STATE REGULATION OF LIFE INSURERS: IMPLICATIONS FOR ECONOMIC EFFICIENCY AND FINANCIAL STRENGTH

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EXECUTIVE SUMMARY

STATE REGULATION OF LIFE INSURERS: IMPLICATIONS FOR ECONOMIC EFFICIENCY AND FINANCIAL STRENGTH

Life insurance costs could be reduced by an estimated $5.7 billion annually if insurance companies functioned under a single regulator system as opposed to the current system of multiple regulators.

A single regulator system, as contemplated by proposals in Congress calling for optional federal chartering of insurance companies, would allow insurance companies to operate more efficiently and thus reduce costs. Moreover, certain insurance companies would likely experience better financial strength ratings under a single regulatory system.

This study is based on an analysis of 284 life insurance entities (134 groups and 150 unaffiliated insurers) in the United States holding combined assets of $3.8 trillion. Some of the insurers conduct business in a single jurisdiction while others conduct business in multiple jurisdictions.

The study finds that a life insurer's cost efficiency—which is a measurement of an insurer's success in minimizing costs—declines significantly as the number of states in which an insurer is licensed or domiciled increases.

Insurance companies adjust to the higher costs by raising premiums.

While most life insurers are able to recoup the additional costs of multiple regulation, some companies are not profit-efficient, meaning that they are not fully recovering the additional costs of multiple state regulation. For these insurers, a single regulator system could improve their financial strength ratings.

Moreover, the $5.7 billion annual savings is only one of the potential benefits of an optional federal charter. This study did not attempt to measure other potential benefits, such as increased competition and improved speed-to-market for new products.

About the author

Dr. Steven W. Pottier is an Associate Professor of Insurance in the Terry College of Business at the University of Georgia, Athens, Georgia, where he teaches life insurance as well as other risk management and insurance courses. His research focuses on financial and economic aspects of insurance. Dr. Pottier has published in numerous scholarly journals, including the *Journal of Risk and Insurance*, the world's leading academic journal specializing in risk and insurance. Professor Pottier completed his Ph.D. in finance at the University of Texas at Austin and holds the Chartered Life Underwriter (CLU) designation from the American College in Bryn Mawr, Pennsylvania.

EXPANDED EXECUTIVE SUMMARY

STATE REGULATION OF LIFE INSURERS: IMPLICATIONS FOR ECONOMIC EFFICIENCY AND FINANCIAL STRENGTH

Under the current state regulatory system, life insurers who sell insurance in more than one state must obtain a license for each additional state entered or form a separate insurance company domiciled (and licensed) in the state of entry. Regardless of the mode of entry, multi-state insurers face multiple regulatory bodies and multiple sets of regulations with which to comply. The National Insurance Act of 2006 calls for optional federal chartering (OFC) of insurers. Under the proposed OFC, an Office of National Insurance within the Department of the Treasury would issue federal charters and licenses to insurers, and regulate exclusively their operations and solvency.

The purpose of the present study is to evaluate the potential benefits of a federal regulatory system for life insurer economic efficiency and financial strength. The two main research questions are as follows: first, do life insurers operating under multiple state regulatory jurisdictions experience an unfavorable (or favorable) impact on their cost, revenue, or profit efficiency?; second, do life insurers operating under multiple state regulatory jurisdictions experience an unfavorable (or favorable) impact on their financial strength rating?

The first research question is explored through an evaluation of the relation of insurance benefits provided to policyholders, annuitants, or their beneficiaries, costs incurred to render these benefits, revenues received in exchange for benefits provided, and profits earned by rendering benefits and incurring costs. The analysis and methodology is based on conventional economic theory that posits that firms strive to maximize profits. The two main components of profits, revenues and costs, are examined separately in order to better isolate regulatory impacts. Broadly speaking, the idea of efficiency encompasses productivity, that is, the transformation of inputs into outputs, and performance, meaning the effectiveness at achieving an objective that is usually of a financial nature, such as "profit maximization." An insurer's success in maximizing revenues, minimizing costs, or maximizing profits is expressed in terms of a revenue, cost, or profit efficiency score, respectively, and is derived by comparing an insurer's revenues to a set of insurer's consuming the same (or lower) quantity of inputs for revenue efficiency, or by comparing an insurer's costs to a set of insurers producing the same (or higher) quantity of benefits/outputs for cost efficiency, or by comparing an insurer's profits to a set of insurers producing the same (or higher) quantity of benefits/outputs and (simultaneously) consuming the same (or lower) quantity of inputs for profit efficiency.

Life insurers provide risk pooling services by assuming the risks of premature death and longevity, real services, such as financial planning and investment advice, and financial intermediation services by investing policyholder, annuitant and beneficiary funds, and holding capital to bear underwriting risk. These services are the benefits provided and are represented by eleven distinct outputs—*net incurred claims* for the five main lines of business, individual life insurance, group life insurance, individual annuity contracts, group annuity contracts, health insurance, and *invested assets* for each of the preceding five outputs, and invested assets related to deposit-type contracts. The costs, or inputs, are grouped into six categories—agent labor, administrative labor, business services, policy reserve capital, equity capital and deposit-type funds. The first three inputs in total are equal to general insurance expenses, taxes (except federal income taxes), licenses and fees, commissions on direct business, and commissions and expenses on reinsurance assumed.

The impact of regulation on efficiency is primarily assessed by estimating the relation between the respective efficiency scores (revenue, cost and profit) and the number of state regulatory jurisdictions a life insurer is subject to by being licensed or domiciled in these states. The number of states licensed and the number of states domiciled are the two key explanatory

variables in the empirical models. This is the first study to examine the influence of multiple states of domicile on insurer efficiency, and represents a significant innovation in relation to prior studies because of regulatory differences and market entry cost differences between licensed and domiciled insurers. These variables, along with any others used in the present analysis, are measured at the consolidated group level for affiliated life insurers or individual company level for single unaffiliated insurers. The data used are for the 2005 annual statement year and include life (blue annual statement blank) insurers only.[1]

To address the second research question, the relation between A.M. Best Company (Best) financial strength ratings, regulatory measures, and controls variables for additional firm characteristics are examined. Best ratings are widely used by policyholders, investors and regulators to assess the ability of life insurers to meet their financial obligations and remain solvent.

This is the first study to use consolidated groups to evaluate the impact of regulation on life insurer efficiency. The use of group-level financial data and characteristics in this analysis is an important innovation because the centralized management of some activities of affiliated insurers and transactions among group members imply that the group is the relevant decision making unit.

This study provides results on a near population of U.S. life insurers representing 284 life insurance entities with combined assets of $3.8 trillion. Of the 284 sample firms, 74 are national insurers, licensed in every U.S. state and the District of Columbia. Not surprisingly, an insurer's size, as measured by admitted assets, is strongly positively correlated with states licensed, states domiciled, and life insurance affiliates in a group, all expected correlates with regulatory costs.

The principal findings suggest that a life insurer's cost efficiency declines significantly as the number of states licensed or domiciled increases, but increases with the insurer's size. Overall, revenue efficiency scores do not support any regulatory impact (favorable or unfavorable). However, evidence is found that the unfavorable regulatory impact on cost efficiency is offset to some degree by increased revenues in relation to benefits provided. Further, I do not find any evidence that profit efficiency is affected by multiple state regulation. In other words, the higher costs associated with multiple regulators are passed along to insurance consumers to some extent in the form of higher premiums or fees. In relation to life insurer financial strength ratings, I find that multiple state regulation does not generally affect ratings. However, for life insurers that are *not* profit efficient, and therefore are *not* fully recovering the additional costs of multiple state regulation in higher revenues, operating in more states has a significantly unfavorable impact on their financial strength ratings.

Based on parameter estimates from the cost efficiency regressions, the potential cost savings related to a "single regulator," similar to what would be the case under the Optional Federal Charter, exceed $5.7 billion, or about 1¼ percent of net premiums, annually. The analysis of the relation between state regulation and financial strength ratings suggests the potential for further savings in capital costs and insolvency costs.

It should be noted that the present regulatory financial reporting system does not specifically identify or separate regulatory compliance costs from other costs that might be inherent to expansion into more states. The present study relies on the premise that if regulation imposes costs on firms, then all else equal, firms subject to more regulators will have higher

[1] Health insurance premiums generated by private insurers are primarily reported on the health (orange) annual statement blank. Life insurer sales of health insurance include medical expense insurance, long-term care insurance, and disability insurance.

costs. Finally, it should be noted that the present study did not attempt to estimate other potential benefits of an optional federal charter, such as increased competition and improved speed to market for new products.

STATE REGULATION OF LIFE INSURERS: IMPLICATIONS FOR ECONOMIC EFFICIENCY AND FINANCIAL STRENGTH

1. Introduction

Under the current state regulatory system, life insurers who sell insurance in more than one state must obtain a license for each additional state entered or form a separate insurance company domiciled (and licensed) in the state of entry. Regardless of the mode of entry, multi-state insurers face multiple regulatory bodies and multiple sets of regulations with which to comply. The National Insurance Act of 2006 calls for optional federal chartering (OFC) of insurers. Under the proposed OFC, an Office of National Insurance within the Department of the Treasury would issue federal charters and licenses to insurers, and regulate exclusively their operations and solvency (see Scott, 2007).

The purpose of the present study is to evaluate the potential benefits of a federal regulatory system for life insurer economic efficiency and financial strength. The two main research questions are as follows: first, do life insurers operating under multiple state regulatory jurisdictions experience an unfavorable (or favorable) impact on their cost, revenue, or profit efficiency?; second, do life insurers operating under multiple state regulatory jurisdictions experience an unfavorable (or favorable) impact on their financial strength rating?

The first research question is explored through an evaluation of the relation of insurance benefits provided to policyholders, annuitants, or their beneficiaries, costs incurred to render these benefits, revenues received in exchange for benefits provided, and profits earned by rendering benefits and incurring costs. The analysis and methodology is based on conventional economic theory that posits that firms strive to maximize profits. As profits are the difference between revenues and costs, these two

main components of profits are examined separately in addition to profits, in order to identify areas in most need of improvement. Broadly speaking, the idea of efficiency encompasses productivity, that is, the transformation of inputs into outputs, and performance, meaning the effectiveness at achieving an objective that is usually of a financial nature, such as "profit maximization." An insurer's success in maximizing revenues, minimizing costs, or maximizing profits is expressed as a revenue, cost, or profit efficiency score, respectively, and is derived by comparing an insurer's revenues to a set of insurer's consuming the same (or lower) quantity of inputs for revenue efficiency, or by comparing an insurer's costs to a set of insurers producing the same (or higher) quantity of benefits/outputs for cost efficiency, or by comparing an insurer's profits to a set of insurers producing the same (or higher) quantity of benefits/outputs and (simultaneously) consuming the same (or lower) quantity of inputs for profit efficiency.

Life insurers provide **risk pooling** services by assuming the risks of premature death and longevity, **real services**, such as financial planning and investment advice, and **financial intermediation** services by investing policyholder, annuitant and beneficiary funds, and holding capital to bear underwriting risk. These services are the benefits provided and are represented by eleven distinct outputs—*net incurred claims* for the five main lines of business, individual life insurance, group life insurance, individual annuity contracts, group annuity contracts, health insurance, and *invested assets* for each of the preceding five outputs, and invested assets related to deposit-type contracts. The costs, or inputs, are grouped into six categories—agent labor, administrative labor, business services, policy reserve capital, equity capital and deposit-type funds. The first three inputs in total are equal to general insurance expenses, taxes (except federal income

taxes), licenses and fees, commissions on direct business, and commissions and expenses on reinsurance assumed.

The impact of regulation on efficiency is primarily assessed by estimating the relation between the respective efficiency scores (revenue, cost and profit) and the number of state regulatory jurisdictions a life insurer is subject to by being licensed or domiciled in these states. The number of states licensed and the number of states domiciled are the two key explanatory variables in the empirical models. This is the first study to examine the influence of multiple states of domicile on insurer efficiency, and represents a significant innovation in relation to prior studies because of regulatory differences and market entry cost differences between licensed and domiciled insurers (see Petroni and Shackelford, 1995). These variables, along with any others used in the present analysis, are measured at the consolidated group level for affiliated life insurers or individual company level for single unaffiliated insurers. The data used are for the 2005 annual statement year and include life (blue annual statement blank) insurers only.[2]

To address the second research question, the relation between A.M. Best Company (Best) financial strength ratings, regulatory measures, and controls variables for additional firm characteristics are examined. Best ratings are widely used by policyholders, investors and regulators to assess the ability of life insurers to meet their financial obligations and remain solvent.

