The Effect of Liberalization and Deregulation on Life Insurer Efficiency

Thitivadee Boonyasai
Martin F. Grace
Harold D. Skipper, Jr.

Center for Risk Management and Insurance Research
Georgia State University
Atlanta, GA

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Abstract

With liberalization and deregulation, insurers will be subject to greater competition and, therefore, should become more efficient. We analyze the impact of liberalization and deregulation of four life insurance markets: Korea, Philippines, Taiwan, and Thailand. The first two countries undertook modest liberalization and deregulation efforts, whereas the latter two countries undertook modest liberalization efforts only. Using data envelopment analysis to measure cost efficiency, we find that liberalization and deregulation of the Korean and Philippine life insurance industries seem to have stimulated increases and improvements in productivity. Liberalization of the Taiwanese and Thai life insurance businesses, however, seems to have had little effect on increases and improvements in productivity. Our findings suggest liberalization and deregulation together promote competition. Further, our results are consistent with the view that, in a restrictive regulatory environment, welfare gains will be minimal if deregulation does not closely follow liberalization.

Introduction

Insurance markets worldwide continue to undertake pro-competitive reform predicated on the notion that competitive markets are better at enhancing consumer choice and welfare than are rigidly regulated, insular markets. As a consequence, dozens of countries have deregulated or liberalized their insurance markets. *Deregulation* denotes lessening of national regulation. *Liberalization* denotes a reduction of government or other barriers to market access, especially as relates to foreign insurers (Skipper, 1996).

In some countries, liberalization efforts have been accompanied by deregulation wherein regulatory restrictions deemed less conducive to promoting competition have been removed or modified. For example, Korea and the Philippines undertook modest deregulation and liberalization efforts. In some other countries, such as Taiwan and Thailand, few changes in national regulation accompanied relaxation of market access restrictions.

Economic theory suggests that liberalization is a necessary but not sufficient condition for having competitive markets (i.e., there should be relatively few trade barriers to market access). Thus, market access alone cannot be expected to ensure greater competition if the regulatory system continues to hinder competition. Deregulation and liberalization seek to reform a country's international industrial and trade policies in order to improve economic welfare by bringing a more efficient allocation of a country's resources in the long run.

The internationalization of business is expected to continue to bring pressure on insurers to increase operational efficiency. Any deviation from profit-maximizing strategies will force firms out of the market in the long run. Efficiency of operation requires firms to select an output mix that fully exploits economies of scale and select an input mix that minimizes usage (technical efficiency) and uses the best combination of inputs (allocative efficiency).

The pioneering insurance cost literature typically focused exclusively on scale and scope efficiency (Bernstein, 1992; Cummins and VanDerhi, 1979; Doherty, 1981; Fields, 1988; Fields and Murphy, 1989; Grace and Timme, 1992; Houston and Simon, 1970; Kellner and Mathewson, 1983). Most, if not all, of the studies' findings agreed that relatively small life insurers tended to operate with increasing returns to scale (IRS). There was less agreement regarding the asset size range where returns to scale disappeared and also about the issue of whether larger insurers tended to operate with constant returns to scale (CRS) or decreasing returns to scale (DRS). Bernstein (1992) examined scope economies in the Canadian life insurance industry, finding substantial scope economies, while Grace and Timme (1992) studied the United States' life insurance market and reported the lack of significant economies of scope. With the rapid evolution of frontier efficiency methodologies (see e.g., Cummins and Zi, 1998), interest in analysis of cost

efficiency of insurers has grown rapidly but still focuses mainly on a single country (see Cummins and Weiss, 2000).

The purposes of this study are to determine whether liberalization and deregulation are associated with life insurers' (1) gaining total efficiencies (e.g., technical efficiency, purely technical efficiency, and scale efficiency), (2) realizing a growth in productivity changes (total factor productivity, technological change, technical efficiency change, purely technical efficiency change, and scale efficiency change), and (3) realizing a change in productivity.

The paper is organized as follows. First, we discuss the model and methodology, including measures of outputs and inputs. Next, we cover our data and their sources. Overall results are then presented, followed by a discussion of each country's findings. We then conclude by summarizing our results.

Model and Methodology

This research uses data envelopment analysis (DEA), a mathematical programming approach to determine firm-level efficiency indices. To investigate productivity changes after market liberalization and deregulation, a Malmquist analysis is used.

Unlike the econometric approach, DEA deals with multiple outputs as well as multiple inputs, but does not require exogenous specification of the parametric form of the production function. In addition, the method uses a standard linear programming technique to identify peer groups for each decision-making unit (DMU) or firm being evaluated. Using these group members as reference, DEA provides quantitative insights into the aspects and sizes of adjustments needed to render an inefficient DMU more efficient. As this approach focuses primarily on the technological aspects of production functions, it can be used to estimate productive efficiency without requiring estimates of input and output prices. DEA gets its name because the empirical frontier truly envelops the entire data set,

making no accommodation for random noise that is outside the control of DMUs. In addition, depending on certain assumptions about the structure of production technology, the DEA frontier envelops the data as tightly as possible.

DEA efficiency is obtained by solving a set of linear programming problems. To obtain an estimate of technical efficiency, we solve the following problem for each firm, s = {1,2…S}:[1]

$$(D(y_s, x_s))^{-1} = T(y_s, x_s) = \min q_s \tag{1}$$

$$Subject to Y l_s \geq y_s, X l_s \leq q_s, and\ l_s \geq 0, \tag{2}$$

where Y is an N x S matrix of outputs and X is a M x S matrix of inputs for all of the insurers in the sample, y_s is an N x 1 output vector and x_s is an M x 1 vector of inputs for firm s. Finally, l_s is an S x 1 intensity vector for firm s. The constraint $l_s = 0$ restricts the model to be one that presumes constant returns to scale. The firms with the elements of l_s are non-zero are the set of reference firms.

To obtain an estimate of technical efficiency which is separated into two components, purely technical efficiency and scale efficiency, we estimate equation (1) with an additional constraint $\sum_{s=1}^{S} l_s = 1$ for variable returns to scale (VRS) technology (this step estimates purely technical efficiency) and again with $\sum_{s=1}^{S} l_s \leq 1$ for a non-increasing returns to scale (NIRS) frontier.

Purely technical efficiency (PTE) is defined as the distance from the variable returns to scale frontier and the relationship $TE(x_s,y_s)=PT(x_s,y_s)SE(x_s,y_s)$ can be used to separate purely technical and scale efficiency, where $SE(x_s,y_s)$ represents scale efficiency and

[1] This section follows the description in Cummins and Weiss (2001). In our case, we also examine the efficiency over time. The subscript for time is omitted for ease of exposition.

