THE ALLOCATION OF GOVERNMENTAL REGULATORY AUTHORITY: FEDERALISM AND THE CASE OF INSURANCE REGULATION[*]

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ABSTRACT

We investigate the incentives states have to provide insurance regulatory goods and services in an efficient manner. Regulation of the insurance industry in the U.S. is unique as it is conducted primarily at the state level while the majority of insurance sales are interstate. Consistent with predictions from the federalism literature, we find evidence of trans-state externalities as states with small domestic insurance markets are less efficient producers of insurance regulation and appear to allow states that choose to expend the greatest resources to regulate for them. In addition, states with more profitable domestic insurers are shown to export greater levels of regulation suggesting extraterritorial regulation may erect barriers to entry. We find evidence of increasing economies of scale in the production of insurance regulation after controlling for these regulatory externalities. Taken together, our results suggest aggregating the production of regulation to a multi-state or federal level may resolve a number of inefficiencies in the current system.

I. INTRODUCTION

A fundamental consideration in the provision of public goods and services in a federal system of government is the optimal layer of government that good should be produced. Economic theory suggests the pareto optimal provision of a public good will be achieved when it is produced by the most decentralized layer of government capable of internalizing all the economic costs and benefits associated with the good (Inman and Rubinfeld 1997; Oates 1972). The primary advantage of having local governments produce public goods is that smaller jurisdictions are more likely to be responsive to the tastes and preferences of the local citizen's and therefore can tailor the quality and level of output to maximize their welfare. This advantage must be weighed against the inefficiencies of decentralization which could include possible spillover effects between jurisdictions and the possibility the jurisdiction

may be too small to capture any economies of scale that may be associated with the production of the good.

The current practice of regulating insurance primarily at the state level is unique in our federal system of regulating the financial services industry. Banks are regulated primarily at the federal level by the Federal Reserve Board, the Office of the Comptroller of the Currency, the Office of Thrift Supervision and the Federal Deposit Insurance Corporation (FDIC). States can charter banks, but these banks are now under the joint supervisory and regulatory jurisdiction of the state and the Federal Reserve or the FDIC. Securities are regulated at both the state and federal level. As with other joint regulatory activities, the states and the federal government tend to separate regulatory authority (when they can) based on notions of interstate versus intrastate commerce. The Securities Exchange Commission oversees those securities (and their exchanges) with a national interest as defined in the Securities Acts, and it leaves the remainder to the states to supervise. Thus, although there has been a tradition of sharing authority between the state and federal governments for regulation of other financial services, no sharing of regulatory authority exists for the insurance industry.

The system of state regulation of insurance is currently under pressure from the federal government and from the industry. In the early 1990's the GAO (1989) and the U.S. Congress (1990) found the state system of insurance regulation to be inadequate and inefficient. Both reports concluded that if the states did not improve their regulatory oversight, a federal response to the deficiencies might become necessary. In reply to these critical reports, the states and their regulatory trade association, the National Association of Insurance Commissioners (NAIC), moved to increase both the quantity and quality of regulation. The most important new initiative was the NAIC's state regulatory accreditation program. The program was designed to ensure each state's regulation met certain minimum standards thereby providing other states with confidence in their sister states' abilities to oversee companies

domiciled in their jurisdictions.[1] However, even the adoption of the accreditation program did not silence the critics of state insurance regulation. For example, the industry so objected to the new NAIC regulatory initiatives that many insurers resisted payment of certain voluntary assessments the NAIC relies upon to help fund its regulatory activities (Klein, 1996). Concurrently, renewed concerns about the quality of regulation have been raised that even accredited states still do not have adequate resources or incentives to regulate effectively (Klein, 1995). Most recently, passage of the Graham-Leach-Bliley act weakening of the boundaries separating the various components of the financial services industry has raised questions over which regulatory body should have jurisdiction to oversee the activities of the newly formed financial service conglomerates.

The purpose of this paper is to investigate the production of insurance regulation by the states with a goal toward addressing the question of whether insurance regulation might be more efficiently produced at a more centralized level of government. We begin our analysis by considering the extent to which current system of state-by-state regulation creates the *potential* for individual states to impose significant negative externalities on other states. Our analysis suggests that this potential is high and could be mitigated if a more regional or national approach to insurance regulation were adopted.

We next investigate the sources of inefficiency in the production of insurance regulatory goods and services by first estimating a multi-product non-cost minimizing cost function and then running additional regressions using the error term from the estimated cost function analysis as the dependent variable. The theoretical foundations for our hypotheses are drawn from two areas of the literature: (1) from the literature on fiscal federalism we develop a set of *regulatory externality* hypotheses which

[1]To become accredited a state was required to adopt certain model legislation, increase its regulatory budget to a preset target, and perform a new minimal level of regulatory oversight. Currently 49 states have been accredited. A second program undertaken by the NAIC during this time period was the construction of various databases that can be accessed by the individual state insurance departments to track troubled companies, individuals involved with fraudulent behavior, and licensed agents.

posits variation in the relative efficiency across states can be explained by the extent to which the benefits of regulation accrue to the consumers and insurers located in the state; (2) from the literature on the sources of public sector inefficiency we develop a set of *regulatory environment* hypotheses which suggest differences in efficiency can be explained by variation in the environment in which insurance regulators operate. The results of our tests support both hypotheses. Consistent with predictions from the federalism literature, we find evidence of trans-state externalities as states with small domestic insurance markets are less efficient producers of insurance regulation and appear to allow states that choose to expend the greatest resources to regulate for them. In addition, states with more profitable domestic insurers are shown to export greater levels of regulation suggesting the local insurance industry may demand extraterritorial regulation to the extent it erects barriers to entry for insurers from lax regulatory jurisdictions. We also find evidence the institutional environment of state government plays an important role in providing incentives for insurance regulators to utilize their resources in an efficient manner. For example, state insurance departments which face softer budget constraints, or those states with heightened principal-agent monitoring conflicts are shown to be less efficient producers of regulation. Finally, our results suggest there exists increasing economies of scale in the production of insurance regulation once we control for the incentives of states to export regulatory services.

The paper is organized as follows. The next section offers a brief history of insurance regulation. Section III provides statistics on the structure of the insurance market, discusses attempts by the insurance regulators to coordinate their activities across state boundaries, and highlights some of the possible sources of conflict across the states. In section IV, we estimate a cost function based on the unique characteristics of state regulation to investigate the costs of producing insurance regulation at the state level. In Section V we develop our hypotheses regarding the sources of inefficiency in the

production of insurance regulation, set up the empirical framework, and presents the results. Section VI presents our conclusions and discusses some of the implications of our work.

II. BRIEF HISTORY OF INSURANCE REGULATION

Traditionally, all state regulation is permitted unless the Constitution prohibits it or assigns that power to Congress. Prior to the Civil War, most states regulated their domestic insurance companies through restrictions in their corporate charters. In 1851, New Hampshire became the first state to affirmatively regulate the insurance industry through an administrative agency in the form of a state department of insurance (Kimball and Heaney, 1995). The business of insurance and its regulation was thought to be local in the sense that a local agent dealt with a local consumer within the confines of the state. No mention was made of the fact that the local agent may be a representative of a foreign insurer.[2] However, with the growth of the nation, interstate insurance transactions became more common.

It was not long before the Supreme Court was asked to look at the interstate nature of the insurance industry. The post Civil War era saw the Supreme Court make two landmark (and opposing) rulings regarding the interstate regulation of the insurance industry. The first was *Paul v. Virginia*[3] and the second was *U.S. v. Southeastern Underwriters Association.*[4]

In *Paul*, the State of Virginia prohibited unlicenced companies from doing business within the state. In the case, a New York insurer argued that, because insurance was an interstate transaction, the State of Virginia could not regulate the transaction between itself and a Virginia citizen, even if it were

[2]The term foreign insurer usually refers to U.S. insurance companies licensed to conduct business in the state but chartered in some other state.

[3]75 US 168 (1868).

[4]322 US 533 (1944).

brokered by a local Virginia insurance agent. This view is consistent with the notion that states could not interfere with interstate commerce set out in earlier Supreme court case law.[5] The state, however, maintained that it could regulate the transaction because it was a local transaction: one between the local resident and the locally based agent. The Supreme Court sided with the state, holding that insurance was a local good and therefore state regulation was not preempted by the federal commerce power. According to the Court's reasoning, the contract was signed in Virginia and, if a claim were made, it would be made in Virginia. Thus, the state could properly regulate using its own police power.

Although *Paul v. Virginia* gave the states free reign to regulate the industry, a number of events shaped the eventual regulatory framework that exists today. One of the more significant episodes that led to the first call for federal intervention was a series of fires in Boston (1871) and Chicago (1872) that allegedly bankrupted 3,000 out of 4,000 fire insurance companies due to insufficient reserving (Kimball and Heaney, 1995). To prevent this from recurring, the states altered their regulatory framework to allow either state-made rates[6] or private industry bureaus[7] to set rates to assure adequate pricing and reserving.[8] By the 1940s, this form of common insurance pricing began to present problems for

[5]*See, Gibbons v. Ogden* 22 U.S. (9 Wheat.) 1 (1924). In *Gibbons*, the Supreme Court interpreted the Commerce Power broadly so as to prohibit most state regulations affecting commerce. The only exception was those local activities "which are completely within a state, which do not affect other states, and with which it is not necessary to interfere, for the purposes of executing some of the general powers of the government." *id*. At 195.

[6]State-made insurance rates require all insurers operating in the state to use rates as determined by the state insurance department.

[7]Rating bureaus are industry-sponsored organizations that collect loss information from member insurance companies which is then analyzed using various actuarial and statistical techniques for the purpose of determining adequate insurance rates. These suggested bureau rates are then reviewed by the insurance commissioner before they are approved for use in the marketplace. Danzon (1983) provides a thorough discussion of insurance rating bureaus and their impact in the insurance marketplace.

[8]During the time period from the late 1870s to around 1910, the states were somewhat torn between allowing collusion to stabilize the market and promoting price competition. Joskow (1973) describes the states' view toward the problem as allowing collusion to keep prices from being too low as

some of the state insurance departments. In particular, the State of Missouri concluded it was unable to control the industry's collusive rate-setting ability because of the system of bureau rates. Consequently, Missouri asked the United States Justice Department to intervene. The Justice Department brought suit arguing that, since a rate setting bureau, by definition, is a combination in restraint of trade, this system of insurance pricing violated Section 1 of the Sherman Antitrust Act of 1890. This law, passed after *Paul v. Virginia*, prohibited contracts, combinations, and conspiracies in restraint of trade.[9] The result of this lawsuit, *U.S. v. Southeastern Underwriters*, overturned *Paul v. Virginia*.

The Supreme Court made two important findings in *Southeastern Underwriters*. First, it held that mandatory bureau rates were indeed violations of Section 1 of the Sherman Act and second, it held that insurance was involved in interstate commerce. This ruling severely upset the status quo -- while Missouri sought assistance in controlling the collusive practices of the insurance industry, it was by no means asking the court to invalidate the state system of regulation.[10] One year later, in 1945, Congress passed the McCarran-Ferguson Act which declared that silence on the part of Congress to affirmatively regulate the insurance industry did not prohibit the states from doing so.[11] With passage of McCarran-Ferguson, Congress returned authority to regulate and tax the insurance industry to the states free from

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the states believed this was necessary to prevent destructive competition that would bankrupt the industry.