This is the first study to use consolidated groups to evaluate the impact of regulation on life insurer efficiency. The use of group-level financial data and characteristics in my analysis is an important innovation because the centralized

[2]Health insurance premiums generated by private insurers are primarily reported on the health (orange) annual statement blank. Life insurer sales of health insurance include medical expense insurance, long-term care insurance, and disability insurance. Also see footnote 28.

management of some activities of affiliated insurers and transactions (and allocations) among group members imply that the group is the relevant decision making unit (see Cummins and Zi, 1998). Further, regulators and private rating agencies increasingly recognize that analysis of an individual insurer is incomplete without understanding the group in which the company operates (National Association of Insurance Commissioners, 2002; Puccia and Osborne, 2004; Best, 2004).

The principal findings suggest that a life insurer's cost efficiency declines significantly as the number of states licensed or domiciled increases, but increases with the insurer's size. Overall, revenue efficiency scores do not support any regulatory impact (favorable or unfavorable). However, evidence is found that the unfavorable regulatory impact on cost efficiency is offset to some degree by increased revenues in relation to benefits provided. Further, I do not find any evidence that profit efficiency is affected by multiple state regulation. In other words, the higher costs associated with multiple regulators are passed along to insurance consumers to some extent in the form of higher premiums or fees. In relation to life insurer financial strength ratings, I find that multiple regulators do not generally affect ratings. However, for life insurers that are *not* profit efficient, and therefore are *not* fully recovering the additional costs of multiple state regulation in higher revenues, operating in more states has a significantly unfavorable impact on their financial strength ratings.

The remainder of the paper is organized as follows: Section 2 gives a brief overview of life insurer regulation to serve as background for the subsequent discussion. In section 3, I review the academic literature on life insurer efficiency, provide a background discussion on efficiency estimation methods, and give a more in-depth

overview of two academic studies that specifically focus on regulation and efficiency. Section 4 discusses hypotheses and variables regarding life insurer efficiency, regulatory and other insurer-specific characteristics. An overview of A.M. Best Company financial strength ratings is provided in section 5. In section 6, the sample, inputs, and outputs used in the efficiency analysis are described. The empirical results on state regulation and life insurer efficiency are reported and analyzed in section 7. Section 8 provides empirical results on state regulation and life insurer financial strength ratings. Section 9 summarizes and concludes the study.

2. Overview of life insurer regulation

The McCarran-Ferguson Act of 1945 gave states primary regulatory authority over the insurance industry. The Gramm-Leach-Bliley financial services reform law of 1999 enables insurers, banks, and securities firms to engage in a broad range of financial services by forming financial holding companies, but restricts insurance underwriting activities to insurance entities and preserves the state insurance regulatory system. The Securities and Exchange Commission has regulatory responsibility in relation to variable life and variable annuities.

The National Association of Insurance Commissioners (NAIC) is an organization of insurance regulators from the 50 states, the District of Columbia and U.S. territories. The NAIC is not a regulator per se, but provides support to insurance regulators and promotes uniformity of insurance laws and regulations in order to help regulators protect the interests of insurance consumers. The NAIC has been instrumental in the following areas, to mention only a few: adoption by all states of uniform regulatory financial reports, adoption of uniform rules for valuation of securities, preparation of new standard

mortality tables, preparation of standard valuation and nonforfeiture laws, creation of a state insurance department accreditation program to strengthen and harmonize state solvency regulation, drafting many other model laws and regulations related to life and health insurance, and coordinating regulatory activities among the states and with the federal government. However, even with the accomplishments of the NAIC, life insurers operating in multiple states face multiple regulatory bodies, and must comply with regulations that differ to varying degrees, and submit to regulatory reviews/examinations with similar aims from different jurisdictions (American Council of Life Insurers, 2005; Harrington, 2006; Klein, 2006).

State regulation of life insurers falls into two main areas: solvency regulation and market regulation. Solvency regulations encompass capital requirements, investment limitations, reserve requirements, and insolvency (guaranty) funds. Market regulations are concerned with insurer licensing, policy/contract provisions, rates, sales and claims practices. In general, life insurance and annuity rates are not subject to regulatory approval, while health insurance rates are in most states (Black and Skipper, 2000). An insurer must obtain a license from each state in which it plans to sell its products. The state in which an insurer is chartered or incorporated is referred to as the state of domicile or home state. The states tend to defer responsibility for solvency oversight to the insurer's state of domicile (Klein, 1995). For more on life insurer regulation, see Black and Skipper (2000) and Hanson (1998).

3. Literature review and overview of efficiency analysis

The following literature review focuses on life insurer efficiency studies. For my purposes, studies that use only conventional performance measures, such as financial

statement ratios, are not, strictly speaking, considered efficiency studies, and therefore are beyond the scope of this literature review. In general, the conventional performance measures do not entail identification of inputs and outputs and lack the multi-dimensional nature of modern efficiency analysis. This literature review is intended to provide the reader with a basic understanding of the input and output measures, and the quantitative methods used to estimate efficiency.[3]

Outputs and inputs

Like the financial services sector in general, the life insurance industry presents difficulties of output definitions and measurement. Virtually all life insurer efficiency studies identify outputs with major lines of business, which include life insurance, annuities, and accident and health (a/h) insurance, and most add an output to measure investment activities. Premium revenue (Gardner and Grace, 1993; Greene and Segal, 2004), amount of life insurance sold (Greene and Segal, 2004), additions to reserves (Yuengert, 1993), deposit-funds (Yuengert, 1993), and net incurred benefits (Cummins and Zi, 1998; Cummins, Tennyson and Weiss, 1999; Cummins, Eckles and Zi, 2006) have been used as output measures. Premiums are potentially problematic as an output measure because they represent price times output, not output (Yuengert, 1993; Greene and Segal, 2004). Financial intermediation activities have been captured by including invested assets (Gardner and Grace, 1993; Greene and Segal, 2004; Cummins, Eckles and Zi, 2006) or additions to reserves as outputs (Yuengert, 1993; Cummins and Zi, 1998; Cummins, Tennyson and Weiss, 1999). The number of outputs has ranged from four (Greene and Segal, 2004) to seven (Yuengert, 1993).

[3] For a more rigorous discussion of efficiency analysis, including underlying economic theory, see Coelli et al. (2005).

In general, inputs are easier to identify and measure than outputs for life insurers (Weiss, 1986). Most studies use labor, capital and materials as inputs, but differ in how these are measured. Input costs usually consist of general expenses plus commissions (Yuengert, 1993; Gardner and Grace, 1993; Greene and Segal, 2004; Cummins and Zi, 1998; Cummins, Tennyson and Weiss, 1999; Cummins, Eckles and Zi, 2006). Most studies have used only equity capital, not policyholder supplied capital, as an input.

Efficiency estimation methods

The two major methods of estimating relative efficiency are stochastic frontier analysis and data envelopment analysis. Both methods involve estimating a firm's relative efficiency where efficient firms lie on the "best practices" frontier. Firms on the cost frontier are minimizing their costs given their output levels. Firms on the revenue frontier are maximizing their revenues given their input levels. Firms on the profit frontier are maximizing their profits given their combination of inputs and outputs.

Stochastic frontier analysis (SFA) involves econometric estimation and assumes a given functional form for the relationship between inputs and outputs. The function may be for the cost, revenue, profit or production frontier. Once the functional form is specified, the parameters of the function need to be estimated using econometric techniques, such as ordinary least square or maximum likelihood regressions. In stochastic frontier efficiency analysis, suboptimal outcomes (i.e., actual costs above minimum attainable costs, actual revenues below maximum attainable revenues, actual profits below maximum attainable) or equivalently deviations from the relevant frontier are attributed to two sources, inefficiency and random errors in the data. Both sources are considered random variables and probability distributions, usually different ones,

must be assumed for each. Life insurer studies using stochastic frontier efficiency analysis to estimate cost efficiency include Yuengert (1993), Gardner and Grace (1993), Cummins and Zi (1998), and Greene and Segal (2004).

Data envelopment analysis (DEA) is a linear programming approach to efficiency estimation.[4] For purposes of cost efficiency, DEA involves finding the optimal input quantities from the cost minimization problem. Similarly, for revenue efficiency, the optimal output quantities are obtained from the revenue maximization problem. And lastly, for profit efficiency, the optimal combination of input and output quantities is derived from the profit maximization problem. In DEA cost efficiency estimation, a linear combination (i.e., linear sum) of a set of firms (known as reference set) is identified that produce the same or more outputs at the same or lower cost than the firm being evaluated (that is, the firm in question).[5] The input quantities for this linear combination of firms are used to calculate the costs of a fully efficient firm using the input prices of the firm being evaluated. The ratio of the costs of a fully efficient firm to the actual costs of the firm being evaluated is the cost efficiency score of the firm in question. The reference set for cost efficiency consists of one or more firms with cost efficiency scores of one. In DEA revenue efficiency estimation, a set of reference firms with the same or higher revenues and the same or lower input quantities than the firm being evaluated is identified. The revenues of the firm being evaluated are then divided by the revenues of a fully efficient firm based on the output quantities of the linear combination of reference set firms (i.e., firms with revenue efficiency scores of one) and the output prices of the

[4] Charnes, Cooper and Rhodes (1978) are attributed with the linear programming formulation of the efficiency estimation problem and the term "data envelopment analysis."

[5] It should be noted that the linear programming problem is solved for each firm in the sample, and hence, each firm is assigned a set of weights most favorable to it.

firm being evaluated to obtain the revenue efficiency score for the firm in question. It is important to note that firms that are cost efficient need not be revenue efficient. The profit efficiency score equals the ratio of actual profits to optimal (i.e., maximum) profits.[6] For purposes of profit efficiency, optimal inputs and optimal outputs are *simultaneously* determined. Thus, one set of weights is derived that applies to *both* inputs and outputs of reference firms to determine optimal profits. The weights for optimal revenues for revenue efficiency, or optimal costs for cost efficiency, do not, in general, equal one another. Consequently, in general, the reference set of firms differs for cost, revenue and profit efficiency. And, while a firm with a score of one for *both* cost efficiency and revenue efficiency will have a profit efficiency score of one, the converse is not true. That is, a firm might be maximizing revenues (minimizing costs), but not minimizing costs (maximizing revenues). Firms in the reference set are considered fully efficient because they dominate all other firms with similar inputs (revenue efficiency), outputs (cost efficiency), or input-output combinations (profit efficiency) for the respective optimization problem.[7]

Cummins and Zi (1998) apply different methods of efficiency estimation to a sample of life insurers. Their study is the first to estimate cost efficiency for life insurers using DEA. They compare cost efficiency scores and rank correlations among the methods. The rank correlations between DEA and SFA efficiency scores range from .50 to .66. They also find that DEA efficiency scores are more highly correlated with conventional performance measures than estimates from SFA.

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[6] Unlike cost and revenue efficiency scores, profit efficiency scores can be negative or infinite.

[7] A fully efficient firm is also referred to as "self efficient" (Cummins, 1999). Unlike SFA, in DEA all deviations from the relevant frontier are considered inefficiencies.

Next, I provide a more in-depth overview of two academic studies of the economic impact of state regulation on life insurers. These two studies are similar to the present study in purpose, although their data and methodologies differ from my study.

Grace and Klein (2000)

Grace and Klein (2000) pose the questions "Does regulation by the states impose extra costs or inefficiencies that could be avoided through federal regulation?" and "How should regulatory costs be defined and measured?" (p. 80) They identify three basic categories of regulatory costs: (1) government expenditures on regulation; (2) direct costs incurred by insurers in complying with regulation; and (3) indirect costs reflecting market distortions caused by regulation, net of any benefits derived from regulation. An important caveat of the authors is that "evaluating regulatory costs is a formidable task, and we need to do much more work in this area" (p. 82). As noted earlier, states rely primarily on the domiciliary regulator for solvency oversight, but each state regulates the market activities of all insurers operating within its jurisdiction. Consequently, the authors expect a much larger savings in government expenditures related to market regulations than financial regulations by moving to optional federal chartering and regulation of insurers.

Direct compliance costs includes costs related to the following: "submitting applications for licensing; submitting financial and statistical reports; paying for independent audits and regulatory examinations; preparing and submitting rates and forms filings; ensuring internal compliance with state regulations; responding to regulatory inquiries; paying taxes, fees, and assessments." The authors begin their analysis of direct compliance costs by stating "there is little doubt that a state-based

regulatory system significantly increases insurers' regulatory compliance costs" (p. 109), but again note that the potential cost savings are greater for compliance costs imposed by market regulations rather than financial regulations. Indirect costs of regulation are market distortions created by regulation, such as restrictions on insurers' investment portfolios or product offerings. Further, dealing with multiple states may impose additional costs by delays in obtaining approvals for rate or product changes.

