	1	1,690	0.022	0.093	0	0	0	0.014	0.81
GlobalHHI (modified Herfindahl index)	1	1,690	0.013	0.058	0	0	0	0.0040	0.50
Globalcount (no. of continents operated)	1	1,690	1.14	0.38	1	1	1	2	4
Panel B: Profitability									
ROA	1	1,690	0.0036	0.036	-0.26	-0.022	0.0038	0.028	0.23
Risk Adjusted ROA	1	1,690	57.3	111.7	0.29	5.45	21.9	135.0	1,445.1
ROE	1	1,675[b]	0.043	0.25	-1.66	-0.20	0.071	0.27	0.85
Risk Adjusted ROE	1	1,665[b]	19.0	20.6	0.071	4.03	11.8	40.8	126.3
ROP	1	1,687[b]	0.091	0.57	-4.48	-0.12	0.028	0.35	9.29
Risk Adjusted ROP	1	1,659[b]	93.8	169.7	0.0095	5.08	40.4	248.0	3,186.9
Benefit ratio	1	1,690	1.43	1.21	0.077	0.58	1.11	2.47	9.32
Panel C: Cost Efficiency Scores									
Cost efficiency (bootstrap & regional frontiers)	1	1,690	0.61	0.24	0.034	0.26	0.65	0.89	0.98
Cost efficiency (bootstrap & global frontier)	1	1,690	0.55	0.25	0.027	0.18	0.59	0.84	0.98
Panel D: Input Quantities									
Labor (approximated number of employees)	1	1,690	7,322.6	19,241.5	1.57	45.3	795.8	17,215.9	146,661.8
Equity capital (capital and surplus)[a]	1,000	1,690	560,934.4	1,421,948.8	676.6	18,477.1	144,629.5	1,279,342.7	18,861,574
Debt capital (total liabilities) [a]	1,000	1,690	7,816,192.7	14,596,629.6	228.9	124,810.7	2,246,057.6	22,892,807	121,429,032
Panel E: Input Prices									
Labor price (Wage) [a]	1	1,690	60,915.4	30,270.0	3,383.8	10,136.7	72,684.8	94,825.6	124,558.1
Equity price (MSCI yearly returns)	1	1,690	0.10	0.074	0.000077	0.019	0.089	0.24	0.36
Debt price (IMF long-term govt. bond rates)	1	1,690	0.043	0.019	0.0055	0.025	0.040	0.055	0.13
Panel F: Output Quantities									
Benefits paid plus reserve changes [a]	1,000	1,690	1,675,474.9	4,458,823.1	-27,836,548	265.5	420,359.4	4,389,723.5	83,296,184
Total invested assets [a]	1,000	1,690	7,628,162.7	14,174,676.7	5,250.3	129,659.0	2,193,999.5	22,054,731	112,771,936
Panel G: Other Firm- and Country- Specific Characteristics									
Total assets [a]	1,000	1,690	8,377,127.1	15,679,565.3	5,542.9	158,189.7	2,519,659.4	23,742,157	128,217,000
Real asset growth	1	1,690	0.17	0.34	-0.53	-0.095	0.10	0.48	2.63
Net premiums written [a]	1,000	1,690	823,555.8	1,480,139.9	152.6	17,093.6	302,361.9	2,282,828.6	14,556,958
Reinsurance ratio	1	1,690	0.92	0.16	0.16	0.73	0.99	1	1
Leverage ratio	1	1,690	21.0	25.8	0.043	2.54	14.2	44.4	381.1
Liquidity ratio	1	1,690	1.00	0.86	0.028	0.58	0.98	1.15	22.9
Number of lines of business	1	1,690	2.05	1.60	1	1	1	4	12
Life insurance density	1,000	1,690	2.46	1.53	0.0022	0.100	2.80	4.22	7.15
Real GDP growth	1	1,690	0.023	0.038	-0.14	-0.024	0.018	0.076	0.14

Notes: [a] In USD and inflation adjusted at 2013. [b] The smaller number of observations is due to missing values in respective firm-years.

IV. Empirical Models and Results

To test our hypotheses, we conduct firm-year fixed-effects regressions (Least Squares Dummy Variables, LSDV) using Equations (3) and (4) subject to Log-likelihood Ratio tests and Hausman tests.[13] The simultaneous equations are recursive models, because there is a single direction causal relationship between cost efficiency and profitability, i.e., good cost efficiency causes high profitability (Green & Segal, 2004; Hitt et al., 2006; Venkatraman & Ramanujam, 1986; Wagner, 2004). The reverse causation is not meaningful. For recursive models, OLS, and thus LSDV, is consistent and appropriate, since there should be no simultaneity problems (Greene, 2011).

To address the concerns regarding simultaneity and endogeneity of the variable cost efficiency, we approximate CE by the instrument variable of net premiums written per person (NPWPP). The NPWPP is a good instrument because (1) it measures the operational efficiency of an insurer; (2) its impact on profitability only goes through cost efficiency, thus it is less related to the error term. We then apply 2SLS on Equation (3) as a robustness test, the results of which are consistent with our core model. We show two alternative models using Tobit and truncated regressions with upper limits at 1 with Equation (4); we also show the specification applying the bootstrap procedure with 2,000 replications to further account for the heteroscedasticity in DEA second stage regressions (Simar & Wilson, 2007). The globalization entropy and the size variables are centered to avoid multicollinearity with their squared terms. We control for firm- and country-specific characteristics with $X_{i,t}$.

$$Risk\ adjusted\ performance_{i,t} = \beta_0 + \beta_1 Globalization_{i,t} + \beta_2 Globalization_{i,t}^2 + \beta_3 CE_{i,t} + \beta_4 X_{i,t} + \beta_5 Year_t + \beta_6 Firm_i + \varepsilon_{i,t} \quad (3)$$

$$CE_{i,t} = \beta_0 + \beta_1 Globalization_{i,t} + \beta_2 Globalization_{i,t}^2 + \beta_3 X_{i,t} + \beta_4 Year_t + \beta_5 Firm_i + \varepsilon_{i,t} \quad (4)$$

Table 2 presents the estimation results from Equation (3). The first two rows of Table 2 show that globalization has a linear negative impact on life insurers' risk adjusted returns. Such negative impact remains in the same level, subject to T-tests, whether we control for CE (Column 4-9) or not (Column 1-3). Our finding is in line with what Elango et al. (2008) found in US-based P&L insurers and what Cummins et al. (2004) found in US-based life insurers that geographical diversification negatively correlates with risk adjusted returns. It is

[13] The log-likelihood ratio tests give p-values of 0.00 for both equations, suggesting the pooled regression is unacceptable. Hausman tests give p-values of 0.08 (r.ad.ROA), 0.00 (r.ad.ROE), and 0.10 (r.ad.ROP) for Equation (3) and 0.00 for Equation (4), suggesting fixed effects models are appropriate.

also partially in line with what Qian et al. (2010) found in US-based manufacturing firms in the sense that inter-regional over-diversification decreases returns. We believe that the I-P pattern in Table 2 captures the right tail of an inverted U shape and of S shape. Thus together with the findings in Cummins et al. (1999) and Biener et al. (2015), we complete the full picture of an inverted U shape, thus supporting Hypothesis 1.