[9]It should be noted that the Supreme Court has made a distinction between certain trade restrictions. There exist *per se* unreasonable offenses as well as offenses that are deemed unreasonable after careful scrutiny of possible beneficial effects of the restrictions. The Court has always held horizontal price fixing, no matter what the justification, to be a *per se* illegal activity (see e.g. *Arizona v. Maricopa County Medical Society* 457 U.S. 332, 1981)

[10]In fact, 35 states joined in an *amicus curiae* to oppose the application of the commerce power to the insurance industry. See *U.S. v. Southeastern Underwriters*, 322 U.S. 533, 595 n. 18.

[11]Currently codified at 15 U.S.C. §§ 1- 4.

active federal oversight and intervention. With a few limited exemptions,[12] this is were the law stands today.[13]

III. STRUCTURE OF THE INSURANCE MARKETPLACE

In this section we present basic statistics on the insurance market to demonstrate the interstate nature of the majority of insurance transactions. Consider Tables 1 and 2. Table 1 shows the percent of premiums written in each state by locally headquartered companies. In 1995, an average of 21.3 percent of property-liability premiums and 11.8 percent of life insurance premiums were written by locally domiciled companies. Table 2 shows the percent of companies conducting business in the state that were also domiciled in that state. In 1995, on average only 6.3 percent of property-liability insurers and 3.4 percent of life insurers writing business in the state were also domiciled there.[14] Even the states with the largest percentages of domestically generated premiums, 57.2 percent in Illinois for the property/liability industry and 48.4 percent in Connecticut for the life insurance industry, demonstrate the significant interstate relationships that exist in the insurance industry.

To avoid duplication of insurance regulatory activities across jurisdictions, the common practice is for the states to concentrate their regulatory efforts on the locally domiciled companies and rely upon the other states to monitor the foreign insurers that do business in the state (Klein 1996). Although this delegation of regulatory responsibility has the potential to be efficiency enhancing, it also creates the

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[12]Section 2 of the McCarran-Ferguson Act, for example, allows prosecution under the Sherman Act for agreements to boycott, coerce, or intimidate or for acts of boycott, coercion, or intimidation.

[13]For a more detailed history and economics of insurance regulation in the United States, see Joskow (1973) who focuses on fire insurance and Meier (1988) who focuses on the broader market.

[14]The data used to calculate these tables came from the 1995 NAIC data tapes. These tapes contains the annual regulatory accounting statements filed with the NAIC and represent approximately 98 percent of the entire industry's assets.

potential for significant free-rider problems. In addition, the activity (or lack of activity) by a state insurance regulator can have a direct effect on consumers in other states.[15] To help coordinate regulatory activities between the states to avoid these problems, the National Association of Insurance Commissioners was formed in 1871. The NAIC is a trade association whose mission is to assist the individual state insurance commissioners performing their regulatory responsibilities. Without having governmental authority, the NAIC has had to rely upon moral suasion and the threat of federal intervention. This ability to persuade states to enact new laws and regulate in a different manner appears to be losing its effectiveness (Klein, 1995). In addition, as a trade association of state regulators, the NAIC does not have the coercive power of government to force the industry to pay any taxes or fees to finance its operations. Thus, the NAIC relies heavily upon "voluntary" assessments. In 1995, 45 percent of the NAIC's revenues were generated from voluntary fees paid by insurers when they filed their annual and quarterly financial statements. Klein (1996) reports that this system of voluntary payments by the regulated industry leaves the NAIC particularly vulnerable to the industry's willingness to pay - a willingness that can change depending on whether the industry believes the NAIC is spending the money wisely.

As an alternative to the NAIC, a number of parties have called for a multi-state or federal approach to insurance regulation.[16] These proposals all rely upon a notion that economists have long understood: only when all the costs and benefits of a good or service are internalized will that good or

[15]For example, suppose the insurance regulator does not have adequate resources to monitor the solvency of the local industry and one of its domestic firms becomes insolvent. In this case, the guaranty fund of the local state is responsible only for a portion of the insolvent company's shortfall representing the amount of business sold within the state. State guaranty funds are essentially policyholder compensation pools for insolvencies and, for the most part, are funded in an ex-post manner as a tax on those remaining companies doing business in a state. Thus, the other states where this insurer wrote business would retain responsibility for the remaining shortfall through their own guaranty funds.

[16]See ACIR (1992), Otis (1994), or Mulcahy (1995).

service be produced in the optimal quantity. The provision of regulatory services is no different. As insurance is largely interstate commerce, the optimal scale of the regulator should be inclusive of large amounts of the interstate trade to internalize the benefits and costs of regulation. Thus, it may be efficient, for example, for the New England states to form a regional compact to regulate the business of insurance in New England if the interstate spillover effects are substantially reduced.[17]

To investigate the merits of this idea, Table 3 reports the percentage of premiums that would be written by domestic companies after merging the individual states into either nine census regions and into four NAIC regions[18] (see Appendix A for the census region and Appendix B for the NAIC region definitions). After merging, "local census region" companies write an average 36.1 percent of property/liability premiums and 26.4 percent of the life insurance premiums. When aggregating the states even further, into NAIC regions, the percentage of premiums written by domestic companies for the property/liability and life insurance industries is 49.7 percent and 42.5 percent, respectively.

Table 4 reports the percent of companies that would be considered domestic companies after merging the states into census or NAIC regions. In the average census region, 25.6 percent of the property/casualty companies and 16.7 percent of the life insurers would be considered local. The corresponding percentages aggregating to the NAIC region level would be 45.3 percent and 34.8, respectively.

As demonstrated in Tables 3 and 4, merging the individual states into larger geographical regions would greatly internalize the business of insurance. However, even after aggregating to only four

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[17]There has been some discussion of the use of interstate compacts (see Schact and Gallanis, 1993) and at least two states (Iowa and New Hampshire) have passed authorizing legislation of a interstate solvency compact. The push for interstate compacts has likely abated due to the change in Congressional interest in regulation since the Republicans took control of the Congress.

[18]The term "NAIC region" refers to the categorization of the fifty states and Washington D.C. into four groupings based upon geographically proximity as defined by the NAIC

regulatory regions, approximately one-half of the premiums written in the average region would still be written by foreign companies. Further, the life insurance industry appears to operate in a more national market than does the property-liability industry. No matter the level of aggregation, the life industry is always less concentrated within a particular geographic area than the property-liability industry.

IV. Estimating Cost and Efficiency of the Regulatory Function of the State

We now turn to the issue of investigating the cost and efficiency of regulating the insurance industry at the state level. Table 5 shows the direct costs of insurance regulation to the state taxpayers. For the 1995 budget year, the average budget for insurance regulation was just under $13 million. States receive substantially more money in taxes, licenses, and other fees from the industry, averaging just over $182 million in 1995. Thus, the average state uses only 6.68 percent of the revenues collected from the insurance industry to finance the operations the regulator in the state. The size of the insurance department budget relative to premiums collected by the industry is relatively small, averaging only 0.10 percent and ranging from 0.03 to 0.25 percent.[19]

Economic cost-function based efficiency studies have been conducted on the life and health industry (Grace and Timme, 1992) and the property-liability industry (Cummins and Weiss, 1993). The present study differs from these earlier studies in two important ways. First, we examine the regulators rather than the industry. This is potentially important to the extent that we find significant economies

[19]Table 5 shows only the direct cost to the taxpayer, it does not include the costs born by the industry for compliance. Further, the costs imposed by the NAIC are not considered. In 1995 the NAIC's budget was approximately $39.9 million (Klein, 1996). However, this amount as a percent of the total 1995 expenditure by the states was only 6.2 percent. Thus, the predominant expenditures on insurance regulation are at the state level.

of scale or scope in the production of insurance regulatory services. Second, we develop an empirical cost function that does not assume that the regulator is a cost-minimizer. Because government officials, such as insurance regulators, are not necessarily profit maximizing agents,[20] estimating the traditional cost function may lead to biased results. Thus, we explicitly model the cost function of a non-cost minimizing agency using a method similar to one proposed by Eakin and Kneisner (1988).[21,22] This approach essentially allows us to test whether the agency is cost minimizing rather than making it a maintained assumption.

Non-Cost Minimizing Cost Function (NCMCF) Analysis

To allow for the possibility that insurance regulators may not be cost minimizers subject to market prices, we employ a model where the regulator makes decisions based upon shadow prices which are a function of the market price of the inputs and a shadow divergence parameter for each input. Thus, one can think of the NCMCF analysis as a more general model with the traditional cost-minimizing neo-classical cost function as a special case. To begin, we define C^{sh} to be the shadow cost of the regulatory agency such that

$$C^{sh} = C^{sh}(\boldsymbol{Y}, \boldsymbol{w}^{\boldsymbol{sh}}) \qquad \textbf{(1)}$$

[20]For example one assumption about the objective function of the public sector common in the public finance literature is the Niskanen assumption (Niskanen 1971) that government officials will behave as if they are budget maximizes, not cost minimizers. Ideally, a regulator should maximize social welfare, but some of the earliest work on the economics of regulation by Stigler (1973) and Pelzman (1976) suggests this is not necessarily the case. More recently, other authors have suggested economic policy choices can be affected by the possibility of reelection (Besley and Case 1995), by the politics of the state (Poterba 1994), or by pressure from special interest groups (Pelzman, 1976; Coate and Morris 1995).

[21]To undertake the analysis one needs also to see a comment by Atkinson and Halvorsen (1992) and the reply by Eakin and Kneisner (1992).

[22]Berger, Hancock, and Humphrey (1993) investigate allocative efficiency similar to the technology we employ in an examination of the profit efficiency of U.S. commercial banks.

where **Y** is the vector of outputs and $\mathbf{w}^{sh}$ is a vector of the shadow price of inputs. Using Shephard's lemma we can obtain the conditional input demands. In the logarithmic form, these can be expressed as the shadow share equations

$$S_i^{sh}(\boldsymbol{Y},\boldsymbol{w}^{sh}) = \frac{w_i^{sh} X_i}{C^{sh}} = \frac{\partial \ln C^{sh}}{\partial \ln w_i^{sh}}, \quad i = 1,...,n. \tag{2}$$

Rearranging (2) gives the observed input usage as a function of the shadow input prices, shadow cost, and shadow cost share:

$$X_i(\boldsymbol{Y},\boldsymbol{w}^{sh}) = \frac{C^{sh} S_i^{sh}}{w_i^{sh}}. \tag{3}$$

Using the conditional factor demands from (3) and the observed wage rates, w_i, it is then possible to calculate the observed costs as

$$C^{obs}(\boldsymbol{Y},\boldsymbol{w}^{sh},\boldsymbol{w}) = \sum_{i=1}^{n} w_i X_i(\boldsymbol{Y},\boldsymbol{w}^{sh}) = C^{sh} \sum_{i=1}^{n} \frac{S_i^{sh} w_i}{w_i^{sh}} \tag{4}$$

By letting $T_i = S^{sh} w_i / w_i^{sh}$ and $T = \Sigma_i T_i$, the natural logarithm of the observed cost function system of equations can be expressed as

$$\ln C^{obs} = \ln C^{sh} + \ln T \tag{5}$$

and

$$S_i^{sh} = \frac{T_i}{T}, \quad i = 1,...,n. \tag{6}$$

One further decision to be made is the form of the shadow price's deviation from the actual price. We define θ_i as the shadow price divergence parameter and we employ an additive form such that[23]

$$w_i^{sh} = w_i + \theta_i. \tag{7}$$

If θ_i is positive, all other things held constant, then $w_i^{sh} > w_i$ implies that the input is under employed. If $\theta_i < 0$, the reverse is true, and the input is over employed.