Grace and Klein (2000) limit their *quantitative* analysis to direct regulatory expenditures and estimates of compliance costs, and assess indirect costs in qualitative terms. Their sample consists of 1,001 individual insurers for 1997. Their analysis of compliance costs is most relevant to my study because these costs are directly borne by insurers. Interested readers are referred to Grace and Klein (2000) for their evaluation of the other cost categories. Like my study, a premise of their analysis of compliance costs is that "If regulation imposes costs on a firm, then it may show up in the expenses of the firm. Higher expenses, all other thing held constant, should exist in those firms that are more heavily regulated" (p. 117). Their empirical analysis of compliance costs examines the relationship between three expense ratios and two indicators of compliance costs: the amount of business written in a restrictive regulatory environment and the number of states in which an insurer conducts business. In their multivariate regression analysis of life insurers, total expenses, regulatory license and fee expenses, and salary expenses, each divided by direct premiums written, are dependent variables. They include control variables for size (log of premiums), line of business (life, annuity, a/h premiums), ownership form (stock or mutual), distribution system (direct), and group membership (premiums written by group). Their key findings are that all three expense ratios increase

with the number of states licensed, and both the salary expense ratio and the license/fee expense ratio increase with the amount of premiums in restrictive regulatory environments. Finally, each expense ratio is inversely related to (i.e., decreases with) firm size.

McShane and Cox (2006)

McShane and Cox (2006) examine the impact of multi-state regulation on life insurer costs and profitability. These authors use individual insurer data on both single affiliated and single unaffiliated life insurers, and hence, do not use any consolidated group data. Their measure of insurer costs is an expense ratio defined as general expenses, including both insurance and investment expenses, divided by direct premiums written. Their measure of insurer profitability is return on equity defined as net income before federal income taxes and policyholder dividends divided by capital and surplus. Key regulatory variables in their models are the number of states in which the insurer is licensed, an indicator variable for single-state (i.e., licensed in one state) insurers, and an indicator variable for New York licensed insurers. Their models include up to 75 explanatory variables, including market share variables for each of 50 states, and measures of the following: reinsurance, separate accounts, marketing system, financial strength (Best's rating), size (log of assets), geographic concentration, line-of-business concentration, ownership form (stock or mutual), group membership, leverage, line of business mix, and investment composition.

McShane and Cox (2006) find that the expense ratio is not significantly related to the number of states licensed, or to being a single-state insurer. They do find that New York licensed life insurers have a higher expense ratio than insurers not licensed in New

York, consistent with earlier findings of Pottier and Sommer (1998). They also find that insurers with higher line-of-business concentration (i.e., greater specialization) and group members have lower expenses ratios. Lastly, these authors find that return on equity increases with the number of states licensed and is greater for single-state insurers than multi-state insurers. The authors note that size has a pairwise correlation of over .50 in absolute value with the following explanatory variables: the number of states licensed, being a single-state insurer, geographic concentration and financial strength, but that "omitting size did not affect results for any of the other variables." The variance inflation factors, a measure of multicollinearity, "were all below 5.0" (p. 36).[8]

4. Hypotheses and variables

This study includes two sets of dependent variables, one intended to measurer insurer efficiency and the second to measure insurer financial strength. The efficiency variables (first set) include measures of cost, revenue and profit efficiency. Efficiency variables include efficiency scores derived from DEA and conventional performance measures. The conventional measures most analogous to the efficiency scores are the costs-to-benefits ratio, revenue-to-benefits ratio, and return on equity capital. The following explanatory variables are included in one or more regression models, although in some instances, the results are reported only in the discussion, and not in the tables. The two key regulatory variables, number of states licensed and number of states domiciled, are presented first, followed by various control variables.

Number of states licensed

[8] A variance inflation factor (VIF) of 5 implies a R^2 of .8, meaning that for the particular explanatory variable with a VIF of 5, 80 percent of its variation about its mean is explained by the remaining explanatory variables.

Regulatory compliance costs are likely to increase as an insurer expands operations into multiple states and thereby faces regulatory oversight from multiple regulators. The higher regulatory compliance costs should result in higher expenses in relation to benefits/services provided, and hence, lower cost efficiency. Expansion into multiple states may present opportunities to increase revenues relatively more than growth within existing states or insurance consumers may be willing to pay more for insurance from a more geographically visible insurer. Thus, revenue efficiency may increase with an increase in the states licensed. The number of states licensed for a single unaffiliated insurer is simply the sum of the number of states licensed using only the 50 U.S. states and Washington, D.C. For each consolidated group, the number of different states licensed among affiliates within a group is calculated. In other words, within a group, if more than one group member is licensed in a particular state, that state counts as one state licensed for the group even though several group members are licensed in it. A variable used in place of the number of states licensed is a binary variable that indicates that the insurer is licensed in more than one state to capture the efficiency differences between single and multi-state insurers.

Number of states domiciled

While an individual insurer can be domiciled in only one state, a group of affiliated insurers may include insurers domiciled in different states. The incorporation, chartering and formation of a separate legal entity is likely to entail legal, accounting and administrative costs in addition to the costs related to operating as a licensed insurer outside the insured's state of domicile (Petroni and Shackelford, 1995). For example, since solvency regulation focuses primarily on domiciled insurers, each additional state

of domicile in a group of affiliated life insurers potentially increases compliance costs related to financial regulations. In a similar vein, Pottier and Sommer (1998) find evidence that life insurers create subsidiaries domiciled in New York to limit the costs of complying with New York life insurer regulation. Entering a state as a domiciled insurer to isolate unfavorable regulatory impact need not be limited to New York, and therefore, exploring the relation between states domiciled and efficiency is especially relevant to this study. For each consolidated group, a variable is created that equals the number of different states of domicile among affiliates within a group.[9] A variable used in place of the number of states domiciled is a binary variable that indicates that the insurer (i.e., group) is domiciled in more than one state to capture the efficiency differences between single-state and multi-state insurers.

Size

Insurer efficiency is likely to be positively associated with firm size. Economies of scale and economies of scope may vary by firm size (Cummins and Zi, 1998). Historically, larger life insurers have experienced lower rates of insolvency (Best, 2004). Size-related risk differences may be associated with efficiency differences. For instance, higher efficiency whether a result of lower costs or higher revenues increases a firm's net cash flows, which, all else equal, lowers a firm's risk. Since the method of calculating efficiency scores does not allow them to vary because of size alone, including a size variable helps controls for size-related efficiency differences. Firm size is measured as the natural logarithm of total admitted assets. To determine whether results for regulatory variables differ by size group, each sample insurer is assigned to a size quartile based on its assets, and separate analysis is performed on these four separate samples.

[9] Clearly, single unaffiliated life insurers cannot be domiciled in more than one state.

Health insurance

Health insurance differs from life and annuity business in terms of underwriting risks, claim payment patterns, markets served, and regulatory issues. A variable for the proportion of net premiums related to health insurance is included to control for these differences. Thus, the results for the health insurance variables should be interpreted relative to life and annuity business.

Ownership form

Stock and mutual insurers are the dominant ownership forms in the life insurance industry. In the mutual form, the policyholders are the ultimate owners. In the stock form, the owners and policyholders are separate claimants on the insurer's cash flows. The mechanisms available to monitor firm managers differ between stock and mutual insurers, and therefore the relative costs of monitoring managers are likely to differ. The implications of these differences for the operating, financing and investment decisions of life insurers are discussed in Pottier and Sommer (1997). For instance, these authors expect that mutual insurers will be more prevalent in longer-duration life insurance products, such as whole life insurance. The expenses of mutual and stock insurers might differ because of different product characteristics or different managerial incentives (such as the absence of stock-based compensation). The ownership form of a consolidated group is based on the ownership form of the ultimate parent company as reported in Best (2006b). An indicator variable is included to control for whether the insurer is a stock or mutual firm.

Publicly-traded

Publicly-traded companies generally are subject to more extensive financial reporting and other regulatory requirements than privately-held companies. Public firms generally have easier access to capital markets than private firms. In addition, incentives for risk-taking are likely to differ between public and private companies. Publicly-traded insurers are identified from Best (2006b) and *SNL Insurance Quarterly* (SNL Financial, 2005). A binary variable equal to one for publicly-traded insurers is included in the study to control for differences between public and private life insurers.

Multi-line insurer

Life insurers that are affiliated with insurers in other segments of the insurance industry, such as property-liability and health insurance, may have lower costs or higher revenues due to shared resources that result in economies of scope. Berger et al. (2000) examine life-health (l/h) and property-liability (p/l) insurers and "generally find evidence of cost scope economies and revenue scope diseconomies that tend to balance each other out in the profit scope economy measure" (p. 359). That is, while joint producers of l/h and p/l realize cost savings relative to specialist insurers, joint producers experience offsetting revenue decreases. Economies of scope come about when combining operations in related activities reduce costs or increase revenues because multiple products or services cost less to provide or generate more revenue when one firm rather than separate firms sell the products or services. The basis of scope economies is shared resources, such as information systems or customer lists. For purposes of this study, life insurers are defined as multi-line if a group affiliate is on the NAIC property-liability or health insurance annual statement database.

Line-of-business concentration

A line-of-business concentration measure based on the sum of the squared net premium proportions from the five lines of business in Table 1 is used to capture scope economies or diseconomies. A insurer deriving one hundred percent of its net premiums from one line would have a concentration measure of exactly one. A lower concentration measure indicates that the insurer is more diversified across lines of business.

New York insurer

New York is unique among states in that life insurers licensed in New York must adhere to New York regulations in every jurisdiction in which they operate. This regulatory practice is known as "extraterritoriality." Pottier and Sommer (1998) provide an empirical analysis of New York licensed life insurers, including a discussion of key features of New York life insurer regulation. Academic researchers have conjectured that New York licensed insurers might have significantly higher or lower general expenses than insurers not licensed in New York (Harington, 1982; Boose 1990; McShane and Cox, 2006). Following prior literature, a binary variable to indicate whether an insurer is licensed in New York is considered.

Capital ratio

Equity capital is the ultimate cushion against underwriting, investment, financial and other risks facing an insurer. Insurer capitalization is closely monitored by regulators and rating agencies. While reducing insolvency risk, more capital increases an insurer's total capital costs. The ratio of equity capital to admitted assets is included to control for this critical firm characteristic.

Common stock investments

Common stocks are among the most risky investment holdings of life insurers. The ratio of common stock investments to total invested assets is included to control for investment portfolio risk.

Group insurer

The efficiency of group insurers may differ from that of single unaffiliated insurers for several reasons. If group operations are more complex, then that is likely to increase costs (Colquitt and Sommer, 2003). If groups offer more services or products, then insurance consumers may be willing to pay more for these services or products because they value "one-stop shopping." If groups realize economies in adhering to regulations, then their regulatory costs are likely to be lower. Whatever the case may be, it is important to consider whether a sample firm is a group or a single unaffiliated insurer. In addition, many academic studies of life insurers control for whether an insurer is affiliated with a group (Pottier and Sommer, 1997, 1998, 2003; Colquitt and Sommer, 2003).

5. A.M. Best Company financial strength ratings[10]

A.M. Best Company (Best) is the oldest and most widely recognized rating agency specializing in the insurance industry. Best is "dedicated to encouraging a financially strong industry through the prevention and detection of insurer insolvency." In 1928, Best began providing financial strength ratings on U.S. life insurers.[11] An insurer financial strength rating (FSR) represents an opinion as to an insurer's financial strength and

[10] This section draws heavily on the "preface" to Best (2006b), "Overview of Best's Rating System and Procedures."
[11] See http://www.ambest.com/about/events.html.

ability to meet its ongoing obligations to policyholders.[12] It is neither a warranty of expected performance nor a recommendation to purchase insurance from a particular firm.

Best issues two types of rating opinions—interactive and public data. Interactive ratings are based upon public and private sources of information, and range from A++ to F, where E and F ratings indicate insolvency or liquidation, respectively. Financial strength ratings are divided into two broad categories—Secure (A++ to B+) and Vulnerable (B to D). Based on *Best's Insolvency Studies* (Best, 2004), higher rated companies have experienced lower failure (i.e., insolvency) frequency than lower rated companies. The time frame for companies to meet their current and ongoing obligations to policyholders varies with higher rated insurers having greater ability to withstand adverse changes in underwriting, investment or economic conditions over longer periods of time than lower rated insurers. The focus of the remainder of this overview of Best's financial strength ratings is on "interactive" rating opinions.

