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State Insurance Regulation and Employers' Decisions to Self-Insure

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ABSTRACT

With their tremendous growth over the last decade, self-insured health plans now enroll the majority of people who have employer-sponsored health insurance. This article develops a model of an employer's choice of funding method for workers' health insurance benefits that predicts that self-insurance is more likely as the burden of state insurance regulation increases. We then test the hypothesis that employers' decisions to adopt self-insurance during the 1980s were motivated by desires to avoid state premium taxes and the increasing number of state-mandated benefits. Using data on 274 firms observed between 1981 and 1984/1985 and 219 firms observed between 1984 and 1987, we estimate two logit models for an employer's decision to convert to self-insurance (one for each data set). We find evidence that state insurance regulation spurred the adoption of self-insurance in the early 1980s, but by the mid-1980s firms were converting for reasons other than the avoidance of regulation.

Introduction

A major change in the provision of private health insurance for Americans occurred during the 1980s. Employers who self-insure their health plans, rather than purchase insurance from Blue Cross and Blue Shield (BCBS) or commercial insurers, became the leading underwriters of group coverage in the United States, accounting for 58 percent of all group health premiums by the close of

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the decade. Yet in 1980, self-insured plans accounted for less than a quarter of all group health premiums (Health Insurance Association of America, 1992).

Some observers attribute employers' conversions to self-insurance to the preemption requirements of the federal 1974 Employee Retirement Income Security Act (ERISA). Beginning in 1977 and culminating with a 1985 Supreme Court decision, federal judges have held that states can regulate and tax insurance sold by BCBS and commercial insurers but not employers' self-insured plans (Fox and Schaffer, 1989). In interpreting ERISA's preemption in this way, the courts effectively created incentives for firms to self-insure their health plans. By self-insuring, a firm escapes compliance with state-mandated benefit requirements and can avoid paying state premium taxes. All firms, regardless of their size or industry, are covered by ERISA's exemption from state insurance regulation if they self-insure (Employee Benefit Research Institute, 1993).

Coinciding with the trend toward self-insurance has been a proliferation of state-mandated benefits and increased state insurance taxation. State-mandated benefits are laws that prescribe the terms of coverage for group insurance purchased from BCBS and commercial insurers. Such laws include requirements that plans cover specific services, categories of providers, diseases, or persons who might otherwise have difficulty obtaining coverage. Between 1980 and 1990, the number of state mandates (in place across all the states) almost doubled, from 450 to 854 (*Mandated Benefits Manual,* 1992). State taxes on the plans sold by these insurers also increased slightly over the decade, largely to help finance new state risk pools for persons otherwise deemed uninsurable (Laudicina, 1988).

The main purpose of this article is to examine the relationship between the growth of state mandates, insurance taxation, and the decisions of firms to convert to self-insurance as a way to provide health benefits. The fact that all three have increased together is consistent with, though not sufficient evidence of, the premise that the growth of state-mandated benefits and insurance taxation fueled the self-insurance movement of the 1980s. Using data from several nationwide employer surveys conducted over the 1980s, we formally test the hypothesis that mandates and state taxation indeed motivated employers to convert from purchased insurance to self-insurance.

Understanding the motives for self-insurance is important for two reasons. First, many mandated health coverages add substantially to employers' costs for insurance benefits (Jensen and Morrisey, 1990; Frank, Salkever, and Sharfstein, 1991; Dyckman and Anderson-Johnson, 1989). If increased foreign competition in the 1990s pressures U.S. firms to increase their efforts to control benefit costs, as suggested by some, then firms that have not already converted to self-insurance may decide to do so. Self-insurance for these mostly medium and small businesses could be risky. While stop-loss coverage is available to most employers, some firms might choose to forego it. Thus, a continuation of the self-insurance trend as a way to avoid costly state regulations could result in increased financial risk for some firms.

Second, self-insurance raises an issue of efficiency in the provision of employer-sponsored insurance. Some research suggests that employers' benefit and administrative costs for self-insured plans are actually higher than those of purchased plans containing the same coverage (Jensen and Gabel, 1988; Jensen and Morrisey, 1990). Nonetheless, self-insurance may still be a cost-effective choice for many employers: by avoiding some mandates and reducing coverage, the resulting savings may more than offset the additional loading cost of self-insuring. This is clearly a socially inefficient allocation of resources.

The next section develops a model of employer decision-making, which illustrates both the avoidance-of-regulation motive and the role of assuming financial risk in deciding whether to self-insure workers' benefits. Then, we describe our methodology and the data we use to model actual self-insurance decisions over the 1980s. The next section presents the estimation results, and the conclusions follow in the last section.

Theoretical Framework

This section presents a model of employer choice between self-insurance and purchased coverage which predicts that the likelihood of self-insurance will increase with the burden of regulation. For simplicity, the model considers only the most basic form of self-insurance—total self-insurance under which the employer assumes *all* the risk for paying claims. Allowing partial self-insurance, where an employer *shares* the risk of paying claims with an insurer through reinsurance, would not change the main results of our model.

The Market for Employer-Sponsored Coverage

Consider a competitive labor market with K distinct types of workers and a large number of workers of each type. A type k worker faces the risk of a loss L_k with probability p_k, and these losses are independent across workers.[1] For simplicity, we assume there is no moral hazard. Workers cannot buy insurance against the risk of a loss but can receive insurance as part of a compensation package from their employer.[2] A compensation package to a type k worker consists of wage income W_k and an insurance contract, which pays an indemnity I_k if a loss occurs. A package consisting of only wages with no insurance benefits corresponds to $I_k = 0$.