The empirical cost function to be estimated is a translog cost function. The cost function can be written as

$$\begin{aligned} \ln C^{obs} &= \alpha_0 + \sum_i \alpha_i Y_i + \frac{1}{2}\sum_i \sum_j \alpha_{ij} Y_i Y_j + \sum_k \gamma_k \ln(w_k + \theta_k) \\ &+ \frac{1}{2}\sum_k \sum_h \delta_{kh} \ln(w_k + \theta_k)\ln(w_h + \theta_h) + \sum_i \sum_k \varphi_{ik} \ln(w_k + \theta_k) Y_i + \\ &\ln T + \varepsilon \end{aligned} \tag{8}$$

and is estimated with the following share equations for each input i

$$\begin{aligned} S^{obs} &= (\gamma_i + \sum_j \delta_{ij} \ln(w_j + \theta_j) + \sum_k \varphi_{ik} Y_k) \\ &+ [\sum_h (\frac{w_h}{w_h^{sh}})\alpha_h + \sum_j \alpha_{ij} \ln(w_j + \theta_j) + \sum_h \delta_{hk} Y_k \ln(w_i + \theta_i)]. \end{aligned} \tag{9}$$

Note that if $w_i = w_i^{sh}$ then $T = 1$ and $\ln T = 0$. This is the case where the shadow price is equal to the observed price.

[23]Alternatively, we could have chosen a multiplicative form such that $w_i^{sh} = w_i * \theta_i$. In this case, the shadow input price varies from the true price when $\theta_i \neq 1$.

Finally, the general restrictions on symmetry are imposed as follows: $\Sigma\alpha_i = \Sigma\gamma_i = 1$, $\delta_{ij} = \delta_{ji}$, $\varphi_{ij} = \varphi_{ji}$ and $\Sigma_i \delta_{ji} = \Sigma_i \varphi_{ij} = 0$). In the empirical estimation of this model, the outputs and input prices are normalized by their means to increase the efficiency of the non-linear estimation and to allow for unbiased hypothesis testing (Spitzer, 1985).

Using the estimated non-cost minimizing cost function, we can investigate a number of important characteristics in the production of insurance regulation. First, we investigate whether there are any economies of scope in the production of insurance regulatory services by estimating pair-wise cost complementaries between each output. Economies of scope are said to exist when the costs associated with joint production of two outputs is lower then the production of the same two outputs by separate units. Cost complementaries between two outputs are defined as $CC_{ij} = \frac{\partial^2 C}{\partial Y_i \partial Y_j}$. Cost complementaries suggest economies of scope exist when $C_{ij} < 0$. Finding $C_{ij} > 0$ suggests diseconomies of scope and C_{ij} not significantly different than zero implies costs are additive.

We next investigate overall economies of scale which is a measure of the marginal cost of the state expanding its level of outputs holding the output-mix fixed. To test whether there are overall economies of scale in the production of insurance regulation, we define $E_s = \Sigma_k \frac{\partial \ln C}{\partial \ln Y_k}$. When E_s is greater than, equal to, or less than one there are decreasing, constant, and increasing returns to scale, respectively.

Additional insights into the existence of potential scale economies for the specific outputs of insurance regulation are examined by estimating product specific scale economies. Product specific scale economies for each output k are defined as $PSE_k = \frac{\partial^2 C}{\partial Y_k^2}$. Marginal costs are decreasing when $PSE_k < 0$ suggesting product specific increasing returns to scale. Finding $PSE_k > 0$ suggests marginal costs are increasing and therefore product specific decreasing returns to scale. PSE_k not significantly different than zero implies constant returns to scale.

Following the literature, it is possible to examine the distribution of the error term to garner some information about the relative efficiency of the state regulatory authorities. Similar to Schmidt and Sickles (1984) and Berger (1993), we assume the error term for state s in year t, ε_{st}, has two components, i.e., $\varepsilon_{st} = \ln u_{st} + \ln v_{st}$ where $\ln u_{st}$ is state s's persistent error term in time t while $\ln v_{st}$ is a random disturbance term with mean zero for state s over the time period used in this study. Further, by assuming the minimum cost state represents the frontier (or best practice state), we can calculate how far each state is from this frontier. This estimate of inefficiency, usually referred to in the efficiency literature as *x-efficiency,* is defined as

$$XEFF_i = \exp(\ln \hat{u}_{\min} - \ln \hat{u}_i) \qquad \textbf{(10)}$$

where $\hat{u}_{min}$ is the average (across time) minimum residual from the estimation of the cost function and $\hat{u}_i$ is the average residual for state i.[24]

We can also determine the allocative inefficiency resulting from the divergence between the observed prices and the shadow prices. Following Eakin (1993), we can estimate C^{obs} with all the price divergence terms (θ_i) set equal to 0. This provides an estimate of the long run average cost. Thus,

$$\hat{C}^{min} = \hat{C}^{obs}(\boldsymbol{Y, w : \theta = 0}) \qquad \textbf{(11)}$$

and allocative inefficiency (AI) is measured as

$$AI = \frac{(\hat{C}^{obs} - \hat{C}^{min})}{\hat{C}^{min}} \qquad \textbf{(12)}$$

[24]Consistent with the literature, (see Berger 1993), we compute truncated x-efficiency measures by setting the top and bottom 5 percent of the averaged state residuals to the 5th and 95th percentile, respectively. The truncation is employed because the average state residual may still contain some error from the $\ln v_{st}$ term not fully canceled out over the six year time period used in this study.

Allocative inefficiency is thus the proportion by which actual costs exceed minimum costs due to the regulators incorrect perception of prices for the regulatory inputs. It can be thought of as the opportunity cost of misallocated resources whose next best use might or might not be the production of regulation.

Data and Data Sources

The primary data for this study comes from the NAIC's *Annual Insurance Department Resource Report* for the time period 1990-1995.[25] These reports provide detailed data on the quantity and costs of the various regulatory services produced by the individual state insurance departments. We also obtained wage data from the Bureau of Labor Statistics (1990-1995).

Outputs Definitions. Estimation of the neoclassical cost function requires data on the quantity of the outputs produced by the regulators and the prices of the inputs to regulation. Determining the proper outputs for the regulatory agency is difficult and may, in part, depend upon the regulator's objective function. However, we were able to identify a number of outputs which appear to explain much of the variation in costs across the states. The outputs we considered in this analysis were:

- *Number of Licensed Producers.* The regulator in each state is responsible for monitoring the conduct of the agents that operate within the state. Accordingly, this output was measured by the number of producers licensed to conduct business in the state.
- *Market Conduct and Solvency Oversight.* Market conduct exams are undertaken to ensure that company advertising, and sales materials and practices are accurate and not misleading. The states perform solvency oversight by conducting periodic solvency exams or audits, primarily on locally based insurers. Because many of these market conduct and solvency exams are

[25]Our data set contains 277 observations over the six-year time period. Twenty-nine observations were deleted due to missing data or because inconsistent variable definitions were used by some of the states over subsets of the time period studied. Details of which state observations excluded from the analysis are available upon request.

performed concurrently, we measured this output as the sum of market conduct and financial exams conducted each year weighted by the average assets of the insurers domiciled in the state. We employ this weighting in an attempt to recognize the difference between a state with small, relatively simple local insurers and a state with larger insurers and therefore potentially more complicated examinations.

- *Model Law Development and the Investigation of Common Problems.* The individual insurance commissioners and their staff serve on numerous committees, established with the help of the NAIC, to develop new regulations and to examine problems and issues that are common to many or all of the states. To measure the extent that a state commits time and resources to this function, we determined the number of committee positions that are filled by a representative from each state, using the *1996 Committee List* obtained from the NAIC.[26]
- *Consumer Services.* Individual insurance departments provide a number of services to the state's residents. These include such things as telephone "hotlines" that provide consumers a mechanism to contact the insurance commissioners' office to lodge complaints against their insurer and the development of brochures and price guides to help educate consumers about the insurance market. We measured the state's quantity of consumer services as the number of consumer complaints received and acted upon by the state insurance department each year.
- *Regulation of Prices.* Approximately 50 percent of the states regulated the price of private passenger automobile (PPA) and workers' compensation insurance over this time period. To control for the production costs associated with regulating the price of insurance, we employ

[26]There is no time series variation in this variable because we were able to obtain this information for one year only . However, conversations with officials from the NAIC suggest that the composition of the majority of these committees was relatively stable over the time period considered.

three rate regulation dummy variables .[27] First, since the majority of states that regulate the price of insurance do so for both lines of business, we employ a dummy variable equal to one if the state used either prior approval or state-made rates for both PPA and worker's compensation. Otherwise, the dummy variable equals zero.[28] We expect a positive sign on this variable. We employ two other dummy variables to control for differences in production costs when the state regulates prices in only one of the two lines of insurance: one dummy variable set equal to one if the state regulated rates for private passenger automobile insurance only and a second dummy variable equal to one if the state regulated rates for only workers' compensation. The expected signs on these two dummy variables are negative reflecting the reduced production costs the state should incur when they do not regulate prices in both lines of insurance.

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[27]We considered alternative methods to estimate the production of "price regulation". One alternative would be to determine the benefit to consumers of price regulation. Ideally, we would like to obtain some measure of the consumer surplus gained from price regulation. Unfortunately, the practical problems of estimating this are innumerable. Another alternative would be to determine the number of rate filings that the regulator reviews during the year. However, there are problems with this alternative as well. For example, some states require all companies which operate in the state to use rates determined by the regulator - so called state-made rates while other states allow the companies to determine their own rates and then request approval to use those rates from the regulator. Therefore, it was not clear how to uniformly determine the number of different rate filings a regulator must review in the state during each year.

[28]Other lines of business often subject to price regulation include homeowners insurance and some commercial property/liability coverages. We use the state's PPA and workers' compensation rating laws for two reasons. First, PPA and workers' compensation are the two largest lines of business in the property/liability industry. In 1995, PPA and workers' compensation premiums constituted 39.3 percent and 10.1 percent of all property/liability net premiums written in the United States, respectively (Insurance Information Institute 1996). Second, the rating laws that apply to the other property/liability coverages are usually similar or less stringent to the law that applies to these two lines of insurance. In general, there is no price regulation in the life insurance industry. Cummins, Phillips, and Tennyson (1998) report the implementation of rate regulation for some states appears to differ substantially from the state's rating legislation. We therefore follow their procedure and determine each state's regulatory status from a number of industry sources and from direct contact with the state insurance departments when necessary. Industry sources used include the Alliance of American Insurers (1993), the American Insurance Association (1995), National Association of Insurance Commissioners (1995a).

- *Fraud.* We also use a dummy variable for those states that have separately funded insurance fraud prevention and detection departments. We have no method of comparing the intensity of the effort across states, so we use a dummy variable that is one if the state has a unit or bureau devoted to detecting and/or prosecuting insurance fraud within the state, zero otherwise.

Inputs Definitions. Empirical estimation of the cost function requires estimates for the prices of the inputs to insurance regulation. Inputs used in this study were wages for professionals (lawyers and actuaries), clerks (which includes all other labor staff of the insurance department), and the cost of materials (such as paper, pencils, and photocopying).[29]

To estimate the input prices of labor we obtained average wage data from the Bureau of Labor Statistics' publication *Annual Employment and Wages.* For lawyers we used the wage data from the series entitled "Lawyers" (SIC code 8111), for actuaries we used data for "Management Consultants" (SIC code 8742), and for clerical staff we used the series entitled "Total State Government." To save degrees of freedom, we took the weighted average of lawyers and management consultant wages to calculate the wage for professionals in each state. To estimate the price of materials, we assumed that the states faced the same price for materials in a given year equal to the producer price index in a given year.