The expected advantages of globalization are difficult to realize in the life insurance industry, due to the low transferability of technical and knowledge competences, considering the increased cultural and economic diversity that comes along with an inter-continent scope (Bartlett & Ghoshal, 1989; Qian et al., 2010; Sundaram & Black, 1992). Another potential undercut to the globalization aspiration in life insurance is the competitive environment in foreign markets (Contracter et al., 2003), which may force the newcomers to underwrite poor quality risks at an unfavorable price and thus endanger the profitability. Grant (1987) suggests that there are limits to the capacity of managers to cope successfully with greater complexity. Siddharthan and Lall (1982) also suggest that excessive internationalization may lead to increased managerial constraints due to physical, cultural, and linguistic distance.

The positive relationship between cost efficiency and risk adjusted returns indicates that cost efficiency is an important driver of risk adjusted returns, however, the impact of globalization remaining significant after controlling for cost efficiency. These observations suggest that CE is only one of the mediators and there are other channels through which globalization influences returns. Risk may also serve as an I-P mediator (Hitt et al., 2006). However, in the life insurance industry, we found no significant impact of globalization on firm risk as discussed later in Table 4, thus exclude risk as one of the mediators.

Columns 1-4 of Table 3 present the estimation results from Equation (4), which suggest an inverted U shape relationship between the level of globalization and cost efficiency, as illustrated in Figure 1. The results confirm our Hypothesis 2. There might be some cost efficiency gains at lower level of globalization, however, such gains, if any, diminish quickly along with an increased level of inter-continent globalization. Over-globalization, for example entropy > 0.3 in our sample, results in high cost disadvantages. The results are in line with the inverted U shape patterns found by Hitt et al. (1997) in the sense that globalization may generate some geographical scope economies at lower levels, but the complexities of globalization and the increased costs of governance and management limit its feasibility and result in large scale cost inefficiencies.

We further decompose CE into AE, PTE, and SE and apply the same LSDV models with Equation (4). The results in Columns 5-7 of Table 3 suggest that the globalization-CE pattern is primarily driven by the globalization-AE relationship. For over-globalized life insurers, the increased difficulties of allocating inputs significantly reduce firm's cost efficiency. In other words, over-globalization makes it more difficult for life insurers to source its inputs (labor, equity capital, and debt capital) in the most efficient way. Restrictions and regulations in different locations that limit the free flow of capital and labor may play an important role here. The impact of globalization on PTE and SE is insignificant. The I-P pattern in Table 3 and Figure 1 captures the inverted U shape or the right tail of S shape, thus supporting H2.

Internationalization (geographical diversification) is particular important to the insurance industry, because insurance risks in different locations are not perfectly related to each other, and thus internationalization reduces the loss volatility and smoothes the cross-location underwriting results. As a by-product, we test this argument with Equation (5). We use the country fixed effects instead of firm-year fixed effects in the regressions, because we do not really have a panel at firm-year level here considering the dependent variables, standard deviations of performance indicators, are the same for one firm over years. The results in Table 4 show that the globalization reduces neither the loss volatility nor the volatility of overall performance significantly. This finding is in line with Eckert and Trautnitz's (2010) doubt on the relation between internationalization (geographical diversification) and risk reduction.[14] Alternatively, we use the rolling-window five-year moving standard deviations as the measurement of firm risk, the results of which are consistent with the core model.

$$Risk_i = \beta_0 + \beta_1 Globalization_{i,t} + \beta_2 Globalization_{i,t}^2 + \beta_3 Performance_{i,t} + \beta_4 X_{i,t} + \beta_5 Y_i + \beta_6 Z_i + \varepsilon_i \quad (5)$$

[14] Looking at the control variables, the relationship between the mean of performance indicator and its standard deviation can be explained as follows. The high standard deviations are driven by a few poor performance insurers, which have high benefit ratios and low ROAs/ROEs. The distributions of ROE, ROA, and benefit ratio are skewed to the left. In other words, life insurers having superior underwriting results are also successful in term of managing their portfolios with low volatility. We do not use standard deviation of ROP as a risk measurement here, because it is highly driven by the reinsurance strategy and business development strategy of the insurer (e.g. run-off), thus it cannot fully capture the business volatility.

Table 2 Estimation of Equation (3)