$PT(x_s,y_s)$ represents purely technical efficiency. So, if $TE=PT$, the constant returns to scale and the variable returns to scale estimates are equal, then $SE=1$ and the firm experiences constant returns to scale. If SE ? 1 and the NIRS measure = PT, we have decreasing returns to scale. If, by contrast, SE ? 1 and the NIRS measure is not equal to PT, then increasing returns are indicated.

Finally to obtain the firm's relative cost efficiency, we solve the following problem for each firm:

$$\begin{aligned} &Min w_s^T x_s \; s.t. Y l_s \geq y_i, \\ &i=1,2...N, \; X l_s \geq x_j, \; j=1...M, and \; l_s \geq 0, \end{aligned} \tag{3}$$

where T stands for a vector transpose. The solution vector x_s^* is the cost minimizing input vector for the input price vector, w_s, and the output vector, y_s. After obtaining the efficient level of costs, we calculate firm s's cost efficiency as the ratio of frontier costs to actual costs (i.e., $EFF_s = \frac{w_s^T x_s^*}{w_s^T x_s}$). Thus, $0 < \text{EFF}_s = 1$ where, if the score is 1, the firm is fully efficient. A score of 0.80 implies, for example, that the firm is 80 percent efficient or that the firm could produce the same level of output with 80 percent of the inputs actually employed.

We also calculate a measure of total factor productivity (TFP). TFP growth in this case essentially measures the change in the production frontier and how the current frontier relates to the firms' frontiers over time. The growth in TFP has two major components: technological change and efficiency change. Technological change is represented by a shift in the production frontier while efficiency change is based upon an index of a firm's efficiency relative to past and future frontiers.

If we let $D^t(x^t,y^t)$ be the distance from the origin for a firm with an input vector of x^t and an output vector of y^t where t represents time and the subscript s for the firm is omitted for clarity, then,

$$M^t = \frac{D^t(x^t, y^t)}{D^t(x^{t+1}, y^{t+1})} \tag{4}$$

The ratio of the two distances, M^t, is the Malmquist productivity index. This index suffers from a problem that it depends upon the starting values. For example, if we examined the Malmquist index with respect to the period t + 1 frontier, we have

$$M^{t+1} = \frac{D^{t+1}(x^t, y^t)}{D^{t+1}(x^{t+1}, y^{t+1})}, \tag{5}$$

so, to avoid an arbitrary choice of which frontier to choose, we take the geometric mean, which yields the Malmquist index of total factor productivity,

$$M(x^{t+1}, y^{t+1}, x^t, y^t) = \left[\frac{D^t(x^t, y^t)}{D^t(x^{t+1}, y^{t+1})} \frac{D^{t+1}(x^t, y^t)}{D^{t+1}(x^{t+1}, y^{t+1})} \right]^{1/2}. \tag{6}$$

The change in efficiency is thus the ratio of the distance from the frontier in period t to the distance in period t + 1. If technical efficiency increases, the ratio will be greater than one and, if it decreases, the ratio will be less than one.

To calculate technical change, we examine how the firm uses its inputs to produce outputs in periods t and t + 1 and how the input/output bundles change over time. Technical change is computed as follows:

$$TC(x^{t+1}, y^{t+1}, x^t, y^t) = \left[\frac{D^{t+1}(x^{t+1}, y^{t+1})}{D^t(x^{t+1}, y^{t+1})} \frac{D^{t+1}(x^t, y^t)}{D^t(x^t, y^t)} \right]^{1/2}. \tag{7}$$

If favorable technological change exists, the frontier will have moved to the left, and both output bundles will be farther from the period t + 1 frontier than they are from the period t frontier. Once again, a ratio greater than one indicates progressive technical change.

We employ these measures to examine how liberalization and deregulation influence efficiency and technological progress for our sample of countries' insurance markets.

Output Measurement

Insurance is a method of spreading, over time and over a wider body of individuals and organizations, the financial effects arising from the occurrence of some types of uncertain events. Insurers are analogous to other financial firms in that their outputs consist mainly of services that are primarily intangible. Three principal alternative methods have been used to measure outputs in the financial services sector: (1) the asset approach, (2) the user cost approach, and (3) the value-added approach (see Berger and Humphery, 1992).

Under the asset approach, financial service firms are considered merely as financial intermediaries, raising funds from one group of decision makers, transforming the balance-sheet liabilities into assets, and paying out and receiving interest to cover the time value of the funds used in this capacity. Intermediation is certainly an important function for life insurers. However, ignoring other outputs is likely to overlook important distinctions among life insurers. Therefore, the asset approach is considered inappropriate as a method to measure life insurance output.

The user-cost approach determines whether financial product is an output on the basis of its net contribution to the financial sector's revenues. The product is considered to be a financial output if the financial returns on an asset exceed the opportunity cost of funds or if the financial costs of a liability are less than the opportunity costs. It is otherwise considered to be a financial input. This approach is theoretically sound. However, it requires accurate data on product revenues and opportunity costs that are not easily obtained.

Consistent with most of the recent banking and insurance literature (see e.g., Cummins and Weiss, 2000), the value-added approach is adopted here to measure life insurer outputs. The value-added approach differs from the asset and user-cost approaches in that it considers all asset and liability categories to have some output attributes rather than

distinguishing inputs from outputs in a mutually exclusive way. The categories having substantial value added, as judged using operating cost allocations, are employed as important outputs. Others are treated as unimportant outputs, intermediate products, or inputs, depending on the characteristics of the specific category. The following discussion focuses on the value-added approach.

In general, life insurers provide three principal services: risk-pooling and risk-bearing services, financial intermediation services, and real financial services relating to insured losses. Each is discussed below.

Risk-Pooling and Risk-Bearing Services. Insurance provides a mechanism through which consumers and businesses exposed to losses can engage in risk reduction through the diversification effect of pooling. Insurers collect premiums in advance from their customers and redistribute most of the funds to those policyholders who sustain losses. The actuarial, underwriting, and related expenses incurred in operating the risk pool are a principal component of value added in the insurance industry.

Financial Intermediation Services. Insurers issue debt contracts (insurance policies and annuities) and invest the funds until the benefits are paid. In life insurance, interest credits are made directly to policyholder accounts to reflect investment income and compensate for the opportunity cost of the funds held by the insurer. The borrowed funds are invested primarily in marketable securities such as privately placed bonds and structured securities. The net interest margin between the rate of return earned on assets and the rate credited to policyholders is the value-added of the intermediation function.

Real Financial Services Relating to Insured Losses. Life insurers provide a variety of real services for policyholders including personal financial planning and the administration of group life, annuity, and health insurance plans. By contracting with insurers to provide these services, policyholders can take advantage of insurers' specialized expertise to reduce costs associated with insurable risks.

Defining and measuring outputs in the insurance industry has been a challenging task. Of the several different measurements of outputs suggested so far, three have been commonly used in earlier cost studies: premium income, weighted sum of activities, and incurred benefits plus additions-to-reserves.