Control Variables.

Cost efficiency studies often are criticized because no attempt is made to control for product quality differences. Failure to adequately control for these differences will show up as cost inefficiencies if states incur additional costs in providing higher quality regulatory services. Fortunately, beginning in 1990, the NAIC began a review of each state's insurance department to determine if the state met a

[29]The departments often hire part time or contract workers and professionals. We use full-time equivalents for our quantity of labor measure.

comprehensive set of standards designed to ensure that the state could efficiently and effectively regulate the insurers domiciled in its jurisdiction. The standards for a state to become accredited went beyond requiring the adoption of certain laws and regulations to include other areas such as the operational and administrative functions of the departments. For example, departments were required to demonstrate an adequate level of overall funding, establish training seminars for insurance department staff and examiners, and ensure salary levels were adequate to attract and retain quality employees (National Association of Insurance Commissioners 1995b). To control for cost differences associated with states certified as high quality producers of insurance regulatory services, we include a dummy variable equal to one if the state was accredited by the NAIC during the year, zero otherwise.

The second control variable we include is a dummy variable set equal to one for the state of New York and zero otherwise. New York is the only state to require all life insurers licensed in New York to substantially comply with its rules and regulations in all states that insurer operates in regardless of its state of domicile.[30] This effectively requires the New York insurance department to oversee the operations of both the domestic and foreign insurers operating in New York nationwide. Thus, we include a New York dummy variable to control for cost differences associated with this extra-territorial requirement.

Table 6 presents the summary statistics for the inputs and the outputs. The budget of the average state insurance department was $11.6 million over the time period 1990-1995 as measured in real 1995 dollars. Notice, however, that the smallest insurance department (South Dakota) had a real budget of less than $1,000,000 on average during this time period, while California reported the largest department of over $90 million. Correspondingly, there is a wide variation in the quantity of regulatory outputs produced by the insurance departments. For example, the average state had 49,064 licensed producers

[30]See N.Y. Insurance Law § 4205 (consol. 1998).

with a range of 1,718 to 321,266 producers. Market conduct and financial exams averaged 81.6 per state, the average number of NAIC committee representatives provided by a state was 25.6, and the mean number of consumer complaints was 9,190.7. Approximately 60 percent of the states in the sample have prior approval or state-made rate regulation for workers' compensation and private passenger automobile insurance and 41 percent of the states were accredited by the NAIC during the sample period.

In addition to the wide variation of output levels produced by the various insurance departments, the quantity of inputs employed also varies dramatically. For example, the number of full time equivalent actuaries employed by the average state was 5.2 and ranged from none to 71.5 actuaries (New York in 1993).[31] The number of clerical workers also varies dramatically across the states. The average state insurance department employed 203 clerical workers. The state with the largest number of clerical employees was Texas which employed 1,541.3 workers. To estimate the quantity of materials employed by each state, we determined the amount of the insurance department's budget not allocated to wages for professionals (actuaries and lawyers) and clerks and divided that amount by the materials input price, the producer price index.

Estimation Results. Table 7 shows the results of the estimation of equations (8) and (9). We estimated two share equations: one for professionals and one for clerical workers. The materials equation was dropped to prevent singularity since the three share equations sum to 1. Further we estimate two cost functions. The first is a cost function assuming cost minimization. This is essentially the non-cost minimizing cost function as described in equations (8) and (9) except we set $\theta_i = 0$ for all θ_i . The second is the non-cost minimizing cost function as described in equations (8) and (9).

[31]Insurance department often hire outside consultants and temporary workers to staff positions. Our measure of the number of employees includes both salaried staff as well as contact staff.

It is possible to test assumption of cost-minimization by conducting a likelihood ratio test between the two estimated cost functions. The log likelihood function is greater for the non-cost minimizing cost function and the difference is significant at the 0.005 level with two degrees of freedom. Thus, the cost minimizing assumption is rejected. In addition, we tested the joint hypothesis that $\theta_i \neq 0$ for all i from the estimated NCMCF. With 2 degrees of freedom, the joint hypothesis is rejected at all reasonable levels of significance. This second test further supports the conclusion that state insurance regulators are not cost-minimizers and therefore the conjecture of allocative inefficiency in state insurance regulatory departments' is warranted.

Examining the parameter values from Table 7 for the non-cost minimizing cost function we see that the shadow divergence parameter for professionals, θ_1, is negative but not significantly different than zero. For clerks, $\theta_2 < 0$ implies that $w_2^{sh} < w_2$ and the states, on average, over employ clerical assistance. These results are at least consistent with the anecdotal evidence regarding the heavy work load of professionals who tend to have competitive market salaries in insurance departments and the lack of investment in computers and technology (see GAO: 1989). Table 7 also shows that accredited states do incur significantly higher production costs consistent with the hypothesis the quality of regulatory services produced by these states is higher.

Table 8 shows that the average state's efficiency score was 0.6608 for the non-cost minimizing cost function result.[32] Thus, the average state could produce the same level of outputs at 66.08 percent of the cost if they adopted the optimal technology. Table 8 also provides evidence regarding the degree of allocative efficiency. Using Eakin's (1993) allocative inefficiency measure described in equation

[32]Although we must express some caution making comparisons between the industry and the regulators which oversee its actions, it is interesting to note that efficiency estimates of the insurance industry reported by various researchers are consistent with the estimate we report here. See, for example, Gardner and Grace(1993), Cummins and Zi (1995) and Yuengert (1993).

(12), we see that costs are on average about 1.6 percent higher for the non-cost minimizing models than they would be if the state employed the market input prices and employed the correct input amounts. Thus, the majority of the estimated inefficiencies in state regulation are attributable to technical inefficiencies and not to allocative inefficiencies.

Although the overall allocative efficiency difference is small, the price elasticity of input demand differs between the cost-minimizing and non-cost minimizing models for the two observed elasticities. Further the shadow own price elasticities are more inelastic than the observed elasticities. There is also a difference between the input cross elasticity of demand estimates. The non-cost minimizing model shadow elasticity is lower than the observed, implying less substitutability between clerks and professionals. Thus, the perceived production function is quite different than the cost-minimizing version. A likelihood ratio test of these differences is significant at all relevant ranges.

Table 9 shows the pairwise cost complementary estimates using the non-cost minimizing cost function for three levels of output.[33] We examine the cost function at the first quartile of outputs, at the mean level of outputs, and at the third quartile. The results are largely consistent across each output level. We find that costs are additive across most outputs pairs with the only exceptions being diseconomies of scope for 1) model law development and monitoring of licensed producers, and 2) production of consumer services and conducting regulatory examinations. In addition, we find diseconomies of score between consumer services and licensed producers at the mean and third quartile level of outputs. The only instance where we find any evidence suggestive of economies of scope is a marginally significant cost complementary measure for the output pair regulatory examinations and model law development at the mean level of outputs. The results on the whole suggest there are few,

[33]The estimates using the cost-minimizing cost function are essentially the same as those reported in Table 9 and thus are not shown.

if any, economies of scope in the production of insurance regulatory services. Thus, solely from a cost efficiency viewpoint, only a weak argument can be made suggesting each output of insurance regulation should be produced in every state. Table 10 reports the overall economy of scale estimates and the product specific scale estimates for each regulatory output. The first column reports scale economies using the estimated cost function assuming cost minimization. The second column reports those same estimates using the non-cost minimization cost function. As before, we report these estimates at the first quartile, mean level, and third quartile of outputs.

The top portion of Table 10 shows at the mean level of outputs, the overall observed elasticity of scale is 0.8412. Using a one-tail test, this is significantly less than one at the 0.01 level. With the relaxation of the cost minimization assumption, we see that the estimated observed economies of scale are slightly higher at 0.8853 which is also significantly less than one at the 0.01 level. Examining the results for the outputs at the first quartile, we see that the elasticities of scale are even lower than that of the mean state. This makes intuitive sense as the states are to the left of the mean state on the estimated average cost curve. However, when we examine the results at the levels of the third quartile we see that the non-cost minimizing state experiences decreasing returns to scale which are statistically greater than one at the 0.01 level.

In contrast to the overall scale economy estimates, the bottom portion of Table 10 suggests there are significantly increasing product-specific scale economies for all outputs of insurance regulation except model law development. The only exception to this general conclusion is the monitoring of licensed producers output for which the product specific scale estimates at the first quartile of outputs are not statistically different than zero. Thus, we find evidence indicating there are decreasing marginal costs for increasing levels of production for most regulatory outputs for even the largest states.

Prior to conducting this analysis, we expected there would be few, if any, fixed costs associated with the production of insurance regulation. Thus, we expected to find increasing economies of scale for all but the smallest states and constant returns for the remaining states. However, our results suggest a range of potential economies of scale, including decreasing returns for the model law development output for small and medium sized states. It is also interesting to note that even though the product-specific scale estimates all suggest scale economies have not been exhausted for even the largest states, the overall economy of scale estimates for the large states suggests the marginal cost of increasing regulatory outputs, holding the output mix fixed, is increasing. These results could be interpreted in two ways. First, our results could suggest state regulation is the most cost efficient scale to produce insurance regulation and aggregating the production of one or more of the regulatory functions to a multi-state or federal regulator would lead to increases in the average cost of production. Alternatively, the result may also be consistent with the hypothesis that larger states are regulating for a national audience and are thus are providing regulatory benefits not fully captured by the state even though the cost of doing so is fully borne by the state. This latter interpretation of our scale economy result suggests we need to control for the incentive for states to free-ride on the regulatory outputs of other states before we can make any conclusions regarding the optimal scale of insurance regulation. We investigate this and other hypotheses designed to explain the relative cost-efficiency of the states next.

V. Determinants of Efficiency

In this section we develop and test hypotheses designed to explain the level of efficiency across the states. We are interested in three principal questions: (1) is there evidence of states free-riding on the regulatory outputs and services of other states; (2) if the answer to the first question is yes, does controlling for the regulatory externality give us any additional information regarding the optimal scale

for the production of insurance regulation; and (3) does the environment the insurance department operates in effect the level of efficiency. We investigate our hypotheses by estimating additional regressions using the error term from the estimated non-cost minimizing cost function analysis as the dependent variable.[34]

Regulatory Externatilities. The literature on fiscal federalism suggests governmental jurisdictions have strong incentives to utilize their resources efficiently when the benefits of the public goods they produce are fully internalized (Oates 1972 and see, e.g. Inman and Rubinfeld 1997). Thus, our first hypothesis is that states with a greater percentage of premium written in the state by locally headquartered companies will have a stronger incentive to utilize their resources in a more cost efficient manner. Stated differently, states with small domestic industries have a lesser incentive to use their regulatory resources efficiently and will instead rely upon other states to regulate for them[35]. To test this hypothesis, we include a variable equal to the percent of the premiums written in the state by foreign insurance companies. We expect a positive sign suggesting states with a greater proportion of premiums being written by foreign insurers will be further from the estimated frontier, i.e., less cost efficient.

As a more refined test of the externality hypothesis, we run an additional test where we decompose the foreign insurer market share variable discussed above into two components: one equal to the proportion of the state's insurance premiums written by foreign insurers headquartered in the top ten states in terms of regulatory expenditures; and two, a variable equal to the proportion of the state's

[34]It is also common in the literature to use the x-efficiency score for each state as computed by equation (10). However, we use the error term to take advantage of the time varying nature of the results from our analysis. Year dummies are used to control for any time specific fixed effects not captured by the explanatory variables.