Models	LSDV			LSDV			2SLS		
Variables	R.A.ROA	R.A.ROE	R.A.ROP	R.A.ROA	R.A.ROE	R.A.ROP	R.A.ROA	R.A.ROE	R.A.ROP
Globalization_c	-1.286**	-1.306**	-2.102***	-1.452**	-1.456**	-2.245***	-1.772**	-1.860**	-1.355*
	(0.581)	(0.590)	(0.610)	(0.608)	(0.614)	(0.650)	(0.720)	(0.757)	(0.732)
Globalization_c2	-0.648	-1.424	-0.0670	0.110	-0.740	0.591	1.573	1.100	-3.505
	(2.334)	(2.338)	(2.809)	(2.378)	(2.351)	(2.848)	(2.773)	(3.116)	(3.749)
Cost efficiency				1.326***	1.177***	1.154***	3.886**	4.349*	-6.029
				(0.238)	(0.230)	(0.238)	(1.961)	(2.479)	(3.880)
LnAsset_c	0.258***	0.376***	0.184**	0.202**	0.332***	0.135	0.0946	0.214	0.439**
	(0.0801)	(0.0850)	(0.0847)	(0.0794)	(0.0843)	(0.0932)	(0.129)	(0.141)	(0.203)
LnAsset_c2	-0.0163	0.00161	0.0147	-0.0265	-0.00785	0.00576	-0.0462	-0.0333	0.0611
	(0.0224)	(0.0227)	(0.0195)	(0.0220)	(0.0225)	(0.0197)	(0.0294)	(0.0335)	(0.0413)
Real asset growth	-0.149	-0.139	-0.00231	-0.0821	-0.0783	0.0587	0.0471	0.0853	-0.321
	(0.0997)	(0.120)	(0.112)	(0.0942)	(0.116)	(0.107)	(0.130)	(0.162)	(0.262)
Reinsurance ratio	-0.577*	-0.528	-0.809**	-1.003***	-0.903***	-1.179***	-1.825***	-1.911**	1.122
	(0.342)	(0.341)	(0.378)	(0.338)	(0.339)	(0.389)	(0.692)	(0.820)	(1.414)
Leverage ratio	-0.0115***	-0.0119***	-0.0142***	-0.0119***	-0.0126***	-0.0146***	-0.0127***	-0.0145***	-0.0125***
	(0.00255)	(0.00320)	(0.00280)	(0.00252)	(0.00325)	(0.00287)	(0.00283)	(0.00414)	(0.00403)
Liquidity ratio	0.205***	0.184***	0.129**	0.157***	0.142***	0.0869*	0.0640	0.0276	0.348**
	(0.0563)	(0.0516)	(0.0521)	(0.0550)	(0.0500)	(0.0500)	(0.0888)	(0.103)	(0.171)
Life ins. density	0.0208	0.0181	-0.0278	0.0276	0.0245	-0.0212	0.0407	0.0416	-0.0626
	(0.0397)	(0.0490)	(0.0470)	(0.0390)	(0.0489)	(0.0471)	(0.0436)	(0.0567)	(0.0652)
Real GDP growth	-2.138	-1.359	-1.957	0.138	0.635	0.00532	4.533	6.005	-12.20
	(1.784)	(1.871)	(1.857)	(1.725)	(1.785)	(1.899)	(3.807)	(4.525)	(7.454)
LOB (factor var.)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year /Firm FE/ Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,690	1,665	1,659	1,690	1,665	1,659	1,690	1,665	1,659
No. of Firms	350	344	336	350	344	336	350	344	336
R^2	0.211	0.200	0.198	0.240	0.220	0.219	N.A.	N.A.	N.A.

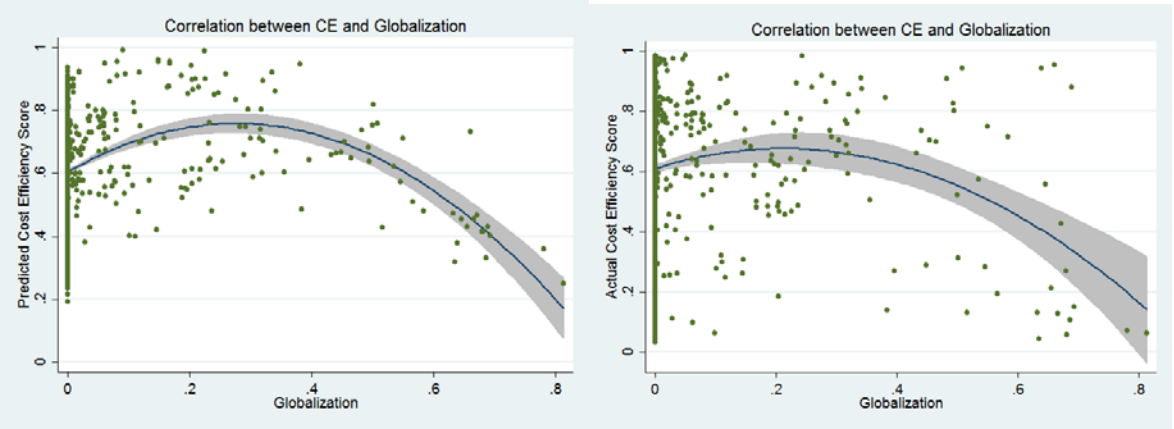
Notes: The clustered robust standard errors are provided in parentheses. *, **, *** indicates the significant differences of the coefficients from 0 at the 10%, 5%, and 1% levels, respectively.

Table 3 Estimation of Equation (4)

Variable	CE				AE	PTE	SE
Models	LSDV	LSDV	Truncated	Tobit	LSDV	LSDV	LSDV
Globalization_c	0.125*	0.125	0.135*	0.125*	0.114	-0.0475	0.0395
	(0.0728)	[0.0791]	(0.0785)	(0.0721)	(0.0775)	(0.0484)	(0.0252)
Globalization_c2	-0.572**	-0.572*	-0.634**	-0.572**	-0.573***	-0.137	0.0778
	(0.273)	[0.306]	(0.293)	(0.271)	(0.218)	(0.266)	(0.172)
LnAsset_c	0.0420**	0.0420**	0.0442**	0.0420**	0.0489***	-0.00261	0.00213
	(0.0166)	[0.0170]	(0.0179)	(0.0165)	(0.0186)	(0.00759)	(0.00545)
LnAsset_c2	0.00771*	0.00771*	0.00915*	0.00771*	0.00988**	0.00187	-0.00112
	(0.00420)	[0.00429]	(0.00492)	(0.00417)	(0.00430)	(0.00215)	(0.00120)
Real asset growth	-0.0505***	-0.0505***	-0.0517***	-0.0505***	-0.0503***	-0.00491	-0.00401
	(0.0151)	[0.0145]	(0.0158)	(0.0150)	(0.0154)	(0.00722)	(0.00937)
Reinsurance ratio	0.321***	0.321***	0.327***	0.321***	0.175***	0.287***	0.0322
	(0.0573)	[0.0554]	(0.0578)	(0.0568)	(0.0468)	(0.0504)	(0.0440)
Leverage ratio	0.000299	0.000299	0.000556	0.000299	-5.76e-05	0.000724**	-0.000195
	(0.000420)	[0.000464]	(0.000537)	(0.000417)	(0.000511)	(0.000359)	(0.000164)
Liquidity ratio	0.0362***	0.0362*	0.0369***	0.0362***	0.0308***	0.0127***	0.00311
	(0.00940)	[0.0218]	(0.0113)	(0.00932)	(0.0107)	(0.00381)	(0.00225)
Life ins. density	-0.00511	-0.00511	-0.00455	-0.00511	-0.00345	-0.00861***	-0.00234
	(0.00604)	[0.00592]	(0.00667)	(0.00599)	(0.00647)	(0.00316)	(0.00355)
Real GDP growth	-1.717***	-1.717***	-1.832***	-1.717***	-1.729***	-0.185	0.0871
	(0.284)	[0.285]	(0.299)	(0.281)	(0.291)	(0.119)	(0.0985)
LOB (factor var.)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year/Firm FE/Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,690	1,690	1,690	1,690	1,690	1,690	1,690
No. of Firms	350	350	350	350	350	350	350
R^2 / Log -pseudolikelihood	0.213	0.213	1,602.4	1,500.5	0.175	0.259	0.033

Notes: The bootstrapping standard errors are provided in brackets, and the clustered robust standard errors are provided in parentheses. *, **, *** indicates the significant differences of the coefficients from 0 at the 10%, 5%, and 1% levels, respectively.