Net written premiums or net earned premiums have been used as proxies for outputs in most previous cost studies (Blair et al., 1975; Colenutt, 1977; Donni and Fecher, 1997; Fecher et al., 1993; Gardner and Grace, 1993; Grace and Timme, 1992; Hardwick, 1997; Houston and Simon, 1970; Praetz, 1980, 1981; Rai, 1996; Ruttledge and Tuckwell, 1974). Premiums can be viewed as including the flow of services to policyholders for a certain period. Unlike the weighted-sum-of-activities approach, the premium-income method allows a vector of output proxies.

Although premiums capture the flow of services provided to insureds, premiums are not the quantity of output, but the revenue (price times quantity). Systematic differences in price across large and small life insurance firms may lead to misleading inferences about average costs if premiums are used as a output proxy. Doherty (1981) criticized the use of premiums because it results in simultaneous equation bias. In using premium income as an output measure, both Allen (1974) and Blair et al. (1975) suggested that this is appropriate, assuming the product is homogeneous and competitive pressures compel all insurers to charge the same price.

Another approach is to use a weighted sum of activities using industry average units of these activities as weights, instead of unobservable implicit prices. Several studies measured outputs using this approach with some modifications, especially in life insurance (Geehan, 1977; Hirshhorn and Geehan, 1977). For example, Hirshhorn and Geehan proxied outputs by aggregating 29 activities of life insurance companies. Each activity was weighted by an index value and summed for the output proxy. These activities included not only most product lines of life insurers but also different asset amounts.

The weighted sum of activities approach is useful in considering differences in aggregate outputs but provides little assistance in measuring variations in activities among firms. This method is biased for inefficient insurers over efficient insurers as it assumes that the value of expenses equals the value of life insurance output (i.e., ordinary life, group life, or group annuities); that is, some insurance companies may incur higher expenses, not because they produce more outputs, but because they are less efficient. Another shortcoming to Geehan's approach is that it does not explicitly recognize insurer's risk-bearing and risk-pooling services (Denny, 1980).

Finally, another unique measurement of outputs, additions-to-reserves, was suggested by Yuengert (1993). These measures equal reserves set up for new business and new deposit funds and new reserves set up as policies age. The most important shortcoming of the additions-to-reserves approach, representing the intermediation service, is that it does not consider the benefits delivered to customers during the period, which is one of the primary services performed by insurers. Therefore, the outputs measured by additions-to-reserves may underestimate the total outputs of an insurance firm.

Incurred benefits represents the risk bearing services. In several recent life insurance cost studies, output is defined as incurred benefits plus additions-to-reserves (Cummins et al., 1996; Cummins et al., 1998; Cummins and Zi, 1998). However, use of incurred benefits still has some problems although it captures the flow of services provided to customers in a certain period. Additions-to-reserves also is not immune to differences in prices, reserving methods, and interest assumptions across firms.

The objective of risk-pooling/risk-bearing is to collect funds from the policyholder pool and equity providers and redistribute these funds to those who incur losses. Although the use of premium income results in simultaneous bias, constraints imposed by the data for the developing country sample exist. As a consequence, premium income, representing risk-bearing and risk-pooling services, is the most appropriate and used as the output

measurement. To control for differences among individual and group products and among life insurance, annuities, and accident and health insurance, premium income is categorized into clusters as detailed as possible.

In addition to considering risk-pooling/risk-bearing services, we also account for the intermediation function of borrowing from policyholders and investing the funds in marketable securities. Net investment income, representing intermediation services, is used here as another proxy of output. These output proxies capture most, if not all, principal services provided by life insurers.

Input Measurement

Inputs usually are easier to identify and measure relative to outputs in the insurance industry as the units of measurement tend to be tangible or at least directly observable. Cost studies in insurance most commonly employ three inputs (Cummins et al., 1996; Cummins and Weiss, 1993; Cummins and Zi, 1998; Gardner and Grace, 1993; Grace and Timme, 1992; Weiss, 1986). This study categorizes inputs of a life insurance company into labor, capital, and materials, following previous literature.

With each broad classification, further breakdown is necessary since quality differences among inputs exist in the same classification. Labor input consists of the company's employees, agents, and brokers. Agents and brokers are primarily responsible for marketing the insurer's product while employee labor includes all management and clerical workers. Labor input volume for employees and agents for each company is obtained by summing all wages, salaries, and benefits provided to all employees and commissions and benefits paid to agents.

No consensus exists on the measurement of capital input quantity in insurance cost studies. Physical capital represents expenditure on equipment and occupancy costs. The amount of physical capital used by insurance companies in producing outputs measured by the value of the physical capital assets is used here as a proxy for physical capital input.

This physical approach is consistent with previous research (e.g., Grace and Timme (1992), Yuengert (1993), Gardner and Grace (1993), and Kim (1995)).

Another approach to measuring capital quantity is to use financial capital instead of physical capital (Cummins and Weiss, 1993; Cummins et al., 1996; Cummins et al., 1998; Cummins and Zi, 1998; Kim, 1995; Weiss, 1991). These authors argue that the capital structure of the insurance industry is quite different from that of manufacturing industries and that an insurance company's capital consists mostly of financial capital. Financial capital is a crucial input in insurance as insurers must maintain equity capital to assure policyholders that they will receive payment even if experience is below expectations. As a result, financial capital more closely represents the real capital used in producing output. The volume of financial capital is easily calculated by estimating capital and surplus. In this study, financial capital obtained by summing capital and surplus is used as a proxy for financial capital input.

All input associations, other than labor, physical capital, and financial capital inputs, are categorized together as material or business and services input. In a life insurance company, material or business services input consists of communication services, rents, equipment rentals, stationary, and professional services provided by external lawyers, physicians, actuaries, and accountants. Including this input allows the estimation to account for variations across insurers in expenditures on computers, communications, and other technology-related items. The volume of materials and business services is computed by dividing expenditures on these inputs by a consumer price index. This approach is consistent with Cummins and Weiss (1998). The consumer price index used in this study is obtained from the consumer price index reported by the International Monetary Fund.

Data Sources

The data used in this study are drawn from the annual reports filed with the national insurance regulatory officials by insurers in Korea, the Philippines, Taiwan, and Thailand as well as financial statistics reported by the International Monetary Fund. As we are investigating the impact of market liberalization and deregulation on life insurers' total efficiency and productivity change, data were collected as from the late 1970s or 1980s, depending on data availability for each country, until the most recent date for which data were available.

According to the Korean annual reports, the life insurance company population varied from a low of six to 33 during the study period 1980 to 1997. Philippine life insurers ranged in number from 24 to 33 during the study period 1987 to 1997. The number of Taiwanese life insurance companies varied from eight to 31 during the study period 1983 to 1997. Finally, the number of Thai life insurers varied from 11 to 13 during the study period 1978 to 1996. One of the major benefits of DEA over econometric techniques is that we are able to make efficiency estimates with small numbers of firms.