[35]Small states may just choose to reduce the level of services they provide rather than produce those services in an inefficient manner. Put in here that states are required to produce so many services by law but the manner is which they produce them is not mandated.

insurance premiums written by foreign insurers from all other states excluding the large regulatory states. We expect both variables will be positive. However, the coefficient on the variable measuring the proportion of the foreign insurer market share from the large regulatory states should be larger in magnitude than the foreign insurer variable from the smaller regulatory budget states if states have a greater ability to free-ride on those states which choose to expend the greatest regulatory resources. We test this hypothesis by conducting a Wald test on the restriction that the estimated coefficients on the two foreign insurer market share variables will be equal.

The regulatory externality hypothesis suggests small states have an incentive to conduct minimal oversight of their own domestic insurers because they believe large regulatory budget states will pick up the slack. However, the local insurance industry in these large regulatory budget states may have incentive to encourage their home state regulator to scrutinize foreign insurers more carefully if doing so creates a significant barrier to entry for insurers coming from lax regulatory jurisdictions. Most studies of the industrial organization of the insurance industry suggest that there are relatively low barriers to entry (See e.g. Joskow and McLaughlin 1991). However, if the local industry is successful in influencing the regulator to erect modest barriers which discourage the marginal low cost (and/or low quality) insurers, then we would expect the profitability of the domestic insurance industry to be positively correlated with degree to which the state appears to be regulating beyond its jurisdiction. To test this hypothesis we include a variable equal to the total net income generated by the domestic insurers in the state divided by their total capital and surplus.[36] The sign on the estimated coefficient should be positive suggesting states which regulate beyond their borders, and thus appear more cost inefficient. will have a more profitable domestic insurance industry.

[36]This ratio can be thought of as the total return on equity for companies headquartered in a given state.

Regulatory Environment. There is a growing literature which investigates how the institutional structure of government affects the incentives officials have to utilize their resources in an efficient manner. We draw from this literature to further explain the estimated variation in cost efficiency across states.

Our first environmental hypothesis is related to the concept of a soft budget constraint. Budget constraints are said to be soft, i.e., not fixed, whenever an enterprise can be infused with additional capital when it is on the verge of failure (Maskin 1998). Using this idea, Bartel and Harrison (1999) empirically demonstrate that public sector enterprises, which face softer budget constraints than their private sector competitors, are more cost inefficient and argue the primary reason is because they are able to hire and retain unnecessary workers given their access to subsidized government loans. In this study we proxy for the presence of a soft budget constraint by including an indicator variable equal to one when the state insurance department has access to reserve funds through a system known as dedicated funding. A dedicated funding system is one where the insurance department is allowed to build up cash reserves, which can be carried over from year to year, whenever the revenue of the department exceeds its expenses. In doing so, the department has access to additional funds which allow it to continue spending money even when its anticipated expenditures for the year are greater than its legislative appropriation (NAIC 1997). The alternative to the dedicated funded system, known as general revenue funding, requires the insurance department to request funds each year through the annual budgetary appropriation process which, according to the NAIC, gives the state government greater incentives to monitor the department and also substantial control over how the department spends this money. We expect the sign on the estimated coefficient of the reserve funds indicator variable to be positive suggesting insurance departments with access to additional funds through a dedicated fund will be more cost inefficient.

Our second environmental hypothesis is related to source of the insurance department's funds. There are two primary methods the states use finance the operations of the insurance department: general appropriations from the overall state budget; and from fines, fees, and assessments imposed on the industry which flow directly into the state insurance department's budget. We expect departments which obtain a greater percentage of their funds through general state appropriations will be more cost efficient since the legislative and executive branches of state government have a strong incentive to monitor how efficiently the department uses its resources as any savings from efficiency gains by the department could be reallocated to other uses within the state. Insurance companies in states which rely more heavily upon fines, fees, and assessments, also have an incentive to monitor how efficiently the department utilizes its resources. However, it is unlikely the industry's ability to monitor the actions of the regulator are superior to the state's and its ability to enforce more fiscal discipline upon the department is likely to be weaker than the state's. Thus, we expect insurance departments which finance their operations through fines, fees, and assessments will be more cost inefficient. To test this hypothesis we include a variable equal to the percent of the insurance department's annual budget which comes from fines, fees and assessments. We expect the sign on the estimated coefficient to be positive.

One of the results we found in conducting our non-cost minimizing cost function analysis is that the estimated shadow input price for clerical assistance was significantly below the market input price suggesting the average insurance department over employs clerks. A large literature exists that predicts the level of wages in unionized state government labor markets is higher than in non-unionized states (see e.g., Poterba and Reuben 1998). Assuming these results hold in the market for insurance department clerks, than the presence of a union, through it ability to collectively bargain with the state, may correct the divergence between actual market prices and the estimated shadow prices and therefore

lead the department to employ the efficient level of clerical assistants.[37] To test this hypothesis, we estimated a variable equal to the percent of government employees in the state (excluding teachers) which are either members of a union or a covered under a union contract. The data to estimate this variable is available in the March Supplement of the Current Population Survey published by the Bureau of the Census. We expect the sign on this variable to be negative suggesting states with a greater percentage of their workers in unions will be less cost inefficient.

Our final environmental hypothesis is designed to investigate whether the method by which the insurance commissioner of the state is determined explains the levels of efficiency across the states. In most states, the insurance commissioner is appointed by the governor. However, in approximately fourteen states, the insurance commissioner is an elected position. To generate our hypothesis, we draw our intuition from the principal agent literature of politics which suggests officials who desire to advance their political careers must act in the principal's interest sufficiently often to merit consideration for the same or a higher office (Besley and Case 1995). Since the effort level of the political agent is not directly observable, the principal will use some output measure correlated with the agent's performance to gauge the quality of the agent. In the case of the appointed commissioner, the principal primarily judging the performance of the insurance commissioner will be the governor of the state. Given the institutional memory contained by the staff of the executive branch, governors should have reasonable expectations regarding the efficient production of insurance regulatory outputs given departmental budgetary constraints and thus should judge the quality of the commissioner by the how efficiently the

[37]Unions may increase productivity for other reasons besides correcting the shadow/market price differences estimated in this paper. For example, Cavalluzzo and Baldwin (1993) argue unions can force management to adopt more efficient job practices. Freemen and Medoff (1984) suggest unionized workers are more likely to have longer job tenures which may lead to increases in productivity due to their greater training and experience with the firm. Finally, Mohanty (1997) finds empirical evidence the higher wages promised by unions attracts more productive workers to unionized government jobs which leads to higher levels of estimated productivity.

department's resources are utilized. For the elected commissioner, however, the primary principal monitoring the performance of the commissioner will be the voters of the state. We hypothesize voters are unlikely to use economic cost-efficiency as the primary performance measure by which they gauge the quality of their regulator given the complexity of the variable. The general electorate is more likely to use output measures which can be easily communicated to them such as the number of consumer complaints reviewed by the insurance department or the number of consumer brochures made available to them. Thus, we predict appointed commissioners have a greater incentive to use their resources in a cost efficient manner. To test the hypothesis, we include dummy variable equal to one if the position of insurance commissioner is an appointed one and zero otherwise. We expect a negative sign suggesting appointed insurance commissioners operate closer to the estimated frontier and therefore more cost efficient.

In Table 11 we present the descriptive statistics of our sample. Note that this is the same sample of states and the same time period we use to estimate the non-cost minimizing cost function. We include these statistics here to show the values of the variables employed in the regression models described in Table 12.

The results reported in the first two columns of Table 12 are largely consistent with our hypotheses. In Model 1, the foreign insurer market share variable is positive and significant suggesting states with a greater percentage of the premiums being written by insurers domiciled in other states are less efficient. In Model 2, both the large regulatory states' foreign insurer market share and the all other states' foreign insurer market share variables are positive although only the large regulatory variable is significant. A Wald test rejects the null hypothesis that the coefficient on the large regulatory states foreign insurer market share variable is equal to the all other states foreign insurer market share variable

(χ^2=6.038, one-sided p-value is 0.014 with one degree of freedom).[38] Thus, we find strong evidence states have a greater ability to free-ride on those states which choose to expend the greatest resources on insurance regulation. In addition, the coefficient on the profitability of the domestic industry variable is positive and significant consistent with the hypothesis extraterritorial regulation is correlated with the profitability of the domestic insurance industry. Viewed broadly, our results are consistent with the conclusion reached by Case, Rosen and Hines (1993) that states are influenced by the choices made by other states when they are deciding what their own state government should do.

In addition to the regulatory externality tests, many of the regulatory environment variables are consistent with our expectations. The percent of state government employees covered by a union contract is negative and significant consistent with the hypothesis that unions force government managers to raise the wages of government workers to market prices thereby giving them stronger incentives to employ the allocatively efficient number of clerks. The percent of funding from fees, fines and assessments variable is positive and significant suggesting state insurance departments funded by directly taxing the industry are more cost inefficient consistent with a heightened principal-agent problem. The reserve funding indicator variable is also positive and significant consistent with the hypothesis state insurance departments with softer budget constraints are be more cost inefficient. Finally, in Models 1 and 2 the appointed commissioner dummy variable is negative although not significant suggesting elected and appointed insurance commissioners have equal incentive to use their resources in a cost efficient manner.

Optimal Scale

[38]This result is robust changing the decomposition of the foreign insurer market variable defining the large regulatory states as being either the top five or the top fifteen states. We report the result making the delineation using the top ten states as it yields the best overall fitting model in terms of F-statistic.

Having found direct evidence of extraterritorial regulation by large regulatory states, we now return to the question of whether the optimal scale for insurance regulation is still smaller than the largest quartile of insurance departments. We conduct this investigation by including a proxy for the size of the state's insurance department in the regulatory efficiency regressions reported in Table 12. Our proxy for state size equals the percent of national premiums written in the state and we include both linear and quadratic specifications to test for the presence of a non-linear relationship between cost efficiency and state size. The estimated coefficient in the linear specifications, reported in Models 3 and 5 of Table 12 are both negative but not significant suggesting no significant cost efficiency differences between large and small states. However, the coefficients in the quadratic specifications reported in Models 4 and 6 are all significant and suggest the average level of cost efficiency is negative for smaller states but is positive for states with nationwide premium volumes greater than 6.0 (5.5) percent, respectively. Thus, larger states appear more cost efficient once we control for the incentive of small states to free ride on larger budgetary states. This result can also be seen in Model 7 where we interact the state size variable with the foreign insurer market variable. The estimated coefficient on variable proxying for state size is now negative and significant suggesting larger states are more cost efficient and the interaction variable is positive and significant suggesting that after controlling for size, states with greater levels of foreign market share are more cost inefficient. The results for the remaining tests are largely unchanged except for the appointed commissioner dummy variable which is marginally negative and significant after controlling for state size.

VI. CONCLUSION AND IMPLICATIONS

Our interest in this paper is to examine the sources of inefficiency in the production of state regulation of the insurance industry. We pay particular attention to examining the implication of the nature of insurance regulation as it is unique in the U.S. federal system of government. The industry is

regulated at the state level while the majority of insurance transactions are conducted interstate. Using data on the annual resources of state insurance departments, we estimated a non-cost minimizing cost function of insurance regulation and obtained various measures of state regulatory efficiency. We then attempt to use these efficiency results to infer the source of some of the inefficiencies.