Figure 1 Correlation between CE and Globalization



Notes: The two charts illustrate CE scores against the level of globalization for our sample. The left chart uses the predicted CE values after the regression in Column 1 of Table 4. The right chart uses the actual CE values. The curve represents the quadratic fit. The grey shade illustrates the 95% confidence intervals.

Table 4 Estimation of Equation (5)

Variables	Std. Dev. Benefit ratio	Std. Dev. ROA	Std. Dev. ROE
Globalization_c	-0.185	-0.00518	-0.0308
	(0.140)	(0.00965)	(0.0572)
Globalization_c2	-0.146	0.0161	0.149
	(0.715)	(0.0435)	(0.244)
Mean of Benefit ratio, ROA, ROE	0.706***	-0.251***	-0.531***
over years	(0.0535)	(0.0885)	(0.0679)
LnAsset_c	-0.0204	-0.00222***	0.00870*
	(0.0167)	(0.000640)	(0.00449)
LnAsset_c2	0.0119*	0.000392	-0.000751
	(0.00694)	(0.000254)	(0.00163)
Real asset growth	0.00230	0.00340*	0.0102
	(0.0342)	(0.00196)	(0.0103)
Reinsurance ratio	-0.202*	-0.0121*	0.0443
	(0.113)	(0.00624)	(0.0325)
Leverage ratio	-0.000309	-0.000130**	0.000112
	(0.000661)	(5.61e-05)	(0.000219)
Liquidity ratio	-0.00292	-1.08e-05	-0.0158***
	(0.0153)	(0.00161)	(0.00600)
Life insurance density	0.0137	0.00233***	-0.00476
	(0.0134)	(0.000536)	(0.00406)
Real GDP growth	0.0565	-0.0248	0.0660
	(0.338)	(0.0155)	(0.0852)
LOB (factor var.)	Yes	Yes	Yes
Country FE/Constant	Yes	Yes	Yes
Year/Firm FE	No	No	No
Observations	1,638	1,690	1,678
No. of firms	324	350	344
R^2	0.770	0.457	0.415

Notes: The clustered robust standard errors are provided in parentheses. *, **, *** indicates the significant differences of the coefficients from 0 at the 10%, 5%, and 1% levels, respectively.

V. Robustness Tests

To test the robustness of our findings, we conduct the following seven robustness tests, the results of which are listed in Appendix 2.1-2.7 and consistent with our conclusions unless otherwise specified. These tests demonstrate the robustness of our conclusions for the life insurance industry.

First, we use the complete dataset by assuming all companies that do not report their premium geographical distribution are not globalized, i.e. firms that operate only in one continent with the entropy of 0. Second, we use a sub-sample containing only globalized firms (51 firms and 226 firm-year observations), i.e., firms that operate in more than one continent with the entropy > 0. Third, we use two alternative globalization measures, i.e., the modified globalization Herfindahl index *globalHHI* (Cummins et al., 1999) and the count of continents a firm operates in, *globalcount.* The *globalcount* is used as a factor variable and thus is not able to capture the nonlinear relationship in Equation (4). Fourth, we use three alternative performance measures, i.e. (1) risk adjusted returns without shifting the negative return values to positive (No Shift), (2) actual returns without risk adjustments, and (3) rolling window five-year moving standard deviations (MSD) to adjust the returns. Fifth, we use the rolling window five-year moving standard deviations as the measurement of risk and re-estimate Equation (5). The globalization impact remains insignificant for two out of three risk measurements. Sixth, we use the estimated cost efficiency based on one global frontier to replace that based on regional frontiers. Seventh, we use firm random-effects models to replace the firm fixed-effects models.

VI. Expansion to Nonlife Insurance

To test our Hypothesis 3, we replicate our empirical analyses to the nonlife insurance industry using the same A.M. Best dataset. Columns 1-6 in Table 5 show an insignificant impact of globalization on performance and on cost efficiency in the nonlife insurance industry. The globalization impact on firm risk (volatility) is negative when using overall performance measurements (Columns 7-9, Table 5). Thus, we conclude that the globalization impact in the nonlife insurance industry is different from that in the life insurance industry, which supports our H3. The results suggest that (1) the industry dependency in internationalization studies is important even for close industries such as life and nonlife insurance; (2) the impact of globalization on the nonlife insurance industry is more positive than it is for life insurance industry, where we find a significant negative impact.

Possible explanations for the differences in the two industries are the following: (1) globalization is potentially more beneficial to nonlife insurers, because of the diversification of regional catastrophe exposure; (2) the underwriting know-how in nonlife insurance may be easier to transfer from country to country as compared to life insurance, since property risk assessment maybe subject to similar rules but way of life is rather different across countries (3) the nonlife market is more internationally standardized, while the life insurance market is more driven by local culture (Chui & Kwok, 2008), and thus nonlife insurers have marketing advantages to access foreign markets that life insurers have not. The results also explain the fact that nonlife insurers are on average more globalized (with an average entropy of 0.108) than life insurers (with an average entropy of 0.022), subject to a mean comparison T-test.