Empirical Results

This section explicitly examines the key question of this paper: did market liberalization and deregulation improve efficiency in the Korean, Philippine, Taiwanese, and Thai life insurance industries? This section begins with a discussion of the empirical results of the impact of liberalization and deregulation on the efficiency of the Korean and Philippine life insurance industries. Then follows a discussion of the effect of market liberalization on the efficiency of the Taiwanese and Thai life insurance businesses. The country discussions that follow the Korean analysis are less detailed than that of Korea so as to avoid duplication.

The Republic of Korea

In the early 1980s, under the pressure from the U.S. government, Korea began to open its life insurance market to foreign insurers. In 1987, LINA, a member company of the CIGNA Group, and AIA, a member company of AIG, received licenses to establish life insurance companies. In 1989, many foreign insurance companies, joint ventures with foreign companies, and new domestic life insurance companies started operations. Therefore, the year 1989 is considered to be the benchmark year for insurance liberalization in the Korean life insurance industry in the empirical analysis that follows.

Although liberalization started in 1989, Korea still had not truly opened its market and certainly had not deregulated. The government had been implementing deregulation through administrative regulation starting in 1993 (Shim, 1995) (although only recently did it make significant progress in this regard, primarily because of the Korean accession to the OECD). As a result, the year 1993 is considered the benchmark year for deregulation in the Korean life insurance market in the empirical analysis.

Price regulation was partially reduced in 1993 (Shim, 1995). Insurance distribution in Korea had relied exclusively on tied agents, with independent agents allowed only in 1996 for non-life insurance and in 1997 for life insurance. The brokerage system will be introduced into the insurance market after satisfying prior conditions such as complete implementation of price liberalization and the full settling in of the independent agency system (KIDI, 1998).

Data and Output and Input Specification. All data used in the Korean life insurance study were obtained from the Insurance Supervisory Board of Korea and the Korea Insurance Development Institute. The total life insurer population ranged from six life insurers in 1980 to 33 in 1997. Group life insurance premiums (y_1), individual life insurance premiums (y_2), and investment income (y_3) have been chosen as proxies for

outputs. Input variables are physical capital, measured by real estate (x_1); salaries, wages, and commissions (x_2); and business and services expense (x_3). Based on statutory accounting principles, capital and surplus, a proxy for financial capital, is negative in most, if not all, Korean life insurers during the study period. (Of course, the negative capital and surplus is inconsistent with theory and practice, but reflects both accounting convention in Korea and financial difficulties being experienced by Korean life insurers.) Therefore, negative capital and surplus of Korean life insurers does not truly represent the risk-pooling/risk-bearing function as some insurers seemingly had no capital to back their promises to pay benefits if losses were larger than expected. As a result, capital and surplus are not used as a proxy for financial capital input in the study of Korean life insurance efficiency.

A set of linear programs described above calculates the within-year output-oriented total efficiency and between-year output-oriented productivity change.[2] First, we begin an analysis with a discussion of total or technical efficiency (TE), purely technical efficiency (PTE), and scale efficiency (SE). Finally, productivity changes – productivity growth or total factor productivity (TFP), technical change (TC), technical efficiency change (TEC), purely technical efficiency change (PTEC), and scale efficiency change (SEC) – are investigated.

Total Efficiency. We examine the impact of liberalization and deregulation on the Korean life insurance efficiency. We employed the computed TE, PTE, and SE estimates (one for each sample firm) from 1987 to 1997. Thus we have a total of 242 observations in the panel.

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[2] Within-year efficiency measures efficiency in year t. Between-year productivity change is the ratio of the efficiency in year t+1 to that in year t.

To provide some evidence on the impact of liberalization and deregulation on the efficiency of the Korean life insurance business, we use dummy variables (Lib9091, De9495, and De9697) to test the relationship between **liberalization and deregulation** and firm efficiency. The variable assessing the impact of liberalization on efficiency (Lib9091) is assigned a value of one if it is one or two years after the year of liberalization (1989) and zero otherwise. Similarly, the dummy variables reflecting the effect of deregulation on efficiency are assigned a value of one if it is one or two years (De9495) after the year of deregulation (1993) and zero otherwise. Finally, if it is three or four years (De9697) after the year of deregulation (1993), the variable takes the value of one and is zero otherwise.

We also include a variable to control for the number of firms in the Korean insurance market. We include the number of firms in the market to control for the possibility that the number of firms in the market influences the efficiency measure. Under DEA, the piecewise-linear convex isoquant constructs the best practice frontier from the sample data. Therefore, with a small number of sample firms, efficiency is likely to be inflated, as these firms are likely to define the frontier. On the other hand, with a larger number of sample firms, efficiency is likely to be lower because the best-practice firms will lie on the frontier and envelop the rest of the firms. It is less likely that samples with a larger number of firms will define the efficiency frontier. Thus, with a larger number of firms, the average efficiency score of the Korean life insurance industry is likely to be lower. As a result, it is hypothesized that the number of firms (Nofirm) is negatively related to efficiency.

In addition to the number of firms, we also include a variable to account for size (Lprem). We allow for the possibility that efficiency may be related to the size of the firms. Thus, we include the logarithm of premium to account for size differences.

We examine the relationship between Korean life insurers' TE, PTE, and SE and liberalization and deregulation and other exogenous events. The efficiency score is bounded

between zero and one and, in the sample, a large number of observations have an efficiency score of one. Thus, we employ a Tobit regression weighted by the square root of premium to account for cross-sectional heteroscedasticity in the data.[3] This regression uses data pooled during 1987-1997:[4]

$$TE_{st} = \alpha_1 + \beta_1 Lib9091_{st} + \beta_2 De9495_{st} + \beta_3 De9697_{st} + \beta_4 Nofirm_{st} + \beta_5 Lprem_{st} + \varepsilon_{st} \quad (8)$$

$$PTE_{st} = \alpha_2 + \delta_1 Lib9091_{st} + \delta_2 De9495_{st} + \delta_3 De9697_{st} + \delta_4 Nofirm_{st} + \delta_5 Lprem_{st} + \upsilon_{st} \quad (9)$$

$$SE_{st} = \alpha_3 + \gamma_1 Lib9091_{st} + \gamma_2 De9495_{st} + \gamma_3 De9697_{st} + \gamma_4 Nofirm_{st} + \gamma_5 Lprem_{st} + \eta_{st} \quad (10)$$

where, TE_{st} = Technical efficiency for firm s in year t;

PTE_{st} = Purely technical efficiency for firm s in year t;

SE_{st} = Scale efficiency for firm s in year t;

Our Tobit regression examines the relationship between (1) Korean life insurers' technical efficiency, purely technical efficiency, and scale efficiency and (2) liberalization and deregulation and other exogenous events. The estimated coefficients and standard errors presented (in parentheses) are reported in Table 1. For the total efficiency regression, the results show that Lib9091 (one or two years after liberalization) and Lprem (logarithm of premium) are statistically and positively related to TE, while De9495 (one or two years after deregulation), De9697 (three or four years after deregulation) and Nofirm (number of firms) are statistically and negatively correlated with TE. Thus, liberalization appears to have had a positive effect on total efficiency. The marginal effect ($\partial TE/\partial Lib9091$) for total efficiency is a 3 percent increase two years after liberalization.[5]

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[3] The finding that there was heteroscedasticity related to size in the life insurance industry is consistent with Gardner and Grace's (1993) and Yuengert's (1993) findings.