We conjecture there are two major sources of inefficiency. The first is derived from the existence of a regulatory externality. That is, we hypothesize some states will voluntarily produce regulation that benefits consumers or taxpayers outside of the state's jurisdiction and that other states have incentives to shirk their regulatory responsibilities. Specifically, we find evidence that small insurance regulatory budget states free-ride on larger budget states and that large states may voluntarily export these regulatory goods and services as a way to erect entry barriers into the state by insurers from lax regulatory jurisdictions. One of the seemingly anomalous results we obtained with the cost function efficiency estimates was that there appeared to be decreasing returns at the largest level of regulatory production. On the surface this implies that the optimal level of regulation is below the scale of the largest states. However, once we control for the trans-state externality by looking at the mix of business (domestic versus foreign) in a market we see that states with larger budgets are actually more efficient, all other things held constant. Thus, controlling for the existence of the trans-state externality we see, consistent with the theoretical literature on fiscal federalism, that there may be benefits to internalizing regulatory costs by increasing the scale of regulatory jurisdiction.

We also examine the possibility that the state's own regulatory environment may dictate the level of efficiency obtained by the regulatory agency. Drawing from a growing literature on the sources of public sector inefficiencies, we investigate how regulatory and budget institutions within a state create or reduce incentives for bureaucrats to utilize their resources efficiently. We find that proxies for differences between the methods used to finance the activities of the agency and the degree to which the

agency has access to resources external to the direct oversight of the state government are important indicators of how efficient the regulator might be.

An interesting implication for our analysis concerns the regulatory issues that are likely to be raised with the recent passage of the Gramm-Leach-Bliley Financial Services Modernization Act of 1999. While the Act eliminated the remaining barriers between the various sectors of the financial services industry, it maintained status quo with respect to the regulation of the industry. Bank regulators will continue to regulate bank-like activities and insurance regulators will continue to regulate insurance-like activities - so called functional regulation. Thus, for the time being, the U.S. will stay with the state level for the regulation of the insurance industry.

An interesting ramification of functional regulation will be that newly formed financial service conglomerates owning banks, insurers, and securities firms will soon be able to sample from all the regulatory agencies and then will be able to compare and contrast the costs of compliance associated with the various agencies. An interesting question is how long major financial service companies will tolerate having to deal with potentially fifty-one state regulatory jurisdictions for insurance and only two or three for their banking operations. In addition to the direct costs of compliance, these large financial firms will also will be able to assess the quality of state insurance regulation versus federal bank and securities regulation. This is likely to become more important in the near future to the extent state regulation appears duplicative, inefficient, or ineffective due to the trans-state externalities or the states' own regulatory environments. Pressure by the industry to form a new system will be proposed if these firms find the costs and benefits of regulation are different in their insurance operations then in the other areas of their businesses. To survive in an environment where the costs and benefits of regulation can be inferred from within the same company, state insurance regulators will need to provide new methods

of regulation that reduce the cost of regulation to the regulated industries. The results we document regarding the sources of inefficiency in the current system should prove useful as this debate begins.

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Table 1
Percent of State Insurance Premiums Written by Domestic Companies, 1995

State	Property/Casualty Premiums			Life/Health Premiums			Insurance Industry Premiums		
	Domestic	Total	Percent Domestic	Domestic	Total	Percent Domestic	Domestic	Total	Percent Domestic
Alaska	121.4	769.9	15.8%	-	625.9	0.0%	121.4	1,395.7	8.7%
Alabama	610.2	3,455.1	17.7%	370.3	3,235.9	11.4%	980.5	6,691.0	14.7%
Arkansas	116.8	2,235.2	5.2%	579.0	2,405.3	24.1%	695.8	4,640.6	15.0%
Arizona	884.9	4,427.6	20.0%	304.7	4,105.6	7.4%	1,189.6	8,533.2	13.9%
California	14,250.5	33,471.6	42.6%	2,094.7	28,911.6	7.2%	16,345.1	62,383.2	26.2%
Colorado	509.1	4,321.0	11.8%	236.5	4,618.6	5.1%	745.6	8,939.6	8.3%
Connecticut	778.4	4,519.0	17.2%	3,698.7	7,627.0	48.5%	4,477.1	12,146.0	36.9%
District of Columbia	42.7	844.1	5.1%	3.1	1,383.7	0.2%	45.8	2,227.8	2.1%
Delaware	359.1	1,256.8	28.6%	143.2	1,896.3	7.5%	502.3	3,153.1	15.9%
Florida	2,683.3	15,807.7	17.0%	2,134.9	16,942.7	12.6%	4,818.2	32,750.4	14.7%
Georgia	908.9	6,904.8	13.2%	279.7	7,078.7	4.0%	1,188.6	13,983.5	8.5%
Hawaii	480.6	1,628.3	29.5%	63.8	1,203.3	5.3%	544.4	2,831.6	19.2%
Iowa	795.1	2,584.8	30.8%	1,896.6	4,507.7	42.1%	2,691.7	7,092.5	38.0%
Idaho	288.3	1,110.7	26.0%	22.1	1,256.4	1.8%	310.4	2,367.1	13.1%
Illinois	7,161.8	12,513.9	57.2%	4,129.8	18,240.8	22.6%	11,291.6	30,754.8	36.7%
Indiana	2,101.8	5,954.0	35.3%	937.1	6,210.3	15.1%	3,038.9	12,164.3	25.0%
Kansas	427.1	2,547.2	16.8%	818.0	3,399.9	24.1%	1,245.1	5,947.1	20.9%
Kentucky	452.9	3,226.3	14.0%	274.1	2,886.5	9.5%	727.0	6,112.8	11.9%
Louisiana	545.3	4,777.1	11.4%	584.9	4,073.6	14.4%	1,130.1	8,850.7	12.8%
Massachusetts	3,669.0	7,735.2	47.4%	1,388.8	8,567.8	16.2%	5,057.8	16,303.1	31.0%
Maryland	620.1	4,764.5	13.0%	282.1	5,897.0	4.8%	902.2	10,661.5	8.5%
Maine	304.3	1,135.4	26.8%	56.4	1,158.8	4.9%	360.7	2,294.3	15.7%
Michigan	4,491.4	10,137.7	44.3%	616.5	9,991.0	6.2%	5,107.9	20,128.8	25.4%
Minnesota	925.0	4,972.8	18.6%	1,043.7	5,776.8	18.1%	1,968.8	10,749.6	18.3%
Missouri	650.3	5,183.5	12.5%	957.0	6,382.4	15.0%	1,607.3	11,565.8	13.9%
Mississippi	406.4	2,131.4	19.1%	166.2	1,969.6	8.4%	572.5	4,101.0	14.0%
Montana	21.5	844.1	2.5%	0.8	725.3	0.1%	22.3	1,569.4	1.4%
North Carolina	976.0	5,995.3	16.3%	521.1	7,537.8	6.9%	1,497.2	13,533.1	11.1%
North Dakota	124.5	632.8	19.7%	24.6	690.6	3.6%	149.1	1,323.3	11.3%
Nebraska	374.5	1,738.6	21.5%	897.9	3,103.1	28.9%	1,272.4	4,841.7	26.3%
New Hampshire	193.7	1,203.4	16.1%	20.8	1,205.8	1.7%	214.5	2,409.2	8.9%
New Jersey	4,028.2	11,164.7	36.1%	1,486.3	11,905.1	12.5%	5,514.5	23,069.8	23.9%
New Mexico	119.0	1,485.4	8.0%	0.1	1,559.6	0.0%	119.1	3,045.0	3.9%
Nevada	27.9	1,537.9	1.8%	14.8	1,330.2	1.1%	42.7	2,868.1	1.5%
New York	5,390.5	21,078.7	25.6%	11,424.8	25,108.6	45.5%	16,815.3	46,187.3	36.4%
Ohio	4,702.4	9,843.5	47.8%	1,810.2	12,985.3	13.9%	6,512.6	22,828.9	28.5%
Oklahoma	434.0	2,958.0	14.7%	198.6	2,729.5	7.3%	632.6	5,687.5	11.1%
Oregon	840.9	3,269.7	25.7%	294.4	3,218.5	9.1%	1,135.3	6,488.2	17.5%
Pennsylvania	3,468.0	12,497.4	27.7%	659.0	13,453.7	4.9%	4,127.1	25,951.1	15.9%
Rhode Island	280.8	1,188.2	23.6%	31.6	1,046.9	3.0%	312.4	2,235.1	14.0%
South Carolina	801.4	3,408.2	23.5%	179.1	3,186.1	5.6%	980.5	6,594.3	14.9%
South Dakota	72.4	762.7	9.5%	9.8	850.7	1.2%	82.3	1,613.4	5.1%
Tennessee	663.5	4,679.7	14.2%	399.1	5,493.1	7.3%	1,062.6	10,172.8	10.4%
Texas	7,179.2	18,791.3	38.2%	6,851.6	22,288.8	30.7%	14,030.8	41,080.1	34.2%
Utah	236.0	1,612.1	14.6%	306.4	1,764.7	17.4%	542.4	3,376.8	16.1%
Virginia	198.0	5,548.7	3.6%	1,964.3	8,103.3	24.2%	2,162.2	13,652.0	15.8%
Vermont	110.1	652.0	16.9%	19.3	581.1	3.3%	129.4	1,233.1	10.5%
Washington	1,239.8	4,753.7	26.1%	770.4	5,268.3	14.6%	2,010.2	10,022.0	20.1%
Wisconsin	2,256.2	4,841.2	46.6%	1,273.0	6,203.4	20.5%	3,529.1	11,044.6	32.0%
West Virginia	50.9	1,422.7	3.6%	3.8	1,521.4	0.2%	54.7	2,944.1	1.9%
Wyoming	28.0	408.6	6.9%	0.3	443.0	0.1%	28.3	851.6	3.3%
		270,734.4			302,657.2			573,391.6	
Average			21.3%			11.8%			16.6%
Standard Deviation			13.1%			11.7%			9.9%
Minimum			1.8%			0.0%			1.4%
Maximum			57.2%			48.5%			38.0%

Note - premiums are reported in $ millions.