Table 5 Expansion to Nonlife Insurance Industry

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Models		LSDV		LSDV	Truncated	Tobit	OLS	OLS	OLS
Variables	R.A.ROA	R.A.ROE	R.A.ROP	CE	CE	CE	Std. Dev. Loss ratio	Std. Dev. ROA	Std. Dev. ROE
Globalization_c	0.00715	0.0120	-0.0975	0.0375	0.0376	0.0375	0.0259	-0.00777**	-0.0223*
	(0.252)	(0.262)	(0.226)	(0.0239)	(0.0237)	(0.0237)	(0.0276)	(0.00339)	(0.0115)
Globalization_c2	-0.227	-0.121	-0.116	-0.0399	-0.0402	-0.0399	-0.0238	-0.0106	-0.0221
	(0.554)	(0.603)	(0.508)	(0.0584)	(0.0582)	(0.0581)	(0.0629)	(0.00716)	(0.0271)
Cost efficiency	0.276	0.231	0.145						
	(0.215)	(0.236)	(0.226)						
Mean of Benefit ratio,							0.389***	-0.0823*	-0.222***
ROA, ROE over years							(0.0480)	(0.0424)	(0.0393)
LnAsset_c	0.326***	0.386***	0.308***	0.00662	0.00665	0.00662	-0.0237***	-0.00392***	-0.00334*
	(0.0883)	(0.0929)	(0.0894)	(0.0127)	(0.0126)	(0.0126)	(0.00543)	(0.000612)	(0.00201)
LnAsset_c2	-0.0271	-0.0361*	-0.0173	-0.00561**	-0.00561**	-0.00561**	0.00202	0.000488**	0.000225
	(0.0177)	(0.0211)	(0.0216)	(0.00250)	(0.00249)	(0.00249)	(0.00137)	(0.000223)	(0.000747)
Real asset growth	0.285***	0.206*	0.201**	0.0458***	0.0458***	0.0458***	-0.0138	0.000727	-0.00385
	(0.104)	(0.107)	(0.0974)	(0.0119)	(0.0119)	(0.0118)	(0.0123)	(0.00189)	(0.00643)
Reinsurance ratio	0.721**	0.315	-0.159	0.0203	0.0206	0.0203	-0.105***	0.0201***	0.0832***
	(0.302)	(0.323)	(0.365)	(0.0321)	(0.0320)	(0.0319)	(0.0319)	(0.00410)	(0.0129)
Leverage ratio	-0.165***	-0.0949***	-0.145***	-0.00201	-0.00199	-0.00201	-0.00141	-0.00116***	0.00851***
	(0.0208)	(0.0268)	(0.0182)	(0.00260)	(0.00260)	(0.00259)	(0.00171)	(0.000232)	(0.00118)
Liquidity ratio	0.0374***	0.0292***	0.0526***	0.000806	0.000811	0.000806	0.000462	0.000644	-0.00293***
	(0.0116)	(0.0109)	(0.0183)	(0.00269)	(0.00267)	(0.00267)	(0.00394)	(0.000410)	(0.000980)
Life insurance density	-0.0334	-0.0309	-0.0122	-0.0248***	-0.0250***	-0.0248***	6.00e-06	0.000337	-0.000698
	(0.0331)	(0.0337)	(0.0339)	(0.00395)	(0.00395)	(0.00393)	(0.00272)	(0.000328)	(0.00115)
Real GDP growth	-2.758*	-2.904*	-1.908	-0.175	-0.174	-0.175	0.0111	0.0257*	0.0343
	(1.491)	(1.567)	(1.436)	(0.149)	(0.149)	(0.148)	(0.0996)	(0.0134)	(0.0487)
LOB (factor var.)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year/Firm FE/Constant	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Observations	3,112	3,079	3,080	3,115	3,115	3,115	3,055	3,115	3,094
R^2 / Log p-likelihood	0.160	0.119	0.127	0.245	3436.1	3433.4	0.381	0.380	0.311
No. of Firms	624	618	608	625	625	625	588	625	618

Notes: The clustered robust standard errors are provided in parentheses. *, **, *** indicates the significant differences of the coefficients from 0 at the 10%, 5%, and 1% levels, respectively.

VII. Conclusion

The impact of inter-continental globalization on life insurers' profitability is negative. This finding is partially driven by a sharp decrease in cost efficiency at the higher level of globalization. We introduce the frontier efficiency technique into the internationalization-performance (I-P) studies and thus endorse the argument that operational cost efficiency mediates the I-P relationship. Although our analyses focus on the mostly discussed mediator cost efficiency, we reveal the existence of residual internationalization effects on life insurer performance conditioning on cost efficiency, indicating a promising direction for future research to explore other I-P mediators. We also contribute to the literature analyzing the over-internationalization. We provide an additional piece of evidence from the life insurance industry to support the right tail of an inverted U shaped model (Hitt et al., 1997) as well as the right rail of an S shaped model (Contractor et al., 2003). We find no significant impact of life insurer globalization on their business volatility, thus challenge the conventional wisdom that internationalization (geographical diversification) reduces the volatility (risk) of life insurance performance.

Our findings have important management implications. Life insurers need to be careful when considering globalization strategies or expanding their business to other regions. The expected benefits of globalization are difficult to translate into profits and the costs of governance and coordination, due to globalization complexity, can easily endanger the operational cost efficiency. For life insurers that are already globalized, local expertise may play an important role in life insurance sales considering that products, regulations and market conditions are rather different across countries. The risk reduction effects of globalization to life insurance is minimal, which is not a surprise, since no insurance-disaster level of epidemics or other large scale mortality event occurred in the past decades.

The industry-specific I-P relationship studies are far from conclusive. Our findings highlight that even very close industries, such as the life and nonlife insurance, can yield different patterns regarding the I-P relationship. The advantages that a nonlife insurer can obtain from the globalization are larger than life insurers, due to product complexity, knowledge transferability, and catastrophe risk diversification. Researchers must carefully consider the industry dependency when generalizing their conclusions from one or a few industries to others. There is, thus, large scope for further research on internationalization strategies, with a particular focus on the differences among industries and with the explanations on inconsistent results concluded from early studies.

Appendix 1 DEA Procedure to Derive Efficiency Scores

We use three input quantities: labor (i.e., approximated number of employees), equity capital (i.e., capital and surplus, in real values at 2013), and debt capital (i.e., total liabilities, in real values at 2013). Labor is approximated by operating expenses divided by the annual wage for the insurance sector in respective country-years (The input of business services and materials is integrated into the input of labor, which is a common practice in insurance DEA analyses, due to data limitation).

We use annual wages (in real values at 2013) for the insurance sector in respective country-years as the price for labor. The wage information is obtained from the ILO Main Statistics and October Inquiry database.[15] We use the rolling window 10-year moving averages of yearly rates of total returns of Morgan Stanley Capital International (MSCI) Indices in respective countries, as the price for equity capital.[16] We use the rolling window two-year averages of International Monetary Fund (IMF) long-term government bond yearly interest rates in respective countries, as the price for debt capital.[17] The long-term government bond rates are used, in order to match the long duration of life insurer's liabilities. The MSCI indices and IMF interest rates are obtained from the Thomson DataStream database.