[4] The sample does not include data in the year of liberalization (1989) and the year of deregulation (1993).

[5] The marginal effect is calculated by (number of noncensored observations/total number of observations) × (efficiency coefficient)/(mean of efficiency score; excluding firms with scores 0 and 1)).

Table 1
Weighted Tobit Regression for
the Korean Life Insurance Industry, 1987-1997

	TE Total Efficiency	PTE Purely Technical Efficiency	SE Scale Efficiency
Intercept	-0.9603*** (0.0540)	-0.9171*** (0.0567)	0.0975** (0.0360)
Lib9091	0.0360*** (0.0104)	0.0551*** (0.0101)	0.0325*** (0.0070)
De9495	-0.0935*** (0.0101)	0.0045 (0.0097)	-0.0762*** (0.0067)
De9697	-0.0764*** (0.0099)	-0.0520*** (0.0093)	-0.0479*** (0.0067)
Nofirm	-0.0028*** (0.0006)	-0.0008 (0.0052)	-0.0025*** (0.0004)
Lprem	0.0750*** (0.0019)	0.0731*** (0.0020)	0.0365*** (0.0013)
Log Likelihood Ratio	-838.50	-808.86	315.26

*** Significant at the 1 percent level.
** Significant at the 5 percent level.
*Significant at the 10 percent level.
Notes: standard errors are presented in parentheses below the efficiency coefficients. The weight is square root of premium.

This increase in total efficiency was due to the reduction of the difference between the cost of the average firm and that of the best-practice life insurer (purely technical efficiency) as well as to gains in scale efficiency. We will see this when we examine the PTE and SE regressions below.

Total efficiency, however, appears to decrease after deregulation. Total efficiency decreased by 8 percent (based on the marginal effect) two years after deregulation but, by four years out, the effect on total efficiency was only a 6 percent reduction as measured by the marginal effect. As can be seen in the SE equation in Table 1, this loss in total efficiency was likely a scale effect. Four years after deregulation, however, the effect on total efficiency was lessening.

Table 2 shows the productivity change indicators for Korea. The Korean life insurance market progressed in terms of productivity during the period between liberalization (1989) and deregulation (1993). However, liberalization seems to have had no

effect in terms of stimulating productivity growth or technological change. This may be because liberalization that commenced in 1989 was not accompanied by any meaningful deregulation. Insurance regulation in Korea at that time was highly restrictive, limiting insurers' product innovations, pricing flexibility, and use of distribution systems. By contrast, 1993 witnessed the start of Korea's deregulation program.

Table 2
Geometric Means and Direction of Productivity Change Indicators for the Korean Life Insurance Industry, 1990 -1997

Indicators	*1990-91*	*1991-92*	*1992-93*	*1993-94*	*1994-95*	*1995-96*	*1996-97*	*Average over time*	
								1990-92	*1994-97*
Malmquist Index	0.894	1.068	0.906	0.902	0.884	1.065	1.406	0.977	1.097
TC	0.810	1.062	0.946	1.022	0.783	0.989	1.477	0.927	1.046
TEC	1.104	1.005	0.960	0.883	1.128	1.077	0.952	1.053	1.049
PTEC	1.069	1.010	0.970	0.984	1.050	1.052	0.975	1.039	1.025
SEC	1.033	0.996	0.989	0.898	1.075	1.024	0.976	1.014	1.024

Note: The Malmquist Index is productivity change. Indices greater than 1 denote positive change while indices less than 1 denote negative change relative to previous year.
TC is technological change
TEC is technical efficiency change
PTEC is purely technical efficiency change
SEC is scale efficiency change

The Korean life insurance industry seems to have regressed in terms of productivity after deregulation in 1993. Despite a decrease in total efficiency, scale efficiency loss, and inability of the average firm to keep pace with best-practice life insurers, these negative effects are diminishing over time. What is interesting is that deregulation of the Korean life insurance industry has accelerated productivity growth as rapid as 9.7 percent annually during 1994-1997 as measured by the Malmquist index shown in Table 2. The productivity growth was due primarily to improvement in technical efficiency (better use of inputs) rather than technological progress (increases in the production frontier).

Table 3
Tests of Productivity Change Differences Before and After Market Liberalization and Deregulation for the Korean Life Insurance Industry, 1980-1997

Indicators	**Liberalization** $H_o: I_{BL} \geq I_{AL}$	**Deregulation** $H_o: I_{BD} \geq I_{AD}$
Malmquist	4.125 (0.999)	-1.290* (0.099)
Technological Change	4.917 (0.999)	-1.671** (0.048)
Technical Efficiency Change	-1.994 (0.976)	-0.892 (0.187)
Purely Technical Efficiency Change	-2.155** (0.016)	-0.527 (0.299)
Scale Efficiency Change	-0.386 (0.350)	-0.700 (0.242)

***Significant at the 1% level.
**Significant at the 5% level.
* Significant at the 10% level.
Note: the p-values are presented in parentheses below the T-test statistics .
I_{BL} = Index before liberalization
I_{AL} = Index between liberalization and deregulation
I_{BD} = Index before deregulation
I_{AD} = Index after deregulation

A set of null hypotheses was tested as to whether productivity change indicators of Korean life insurers after market liberalization and deregulation are significantly higher than those before liberalization and deregulation. The T-test statistics are reported in Table 3. The Malmquist index and TC indicator show that, during the period between liberalization and deregulation (1990-1992), Korean life insurers did not exhibit superior performance to those operating prior to liberalization. However, the Malmquist index and TC indicator for the 1994-1997 period show that, after deregulation, Korean life insurers displayed significantly superior performance to those operating before deregulation. The measures of changes in PTE show that between market liberalization and deregulation (1990-1992), improvement in PTE grew significantly. However, this improvement was not statistically significant after deregulation.