The assigned interactive financial strength rating is derived from an in-depth evaluation of a company's balance sheet strength, operating performance and business profile, as compared to Best's quantitative and qualitative standards. An important component of the evaluation process is the interactive exchange of information with insurance company's management. The financial reports filed with state regulators and prepared based on statutory accounting principles (SAP) are Best's primary source of information. Best supplements this information with U.S. Security and Exchange Commission (SEC) filings, Generally Accepted Accounting Principles (GAAP) financial

[12] In addition to financial strength ratings, Best provides issuer credit ratings and debt ratings related to financial (non-insurance) obligations, debt and preferred stock issues.

statements, audit reports prepared by CPAs or actuaries, loss reserve reports prepared by loss reserve specialists, confidential documents provided by management, and Best's proprietary "Background and Supplemental Rating Questionnaires," and annual business plans.

Best's FSR opinions are formally evaluated at least once every 12 months, and analysts maintain rating contact with company managements throughout the year and monitor each company's performance. Ratings are reviewed following the receipt of annual and quarterly financial statements, and as needed based on events, such as mergers or acquisitions, legislative or regulatory actions, or dramatic changes in financial information.

The quantitative evaluation of an insurer is based on an analysis of over 100 key financial tests and supporting data for each company. The interpretation of quantitative measurements involves incorporation of more qualitative considerations into the process that may impact future financial strength. A company's quantitative results are compared with industry composites based on many insurance companies with comparable business mix and ownership structure.

For many insurance groups, Best's quantitative evaluation is based on consolidated group financial information. The implicit or explicit support of a parent or affiliate is considered in assigning ratings. Holding companies can provide insurance operating subsidiaries with capital infusions and access to capital markets. Likewise, debt and other financial obligations of a holding company can reduce the financial flexibility of the group and potentially place a strain on future earnings and limit surplus

growth at a subsidiary, as insurance subsidiaries generally fund holding company obligations.

The analysis of underwriting, financial and asset leverage is very important in assessing balance sheet strength. Balance sheet strength measures the exposure of a company's surplus to its operating and financial practices. A conservative level of leverage enables an insurer to better withstand unexpected losses, adverse changes in underwriting results, fluctuating investment returns, and changes in regulatory or economic factors. Underwriting leverage is generated from premiums, annuity deposits, reinsurance and loss or policy reserves. Financial leverage is associated with debt or debt-like obligations, whether at the operating or holding company. Asset leverage is related to a company's exposure to investment, interest rate and credit risks, and measures credit quality and volatility associated with the company's investment portfolio. Best's Capital Adequacy Ratio (BCAR), a measure of the level of capital required to support the risks of the company is useful here. The credit quality and appropriateness of a company's reinsurance program is another important component of balance sheet strength. For instance, the more a company is dependent upon reinsurance, the more vulnerable its underwriting capacity becomes to adverse changes in the reinsurance market. An evaluation of the adequacy of an insurer's reported loss and policy reserves is essential to an evaluation of its profitability, capitalization and liquidity, as net income and surplus are directly affected by changes in reported reserves. The quality and diversification of invested assets are evaluated to assess the risk of default and changes in market values. Liquidity measures a company's ability to meet its expected obligations to policyholders and other creditors in a timely manner. Cash holdings, operational and

net cash flows are important to the analysis of liquidity. The vulnerability of life insurer's to a loss of policyholder confidence, which can lead to a "run on the bank," is considered in the analysis of liquidity.

The analysis of operating performance is primarily concerned with the stability and sustainability of the company's sources of earnings in relation to the liabilities that are retained by the company. Best reviews the main components of earnings, including underwriting, investments, capital gains/losses and total operating earnings, as well as the volatility of these components. Also important to evaluating profitability is the structure of the company (stock vs. mutual) and the length (or duration) of its insurance liabilities. Operating performance is a more significant consideration for insurer's writing long-duration business, as it is the source of long-term balance sheet strength.

Business profile issues can impact operating performance and financial strength and the company's ability to meet its obligations to policyholders. Business profile is influenced by the spread of risk in a company's books of business, geographically, by product and distribution system. An insurer's competitive market position and management experience/quality are business profile considerations. Best places greater emphasis on business profile issues for insurers writing long-duration business, such as life and retirement savings. Competitive advantages include multiple distribution systems, a low cost structure, effective use of technology, superior service, strong franchise recognition, easy and inexpensive access to capital, and underwriting expertise within the book of business. Insurance market risks, such as financial services reform and health care reform can impact the evaluation of business profile. A variety of sudden or unexpected events can potentially impact financial strength. Event risks, such as

significant litigation, changes in management, changes in ownership, changes in parental support, a legal ruling or regulatory development, are another area of the business profile analysis.

Best reports the rating distribution for individual companies, that is, affiliated and unaffiliated single insurers, and "rating units." The term "rating unit" applies to either individual insurers or a consolidation of group members. The rating unit forms the financial basis on which Best performs its rating evaluation. "The financial results of rating units more accurately represent the way insurance groups operate and manage their business." While Best does not assign financial strength ratings to life insurer groups, affiliated single insurers may receive a rating based on consolidation of some or all group members. Such ratings are designated with a "g" modifier. An indicator of the relative frequency of ratings based on the consolidated group is the ratio of rating units to individual ratings across rating categories, wherein a lower ratio indicates more individual insurer ratings are based on the consolidation of group members.[13] This ratio is lowest for A++ and A+ insurers at slightly over 30 percent, and about 65 percent for "secure" ratings overall. The ratio is over 95 percent for "vulnerable" ratings implying that hardly any ratings below B+ are based on consolidated financial information.

Best Insurance Reports, Life-Health Edition (Best, 2006b) contains information on 2,101 entities, which includes 184 consolidated groups. Of the 1,917 "single" insurers, 849 are blue blank, life-health insurers (subsequently referred to as "life"

[13] Individual insurers that are group members (i.e., affiliated insurers) generally have higher ratings than single unaffiliated insurers. For instance, over 87 percent of affiliated life insurers receive a "secure" rating, while 59 percent of unaffiliated life insurers receive a "secure" rating.

insurers).[14] Of the 849 single life insurers, 602 are affiliated life insurers and 247 are unaffiliated. Letter ratings are assigned to 634 of the 849 single life insurers. These 634 rated single insurers consist of 476 single affiliated insurers and 158 single unaffiliated insurers. Of the 476 single affiliated life insurers, 315 receive ratings with a "g" modifier. The 476 single affiliated life insurers compose 156 distinct insurer groups. Thus, there are 314 (comprised of 156 groups and 158 single unaffiliated) unrelated life insurance entities that receive a letter rating.

6. Sample, inputs, and outputs

The data and sample used in this study, inputs and input prices, outputs and output prices are described next.

[14] The number of blue blank life insurers in Best (2006b) is determined by merging *Best's Annual Statement File* for blue blank life insurers (Best, 2006a) with *Best's Insurance Reports, Life-Health Edition* (Best, 2006b). Best (2006b) includes life (blue blank), health (orange blank) and fraternal (brown blank) insurers.

Sample

The analysis is conducted at the life insurer consolidated group and single unaffiliated firm levels. Prior life insurer efficiency studies generally identify the group as the relevant decision making unit for group affiliated insurers (Cummins and Zi, 1998; Yuengert, 1993), but efficiency analysis has also been conducted at the individual insurer level even for group affiliated insurers when the research question suggested that the individual firm was the relevant unit of analysis (see Cummins, Eckles and Zi, 2006) or due to data limitations since life insurers are not required to prepare consolidated regulatory financial statements.

The present study relies on ***three*** sources of information. Individual insurer and consolidated (i.e., group) financial statement data are obtained from *Best's Annual Statement File, Life-Health Edition* (Best, 2006a)[15] for "life" (blue) annual statement insurers. The consolidated data include life (i.e., blue blank) affiliated insurers only[16]; that is, affiliates that do not file a life (blue) annual statement blank, such as health or property-casualty affiliates, are not included. The data from Best is supplemented with financial statement and other firm-specific data reported to the NAIC on the Life-Accident-Health annual statement (blue) blank (subsequently referred to as "NAIC statement") for data fields that are consolidated by summing values across group members based on group numbers in Best (2006a).[17] All financial statement data is for

[15] Prior-year data (i.e., 2004), where applicable, is obtained from the prior-year's *Best's Annual Statement File*.

[16] A single unaffiliated life insurer is defined as an individual life insurance company that does not have any life insurance affiliates filing with A.M. Best Company. Thus, they may have affiliates in other lines of insurance. For my sample, none of the single unaffiliated life insurers had affiliates in the health or property-casualty NAIC database.

[17] This is based on a review of consolidated data items in Best (2006a). The group membership based on the NAIC group code and the Best (2006a) group code differed for six "Best" groups. These six "Best" groups were assigned to three groups based on the NAIC group code. Further investigation into company

the 2005 annual statement year. The number of states in which an insurer or insurer group is licensed or domiciled is derived from data reported in the NAIC statement for the 2005 data year. Firm-specific non-financial data, such as ownership form, year commenced business, publicly-traded, and financial strength ratings are obtained from *Best's Insurance Reports, Life-Health Edition* (Best, 2006b) and are based on the 2005 annual statement year. Health insurers filing on the "health" (orange) annual statement blank and fraternal (brown annual statement blank) life insurers are not part of the A.M. Best life insurance industry sample even though they may be in Best (2006b).

The sample is limited to active life insurers that are not technically insolvent (i.e., liabilities do not exceed assets). Specifically, sample insurers must have positive values for admitted assets, gross premiums written, net premiums written, and equity capital. In addition, sample firms must have reasonable levels of inputs and outputs (see Table 1)—thus, firms with negative total net incurred claims (sum of outputs one to five) or negative individual inputs are also eliminated. After applying these sample screens, all remaining firms had values for outputs 6 to 11 greater than or equal to zero. Sample firms are also required to be on the NAIC and Best databases because these data sets are merged to create some of our measures. In addition, all life insurers in a group of affiliated life insurers, as defined by Best, must be on the NAIC database in order for that group to be included in the sample. This simply assures that the group data used corresponds to the complete life insurer group. Further, life insurers that obtain more than 50 percent of their gross premiums from reinsurance assumed are considered to be primarily engaged in the reinsurance business and are excluded from the sample. Lastly, single unaffiliated

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ownership and affiliations revealed that the Best group codes reflected the correct group membership as of December 31, 2005.

life insurers must be domiciled and licensed in the U.S., and for consolidated groups, one or more groups members must be domiciled and licensed in the U.S.

As shown in column 2 of Tables 2 and 3 the A.M. Best industry sample consists of 166 consolidated groups and 252 single unaffiliated life insurers for a total of 418 life insurers. The sample requirement that all group members are in the NAIC annual statement file results in a loss of 13 groups. The sample requirement that single unaffiliated insurers are in the NAIC annual statement file resulted in a loss of 17 individual insures. Therefore, before any additional screens are applied, the sample includes 388 observations, of which 153 are consolidated groups and 235 are single unaffiliated companies. Screens related to assets, premiums, and equity capital, reduced the sample by an additional 28 insurers. The sample is further reduced by 35 reinsurers and 7 insurers not domiciled in the U.S. Screen related to inputs and outputs reduced the sample by 34 insurers, resulting in a final sample of 284 life insurers, as shown in column 3 of Tables 2 and 3. These criteria applied to life insurers that receive a letter rating from A.M. Best Company for the 2005 annual statement year results in a "rated" sample of 241 life insurers, as shown in column 4 of Tables 2 and 3.

Inputs and input prices

Life insurer inputs (costs) consist of general expenses, taxes, licenses and fees (excluding federal income taxes), commissions on direct business, commissions and expense allowances on reinsurance assumed, and financial capital. These inputs are grouped into six categories: agent labor, administrative labor, business services, equity capital, policy reserve capital, and deposit-fund capital. In a study of property-liability insurer distribution system efficiency, Berger et al. (1997) use the sum of loss reserves

and unearned premium reserves as their measure of debt capital (p. 529). Life insurer liabilities, which consist mainly of policy reserves and deposit funds, are analogous to risky debt, and like debt, are a costly source of capital (Cummins and Danzon, 1997). General expenses are reported on Exhibit 2, and taxes, licenses and fees (excluding federal income taxes) are reported on Exhibit 3, both of the annual statement blank.[18] General expenses include investment expenses related only to general-account investments, salary and wage expenses, and other operating expenses, except for policyholder claims and benefits. The amount of equity capital is reported on the "Summary of Operations" annual statement page. The amount of policy reserves and deposit-fund liabilities are reported on the "Liabilities, Surplus and Other Funds" annual statement page. Policy reserves consist of aggregate reserves for life, annuity, accident and health insurance, and are reported by the lines of business used in this study on Exhibits 5 and 6 of the annual statement.