Two output quantities are used, net benefits paid plus net reserve changes and total invested assets (both in real values at 2013). The two outputs represent life insurers' two major functions: risk pooling and financial intermediation respectively. The benefits paid plus reserve changes are suitable for life insurance, since reserves reflect the accumulation of unpaid cash values (Cummins & Weiss, 2013). Premiums instead of benefits are sometimes applied as an output. The rational to use premiums is that they represent the business volume generated by insurers. However, Yuengert (1993) points out that the premiums represent price times the quantity of outputs, instead of output quantity only.

[15] To fill missing wages, we adjust the nearest available data point of ILO annual wage to the previous or later years by using changes in general price levels represented by the consumer price indices (CPI).

[16] To fill missing values and to replace negative values, we use the rolling window two-year averages of realized country-average ROEs in respective country-years (see Cummins & Weiss, 2013 for the discussion of capital price proxies). We use two-year moving average values, since we only have the data back to 2002. We use country-average ROEs, because many firms may have negative ROEs due to the volatile nature of insurance business. Less than 10% of our sample is affected by this procedure.

[17] To fill missing interest rates, we use IMF central bank policy rates or deposit rates in respective country-years.

Appendix 2.1 Complete Dataset

Variables	R.A.ROA	R.A.ROE	R.A.ROP	CE
Globalization_c	-0.903*	-0.977*	-1.565***	-0.0250
	(0.516)	(0.507)	(0.487)	(0.0472)
Globalization_c2	0.956	-0.135	2.196	-0.486*
	(1.921)	(1.987)	(2.038)	(0.250)
Cost efficiency	0.992***	1.085***	0.922***	
	(0.126)	(0.124)	(0.126)	
LnAsset_c	0.176***	0.267***	0.179***	0.0626***
	(0.0478)	(0.0430)	(0.0453)	(0.00799)
LnAsset_c2	-0.0404***	-0.0309***	-0.0208**	0.000117
	(0.00859)	(0.00781)	(0.00823)	(0.00149)
Real asset growth	-0.0459	-0.0181	-0.102**	-0.0438***
	(0.0511)	(0.0523)	(0.0485)	(0.00734)
Reinsurance ratio	-0.459**	-0.402**	-1.322***	0.249***
	(0.197)	(0.195)	(0.221)	(0.0414)
Leverage ratio	-0.0102***	-0.00227	-0.0103***	0.000825***
	(0.00209)	(0.00171)	(0.00222)	(0.000184)
Liquidity ratio	0.0686**	0.0529*	-0.0113	0.00332
	(0.0278)	(0.0270)	(0.0375)	(0.00846)
Life ins. density	0.0101	-0.0182	-0.0640**	-0.0109***
	(0.0278)	(0.0301)	(0.0316)	(0.00403)
Real GDP growth	-0.211	0.476	0.374	-0.609***
	(0.718)	(0.742)	(0.716)	(0.0955)
LOB (factor var.)	Yes	Yes	Yes	Yes
Firm/Year FE / Constant	Yes	Yes	Yes	Yes
Observations	8,335	8,231	8,156	8,335
No. of Firms	1,331	1,313	1,248	1,331
R^2	0.096	0.094	0.113	0.122

Notes: The clustered robust standard errors are provided in parentheses. *, **, *** indicates the significant differences of the coefficients from 0 at the 10%, 5%, and 1% levels, respectively.

Appendix 2.2 Sub-Sample of Globalized Firm-Years

Variables	R.A.ROA	R.A.ROE	R.A.ROP	CE
Globalization_c	-1.777***	-1.872***	-2.177***	0.0635
	(0.544)	(0.511)	(0.548)	(0.0910)
Globalization_c2	-0.961	-1.995	-0.999	-0.710*
	(2.059)	(2.088)	(2.946)	(0.376)
LnAsset_c	0.627**	0.877***	0.673**	0.00273
	(0.253)	(0.273)	(0.270)	(0.0438)
LnAsset_c2	0.0705	0.113	0.160**	0.0176
	(0.0752)	(0.0783)	(0.0663)	(0.0225)
Real asset growth	0.289	0.412	0.427	-0.00163
	(0.255)	(0.296)	(0.299)	(0.0480)
Reinsurance ratio	0.784	1.907**	0.813	0.420**
	(0.776)	(0.759)	(0.740)	(0.162)
Leverage ratio	-0.0197**	-0.0208***	-0.0315***	0.00160
	(0.00783)	(0.00735)	(0.00752)	(0.00108)
Liquidity ratio	-0.189	-0.824*	0.0400	-0.0867
	(0.435)	(0.489)	(0.370)	(0.0756)
Life ins. density	0.0294	-0.0335	0.0700	-0.0362**
	(0.104)	(0.114)	(0.119)	(0.0148)
Real GDP growth	4.623	1.964	1.189	-0.988
	(4.798)	(5.585)	(4.791)	(0.607)
LOB (factor var.)	Yes	Yes	Yes	Yes
Firm/Year FE / Constant	Yes	Yes	Yes	Yes
Observations	226	220	223	226
No. of Firms	51	49	50	51
R^2	0.315	0.394	0.364	0.285

Notes: The clustered robust standard errors are provided in parentheses. *, **, *** indicates the significant differences of the coefficients from 0 at the 10%, 5%, and 1% levels, respectively.