The Philippines

Insurance in the Philippines evolved from British agencies in the 1840s. The Philippines, along with other ASEAN (Association of Southeast East Asian Nations) countries, is a signatory to GATS (General Agreement on Trade in Services). The ongoing process of liberalization resulted in several measures to open the market. In March 1992, the 26-year ban on the licensing of new insurance and reinsurance companies, including joint ventures, was lifted. In the meantime, the Foreign Investment Act of 1991 was amended so that foreign equity was allowed up to 100 percent (Malinis, 1996).

Liberalization in the Philippine life insurance market was accompanied by deregulation. The Philippines also deregulated rules on investment and allowed universal banks to invest more in insurance companies. This resulted in the entry of CIGNA into the market with a joint venture company with a local commercial bank. The Philippines further deregulated foreign exchange policies. Foreign exchange receipts, representing earnings, may also be deposited in foreign currency accounts both in the Philippines and abroad, or may be taken out of the country (Malinis, 1996).

Compared with other countries, the Philippine commitments in insurance services to GATS can be considered broad. The commitments include life insurance, non-life insurance, reinsurance, and consultancies (Malinis, 1996). As many aspects of the liberalization and deregulation processes were initiated in 1992, this year is considered the benchmark year for insurance liberalization and deregulation for the Philippines.

We again employ a Tobit regression, following the same process as discussed above with Korea. The estimated coefficients and standard errors (in parentheses) are reported in Table 4.

Market liberalization and deregulation improved Philippine life insurer efficiency. In Table 5, we see the Philippine life insurance industry benefited in terms of gains in total efficiency and scale efficiency and the ability of the average firm to catch up with best-practice life insurers over time. Liberalization and deregulation seem to have stimulated

Table 4
Weighted Tobit Regression for the Philippine Life Insurance Industry, 1990-1997

	Total Efficiency	*Purely Technical Efficiency*	*Scale Efficiency*
Intercept	1.2556***	1.1570***	1.3020***
	(0.0840)	(0.0957)	(0.0501)
Lib9394	-0.0240	0.0753***	-0.0699***
	(0.0193)	(0.0214)	(0.0115)
Lib9597	0.1411***	0.1851***	0.0417***
	(0.0181)	(0.0202)	(0.0108)
Lprem	-0.0152***	-0.0054	-0.0141***
	(0.0043)	(0.0048)	(0.0025)
Log Likelihood Ratio	-1,202.76	-1,085.15	-555.62

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

scale economies. The positive consequences of liberalization and deregulation caused the convergence of Philippine life insurers' operation toward a long-run optimal scale.

Table 5
Geometric Means and Direction of Productivity Change Indicators for the Philippine Life Insurance Industry, 1987-1997

Indicators	*1987-88*	*1988-89*	*1989-90*	*1990-91*	*1991-92*	*1992-93*	*1993-94*	*1994-95*	*1995-96*	*1996-97*	*Average over time*	
											1987-91	*1994-97*
Malmquist Index	1.081	0.988	1.111	0.762	0.995	0.930	1.003	0.971	1.063	1.144	0.975	1.043
TC	1.184	0.983	1.060	0.757	0.960	0.967	1.021	1.004	1.005	1.172	0.983	1.048
TEC	0.914	1.005	1.048	1.007	1.037	0.962	0.983	0.967	1.057	0.976	0.992	0.995
PTEC	0.937	0.989	1.016	0.980	1.028	0.984	1.000	0.964	1.043	0.991	0.980	0.999
SEC	0.974	1.017	1.032	1.027	1.009	0.978	0.982	1.003	1.013	0.985	1.012	0.996

Liberalization and deregulation are associated with a shift of the production frontier. In addition, these government changes seems to have succeeded in stimulating improvements in purely technical efficiency by reducing the difference between the cost of the average firm and that of the best-practice life insurer. A small group of the best-practice firms was gaining efficiency, and the average firm responded to the competitive market by becoming more efficient.

Liberalization and deregulation of the Philippine life insurance industry have generated impressive productivity growth as rapid as 4.3 percent annually during 1994-1997 as measured by the Malmquist index. The productivity growth was due mainly to technological progress rather than improvements in technical efficiency.

Table 6 shows the t-test statistics for whether productivity change indicators of the Philippine life insurance industry after market liberalization and deregulation are significantly higher than existed prior thereto. The Malmquist, TC and PTEC indices are consistent, but not statistically significant, with the view that, after market liberalization and deregulation, Philippine life insurers displayed superior performance when compared with those operating before. On the other hand, TEC and SEC indicator results reveal that the TE

and SE improvement of Philippine life insurers after liberalization and deregulation was not superior to that before such changes.

Table 6
Tests of Productivity Change Differences Before and After Market Liberalization and Deregulation for the Philippine Life Insurance Industry, 1987-1997

Indicators	$H_o: I_{BL} \geq I_{AL}$ $H_a: I_{BL} < I_{AL}$
Malmquist Index	-0.343 (0.366)
Technological Change	-0.030 (0.488)
Technical efficiency Change	1.017 (0.844)
Purely Technical Efficiency Change	-1.212 (0.113)
Scale Efficiency Change	1.376 (0.914)

***Significant at the 1% level.
**Significant at the 5% level.
* Significant at the 10% level.
Note: the p-values are presented in parentheses below the T-test statistics
I_{BL} = Index before liberalization
I_{AL} = Index between liberalization and deregulation
I_{BD} = Index before deregulation
I_{AD} = Index after deregulation

Taiwan

Insurance was first introduced into Taiwan in 1836. The Taiwanese life insurance market is highly concentrated. Insurance business in Taiwan has a remarkably high volume in premium written and this makes Taiwan the fourteenth largest life insurance market in the world. [6] Taiwan also made a commitment to the GATS. Thus, Taiwan liberalized its insurance market progressively.

Taiwan opened its insurance market in 1992, granting licenses to several new domestic and foreign insurers. Taiwan undertook virtually no deregulation. Therefore, the year 1992 is considered the benchmark year of liberalization in the Taiwanese life insurance industry.

[6] Swiss Re (1998).

Using the same procedure as above with the Taiwanese life insurance industry yields results shown in Tables 7 and 8.

Table 7
Weighted Tobit Regression for the Taiwanese Life Insurance Industry, 1990-1997

	Total Efficiency	*Purely Technical Efficiency*	*Scale Efficiency*
Intercept	-3.8831*** (0.2188)	-2.0444*** (0.2499)	-1.5024*** (0.1171)
Lib9394	-2.6815*** (0.1845)	-1.7531*** (0.2143)	-1.4124*** (0.0985)
Lib9597	-2.8709*** (0.1929)	-1.8752*** (0.2234)	-1.4987*** (0.1030)
Nofirm	0.2013*** (0.0140)	0.1129*** (0.0163)	0.1080*** (0.0075)
Lprem	0.1009*** (0.0023)	0.0879*** (0.0026)	0.0493*** (0.0012)
Log Likelihood Ratio	-3,035.64	-2,798.41	-1,480.70

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

The Taiwanese life insurance market regressed in terms of productivity after liberalization. In addition to an absolute decrease in total efficiency, purely technical efficiency, and scale efficiency, these negative effects increased over time. Liberalization seems not to have stimulated productivity growth, technological progress, or improvement in scale efficiency.