Input prices are determined as follows. For administrative labor, agent labor and business services, the 2005 national "average weekly earnings of production workers" from the U.S. Department of Labor Bureau of Labor Statistics for direct life and health insurers, insurance agencies and brokerages, and professional and business services, respectively, are used, as in several other studies (Cummins and Zi, 1998; Cummins, Tennyson and Weiss, 1999; and Cummins, Eckles and Zi, 2006). The cost of equity capital is the 2005 average one-year Treasury constant maturity rate from the Federal Reserve Bank of St. Louis plus the long-horizon equity risk premium from Ibbotson

[18] Unless noted otherwise, input and output data are obtained from the regulatory Annual Statement Blank for Life-Accident-Health Insurers as contained in Best (2006a) or the NAIC annual statement database.

Associates (2006).[19] The cost of policy reserve capital is assumed to equal the 2005 average one-year Treasury constant maturity rate of 3.62 percent, which I considered reasonable based on my knowledge of guaranteed minimum interest crediting rates on life insurance policies. The cost of deposit-fund capital is assumed to equal the investment earnings credited on deposit-funds divided by the amount of deposit-fund liabilities. The average of the beginning and end of year balance of capital and surplus is used for equity capital. The year-end balances are used for reserves and deposit-funds.

[19] The Treasury rate and equity risk premium are 3.62 and 7.1 percent, respectively, making the assumed cost of equity 10.72 percent.

Outputs and output prices

Outputs (benefits) relate to the risk pooling, real service and financial intermediation functions as described earlier. The benefits related to each function are not separable based on available accounting data. For example, part of any death benefit on a whole life policy is associated with the accumulated reserve or cash value and the remaining part is pure risk protection. Outputs (benefits) consist of net incurred claims (i.e., death, annuity, disability, accident and health benefits) and invested assets. Net incurred claims are obtained from "Exhibit 8—Claims for Life and Accident and Health Contracts" of the of the annual statement and are grouped into five lines of business, namely individual life, group life, individual annuities, group annuities, health (i.e., accident and health). Average invested assets are allocated to these five lines of business and deposit-fund business[20] based on the ratio of reserves corresponding to each of the five lines of business or deposit-funds to the sum of reserves and deposit-fund liabilities. Inputs and outputs are summarized in Table 1.

Revenues related to the eleven outputs consists of premium and annuity considerations, net investment income, commissions and expense allowance on reinsurance ceded, separate account net gain from operations, separate account fees, and deposit-type contract fees.[21] These items are obtained from line 9 of the "Analysis of

[20] Deposit-type contracts are defined as any contract "in which the reporting entity does *not* assume any mortality, morbidity, health benefit costs incurred, or casualty risk and which act exclusively as investment vehicles" (Best, 2006b). Beginning in 2001, amounts received as payments for deposit-type contracts are no longer recorded as revenues or premiums. Rather, they are recorded directly as a liability.

[21] Separate account assets are maintained independently from an insurer's general account assets and used primarily for retirement plans, variable life insurance, and variable annuities. The investments are not subject to state investment regulations, such as limitations related to equity investments, or credit quality restrictions. Costs and benefits of separate accounts that flow through the general account annual statement are included.

Operations by Line of Business" of the annual statement. The revenues are grouped into the same five categories as outputs one to five.[22]

Output prices for outputs one to five are defined as the ratio of total revenues less net investment income divided by the output level (each by line amounts). Output prices six to ten are defined as the ratio of net investment income less interest on deposit funds by line, as reported in the "Analysis of Operations by Line of Business," to the corresponding output level. The output price for output eleven, deposit-fund business, is the ratio of interest on deposit funds (summed across lines) to output eleven.[23] These "actual" output prices are truncated at the 10^{th} and 90^{th} percentiles of positive values, and firms with an output price outside this range are assigned the nearest truncated value.[24]

7. Empirical analysis—state regulation and life insurer efficiency

The empirical analysis of state regulation and life insurer efficiency consists of sample summary statistics, correlations between variables, and multivariate ordinary least squares regressions, as discussed next. Efficiency scores are estimated using data envelopment analysis and assuming constant returns to scale.[25]

Descriptive statistics

The financial significance of the full sample of 284 observations is apparent from the summary balance sheet and summary income statement in Tables 2 and 3,

[22] While I would prefer to include net realized capital gains (losses) as a financial intermediation component of revenues, this item is not available by line of business. It averages under one-half of one percent of total revenue for sample firms. To the extent that capital gains (losses) are reinvested, they are included in the balance of invested assets.

[23] This approach to defining output prices is generally similar to that in Cummins, Tennyson and Weiss (1999) who employ five outputs, except that I separate net investment income from premium (and other) income in the numerator because my study includes an additional six outputs that are based on invested assets.

[24] This is similar to Cummins, Eckles and Zi (2006) except that they use the 5^{th} and 95^{th} percentiles of positive values.

[25] DEA Solver Professional Version 5.0 software is used to estimate efficiency scores.

respectively. Column 2 of Tables 2 and 3 contains information on life insurance industry totals for the Best population (henceforth population) of 418 life insurance firms. Column 3 of Tables 2 and 3 contains information on the full sample of 284 life insurers that meet the sample criteria described earlier in section 6. Column 4 of Tables 2 and 3 contain information on the sample of 241 life insurers that receive a letter rating from A.M. Best Company and meet the same sample criteria as the full sample of 284 firms.

The 284 sample firms have assets of $3.8 trillion and capital of $208 billion, which represents 86 percent of assets and 85 percent of equity capital of the population of 418 life insurance firms. The sample firms generated revenues (total income) of over $634 billion, or about 87 percent of life insurer population totals, and provided benefits to policyholders, annuitants, and their beneficiaries of $445 billion or 85 percent of life insurer population totals. The $138 billion, or almost 22 percent, of total revenues derived from net investment income attests to the role of life insurers as financial intermediaries. Based on my review of earlier life insurer efficiency studies, according to these financial measures, my study includes a larger proportion of the life insurance industry than any prior academic work.

Summary statistics on the sample of 284 life insurers are presented in Panel A of Table 4. The median assets and net premiums written of sample firms are $398 million and $80 million, respectively. The range of assets and premiums suggests that very small and very large firms are included in the sample. For instance, firms in the smallest and largest "financial size category" (out of 15 categories) as defined by Best (2006b) are represented. The median firm is well capitalized with a capital to assets ratio of nearly 14 percent. Profitability of the median firm is modest with a return on equity of only 9.6

percent. Health insurance represents 33.5 percent of net premiums, with life and annuity premiums accounting for the balance, based on sample means. The mean and median of the line of business (lob) concentration ratio exceed 63 percent, suggesting moderately high lob specialization among sample firms.[26] This is not surprising given the very low (under 1 percent) share of premiums from group life, group annuity and individual annuity business for most sample firms. Among sample firms, 100 firms generate 50 percent or more of net premiums from individual life and 89 firms generate 50 percent or more of net premiums from health insurance.

As Panel A of Table 4 indicates, the mean cost efficiency score is 61.5 percent, and ranges from 2.7 percent to 100 percent. The mean revenue efficiency score is 33.9 percent, and ranges from 2 percent to 100 percent. Twenty-eight firms are cost efficient, 26 firms are revenue efficient, and 131 firms are profit efficient. Seven firms are both cost and revenue efficient, and hence are among the profit efficient firms. These cost efficiency scores are higher than the ones reported in prior studies of life insurer efficiency using DEA, while the revenue efficiency scores are about the same.[27] Profit efficiency scores were not reported in prior life insurer efficiency studies.

Summary statistics for the full sample of 284 firms related to categorical variables are shown in Table 5. Among the 134 groups in the sample, slightly more than half have more than two group members (i.e., single affiliated life insurers), and over 20 percent

[26] If an insurer had an equal proportion of net premiums from each of the five lines used in the concentration measure, then their line-of-business concentration ratio would be 20 percent. If all premiums were from one line of business, then the ratio would be 1. A lob concentration ratio of 63 percent corresponds to approximately 75 percent of premiums from one line, and 25 percent of premiums from a second line.

[27] In prior studies, DEA mean cost efficiency scores range from about .35 to .46 (Cummins and Zi, 1998; Cummins, Tennyson and Weiss, 1999; Cummins, Eckles and Zi, 2006) and revenue efficiency scores range from about .33 to .38 (Cummins, Eckles and Zi, 2006).

have 5 or more group members, as the "entities" variable indicates. The number of group members is likely to be positively related to the number of acquisitions by the group as well as the number of domiciliary states within the group. The number of states domiciled is two or more for 92 of the 134 groups (about 69 percent). Of the 284 sample firm, 258 (90.8 percent) are licensed in more than one state, and 74 are licensed is every U.S. state and Washington, DC. Of the 40 insurers licensed is all but one of the states, 33 are not licensed in New York (all 40 are licensed in Washington DC), making New York the state most avoided by life insurers. All but five sample firms commenced business over ten years ago, over 95 percent have been in business more than 20 years, and over half have been in business over 50 years. The stock ownership structure is far more common than the mutual (with a ratio of more than 2.7 stock firms to each mutual firm), but the importance of mutual insurers to the life insurance industry should not be assessed based merely on their number, as some prominent life insurers are mutual firms. Over 20 percent of sample life insurers have property-liability insurance or health insurance affiliates—62 life insurers are multi-line since 6 have both property-liability and health insurance affiliates.[28]

Pairwise Spearman correlations among efficiency scores and other variables are shown in Table 6. The cost efficiency score is highly negatively correlated (-.84) with the ratio of cost to benefits, which is a more conventional performance measure. The high negative correlation is not surprising when one considers that the cost efficiency score is, generally speaking, a ratio of optimal costs to actual costs for a given level of benefits, or equivalently, outputs. Therefore, firms with higher costs to benefits, all else

[28] None of the single unaffiliated life insurers are multi-line; that is, they did not have any p/l or health insurance affiliates.

equal, should have lower cost efficiency scores. The strong negative correlation between cost efficiency and the revenue-to-benefits ratio (-.58) as well as the very high positive correlation between the costs-to-benefits ratio and revenue-to-benefits ratio (.76) suggest that increases in costs, or cost inefficiencies, are offset to a large extent with revenue increases. Profit efficiency is positively correlated with cost efficiency (.46) and revenue efficiency (.54) consistent with higher costs being offset with higher revenues. As expected, return on equity is positively correlated with cost, revenue and profit efficiency scores. The proportion of premiums from health insurance is negatively correlated with cost efficiency scores and positively correlated with revenue efficiency scores, while its correlation with profit efficiency is not significantly different from zero. Likewise, the health line variable is positively correlated with costs to benefits (.56) and revenue to benefits (.55), consistent with higher revenues offsetting higher costs. Line-of-business concentration is negatively correlated with cost efficiency scores and positively correlated with revenue efficiency scores, which might indicate negative cost scope economies and positive revenue scope economies. For additional correlations, the reader is referred to Table 6.

As presented in Table 6, life insurer size, measured in assets, is positively correlated with cost efficiency scores (.48), but not significantly correlated to revenue efficiency scores. Assets exhibit high positive correlation with the number of states licensed (.81), number of states domiciled (.56), and the number of entities in a group (.60). Both the number of states licensed and the number of states domiciled are positively correlated with cost efficiency scores, and not significantly related to revenue efficiency scores. As expected, the number of entities in a group is very positively

correlated with both the number of states domiciled (.82) and the number of states licensed (.63).

Regression results

The results of the cross-sectional regression analysis are shown in Tables 7 and 8. Table 7 presents regressions of efficiency measures on size and regulatory variables. The regressions in Table 8 include the variables in Panel A of Table 7 and control variables for additional firm characteristics.

The results in Table 7 provide strong support for the central hypothesis of this study. Briefly stated, life insurers that are subject to the regulation of multiple states incur higher costs relative to benefits and realize lower cost efficiency. Life insurers are exposed to the regulation of multiple states when they obtain a license to operate in additional states or when they form a separate company (i.e., affiliated insurer) or legal entity to domicile in another state. Cost efficiency scores are significantly lower for insurers licensed or domiciled in multiple states, as the shown in columns 2 and 5. On average, an insurer domiciled in more than one state has a cost efficiency score slightly over 12 percentage points lower than an insurer domiciled in only one state. Further, on average, an insurer licensed in more than one state has a cost efficiency score about 8.7 percentage points lower than an insurer licensed in only one state.