Appendix 2.3 Alternative Globalization Measurements

Variables	R.A.ROA	R.A.ROE	R.A.ROP	CE	R.A.ROA	R.A.ROE	R.A.ROP	CE
Herfindahl index _c	-2.118**	-2.161**	-3.332***	0.181*				
	(0.897)	(0.929)	(0.988)	(0.108)				
Herfindahl index _c2	1.876	0.774	3.055	-1.750**				
	(5.776)	(5.562)	(6.869)	(0.719)				
Globalcount_2					-0.186	-0.192	-0.439***	-0.00292
					(0.167)	(0.167)	(0.162)	(0.0199)
Globalcount_3					-0.648	-0.386	-0.738	0.138
					(0.436)	(0.393)	(0.564)	(0.172)
Globalcount_4					-1.550***	-1.020***	-1.556***	0.272*
					(0.546)	(0.358)	(0.567)	(0.141)
Cost efficiency	1.325***	1.177***	1.152***		1.339***	1.182***	1.149***	
	(0.240)	(0.231)	(0.241)		(0.235)	(0.231)	(0.237)	
LnAsset_c	0.201**	0.332***	0.134	0.0423**	0.194**	0.324***	0.125	0.0433***
	(0.0793)	(0.0843)	(0.0933)	(0.0165)	(0.0787)	(0.0842)	(0.0939)	(0.0167)
LnAsset_c2	-0.0266	-0.00799	0.00562	0.00793*	-0.0256	-0.00720	0.00820	0.00757*
	(0.0218)	(0.0225)	(0.0196)	(0.00420)	(0.0224)	(0.0225)	(0.0200)	(0.00422)
Real asset growth	-0.0816	-0.0773	0.0595	-0.0501***	-0.0804	-0.0797	0.0634	-0.0501***
	(0.0942)	(0.116)	(0.107)	(0.0151)	(0.0954)	(0.116)	(0.108)	(0.0151)
Reinsurance ratio	-1.001***	-0.899***	-1.180***	0.317***	-1.041***	-0.921***	-1.215***	0.334***
	(0.337)	(0.341)	(0.391)	(0.0567)	(0.335)	(0.339)	(0.391)	(0.0585)
Leverage ratio	-0.0120***	-0.0126***	-0.0146***	0.000324	-0.0118***	-0.0126***	-0.0143***	0.000261
	(0.00252)	(0.00325)	(0.00288)	(0.000420)	(0.00255)	(0.00327)	(0.00290)	(0.000420)
Liquidity ratio	0.157***	0.142***	0.0871*	0.0360***	0.153***	0.139***	0.0819*	0.0366***
	(0.0549)	(0.0500)	(0.0499)	(0.00940)	(0.0543)	(0.0495)	(0.0493)	(0.00940)
Life ins. density	0.0278	0.0247	-0.0211	-0.00514	0.0312	0.0283	-0.0132	-0.00508
	(0.0390)	(0.0489)	(0.0470)	(0.00603)	(0.0408)	(0.0506)	(0.0500)	(0.00601)
Real GDP growth	0.124	0.626	-0.0174	-1.718***	0.302	0.723	0.112	-1.736***
	(1.727)	(1.785)	(1.902)	(0.283)	(1.728)	(1.801)	(1.913)	(0.285)
LOB (factor var.)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm/Year FE / Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,690	1,665	1,659	1,690	1,690	1,665	1,659	1,690
No. of Firms	350	344	336	350	350	344	336	350
R^2	0.240	0.219	0.218	0.214	0.239	0.217	0.214	0.215

Notes: The clustered robust standard errors are provided in parentheses. *, **, *** indicates the significant differences of the coefficients from 0 at the 10%, 5%, and 1% levels, respectively.

Appendix 2.4 Alternative Profitability Measurements

Variables	ROA_No Shift	ROE_ No Shift	ROP_ No Shift	ROA	ROE	ROP	ROA_MSD	ROE_MSD	ROP_MSD
Globalization_c	-1.452**	-1.456**	-2.245***	-0.0206	-0.187*	-0.682	-218.4***	-22.17**	-153.3
	(0.608)	(0.614)	(0.650)	(0.0222)	(0.104)	(0.464)	(62.88)	(10.99)	(131.5)
Globalization_c2	0.110	-0.740	0.591	-0.0765	0.278	0.733	180.9	27.72	5.787
	(2.378)	(2.351)	(2.848)	(0.0794)	(0.422)	(1.492)	(265.4)	(43.84)	(475.4)
Cost efficiency	1.326***	1.177***	1.154***	0.0280**	0.288***	0.216	-28.37	-17.27*	-94.35
	(0.238)	(0.230)	(0.238)	(0.0129)	(0.0629)	(0.200)	(41.18)	(8.901)	(79.26)
LnAsset_c	0.202**	0.332***	0.135	0.00519	0.0671***	0.0419	56.83***	9.641***	111.9***
	(0.0794)	(0.0843)	(0.0932)	(0.00315)	(0.0190)	(0.0573)	(14.84)	(3.425)	(35.42)
LnAsset_c2	-0.0265	-0.00785	0.00576	-0.00143*	0.00146	-0.00309	14.49***	3.672**	29.20***
	(0.0220)	(0.0225)	(0.0197)	(0.000822)	(0.00487)	(0.0110)	(5.177)	(1.794)	(10.42)
Real asset growth	-0.0821	-0.0783	0.0587	-0.00514	-0.0321	0.114*	-41.39**	-7.218	-29.08
	(0.0942)	(0.116)	(0.107)	(0.00380)	(0.0281)	(0.0643)	(17.85)	(4.597)	(23.35)
Reinsurance ratio	-1.003***	-0.903***	-1.179***	-0.0317***	-0.199***	-0.437***	17.44	-5.636	76.63
	(0.338)	(0.339)	(0.389)	(0.00974)	(0.0693)	(0.168)	(29.68)	(12.48)	(48.09)
Leverage ratio	-0.0119***	-0.0126***	-0.0146***	-0.000168***	-0.00435***	-0.00189**	0.770	-0.205*	0.989
	(0.00252)	(0.00325)	(0.00287)	(5.82e-05)	(0.00102)	(0.000810)	(0.620)	(0.110)	(1.189)
Liquidity ratio	0.157***	0.142***	0.0869*	0.0141***	0.0188	0.0920	-7.805	2.999	-5.068
	(0.0550)	(0.0500)	(0.0500)	(0.00419)	(0.0127)	(0.0832)	(6.821)	(3.289)	(8.906)
Life ins. density	0.0276	0.0245	-0.0212	0.00300***	0.00952	-0.0283	-29.67***	-4.168**	-44.44**
	(0.0390)	(0.0489)	(0.0471)	(0.00111)	(0.00925)	(0.0246)	(8.371)	(1.838)	(19.48)
Real GDP growth	0.138	0.635	0.00532	-0.00399	0.000456	-0.0575	427.1	-15.08	307.5
	(1.725)	(1.785)	(1.899)	(0.0555)	(0.381)	(0.790)	(317.1)	(80.76)	(504.7)
LOB (factor var.)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm/Year FE / Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,690	1,665	1,659	1,690	1,675	1,687	1,131	1,102	1,115
No. of Firms	350	344	336	350	350	350	288	282	284
R^2	0.240	0.220	0.219	0.193	0.195	0.079	0.090	0.052	0.073

Notes: The clustered robust standard errors are provided in parentheses. *, **, *** indicates the significant differences of the coefficients from 0 at the 10%, 5%, and 1% levels, respectively.