Table 8
Geometric Means and Direction of Productivity Change Indicators for the Taiwanese Life Insurance Industry, 1990-1997

Indicators	*1990-91*	*1991-92*	*1991-92*	*1992-93*	*1993-94*	*1994-95*	*1995-96*	*1996-97*	*Average 1993-97*
Malmquist Index	1.124	0.866	0.866	0.203	0.429	0.927	1.045	1.252	0.850
TC	1.076	0.876	0.876	0.224	0.431	0.935	1.004	1.178	0.831
TEC	1.044	0.988	0.988	0.910	0.996	0.992	1.041	1.063	1.022
PTEC	1.033	1.037	1.037	0.983	1.088	0.992	1.031	1.073	1.045
SEC	1.044	0.953	0.953	0.926	0.916	1.000	1.010	0.991	0.978

Rapid productivity growth occurred, however, three years after liberalization. The Taiwanese life insurance industry experienced impressive productivity growth, especially during 1994-1997, at 6.7 percent per annum during the period. This productivity growth was due mainly to improvement in technical efficiency (cost saving) rather than technological progress (use of new technologies).

Null hypotheses as to whether productivity change indicators in the Taiwanese life insurance industry after liberalization are significantly higher than those before liberalization were examined, and the T-test statistics are reported in Table 9. The Malmquist index and TEC indicator show that, after liberalization, Taiwanese life insurers displayed superior performance to those operating before liberalization, although results are only minimally significant. The measure of changes in PTE shows that, after liberalization, Taiwanese life insurers outperformed those operating before liberalization.

Table 9
Tests of Productivity Change Differences Before and After Market Liberalization for the Taiwanese Life Insurance Industry, 1983-1997

Indicators	H_o: $I_{BL} \geq I_{AL}$ H_a: $I_{BL} < I_{AL}$
Malmquist	-1.120 (0.132)
Technological Change	0.019 (0.507)
Technical efficiency Change	-0.142 (0.444)
Purely Technical Efficiency Change	-2.292** (0.012)
Scale Efficiency Change	0.127 (0.550)

***Significant at the 1% level.
**Significant at the 5% level.
* Significant at the 10% level.
Note: the p-values are presented in parentheses below the T-test statistics
I_{BL} = Index before liberalization
I_{AL} = Index between liberalization and deregulation
I_{BD} = Index before deregulation
I_{AD} = Index after deregulation

Thailand

Insurance was first introduced into Thailand in the early 1900s. The Thai insurance market has long been protected from international participation, limiting foreign shareholdings in domestic companies to a maximum of 15 percent and restricting newly licensed insurance companies according to the Non-life and Life Insurance Act of 1983.

From Table 10, we see that liberalization in the Thai market two years out (Lib9394) is negatively related to all three types of efficiency. Further, liberalization four years out (Lib9597) is also negatively related to efficiency in all three categories.

As with Taiwan, the Thai life insurance market regressed in terms of productivity

Table 10
Weighted Tobit Regression for the Thai Life Insurance Industry, 1988-1996

	Total Efficiency	*Purely Technical Efficiency*	*Scale Efficiency*
Intercept	-1.1378*** (0.0944)	-1.4702*** (0.1763)	-0.0237*** (0.0440)
Lib9394	-0.1028*** (0.0148)	-0.1140*** (0.0273)	-0.0374*** (0.0068)
Lib9597	-0.1643*** (0.0148)	-0.2276*** (0.0275)	-0.0661*** (0.0067)
Lprem	0.1109*** (0.0047)	0.1376*** (0.0091)	0.0507*** (0.0022)
Log Likelihood Ratio	-445.94	-565.55	111.87.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

after liberalization. In addition to a decrease in absolute total efficiency, purely technical efficiency, and scale efficiency, these negative effects are increasing over time as we saw in Taiwan. However, liberalization seems to have stimulated productivity growth, technological progress, and improvements in total efficiency and scale efficiency. In Table 11, we see that the Thai life insurance industry had impressive productivity growth, especially during the years 1995-1996, with productivity growing at 3.3 percent annually during the 1993-1996 period. The productivity growth was due mainly to technological progress rather than improvement in technical efficiency.

Table 11
Geometric Means and Direction of Productivity Change Indicators for the Thai Life Insurance Industry, 1988-1996

Indicators	*1988-89*	*1989-90*	*1990-91*	*1991-92*	*1992-93*	*1993-94*	*1994-95*	*1995-96*	*Difference 1993-96*
Malmquist Index	1.125	1.061	0.964	1.137	0.824	0.962	0.996	1.150	1.033
TC	1.124	1.073	0.934	1.122	0.833	0.998	0.979	1.115	1.029
TEC	1.001	0.988	1.032	1.011	0.988	0.964	1.017	1.032	1.003
PTEC	1	1.014	1.008	1.009	0.999	0.958	0.984	1.053	0.997
SEC	1.001	0.975	1.024	1.004	0.989	1.007	1.034	0.980	1.007

Change indicators are shown Table 12. The Malmquist indices and TC and SEC indicators show that Thai life insurers after liberalization significantly outperformed those before liberalization in technical change only. Thus, liberalization in the Thai market seems to have had only marginal real effects on the efficiency characteristics of the Thai life insurance industry.

Table 12
Tests of Productivity Change Differences between Before and After Market Liberalization for the Thai Life Insurance Industry, 1978-1996

Indicators	H_o: $I_{BL} \geq I_{AL}$ H_a: $I_{BL} < I_{AL}$
Malmquist	-1.247 (0.108)
Technological Change	-1.469* (0.073)
Technical efficiency Change	0.066 (0.526)
Purely Technical Efficiency Change	0.006 (0.502)
Scale Efficiency Change	-0.464 (0.322)

***Significant at the 1% level.
**Significant at the 5% level.
* Significant at the 10% level.
Note: the p-values are presented in parentheses below the T-test statistics.
I_{BL} = Index before liberalization
I_{AL} = Index between liberalization and deregulation
I_{BD} = Index before deregulation
I_{AD} = Index after deregulation

Effects of Liberalization and Deregulation on Efficiency

This study examined the effects of liberalization and deregulation on the efficiency of life insurers in selected Asian life insurance markets. As used in this study, liberalization denotes a reduction of barriers to market access, and deregulation denotes a lessening of national regulation.