The results on revenue efficiency, as shown in Panel A of Table 7, are generally weaker than the results on cost efficiency. The number of states licensed is significantly positively related to revenue efficiency scores (column 6, Panel A). Contrary to cost efficiency, larger insurers tend to have lower revenue efficiency, as the negative coefficient on the size variable in columns 3 and 6, Panel A, implies. In general, the

regressions with revenue to benefits as the dependent variable (Panel B, columns 3 and 6) support the notion that revenues increase as the number of states licensed or domiciled increases, which supports the earlier observation based on correlations that increased costs associated with multiple regulators are partly offset by increased revenues generated by operating in more states. As shown in Table 7, the results on profit efficiency (Panel A, columns 4 and 7) and the results on the return on equity (Panel B, columns 4 and 7) provide further evidence that the higher costs associated with multiple state regulation are offset with higher revenues to the extent that profitability is not unfavorably (or favorably) impacted.

The addition of control variables for other firm characteristics does not change the overall conclusions based on Table 7 results. As the results in Table 8 demonstrate, multiple state regulation significantly reduces cost efficiency (columns 2 and 3), and does not have any significant impact on revenue (columns 4 and 5) or profit efficiency (columns 6 and 7). Remarkably, three of the four significant regulatory variables from Table 7 are still significant (only multiple states licensed is no longer significant) in the cost efficiency regressions in the presence of the extensive set of control variables. The analysis presented in Table 8 does reveal that several other variables are significantly related to cost, revenue, and profit efficiency scores. In particular, better capitalized firms have lower cost, higher revenue, and lower profit efficiency. More health insurance premiums are associated with lower cost, higher revenue, and higher profit efficiency.[29] Higher line-of-business concentration significantly increases revenue efficiency, but does

[29] According to Best (2006c), 116.8 billion dollars of net accident and health insurance premiums are reported on the "Life-Accident-Health" annual statement blank and 326.9 billion dollars of premiums are reported on the "Health" annual statement blank. Consequently, the reader is cautioned against making any generalizations regarding health insurer efficiency considering that most health insurers are not included in the current sample.

not affect cost or profit efficiency. Results suggest that mutual insurers may be less profit efficient than stock insurers. Life insurers with property-casualty affiliates have lower costs efficiency (marginally insignificant) and lower revenue efficiency, but not any significant difference in profit efficiency. In section 4, "hypotheses and variables," further economic rationale is provided that may help explain these results related to control variables.

Size quartile analysis

The potential importance of firm size is widely recognized in the finance and economics literature (see Smith and Watts, 1992), and more specifically, in life insurer efficiency studies (see Cummins and Zi, 1998). The sample of 284 firms is disaggregated into four groups of 71 firms each based on each insurer's size quartile. For each size quartile, the cost efficiency scores are regressed on the log of assets, and indicator (i.e., binary) variables for insurers licensed or domiciled in multiple states. As shown in Table 9, the overall finding that cost efficiency decreases as an insurer is subject to multiple state regulatory jurisdictions is confirmed in these size quartile regressions, with the exception of the second size quartile. The coefficient on the multiple states licensed variable is negative and significant for the first quartile only with a value of -.127 (column 2). The coefficient on the multiple states domiciled variable is negative and significant for quartiles three and four (columns 4 and 5) with a value of -.143 and -.119, respectively.

The significant coefficients on the regulatory variables in Table 9 are used to estimate the potential cost imposed by multi-state regulation of life insurers. The costs associated with multi-state regulation are calculated for each size quartile as follows[30]:

> -1 X {[(number of multi-state insurers in quartile)/71 X (coefficient on multi-state indicator variable for quartile, if significant; zero otherwise) X (sum of general insurance expenses, taxes, licenses and fees for insurers in quartile)] + [(number of multi-domicile insurers in quartile)/71 X (coefficient on multi-domicile indicator variable for quartile, if significant; zero otherwise) X (sum of general insurance expenses, taxes, licenses and fees for insurers in quartile)]}/mean cost efficiency score for quartile

The data required for the above calculation and the estimated cost savings for each quartile are contained in Tables 9 and 15. As shown in Table 15, the current system of multiple regulators is estimated to increase life insurer aggregate (i.e., industry total) costs approximately $5.7 billion annually compared to a single regulator system. One should recall that the derivation of cost efficiency scores involves identifying a "reference set" or "peer group" of firms with the same outputs, where a unit of a particular output, such as "individual life insurance," produced by a single-state insurer is equivalent to a unit of that output produced by a multi-state insurer. As discussed earlier, the profit efficiency results suggest that the increased costs of multi-state regulation are recovered in higher revenues. Thus, insurance consumers appear willing to pay more for products

[30] The analysis implicitly assumes that only actual costs change due to multiple state regulation, not optimal costs. The percentage increase in actual costs, at the sample mean, is equal to the negative of the coefficient on the binary regulatory variables divided by the mean cost efficiency score (calculated separately for each size quartile).

(i.e., outputs) of multi-state insurers, which may reflect differences in product quality or service compared to single-state insurers.[31]

8. Empirical analysis—state regulation and life insurer financial strength

The empirical analysis of state regulation and life insurer financial strength consists of sample summary statistics, correlations between variables, and multivariate logistic regressions, as discussed next.

Rating variable

The dependent variable in the regressions in this section is Best's financial strength rating transformed into integer values that range from 1 to 6, as noted in Table 12. As mentioned in Section 5, Best does not assign ratings to consolidated life insurer groups, but does base some individual group member's ratings on the consolidated group ("g" modifier ratings). Since "g" modifier ratings are available for only about two-thirds of the consolidated groups, I assigned ratings to consolidated groups using the rating of the largest individual insurer in each group based on admitted assets, which also is the highest rating in the group for more than 97 percent of group members.

Descriptive statistics

The rated sample of 241 firms generally represents over 99 percent of the full sample of 284 firms based on the summary financial statement information provided in Tables 2 and 3. The aggregate financial statement amounts for the 241 firm (rated) sample (column 4, Tables 2 and 3) generally represents more than 84 percent of industry totals (column 2, Tables 2 and 3). The rated sample includes 76 percent of life insurer

[31] Berger, Cummins and Weiss (1997) find that significant cost inefficiencies associated with independent agency insurers are made up in revenues resulting in no significant differences in profit efficiency. They conclude that there are unmeasured product/service quality differences between exclusive and independent agency insurers.

groups and 46 percent of single unaffiliated life insurers. The $3.78 trillion in admitted assets of the rated sample is 99.7 percent of the full sample; premiums and annuity considerations for the rated sample are 99.6 percent of the full sample. The rated sample includes 94 percent of the consolidated groups (126/134), and 76.7 percent of the single unaffiliated life insurers (115/150) in the full sample. In summary, the rated sample includes virtually all economically and nationally significant life insurers operating in the U.S.

Summary statistics on the sample of 241 rated life insurers are presented in Panel B of Table 4. In relation to unrated insurers, firms in the rated sample are larger based on all size measures in Table 4 (assets, capital, net premiums, gross premiums, net income), have lower capital to asset ratios, write relatively more health insurance, are more diversified by line of business, have right revenue-to-benefits ratios, and higher return on equity, with all differences being statistically significant at the .10 level or lower. Cost and profit efficiency scores are not significantly different between rated and not rated life insurers. In regards to categorical variables reported in Table 5, all differences between rated and unrated insurers are statistically significant. Rated insurers are licensed in more states, domiciled in more states, have more affiliated entities, are older, and more prevalent among mutual insurers, group insurers, New York licensed insurers, publicly-traded insurers, and multi-line insurers.[32]

Summary statistics for the rated sample of 241 firms related to categorical variables are shown in Table 10. The analogous table for the full sample is Table 5. Almost 20 percent of the rated sample receives a "superior" (A++ or A+) financial

[32] The Wilcoxon (rank sum) test is used to compare variables in Table 4 for the rated and unrated insurers. The Chi-squared test is used to compare the categorical variables (Table 5).

strength rating from A.M. Best Company, and only 11.6 percent are considered "vulnerable" (B and lower) by Best. More than 58 percent (140/241) of rated life insurers receive an A- or higher rating. Over 95 percent of the rated sample is licensed in more than one state, while about 91 percent of the full sample is licensed in more than one state.

Pairwise Spearman correlations for the rated sample are presented in Table 11. The correlations between the financial strength ratings and other variables are unique to Table 11. Higher ratings are most significantly correlated with insurer size as measured by assets (.75). Cost efficiency is positively correlated with ratings (.38) and cost to benefits negatively correlated with ratings (.47). The two regulatory variables in Table 11, states licensed (.55) and states domiciled (.39), are positively correlated with ratings, a likely reflection of the strong positive correlation that these two regulatory variables have with firm size. Generally, correlations between variables in the rated sample are similar to the ones reported in Table 6 for the full sample, and therefore are not discussed further.

Regression results

The results of the regression of the rating variable on regulatory and other firm-specific variables are shown in Table 12. As shown in columns 2 through 5, the coefficients of the regulatory variables are not significantly different from zero, implying that multiple state regulation does not have any effect on the financial strength ratings of life insurers. The multivariate results across regressions in Table 12 indicate that larger insurers (i.e., higher log of assets) receive higher financial strength ratings. As results in columns 6 and 7 show, insurers that are better capitalized based on the capital to assets

ratio have higher ratings, while insurers with relatively more health premiums have lower ratings.

In Table 13, results from regressing ratings on the six efficiency measures are reported. In brief, after controlling for size, the efficiency variables are insignificant; that is, they do not explain the cross-sectional variation in ratings.

Table 14 presents regression results for the subsample of rated insurers with profit efficiency scores below one. These 107 life insurers are not profit efficient. Consequently, these insurers are not fully recovering the additional costs of multiple state regulation through higher revenues. The results in columns 3 and 4 of Table 14 support an unfavorable impact on life insurer ratings due to multiple state regulation. Specifically, insurers that are licensed in multiple states and insurers domiciled in more than one state have lower ratings, after controlling for size. Since a lower rating implies a higher likelihood of insolvency, these insurers are likely to face higher capital costs for their financial obligations and receive lower premiums, as investors and consumers recognize the lower financial quality of these firms. The economic significance of these 107 insurers is reflected in their aggregate net premiums of $169.6 billion and admitted assets of $1.38 trillion, or more than 36 percent of the corresponding full sample values.

9. Summary and conclusion

Under the current state regulatory system, life insurers who sell insurance in more than one state must obtain a license for each additional state entered or form a separate insurance company domiciled (and licensed) in the state of entry. Regardless of the mode of entry, multi-state insurers face multiple regulatory bodies and multiple sets of regulations with which to comply. In light of recent proposals for an “Optional Federal

Charter" (see ACLI, 2005), the present study examines the following two questions: first, do life insurers operating under multiple state regulatory jurisdictions experience an unfavorable (or favorable) impact on their cost, revenue, or profit efficiency?; second, do life insurers operating under multiple state regulatory jurisdictions experience an unfavorable (or favorable) impact on their financial strength rating?

Two prior academic studies examined the first question for life insurers using conventional performance measure and single entity data, with conflicting results. One study found that expense ratios increased significantly with the number of states licensed, and another did not. The present study strives to improve upon this earlier work in two important ways. First, this is the first study to use multi-dimensional efficiency scores to evaluate the impact of increased regulation on life insurers. These modern efficiency scores require the specification of life insurer inputs and outputs, and are derived through a linear optimization method based on broadly accepted economic theory. Second, this is the first study to employ consolidated financial and other entity-specific data for group-affiliated life insurers to examine the relation between multiple regulators and life insurer efficiency. Another innovation closely related to using consolidated data is considering how entering states as a domiciliary insurer effects efficiency. Thus, this is also the first study to estimate the relation between states domiciled and efficiency.

This study provides results on a near population of U.S. life insurers representing 284 life insurance entities with combined assets of $3.8 trillion. Of the 284 sample firms, 74 are national insurers, licensed in every U.S. state and the District of Columbia. Not surprisingly, an insurer's size, as measured by admitted assets, is strongly positively correlated with states licensed, states domiciled, and life insurance affiliates in a group,

all expected correlates with regulatory costs. Multivariate regression analysis is conducted using conventional performance measures and efficiency scores to assess the relation between efficiency and state regulation. The two key regulatory variables are number of states licensed and number of states domiciled.