Appendix 2.5 Moving Standard Deviations

Variables	Std. Dev. Benefit ratio	Std. Dev. ROA	Std. Dev. ROE
Globalization_c	-0.175	0.0235**	0.0430
	(0.125)	(0.0115)	(0.0676)
Globalization_c2	-0.711	-0.0356	-0.158
	(0.550)	(0.0458)	(0.242)
Mean of Benefit ratio, ROA, ROE	0.562***	-0.230***	-0.458***
over years	(0.0350)	(0.0641)	(0.0658)
LnAsset_c	-0.00427	-0.00126**	0.0131***
	(0.0102)	(0.000581)	(0.00421)
LnAsset_c2	0.00863**	0.000131	-0.00113
	(0.00359)	(0.000203)	(0.00153)
Real asset growth	-0.0375	0.00176	-0.0130
	(0.0471)	(0.00284)	(0.0239)
Reinsurance ratio	-0.409***	-0.00292	0.0144
	(0.102)	(0.00610)	(0.0373)
Leverage ratio	-0.000540	-0.000174***	-0.000318
	(0.000411)	(5.86e-05)	(0.000218)
Liquidity ratio	0.0169	-7.05e-05	-0.0135
	(0.0201)	(0.00286)	(0.00911)
Life insurance density	-0.0396**	0.00209**	0.00637
	(0.0154)	(0.000968)	(0.00679)
Real GDP growth	-0.700**	-0.0184	-0.267**
	(0.279)	(0.0154)	(0.133)
LOB (factor var.)	Yes	Yes	Yes
Country FE /Constant	Yes	Yes	Yes
Year/Firm FE	No	No	No
Observations	1,107	1,132	1,102
No. of firms	281	288	282
R^2	0.755	0.415	0.389

Notes: The clustered robust standard errors are provided in parentheses. *, **, *** indicates the significant differences of the coefficients from 0 at the 10%, 5%, and 1% levels, respectively.

Appendix 2.6 Cost Efficiency Estimated from One Global Frontier

Variables	R.A.ROA	R.A.ROE	R.A.ROP	CE
Globalization_c	-1.472**	-1.496**	-2.272***	0.106
	(0.609)	(0.625)	(0.651)	(0.0645)
Globalization_c2	0.255	-0.518	0.758	-0.515**
	(2.359)	(2.356)	(2.824)	(0.252)
Cost efficiency_global frontier	1.754***	1.734***	1.616***	
	(0.274)	(0.266)	(0.265)	
LnAsset_c	0.206**	0.332***	0.136	0.0295*
	(0.0811)	(0.0849)	(0.0966)	(0.0150)
LnAsset_c2	-0.0213	-0.00364	0.0102	0.00290
	(0.0213)	(0.0218)	(0.0198)	(0.00313)
Real asset growth	-0.108	-0.0955	0.0372	-0.0235*
	(0.0942)	(0.117)	(0.106)	(0.0129)
Reinsurance ratio	-1.135***	-1.088***	-1.323***	0.318***
	(0.343)	(0.347)	(0.405)	(0.0530)
Leverage ratio	-0.0124***	-0.0133***	-0.0151***	0.000518
	(0.00259)	(0.00333)	(0.00294)	(0.000415)
Liquidity ratio	0.158**	0.138**	0.0854*	0.0267**
	(0.0636)	(0.0585)	(0.0512)	(0.0110)
Life ins. density	0.0225	0.0206	-0.0256	-0.000985
	(0.0403)	(0.0497)	(0.0478)	(0.00553)
Real GDP growth	-0.745	-0.0135	-0.696	-0.794***
	(1.759)	(1.831)	(1.944)	(0.303)
LOB (factor var.)	Yes	Yes	Yes	Yes
Firm/Year FE / Constant	Yes	Yes	Yes	Yes
Observations	1,690	1,665	1,659	1,690
No. of Firms	350	344	336	350
R^2	0.247	0.231	0.227	0.174

Notes: The clustered robust standard errors are provided in parentheses. *, **, *** indicates the significant differences of the coefficients from 0 at the 10%, 5%, and 1% levels, respectively.

Appendix 2.7 Random Effects Models

Variables	R.A.ROA	R.A.ROE	R.A.ROP	CE
Globalization_c	-1.445**	-1.425**	-2.246***	0.0620
	(0.606)	(0.608)	(0.650)	(0.0559)
Globalization_c2	0.0900	-0.751	0.588	-0.449**
	(2.376)	(2.364)	(2.848)	(0.190)
Cost efficiency	1.326***	1.186***	1.155***	
	(0.238)	(0.230)	(0.239)	
LnAsset_c	0.202**	0.312***	0.135	0.0255***
	(0.0792)	(0.0828)	(0.0932)	(0.00616)
LnAsset_c2	-0.0268	-0.00586	0.00560	0.00453*
	(0.0219)	(0.0221)	(0.0197)	(0.00232)
Real asset growth	-0.0820	-0.0862	0.0589	-0.0593***
	(0.0940)	(0.116)	(0.107)	(0.0142)
Reinsurance ratio	-1.006***	-0.934***	-1.177***	0.404***
	(0.337)	(0.339)	(0.390)	(0.0419)
Leverage ratio	-0.0116***	-0.0123***	-0.0145***	0.000791***
	(0.00248)	(0.00322)	(0.00285)	(0.000289)
Liquidity ratio	0.157***	0.147***	0.0870*	0.0283***
	(0.0549)	(0.0506)	(0.0500)	(0.00753)
Life ins. density	0.0281	0.0276	-0.0211	-0.00859*
	(0.0390)	(0.0489)	(0.0472)	(0.00469)
Real GDP growth	0.0882	0.294	-0.00993	-1.663***
	(1.726)	(1.779)	(1.901)	(0.227)
LOB (factor var.)	Yes	Yes	Yes	Yes
Year FE / Constant	Yes	Yes	Yes	Yes
Observations	1,690	1,665	1,659	1,690
No. of Firms	350	344	336	350
R^2	0.240	0.220	0.219	0.283

Notes: The clustered robust standard errors are provided in parentheses. *, **, *** indicates the significant differences of the coefficients from 0 at the 10%, 5%, and 1% levels, respectively.

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