Table 2
Percent of Insurers Conducting Business in the State That Are Domiciled in the State, 1995

	Property/Casualty Companies			Life/Health Companies			All Insurance Companies		
State	Domestic	Total	Percent Domestic	Domestic	Total	Percent Domestic	Domestic	Total	Percent Domestic
Alaska	5	419	1.2%	0	555	0.0%	5	974	0.5%
Alabama	27	662	4.1%	24	666	3.6%	51	1328	3.8%
Arkansas	11	605	1.8%	36	680	5.3%	47	1285	3.7%
Arizona	25	696	3.6%	32	698	4.6%	57	1394	4.1%
California	137	722	19.0%	38	691	5.5%	175	1413	12.4%
Colorado	22	641	3.4%	14	676	2.1%	36	1317	2.7%
Connecticut	55	516	10.7%	23	581	4.0%	78	1097	7.1%
District of Columbia	8	470	1.7%	4	551	0.7%	12	1021	1.2%
Delaware	33	519	6.4%	32	580	5.5%	65	1099	5.9%
Florida	81	784	10.3%	26	721	3.6%	107	1505	7.1%
Georgia	40	755	5.3%	17	685	2.5%	57	1440	4.0%
Hawaii	11	385	2.9%	4	548	0.7%	15	933	1.6%
Iowa	47	668	7.0%	27	620	4.4%	74	1288	5.7%
Idaho	12	566	2.1%	3	595	0.5%	15	1161	1.3%
Illinois	141	804	17.5%	80	701	11.4%	221	1505	14.7%
Indiana	66	775	8.5%	40	693	5.8%	106	1468	7.2%
Kansas	21	632	3.3%	10	639	1.6%	31	1271	2.4%
Kentucky	11	672	1.6%	9	647	1.4%	20	1319	1.5%
Louisiana	27	647	4.2%	51	707	7.2%	78	1354	5.8%
Massachusetts	55	523	10.5%	18	599	3.0%	73	1122	6.5%
Maryland	47	674	7.0%	14	652	2.1%	61	1326	4.6%
Maine	13	413	3.1%	1	523	0.2%	14	936	1.5%
Michigan	56	623	9.0%	27	662	4.1%	83	1285	6.5%
Minnesota	51	652	7.8%	18	606	3.0%	69	1258	5.5%
Missouri	59	718	8.2%	43	690	6.2%	102	1408	7.2%
Mississippi	13	627	2.1%	22	665	3.3%	35	1292	2.7%
Montana	4	527	0.8%	2	586	0.3%	6	1113	0.5%
North Carolina	36	614	5.9%	16	648	2.5%	52	1262	4.1%
North Dakota	12	515	2.3%	4	550	0.7%	16	1065	1.5%
Nebraska	34	623	5.5%	24	619	3.9%	58	1242	4.7%
New Hampshire	24	415	5.8%	5	535	0.9%	29	950	3.1%
New Jersey	57	561	10.2%	7	604	1.2%	64	1165	5.5%
New Mexico	8	563	1.4%	1	665	0.2%	9	1228	0.7%
Nevada	5	552	0.9%	1	635	0.2%	6	1187	0.5%
New York	166	644	25.8%	92	601	15.3%	258	1245	20.7%
Ohio	100	772	13.0%	48	681	7.0%	148	1453	10.2%
Oklahoma	37	639	5.8%	38	687	5.5%	75	1326	5.7%
Oregon	14	636	2.2%	5	620	0.8%	19	1256	1.5%
Pennsylvania	175	782	22.4%	29	645	4.5%	204	1427	14.3%
Rhode Island	18	454	4.0%	2	517	0.4%	20	971	2.1%
South Carolina	14	572	2.4%	13	666	2.0%	27	1238	2.2%
South Dakota	13	542	2.4%	4	565	0.7%	17	1107	1.5%
Tennessee	24	735	3.3%	21	706	3.0%	45	1441	3.1%
Texas	187	873	21.4%	177	829	21.4%	364	1702	21.4%
Utah	10	573	1.7%	22	625	3.5%	32	1198	2.7%
Virginia	14	710	2.0%	11	669	1.6%	25	1379	1.8%
Vermont	24	429	5.6%	3	504	0.6%	27	933	2.9%
Washington	24	617	3.9%	18	630	2.9%	42	1247	3.4%
Wisconsin	78	686	11.4%	26	639	4.1%	104	1325	7.8%
West Virginia	7	521	1.3%	1	600	0.2%	8	1121	0.7%
Wyoming	1	464	0.2%	1	570	0.2%	2	1034	0.2%
Average			6.3%			3.4%			4.9%
Standard Deviation			5.9%			3.9%			4.7%
Minimum			0.2%			0.0%			0.2%
Maximum			25.8%			21.4%			21.4%

Table 3
Percent of Insurance Premiums Written by Domestic Companies
After Merging the Individual States Into Census Regions and NAIC Regions, 1995

Census Region	Property/Casualty Premiums			Life/Health Premiums			Insurance Industry Premiums		
	Domestic	Total	Percent Domestic	Domestic	Total	Percent Domestic	Domestic	Total	Percent Domestic
New England	8,909.0	16,433.2	54.2%	8,247.0	20,187.5	40.9%	17,156.0	36,620.8	46.8%
Middle Atlantic	16,387.0	44,740.9	36.6%	20,665.5	50,467.4	40.9%	37,052.5	95,208.2	38.9%
East North Central	32,153.0	43,290.4	74.3%	19,102.2	53,630.9	35.6%	51,255.2	96,921.2	52.9%
West North Central	5,748.1	18,422.3	31.2%	9,235.2	24,711.2	37.4%	14,983.2	43,133.5	34.7%
South Atlantic	10,413.9	45,952.9	22.7%	10,608.7	53,547.0	19.8%	21,022.6	99,499.9	21.1%
East South Central	2,241.0	13,492.6	16.6%	1,675.8	13,585.1	12.3%	3,916.7	27,077.6	14.5%
West South Central	8,853.9	28,761.7	30.8%	9,118.3	31,497.2	28.9%	17,972.1	60,258.9	29.8%
Mountain	2,450.0	15,747.4	15.6%	1,386.0	15,803.4	8.8%	3,836.0	31,550.8	12.2%
Pacific	19,038.1	43,893.1	43.4%	4,973.7	39,227.6	12.7%	24,011.8	83,120.7	28.9%
Average			36.1%			26.4%			31.1%
Standard Deviation			19.0%			13.1%			13.9%
Minimum			15.6%			8.8%			12.2%
Maximum			74.3%			40.9%			52.9%

NAIC Region	Property/Casualty Premiums			Life/Health Premiums			Insurance Industry Premiums		
	Domestic	Total	Percent Domestic	Domestic	Total	Percent Domestic	Domestic	Total	Percent Domestic
Northeast	40,290.2	68,039.5	59.2%	55,542.8	79,831.9	69.6%	95,833.0	147,871.5	64.8%
Southeast	11,290.9	59,592.3	18.9%	13,577.3	64,434.0	21.1%	24,868.3	124,026.3	20.1%
Midwest	50,135.7	64,670.7	77.5%	43,349.8	81,071.5	53.5%	93,485.5	145,742.2	64.1%
West	33,663.7	78,431.9	42.9%	20,065.9	77,319.8	26.0%	53,729.7	155,751.6	34.5%
Average			49.7%			42.5%			45.9%
Standard Deviation			24.9%			23.0%			22.3%
Minimum			18.9%			21.1%			20.1%
Maximum			77.5%			69.6%			64.8%

Note - premiums are reported in $ millions.

Table 4
Percent of Insurers Conducting Business in Census and NAIC Regions That Are Domiciled in the Region, 1995

Census Region	Property/Casualty Companies			Life/Health Companies			All Insurance Companies		
	Domestic	Total	Percent Domestic	Domestic	Total	Percent Domestic	Domestic	Total	Percent Domestic
New England	200	701	28.5%	53	640	8.3%	253	1,341	18.9%
Middle Atlantic	401	1,003	40.0%	128	705	18.2%	529	1,708	31.0%
East North Central	446	1,080	41.3%	224	779	28.8%	670	1,859	36.0%
West North Central	248	947	26.2%	130	745	17.4%	378	1,692	22.3%
South Atlantic	307	1,109	27.7%	137	792	17.3%	444	1,901	23.4%
East South Central	78	913	8.5%	76	765	9.9%	154	1,678	9.2%
West South Central	268	1,054	25.4%	303	960	31.6%	571	2,014	28.4%
Mountain	91	905	10.1%	78	763	10.2%	169	1,668	10.1%
Pacific	201	892	22.5%	65	728	8.9%	266	1,620	16.4%
Average			25.6%			16.7%			21.7%
Standard Deviation			11.2%			8.6%			9.1%
Minimum			8.5%			8.3%			9.2%
Maximum			41.3%			31.6%			36.0%

NAIC Region	Property/Casualty Companies			Life/Health Companies			All Insurance Companies		
	Domestic	Total	Percent Domestic	Domestic	Total	Percent Domestic	Domestic	Total	Percent Domestic
Northeast	718	1210	59.3%	236	756	31.2%	954	1966	48.5%
Southeast	318	1218	26.1%	248	918	27.0%	566	2136	26.5%
Midwest	736	1277	57.6%	395	864	45.7%	1131	2141	52.8%
West	483	1272	38.0%	325	925	35.1%	808	2197	36.8%
Average			45.3%			34.8%			41.2%
Standard Deviation			16.0%			8.0%			11.9%
Minimum			26.1%			27.0%			26.5%
Maximum			59.3%			45.7%			52.8%

Table 5
1995 Direct Costs of Insurance Regulation to the States

Variable	Mean	Standard Deviation	Min	Max
Total Budget of State Insurance Department*	$ 12.7	$ 18.7	$ 1.2	$ 93.6
Insurance Related Revenues to the States*	$ 182.4	$ 210.6	$ 13.9	$ 1,298.0
Total State Direct Premiums Written*	$ 14,166.0	$ 15,566.7	$ 952.8	$ 68,725.4
Total Budget of State Insurance Department Relative to the Insurance Related Revenues	6.68%	3.16%	1.80%	14.52%
Total Budget of State Insurance Department Relative to the State's Direct Premiums Written	0.10%	0.05%	0.03%	0.25%
Total Insurance Related Revenues Relative to the State's Direct Premium Written	1.54%	0.55%	0.56%	2.92%

Source: *1995 NAIC Insurance Department Resources Report*

*Amounts reported in $ millions.

Table 6
Summary Statistics for Data Used to Estimate Cost Functions

Description	Mean	Standard Deviaiton	Minimum	Maximum
Total Budget of State Insurance Department	$ 11,571,610	$ 18,133,137	$ 843,544	$ 99,167,751
Input Prices				
State Government Employees Wage	$ 29,146.9	$ 4,986.0	$ 20,061.7	$ 43,686.9
State Wage of Lawyers	$ 40,085.6	$ 8,558.6	$ 23,145.1	$ 65,637.0
State Wage of Actuaries	$ 43,074.5	$ 11,533.6	$ 21,301.3	$ 85,837.2
Input Quantities				
Full Time Equivalent Clerks	203.0	298.4	23.0	1541.3
Full Time Equivalent Actuaries	5.2	9.4	0.0	71.5
Full Time Equivalent Lawyers	8.8	12.4	0.0	73.0
Outputs				
Licensed Producers	49,064.5	49,222.6	1,718.0	321,266.0
Consumer Complaints	9,190.7	12,451.1	320.0	100,679.0
Market Conduct + Financial Exams Conducted	81.6	94.2	1.0	606.0
Average Domestic Assets	$ 436,955,742	$ 505,351,403	$ 2,772,546	$ 3,406,023,219
NAIC Committees	25.6	19.6	3.0	89.0
PPA and Workers' Compensation Rate Regulation Dummy	0.623	0.485	0	1
PPA Only Rate Regulation Dummy	0.094	0.293	0	1
Workers' Compensation Rate Regulation Dummy	0.123	0.330	0	1
Fraud Detection Unit Dummy Variable	0.460	0.499	0	1
Control Variables				
New York State Dummy Variable	0.022	0.119	0	1
NAIC Accredidated State Dummy Variable	0.412	0.471	0	1