The life insurance industries selected for examination are those of Korea, the Philippines, Taiwan, and Thailand. All four countries undertook some liberalization during the decade of the 1990s, with Korea and the Philippines undertaking modest deregulation as well. Korean deregulation followed liberalization by a discernable period (four years) whereas Philippine deregulation occurred concurrently with liberalization. In neither instance could these deregulation efforts be characterized as substantial. Nonetheless, these two markets can be contrasted with those of Taiwan and Thailand which undertook virtually no deregulation during the study period.

Liberalization and deregulation of the Korean and Philippine life insurance markets were associated with increases and improvements in total efficiency. The evidence suggests that liberalization and deregulation of the Philippine life insurance market were effective in accelerating a shift of the production frontier and in narrowing the gap between the costs of the average firm and those of the best-practice life insurers. This finding implies that a small group of best-practice firms was gaining efficiency and that the average firm responded to a more competitive market by emphasizing cost saving. In addition, liberalization/deregulation seems to have stimulated scale economies. The positive consequences of these government changes are associated with a convergence of Philippine life insurers' operation toward the long-run optimal scale. The evidence also suggests that liberalization/deregulation generated impressive productivity growth for Philippine life insurers.

On the other hand, for Korea, liberalization alone seemingly failed to stimulate productivity growth. This may be because liberalization of the Korean life insurance industry, which commenced in 1989, was not accompanied at that time by deregulation. However, in 1993, after partial deregulation, the Korean life insurance industry witnessed significant increases in productivity growth.

Although after deregulation, the Korean life insurance market seems to have regressed in terms of efficiency, these negative effects were diminishing over time. This finding implies that deregulation, especially of price, facilitated positive consequences, generating a more competitive market in the long run.

In contrast to the positive effects on efficiency of liberalization and deregulation in the Philippine and Korean life insurance markets, the Taiwanese and Thai life insurance industries seem to have regressed in terms of efficiency after their liberalization efforts, initiated in 1992. This drop in total efficiency was due to the inability of the average firm to keep pace with best-practice life insurers as well as to loss in scale efficiency. These

negative effects are increasing over time. This result is consistent with the contention that liberalization alone within a restrictive regulatory regime is unlikely to yield hoped-for improvements.

The evidence suggests that liberalization of the Thai life insurance industry stimulated productivity growth and a shift of production frontier, while liberalization of the Taiwanese life insurance industry is not associated with productivity growth or technological progress, at least until 1995-1997. The relatively rapid increase in technological change in recent years for Taiwan and Thailand apparently caused the frontier for the best-practice firm to shift out at a rate faster than that which the average firm could respond. Therefore, a small group of the best-practice firms could be pulling away from the average firm in the market.

In conclusion, liberalization and deregulation of the Korean and Philippine life insurance industries seem to have succeeded in stimulating increases and improvements in productivity. Liberalization and deregulation of these markets created more competitive markets as witnessed by life insurers' reactions to competitive pressures. Life insurers responded by improving efficiency; e.g., achieving cost savings and adjusting their scale of operations. However, liberalization of the Taiwanese and Thai life insurance businesses had little effect on increases and improvements in productivity.

The overall findings suggest that liberalization and deregulation together promote competition among life insurers within markets that formerly were characterized by restrictive regulation. Study findings are consistent with the view that liberalization is a necessary but not a sufficient condition for contestable markets. Study findings also are consistent with the view that, in a restrictive regulatory environment, welfare gains will be minimal if deregulation does not closely follow liberalization.

For our four-country sample, the Philippines may have benefited the most from liberalization and deregulation of its life insurance market. Its liberal policies generated

growth in its insurance industry, moving firms towards a more efficient scale and creating a more competitive market in the long run. The Philippines, therefore, provides evidence of the benefits of both liberalizing and deregulating.

Korea might follow the Philippines in terms of benefits. Korea benefited from liberalization in terms of increases in efficiency, while deregulation of the Korean life insurance market facilitated productivity growth. As a result, this study provides some evidence of the benefits associated with less restrictive regulation.

Thailand and Taiwan might follow Korea in terms of positive consequences of liberalization. Liberalization, which occurred in both countries in 1992, seems to have had little effect on efficiency. However, we witnessed some productivity growth in Thailand post-liberalization, with none realized in Taiwan until 1995.

The study finds that productivity growth in the Korean and Taiwanese life insurance markets was due mainly to an improvement of total efficiency. On the other hand, productivity growth in the Philippine and Thai life insurance industries was caused primarily by technological change due to an expanding production frontier. These findings imply that, although Korea and Taiwan also benefited from technological change, the productivity gains were not as great as gains from total efficiency. This result is consistent with the observation that both Korea and Taiwan are more technologically advanced than the Philippines and Thailand and, therefore, would be expected already to have been employing higher levels of technology. They have, for example, higher per capita gross domestic products (GDPs) than do the Philippines and Thailand.[7] Therefore, they could be expected to be less reliant on technological transfer from foreign insurers.

[7] It is difficult to prove this statement empirically. However, Korea had 8.9 fax machines per 1,000 population in 1995, 131.7 personal computers per 1,000 population in 1996, and 28.77 Internet hosts per 10,000 population in 1997, while the Philippines comparable figures were 0.7 fax machines in 1995, 9.3 personal computers in 1996 and 0.59 Internet hosts in 1997, and Thailand had 1.7 fax machines in 1995, 16.7 personal computers in 1996 and 2.11 Internet hosts in 1997 (World Bank, 1998).

On the other hand, the Philippines and Thailand, having lower per capita GDP and lower technology, likely gained benefits from the transfer of ideas, better technical skills and know-how, technology, and managerial techniques from foreign insurers. This is the type of transfer that is said to accompany foreign investment in a host country (World Bank, 1998).

The Philippines and Thailand gained technological transfers from foreign companies during the 1990s due to the high volume of foreign direct investment (FDI).[8] One main contributor to this increase was their increasing liberalization (World Bank, 1998). Study results, hence, provide some evidence supporting Philippine and Thai regulatory changes that would enable host-country insurers to benefit from more open markets.

This research investigates four developing countries only. With continuing globalization and increasing pressures from negotiations under the *General Agreement on Trade in Services* proceed, further studies should be conducted to examine the effects of liberalization and deregulation on the efficiency of national insurance markets. Moreover, cross-country studies based on similar data may provide new insights.

Future research on life insurer efficiencies could test the robustness of this study's results by conducting sensitivity analysis and employing different output definitions, data from different sources, and different measures of efficiency. Finally, this study's findings hint at the importance of studying both liberalization and deregulation together.

[8] The averages of the ratios of foreign direct investment to GDP in Korea and Taiwan were 0.31 percent and 0.57 percent, respectively, per annum, while those in Philippines and Thailand were 2.25 percent and 1.23 percent, respectively, annually during 1993-1996 (International Monetary Fund, 1997).

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