The principal findings suggest that a life insurer's cost efficiency declines significantly as the number of states licensed or domiciled increases, and increases with an insurer's size. Further, this decline in cost efficiency is smaller for the largest life insurers. Overall, revenue efficiency scores do not support any regulatory impact (favorable or unfavorable). However, evidence is found that the unfavorable regulatory impact on cost efficiency is offset to some degree by increased revenues in relation to benefits provided. In other words, the higher costs associated with multiple regulators is passed along to insurance consumers to some extent in the form of higher premiums or fees. Based on parameter estimates from the cost efficiency regressions, the potential cost savings related to a "single regulator," somewhat similar to what would be the case under the proposed Optional Federal Charter, exceed $5.7 billion, or about 1¼ percent of net premiums, annually. The analysis of the relation between state regulation and financial strength ratings suggests the potential for further savings in capital costs and insolvency costs.

Finally, an important caveat is in order. The present regulatory financial reporting system does not specifically identify or separate regulatory compliance costs from other costs that might be inherent to expansion into more states. Therefore, as Grace and Klein (2000) observe, "evaluating regulatory costs is a formidable task." The present study relies on the premise that if regulation imposes costs on firms, then all else equal, firms

subject to multiple regulators will have higher costs than firms subject to a single regulator. By comparing firms that provide similar benefits to life insurance consumers, and adding various control variables, the current study reasonably adheres to the principle of "all else equal" in finding evidence consistent with inefficiencies related to the present state-based insurance regulatory system. Further investigation of the drivers of life insurer efficiency and analysis of regulatory costs are likely to be promising areas of future research.

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Table 1
Inputs and Outputs

Inputs
Agent labor
Administrative labor
Business services
Equity capital
Policy reserve capital
Deposit-fund capital
Outputs
Individual life insurance, net incurred claims
Group life insurance, net incurred claims
Individual annuities, net incurred claims
Group annuities, net incurred claims
Accident and health insurance, net incurred claims
Individual life insurance, average invested assets
Group life insurance, average invested assets
Individual annuities, average invested assets
Group annuities, average invested assets
Accident and health insurance, average invested assets
Deposit-funds, average invested assets

Table 2
Summary Balance Sheet
2005 Annual
(Thousands of Dollars)

1	2	3	4
Description	A.M. Best Industry Totals	Full Sample Totals	Rated Sample Totals
Invested assets	2,801,374,860.4	2,483,464,756.9	2,474,836,016.2
Separate account assets	1,467,101,092.6	1,205,246,415.3	1,204,898,236.6
Total admitted assets	4,391,056,379.3	3,789,687,962.2	3,780,364,770.8
Life and annuity reserves	1,876,331,919.4	1,681,004,830.2	1,674,902,881.0
Accident and health reserves	136,150,978.1	115,685,724.5	115,277,851.1
Liability for deposit-type contracts	319,223,718.5	291,089,823.3	290,574,243.6
Separate account liabilities	1,467,101,092.6	1,205,246,415.3	1,204,898,236.6
Capital and Surplus	245,419,412.7	208,030,015.7	206,853,229.0
Consolidated life insurer groups	166	134	126
Single unaffiliated life insurers	252	150	115
Number of life insurers (N)	418	284	241

Table 3
Summary Income Statement
2005 Annual
(Thousands of Dollars)

1	2	3	4
Description	A.M. Best Industry Totals	Full Sample Totals	Rated Sample Totals
Premiums and annuity considerations (net)	530,070,105.4	453,895,379.8	452,157,322.3
Net investment income	155,639,647.9	138,026,516.4	137,563,485.9
Total income	733,424,575.4	634,580,340.0	632,225,495.2
Total benefits	523,414,204.9	445,580,203.5	444,093,652.1
Commissions on direct premiums and deposit-type contracts	39,294,128.7	34,137,667.2	33,996,738.2
Commissions and expenses on reinsurance assumed	8,920,095.9	5,618,862.4	5,614,904.9
General insurance expenses incurred	54,546,520.7	47,613,004.1	47,310,867.9
Insurance taxes, licenses and fees (excluding federal income taxes) incurred	7,215,941.7	5,986,977.4	5,958,271.8
Net gain from operations before dividends to policyholders and federal income taxes	58,078,411.1	51,208,763.9	51,081,642.1
Net realized capital gains	3,168,168.1	2,816,189.8	2,839,617.2
Net income	36,535,991.2	31,691,209.9	31,593,182.3
Consolidated life insurer groups	166	134	126
Single unaffiliated life insurers	252	150	115
Number of life insurers (N)	418	284	241

Table 4
Summary Statistics
(Thousands of dollars)

Variable	Mean	25th Percentile	Median	75th Percentile	Range
	Panel A: Full Sample (N=284)				
Assets	13,343,971.7	60,593.6	398,596.9	3,050,430.0	407,777,397.7
Equity capital	732,500.1	13,296.6	52,788.0	305,966.0	19,784,466.4
Net premiums	1,598,223.2	13,276.9	80,517.5	532,984.4	44,731,359.1
Gross premiums	1,873,256.4	21,463.2	105,744.0	604,875.0	55,925,643.6
Net income	111,588.8	430.0	3,990.4	33,457.9	3,239,402.5
Capital/assets	0.229	0.076	0.135	0.328	0.935
Health npw/npw	0.335	0.002	0.136	0.719	1.000
Line of business concentration	0.662	0.481	0.637	0.878	0.763
Cost efficiency	0.615	0.421	0.636	0.798	0.973
Revenue efficiency	0.366	0.159	0.295	0.472	0.978
Profit efficiency	0.577	0.163	0.570	1.000	1.000
Costs/benefits	0.120	0.035	0.061	0.143	1.919
Revenues/benefits	0.339	0.168	0.244	0.437	1.952
Return on equity	0.099	0.034	0.096	0.157	1.128
	Panel B: Rated Sample (N=241)				
Assets	15,686,160.9	91,962.0	579,523.7	3,997,630.4	407,774,598.5
Equity capital	858,312.2	21,107.8	79,416.4	469,598.1	19,782,181.2
Net premiums	1,876,171.5	31,146.2	111,432.1	727,032.9	44,731,340.6
Gross premiums	2,199,027.8	41,204.2	133,461.5	842,165.9	55,925,533.0
Net income	131,092.0	994.3	6,034.5	43,959.7	3,239,402.5
Capital/assets	0.209	0.074	0.123	0.294	0.860
Health npw/npw	0.351	0.005	0.177	0.766	1.000
Line of business concentration	0.637	0.465	0.599	0.822	0.763
Cost efficiency	0.661	0.490	0.678	0.859	0.892
Revenue efficiency	0.419	0.181	0.337	0.556	0.954
Profit efficiency	0.661	0.256	1.000	1.000	1.000
Costs/benefits	0.113	0.035	0.061	0.142	1.009
Revenues/benefits	0.338	0.175	0.245	0.436	1.164
Return on equity	0.099	0.043	0.098	0.157	1.011

N=number of life insurers. Gross premiums=direct premiums plus premiums on reinsurance assumed. Net premiums=gross premiums minus premiums on reinsurance ceded. NPW=net premiums written. Costs=the sum of general insurance expenses, taxes, licenses and fees (except FIT), commissions on direct premiums and deposit-type contracts, commissions and expense allowances on reinsurance assumed. Benefits=the sum of net incurred benefits (claims) on life, annuity, health and disability insurance contracts plus invested assets. Revenues=the sum of net premiums written, net investment income, and other income included in line 9, "Summary of Operations."

Table 5
Summary Statistics
Categorical Variables
Full Sample (N=284)

Variable	Category					
Entities	**1**	**2**	**3**	**4**	**5**	**6-17**
N	150	65	25	13	13	18
States licensed	**1**	**2-49**	**50**	**51**		
N	26	144	40	74		
States domiciled	**1**	**2+**				
N	192	92				
Company age	**1-10**	**11-20**	**21-50**	**51+**		
N	5	7	105	167		
Ownership form	**Stock**	**Mutual**				
N	208	76				
Multi-line	**Property**	**Health**				
N	56	12				
Publicly-traded	**Public**	**Private**				
N	55	229				

N=number of life insurers in respective category. States licensed=number of U.S. regulatory jurisdictions (states and Washington D.C.) licensed in. States domiciled=number of U.S. regulatory jurisdictions (states and Washington D.C.) domiciled in. Company age=years in business. Ownership form=as reported in Best's Insurance Reports (2006b). Multi-line=affiliated insurer in other insurance sector(s). Publicly-traded=as reported in Best's Insurance Reports (2006b).

Table 6
Pairwise Spearman Correlations
Full Sample (N=284)

Variable	*CE*	*RE*	*PE*	*C/B*	*R/B*	*ROE*	*LIC*	*DOM*	*LOB*	*H*	*ENT*	*A*
Cost efficiency (CE)	**1**	0.17	0.46	-0.84	-0.58	0.16	0.25	0.10	-0.23	-0.40	0.12	0.48
Revenue efficiency (RE)		**1**	0.54	-0.01	0.22	0.17	-0.02	-0.05	0.31	0.21	-0.02	-0.05
Profit efficiency (PE)			**1**	-0.20	0.07	0.24	0.18	0.12	0.04	0.05	0.11	0.18
Costs/benefits (C/B)				**1**	0.76	-0.05	-0.22	-0.08	0.33	0.56	-0.11	-0.52
Revenues/benefits (R/B)					**1**	0.16	0.05	0.16	0.25	0.55	0.11	-0.18
Return on equity (ROE)						**1**	0.22	0.14	0.01	0.09	0.18	0.25
States licensed (LIC)							**1**	0.64	-0.27	0.03	0.63	0.81
States domiciled (DOM)								**1**	-0.21	0.02	0.82	0.56
Line of business concentration (LOB)									**1**	0.14	-0.21	-0.37
Health npw/npw (H)										**1**	0.09	-0.17
Entities in group (ENT)											**1**	0.60
Assets (A)												**1**

Table 7
Efficiency Regressions
Full Sample (N=284)

1	2	3	4	5	6	7
Independent variable	***Panel A: Dependent variables***					
	CE	***RE***	***PE***	***CE***	***RE***	***PE***
Log of assets	0.05686 (0.0001)	-0.01266 (0.0877)	0.01294 (0.2492)	0.06665 (0.0001)	-0.02478 (0.0069)	0.01284 (0.3565)
Multiple states domiciled	-0.12115 (0.0002)	0.00589 (0.8877)	0.02796 (0.6584)			
Multiple states licensed	-0.08666 (0.0593)	0.00001 (0.9999)	0.10018 (0.2699)			
States domiciled				-0.03805 (0.0004)	0.00877 (0.5299)	-0.00804 (0.7061)
States licensed				-0.00274 (0.0023)	0.00203 (0.0823)	0.00167 (0.3466)
Mean dependent variable	.615	.366	.577	.615	.366	.577
Adjusted R^2	.265	.004	.010	.275	.016	.009
Independent variable	***Panel B: Dependent variables***					
	C/B	***R/B***	***ROE***	***C/B***	***R/B***	***ROE***
Log of assets	-0.01569 (0.0001)	-0.04345 (0.0001)	0.01414 (0.0004)	-0.01713 (0.0001)	-0.05456 (0.0001)	0.01208 (0.0138)
Multiple states domiciled	0.02072 (0.0596)	0.14605 (0.0001)	-0.02506 (0.2580)			
Multiple states licensed	0.04622 (0.0035)	0.08407 (0.1183)	-0.03602 (0.2569)			
States domiciled				0.00721 (0.0536)	0.04442 (0.0005)	0.00425 (0.5693)
States licensed				0.00060 (0.0529)	0.00310 (0.0032)	-0.00054 (0.3857)
Mean dependent variable	.064	.339	.099	.064	.339	.099
Adjusted R^2	0.197	0.124	0.037	0.184	0.135	0.031

Intercepts not reported. Coefficients are reported with p-values in parentheses below. CE=cost efficiency score. C/B=Costs/benefits. Costs=the sum of general insurance expenses, taxes, licenses and fees (except FIT), commissions on direct premiums and deposit-type contracts, commissions and expense allowances on reinsurance assumed. RE=revenue efficiency score. R/B=revenue/benefits. Revenue=the sum of net premiums written, net investment income, and other income included in line 9, "Summary of Operations." Benefits=the sum of net incurred benefits (claims) on life, annuity, health and disability insurance contracts plus invested assets. PE=profit efficiency score. ROE=return on equity capital. States licensed=number of states licensed. States domiciled=number of states domiciled. Multiple states domiciled=1, if domiciled in more than one state, zero otherwise. Multiple states licensed=1, if licensed in more than one state, zero otherwise.