Note - All dollar amounts are reported in real 1995 dollars

Source: *1990-1995 NAIC's Insurance Department Resources Report*

Number of observations is 277

Table 7
FIML Estimated Cost Functions of State Insurance Departments, 1990-199

Variable	Cost Minimizing		Non-Cost Minimizing	
Intercept	15.1780	***	15.1740	***
	(0.0667)		(0.0669)	
Licensed Producers	0.3649	***	0.3497	***
	(0.0503)		(0.0503)	
Consumer Complaints	0.3038	***	0.3136	***
	(0.0437)		(0.0439)	
(Mkt + Fnc Exams) * Ave. Domestic Assets	0.0939	***	0.1045	***
	(0.0259)		(0.0253)	
NAIC Committees	0.2705	***	0.2713	***
	(0.0448)		(0.0451)	
Licensed Producers^2	0.0007		0.0155	
	(0.0834)		(0.0842)	
Licensed Producers*Consumer Complaints	0.0309		0.0243	
	(0.0511)		(0.0516)	
Licensed Producers*[(Mkt + Fnc Exams)*Ave. Domestic Assets	-0.0312		-0.0328	
	(0.0314)		(0.0318)	
Licensed Producers*NAIC Committees	0.3225	***	0.3101	***
	(0.0610)		(0.0611)	
Consumer Complaints^2	-0.0834	**	-0.0826	**
	(0.0483)		(0.0481)	
Consumer Complaints*[(Mkt + Fnc Exams) * Ave. Domestic Asse	0.0985	***	0.1031	***
	(0.0216)		(0.0219)	
Consumer Complaints*NAIC Committees	-0.0876	**	-0.0752	
	(0.0489)		(0.0485)	
[(Mkt + Fnc Exams) * Ave. Domestic Assets]^2	-0.0252	**	-0.0242	**
	(0.0142)		(0.0142)	
[(Mkt + Fnc Exams) * Ave. Domestic Assets]*NAIC Committees	-0.0427		-0.0442	**
	(0.0265)		(0.0268)	
NAIC Committees^2	0.1264		0.1227	
	(0.1083)		(0.1053)	
Professional's wage	0.0863	***	0.1239	***
	(0.0045)		(0.0160)	
Professional's allocative inefficiency term, θ_1	-		-0.2089	
			(0.1785)	
Clerk's wage	0.9137	***	0.8761	***
	(0.0045)		(0.0160)	
Clerk's allocative inefficiency term, θ_2	-		-0.5910	***
			(0.0663)	
Professional's wage^2	-0.0039		0.0421	**
	(0.0105)		(0.0199)	
Professional's wage*Clerk's wage	0.0039		-0.0421	**
	(0.0105)		(0.0199)	
Clerk's wage^2	-0.0039		0.0421	**
	0.0105		0.0199	
Professional's wage*Licensed Producers	0.0101	***	0.0158	***
	(0.0037)		(0.0051)	
Professional's wage*Consumer Complaints	-0.0067	***	-0.0094	***
	(0.0028)		(0.0038)	
Professional's wage*[(Mkt. +Fnc Exams)*Ave. Domestic Assets	-0.0015		-0.0048	**
	(0.0013)		(0.0026)	
Professional's wage*NAIC Committees	-0.0030		-0.0118	***
	(0.0029)		(0.0049)	
Clerk's wage*Licensed Producers	-0.0101	***	-0.0158	***
	(0.0037)		(0.0051)	
Clerk's wage*Consumer Complaints	0.0067	***	0.0094	***
	(0.0028)		(0.0038)	
Clerk's wage*[(Mkt. +Fnc Exams)*Ave. Domestic Assets	0.0015		0.0048	**
	(0.0013)		(0.0026)	
Clerk's wage*NAIC Committees	0.0030		0.0118	***
	(0.0029)		(0.0049)	
PPA and WC Rate Regulation Dummy	0.1846	***	0.1793	***
	(0.0513)		(0.0518)	
PPA Rate Regulation Only Dummy	-0.0893		-0.1317	
	(0.0851)		(0.0847)	
WC Rate Regulation Only Dummy	-0.2186	***	-0.2150	***
	(0.0667)		(0.0669)	
Fraud Detection Unit Dummy	0.3191	***	0.3226	***
	(0.0402)		(0.0401)	
NAIC Accredited State Dummy	0.1688	***	0.1642	***
	(0.0437)		(0.0429)	
New York Dummy	0.1367		0.1109	
	(0.1527)		(0.1535)	
Log Likelihood Function	368.2382		384.0007	

Note - *** significant at the 1 percent level; ** significant at the 5 percent level
Standard errors reported in parentheses.

Table 8
Estimated Total Inefficiency, Allocative Inefficiency, and Input Elasticities

	Cost Minimizing	Non-Cost Minimizing
Total Inefficiency Score	0.6659	0.6608
	(0.2015)	(0.2004)
Allocative Inefficiency	-	0.0163
		(0.0095)
Elasticity of Factor Substitution Between Professionals and Clerks		
Shadow	-	0.6888
		(0.1489)
Observed	1.0479	
	(0.1291)	
Price Elasticities of Demand: Professional Workers		
Shadow	-	-0.5778
		(0.1237)
Observed	-0.9543	-0.7304
	(0.1180)	(0.1154)
Price Elasticities of Demand: Clerks		
Shadow	-	-0.1119
		-(0.1110)
Observed	-0.0937	-0.2715
	(0.0120)	(0.0471)

Note - All estimates are at the mean input prices and mean output quantities.
Standard errors reported in parentheses.

Table 9
Estimated Pairwise Cost Complementaries

	Consumer Services		Model Law Development		Regulatory Examinations	
Outputs at First Quartile (smallest states)						
Licensed Producers	0.8265		2.1036	***	-1.0844	
	(0.7838)		(0.4046)		(1.5207)	
Consumer Services			-0.6642		9.7535	***
			(0.5210)		(1.7282)	
Model Law Development (NAIC Committees)					-1.3489	
					(0.9418)	
Outputs at Means						
Licensed Producers	0.0919	*	0.3708	***	-0.0057	
	(0.0516)		(0.0632)		(0.0313)	
Consumer Services			-0.0245		0.1258	***
			(0.0501)		(0.0230)	
Model Law Development (NAIC Committees)					-0.0238	*
					(0.0267)	
Outputs at Third Quartile (largest states)						
Licensed Producers						
	0.1226	***	0.2516	***	0.0008	
Consumer Services	(0.0393)		(0.0397)		(0.0224)	
			0.0347		0.1056	***
Model Law Development (NAIC Committees)			(0.0414)		(0.0207)	
					-0.0260	
					(0.0543)	

Note - *** significant at the 1 percent level; ** significant at the 5 percent level; * significant at the 1 percent level
Standard errors reported in parentheses.

Table 10
Estimated Overall and Product Specific Economies of Scale

Overall Economies of Scale				
	Cost Minimizing		**Non-Cost Minimizing**	
Outputs at First Quartile (smallest states)	0.4993	***	0.4888	***
	(0.0454)		(0.0448)	
Outputs at Means	0.8331	***	0.83066	***
	(0.0319)		(0.0312)	
Outputs at Third Quartile (largest states)	1.2522	***	1.2536	***
	(0.0542)		(0.0529)	

Product-Specific Economies of Scale				
	Cost Minimizing		**Non-Cost Minimizing**	
Outputs at First Quartile (smallest states)				
Licensed Producers	-1.1174		-1.0522	
	(0.8352)		(0.8367)	
Consumer Services	-6.0315	***	-6.1233	***
	(1.6148)		(1.6045)	
Regulatory Examinations*Ave Domestic Assets	-24.1610	***	-24.7630	***
	(4.5383)		(4.5035)	
Model Law Development (NAIC Committees)	0.2663		0.2362	
	(0.5513)		(0.5504)	
Outputs at Means				
Licensed Producers	-0.1914	**	-0.1842	**
	(0.0837)		(0.0836)	
Consumer Services	-0.2612	***	-0.2660	***
	(0.0499)		(0.0497)	
Regulatory Examinations*Ave Domestic Assets	-0.1083	***	-0.1115	***
	(0.0155)		(0.0155)	
Model Law Development (NAIC Committees)	-0.0417		-0.0480	
	(0.1038)		(0.1039)	
Outputs at Third Quartile (largest states)				
Licensed Producers	-0.1243	***	-0.1214	***
	(0.0444)		(0.0443)	
Consumer Services	-0.2617	***	-0.2971	***
	(0.0364)		(0.0520)	
Regulatory Examinations*Ave Domestic Assets	-0.0637	***	-0.0661	***
	(0.0168)		(0.0168)	
Model Law Development (NAIC Committees)	-0.0560		-0.0585	
	(0.0464)		(0.0467)	

Note - *** significant at the 1 percent level; ** significant at the 5 percent level
Standard errors reported in parentheses.

Table 11
Summary Statistics: Independent Variables Used in State Insurance Department Efficiency Regressions

Variable	Mean	Standard Deviaiton	Minimum	Maximum
Foreign insurer market share	0.8355	0.1005	0.5847	0.9960
Foreign insurer market share from large regulatory budget states	0.3618	0.0858	0.1583	0.6153
Foreign insurer market share from all other states	0.4737	0.0771	0.2824	0.7146
Domestic industry return on equity	9.9164	3.7637	1.1600	19.7200
Appointed commissioner indicator variable	0.2202	0.4151	0.0000	1.0000
Percent state government employees represented by a union	0.4477	0.3088	0.0000	1.0000
Percent funding from fees and fines	0.6605	0.4148	0.0000	1.0000
Reserve funds indicator variable	0.3827	0.4869	0.0000	1.0000
Statewide DPW / Nat'l DPW	0.0191	0.0230	0.0013	0.1290

Table 12
Determinants of State Insurance Department Efficiency

Variable	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
Intercept	-0.2972		-0.1798		-0.2648		-0.5922	**	-0.0355		-0.3764		0.3649	
	(0.215)		(0.217)		(0.249)		(0.269)		(0.260)		(0.271)		(0.289)	
Foreign insurer market share	0.9127	***			0.8814	***	1.1413	***	-		-		-0.0222	
	(0.223)				(0.254)		(0.265)						(0.334)	
Foreign insurer market share	-		1.2853	***	-		-		1.2006	***	1.5866	***	-	
from large regulatory budget states			(0.263)						(0.276)		(0.291)			
Foreign insurer market share	-		0.3078		-		-		0.1131		0.2488		-	
from all other states			(0.321)						(0.374)		(0.368)			
Domestic industry return on equity	0.0147	**	0.0155	**	0.0147	**	0.0134	**	0.0155	**	0.0142	**	0.0140	**
	(0.007)		(0.006)		(0.007)		(0.006)		(0.006)		(0.006)		(0.006)	
Appointed commissioner indicator variable	-0.0715		-0.0676		-0.0772		-0.0892	*	-0.0906	*	-0.1080	**	-0.0241	
	(0.045)		(0.045)		(0.051)		(0.050)		(0.050)		(0.049)		(0.051)	
Percent state government employees	-0.2519	***	-0.2549	***	-0.2474	***	-0.1922	***	-0.2370	***	-0.1682	**	-0.2758	***
represented by a union.	(0.070)		(0.069)		(0.072)		(0.074)		(0.072)		(0.073)		(0.071)	
Percent funding from fees and fines	0.0016	***	0.0020	***	0.0017	***	0.0017	***	0.0022	***	0.0024	***	0.0025	***
	(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)	
Reserve funds indicator variable	0.1794	***	0.1568	***	0.1795	***	0.1947	***	0.1547	***	0.1673	***	0.1244	***
	(0.043)		(0.043)		(0.043)		(0.043)		(0.043)		(0.043)		(0.044)	
Statewide DPW / Nat'l DPW					-0.1774		5.6209	***	-0.7193		6.1290	***	-26.4334	***
					(0.690)		(2.055)		(0.709)		(2.020)		(6.567)	
(Statewide DPW / Nat'l DPW)^2	-				-		-46.5987	***	-		-56.0390	***	-	
							(15.581)				(15.525)			
Interaction term: (Foreign insurer market	-		-		-		-		-		-		36.4922	***
share) x (Statewide DPW / Nat'l DPW)													(9.079)	
Adjusted R^2	59.1%		60.0%		59.0%		60.2%		60.0%		61.7%		61.2%	

*Weighted least squares. Weight is sqaure root of total premiums written in the state.

Standard errors reported in parentheses.