Table 8
Efficiency Regressions
Full Sample (N=284)

1	2	3	4	5	6	7
Independent variable	*CE*	*CE*	*RE*	*RE*	*PE*	*PE*
Log of assets	0.04647 (0.0001)	0.05069 (0.0001)	0.02342 (0.0139)	0.01614 (0.1257)	0.01904 (0.2244)	0.02161 (0.2146)
Multiple states domiciled	-0.07271 (0.0414)		-0.01168 (0.7899)		0.04191 (0.5632)	
Multiple states licensed	-0.06234 (0.1634)		-0.07563 (0.1707)		0.06303 (0.4894)	
States domiciled		-0.02277 (0.0587)		0.01539 (0.2996)		-0.00803 (0.7433)
States licensed		-0.00153 (0.0966)		0.00055 (0.6263)		0.73099 (0.6961)
Capital/assets	-0.13704 (0.0666)	-0.13806 (0.0646)	0.17150 (0.0629)	0.16493 (0.0737)	-0.30928 (0.0427)	-0.30476 (0.0458)
Health npw/npw	-0.16189 (0.0001)	-0.15339 (0.0001)	0.19149 (0.0001)	0.17838 (0.0001)	0.14420 (0.0540)	0.14581 (0.0567)
Line of business concentration	0.04448 (0.4459)	0.03450 (0.5546)	0.33539 (0.0001)	0.33543 (0.0001)	0.14344 (0.2288)	0.14601 (0.2210)
Common stock/invested assets	-0.06751 (0.7043)	-0.06801 (0.7009)	-0.45979 (0.0370)	-0.39437 (0.0721)	-0.35037 (0.3349)	-0.37069 (0.3056)
Mutual	-0.02476 (0.4096)	-0.02377 (0.4342)	-0.00707 (0.8487)	-0.00702 (0.8516)	-0.13193 (0.0320)	-0.13906 (0.0256)
Public	-0.01620 (0.6468)	-0.00323 (0.9297)	-0.02635 (0.5458)	-0.04079 (0.3667)	-0.07360 (0.3080)	-0.06298 (0.3993)
New York	-0.01853 (0.5969)	-0.01652 (0.6341)	-0.04423 (0.3068)	-0.05116 (0.2331)	0.87040 (0.9903)	0.01177 (0.8681)
Multi-line	-0.05158 (0.1477)	-0.05569 (0.1077)	-0.07639 (0.0826)	-0.08389 (0.0499)	-0.09817 (0.1769)	-0.08010 (0.2565)
Mean dependent variable	.615	.615	.366	.366	.577	.577
Adjusted R^2	0.337	0.336	0.197	0.195	0.052	0.050
Highest VIF	3.1	3.9	3.1	3.9	3.1	3.9

Intercepts not reported. Coefficients are reported with p-values in parentheses below. CE=cost efficiency score. C/B=Costs/benefits. Costs=the sum of general insurance expenses, taxes, licenses and fees (except FIT), commissions on direct premiums and deposit-type contracts, commissions and expense allowances on reinsurance assumed. RE=revenue efficiency score. R/B=revenue/benefits. Revenue=the sum of net premiums written, net investment income, and other income included in line 9, "Summary of Operations." Benefits=the sum of net incurred benefits (claims) on life, annuity, health and disability insurance contracts plus invested assets. PE=profit efficiency score. ROE=return on equity capital. States licensed=number of states licensed. States domiciled=number of states domiciled. Multiple states domiciled=1, if domiciled in more than one state, zero otherwise. Multiple states licensed=1, if licensed in more than one state, zero otherwise. VIF=variance inflation factor.

Table 9
Size Quartile Analysis
Cost Efficiency Regressions
Full Sample (N=284)

1	2	3	4	5
Independent /dependent variable	*CE Quartile 1*	*CE Quartile 2*	*CE Quartile 3*	*CE Quartile 4*
Log of assets	0.04538 (0.2437)	0.11989 (0.0105)	-0.01631 (0.6867)	0.02744 (0.0532)
Multiple states domiciled	-0.19289 (0.2966)	-0.07701 (0.2684)	-0.14319 (0.0042)	-0.11888 (0.0067)
Multiple states licensed	-0.12747 (0.0921)	0.05294 (0.6152)	-0.18394 (0.1161)	*NMV*
Mean dependent variable	.461	.557	.675	.768
Adjusted R^2	0.018	0.080	0.128	0.093
N	71	71	71	71

Intercept not reported. N=Number of life insurers. Coefficients are reported with p-values in parentheses below. CE=cost efficiency score. Multiple states domiciled=1, if domiciled in more than one state, zero otherwise. Multiple states licensed=1, if licensed in more than one state, zero otherwise. NMV=no meaningful value, because all quartile 4 firms are licensed in multiple states.

Table 10
Summary Statistics
Categorical Variables
Rated Sample (N=241)

Variable	Category					
Best's Financial Rating	**A++, A+**	**A**	**A-**	**B++**	**B+**	**B and lower**
N	48	38	54	37	36	28
States licensed	**1**	**2-49**	**50**	**51**		
N	11	118	38	74		
States domiciled	**1**	**2+**				
N	153	88				
Company age	**1-10**	**11-20**	**21-50**	**51+**		
N	1	4	83	153		
Ownership form	**Stock**	**Mutual**				
N	168	73				
Multi-line	**Property**	**Health**				
N	52	12				
Publicly-traded	**Public**	**Private**				
N	52	189				

N=number of life insurers in respective category. States licensed=number of U.S. regulatory jurisdictions (states and Washington D.C.) licensed in. States domiciled=number of U.S. regulatory jurisdictions (states and Washington D.C.) domiciled in. Company age=years in business. Ownership form=as reported in Best's Insurance Reports (2006b). Multi-line=affiliated insurer in other insurance sector(s). Publicly-traded=as reported in Best's Insurance Reports (2006b).

Table 11
Pairwise Spearman Correlations
Rated Sample (N=241)

Variable	*CE*	*RE*	*PE*	*C/B*	*R/B*	*ROE*	*LIC*	*DOM*	*LOB*	*H*	*RTG*	*A*
Cost efficiency (CE)	**1**	0.16	0.43	-0.82	-0.58	0.19	0.30	0.14	-0.25	-0.43	0.38	0.55
Revenue efficiency (RE)		**1**	0.50	0.08	0.25	0.13	-0.01	-0.05	0.27	0.24	-0.11	-0.10
Profit efficiency (PE)			**1**	-0.19	0.02	0.21	0.11	0.08	-0.03	0.01	0.08	0.12
Costs/benefits (C/B)				**1**	0.78	-0.08	-0.28	-0.11	0.41	0.64	-0.47	-0.61
Revenues/benefits (R/B)					**1**	0.09	-0.01	0.14	0.33	0.57	-0.16	-0.26
Return on equity (ROE)						**1**	0.21	0.14	-0.01	0.04	0.17	0.26
States licensed (LIC)							**1**	0.66	-0.22	-0.07	0.55	0.78
States domiciled (DOM)								**1**	-0.20	0.01	0.39	0.56
Line of business concentration (LOB)									**1**	0.24	-0.33	-0.37
Health npw/npw (H)										**1**	-0.27	-0.32
Financial rating (RTG)											**1**	0.75
Assets (A)												**1**

Table 12
Logistic Regressions
Rated Sample (N=241)

1	2	3	4	5	6	7
Independent /dependent variable	*RTG*	*RTG*	*RTG*	*RTG*	*RTG*	*RTG*
Log of assets	0.8682 (0.0001)	0.8924 (0.0001)	0.8760 (0.0001)	0.8416 (0.0001)	1.1760 (0.0001)	1.2146 (0.0001)
States domiciled	-0.1160 (0.2854)					-01096 (0.4073)
States licensed		-0.0113 (0.1981)				-0.0104 (0.2782)
Multiple states domiciled			-0.3786 (0.2020)		-0.3861 (0.2771)	
Multiple states licensed				-0.3837 (0.5003)	-0.3514 (0.5528)	
Capital/assets					6.3084 (0.0001)	6.3326 (0.0001)
Health npw/npw					-1.1239 (0.0065)	-1.0522 (0.0125)
Line of business concentration					-0.7430 (0.2477)	-0.7710 (0.2298)
Common stock/invested assets					-1.3012 (0.5288)	-1.4680 (0.4789)
Mutual					0.2900 (0.3425)	0.3028 (0.3233)
Public					-0.5228 (0.1539)	-0.4913 (0.1891)
New York					0.2465 (0.4653)	0.2510 (0.4584
Multi-line					0.4094 (0.2670)	0.3884 (0.2784)
Mean dependent variable	3.76	3.76	3.76	3.76	3.76	3.76
Logistic R^2	.238	.238	.238	.237	.305	.305

Intercepts not reported. Coefficients are reported with p-values in parentheses below. States licensed=number of states licensed. States domiciled=number of states domiciled. Multiple states domiciled=1, if domiciled in more than one state, zero otherwise. Multiple states licensed=1, if licensed in more than one state, zero otherwise. NPW=net premiums written. Letter ratings (RTG) are assigned numeric values as follows: A++,A+=6; A=5; A-=4; B++=3; B+=2; B and lower=1.

Table 13
Logistic Regressions
Rated Sample (N=241)

1	2	3	4	5	6	7
Independent /dependent variable	*RTG*	*RTG*	*RTG*	*RTG*	*RTG*	*RTG*
Log of assets	0.8578 (0.0001)	0.8344 (0.0001)	0.8338 (0.0001)	0.8499 (0.0001)	0.8430 (0.0001)	0.8485 (0.0001)
Cost efficiency	-0.4554 (0.4626)					
Revenue efficiency		0.0521 (0.8986)				
Profit efficiency			-0.0149 (0.9609)			
Costs/benefits				0.5950 (0.5659)		
Revenues/benefits					0.3073 (0.5692)	
Return on equity						-0.9387 (0.2762)
Mean dependent variable	3.76	3.76	3.76	3.76	3.76	3.76
Logistic R^2	.237	.236	.236	.237	.237	.237

Intercepts not reported. Coefficients are reported with p-values in parentheses below. Costs=the sum of general insurance expenses, taxes, licenses and fees (except FIT), commissions on direct premiums and deposit-type contracts, commissions and expense allowances on reinsurance assumed. Revenues=the sum of net premiums written, net investment income, and other income included in line 9, "Summary of Operations." Benefits=the sum of net incurred benefits (claims) on life, annuity, health and disability insurance contracts plus invested assets. Letter ratings (RTG) are assigned numeric values as follows: A++,A+=6; A=5; A-=4; B++=3; B+=2; B and lower=1.

Table 14
Logistic Regressions
Rated Sample
Profit Efficiency Score less than One (N=107)

1	2	3	4	5
Independent /dependent variable	*RTG*	*RTG*	*RTG*	*RTG*
Log of assets	1.1378 (0.0001)	1.3077 (0.0001)	1.2212 (0.0001)	1.1096 (0.0001)
States domiciled	-0.1353 (0.4338)			
States licensed		-0.0348 (0.0119)		
Multiple states domiciled			-0.9403 (0.0559)	
Multiple states licensed				-0.6227 (0.4777)
Mean dependent variable	3.72	3.72	3.72	3.72
Logistic R^2	.335	.350	.342	.334

Intercepts not reported. N=number of life insurers. Coefficients are reported with p-values in parentheses below. States licensed=number of states licensed. States domiciled=number of states domiciled. Multiple states domiciled=1, if domiciled in more than one state, zero otherwise. Multiple states licensed=1, if licensed in more than one state, zero otherwise. Letter ratings (RTG) are assigned numeric values as follows: A++,A+=6; A=5; A-=4; B++=3; B+=2; B and lower=1.

Table 15
Data for Estimated Costs of Multi-State Regulation
Full Sample (N=284)

1	2	3	4	5
Variable	*Quartile 1*	*Quartile 2*	*Quartile 3*	*Quartile 4*
MULTI-DOM	2	13	**26**	**51**
MULTI-STATE	**53**	66	68	71
GENEXP ($000)	227,178.8	911,713.8	3,599,524.4	42,874,587.0
TLF ($000)	26,784.9	151,111.7	504,152.0	5,304,928.9
COSTS ($000)	**253,963.7**	1,062,825.5	**4,103,676.4**	**48,179,516.0**
Cost Savings	**53,498.2**	0.0	**348,841.0**	**5,343,088.1**
Insurers in quartiles (N/4)	71	71	71	71

N=Number of life insurers. MULTI-DOM=number of insurers in respective quartile domiciled in more than one state. MULTI-STATE= number of insurers in respective quartile licensed in more than one state. GENEXP= General insurance expenses incurred. TLF=Insurance taxes, licenses and fees incurred. COSTS=sum of GENEXP and TLF.