Workers are skill-homogeneous but differ in their preferences over wage-insurance bundles. Let a type k worker's preferences be described by a utility function $U_k(I_k,W_k)$, which is twice differentiable and strictly quasi-con-

[1] This loss distribution obviously represents an abstraction from the real world. We adopt this simple formulation merely for clarity.

[2] In this model, insurance purchased by workers would be identical to employer-purchased traditional insurance.

cave.[3] Assume that the worker's preferences are such that he or she is willing to forego insurance for a sufficiently high wage, and will also not give up his or her last dollar of wages for any insurance plan, no matter how generous. In other words, the marginal rate of substitution $\frac{\partial U_k}{\partial I}(I_k,W_k)/\frac{\partial U_k}{\partial W}(I_k,W_k)$ is bounded for $I_k = 0$ and goes to zero as W_k approaches zero.

Workers are mobile and supply their labor on the basis of utility maximization. Each worker chooses to work for that firm which offers the wage-insurance package yielding the highest utility. In equilibrium, competition in the labor market ensures that the packages offered to any type k worker yield the same utility $\bar{U}_k$, the market clearing level of utility for type k workers. Although packages may differ from one firm to the next, they all share this property.

All of the firm's decisions regarding company-sponsored health insurance, such as whether to offer a plan at all, and if so, whether to self-insure it, are part of the firm's broader choice problem concerning how much labor to hire, which type of workers to hire, and what wage/benefit package to offer them. To focus attention on its choice of a compensation package, assume that each firm hires a fixed number of workers N and earns revenue R per worker net of all nonlabor costs, regardless of the worker's type. Since all workers are perfect substitutes in production, each firm in equilibrium will hire only one type of worker.

The firm's problem is to choose a worker type k, a compensation package (I_k,W_k), and funding method for insurance, subject to workers' utility constraints. Competition in the labor market dictates that if the firm hires type k workers, it must choose a compensation package (I_k,W_k) and a funding method for insurance promising at least as much utility as the market clearing level of utility $\bar{U}_k$ for that worker type. In this model, $\bar{U}_k$ is a function of I_k and W_k.[4] Since the number of workers and their productivity are fixed, the firm's problem is to minimize its cost of compensation per worker.

As in Jensen and Gabel (1992), the firm's problem can be viewed as one of sequential optimization. The firm first chooses the least costly wage-insurance package and insurance funding mechanism given that it hires type k workers only, and the firm does this calculation for each worker type. The firm then chooses the worker type with the lowest overall cost to the firm.

Consider the first stage problem. Conditional on hiring type k workers, the firm has three options for funding insurance: it can purchase a group policy

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[3] $U_k(I_k,W_k)$ can be derived from, say, a worker's expected utility of income. For example, if u is a worker's vonNeumann-Morgenstern utility function in income, then $U_k(I_k,W_k) = p_k u_k(W_k - L_k + I_k) + (1 - p_k)u_k(W_k)$.

[4] A more general formulation would allow worker preferences to depend on the firm's funding method for insurance, as well. It is conceivable, for example, that some workers would perceive self-insurance as a less desirable funding method. For tractability of the model, we ignore this possibility.

from an outside insurer, it can self-insure, or it can decide to forego a plan altogether ($I_k = 0$). If the firm purchases a policy, henceforth referred to as traditional compensation, it must pay an insurer a fixed premium per dollar of coverage purchased, and that insurer assumes the risk for covering losses. Traditional insurance, however, is subject to a premium tax and must comply with the state's minimum coverage standards. If, instead, the firm self-insures, it covers all losses itself and thereby exposes itself to risk. With self-insurance, however, the firm saves on the premium tax and may offer coverage that is less than the mandated standard. Not offering a plan also allows the firm to avoid taxes and mandates.

Denote the choice of traditional coverage by T and the choice of self-insurance by S. Define $C_k^T(I_k,W_k)$ to be the per-worker cost of the compensation package (I_k,W_k) with traditional coverage and $C_k^S(I_k,W_k)$ to be the per-worker "certainty equivalent cost" of this same package with self-insurance. In other words, $C_k^S(I_k,W_k)$ equals a wage, which, if offered alone without insurance, would leave the firm just as well off as if it offered the package (I_k,W_k) and self-insured. By definition, the firm is indifferent between (I_k,W_k) under self-insurance and the package $(0,C_k^S(I_k,W_k))$.

The Cost of Compensation with Traditional Coverage

We now derive the cost functions $C_k^T(I_k,W_k)$ and $C_k^S(I_k,W_k)$. With traditional insurance, the market price of coverage equals the expected value of claims plus a load charge per dollar of indemnity. For each dollar of indemnity, the firm's insurance costs equal the expected claims resulting from that coverage—in this case, the probability of a claim, p_k—plus the loading charge l^T and the premium tax t, so

$$C_k^T(I_k,W_k) = W_k + (p_k + l^T + t)I_k. \tag{1}$$

The Cost of Compensation with Self-Insurance

If the firm self-insures, it incurs a load l^S per dollar of indemnity provided (its administrative costs), but it is exempt from the premium tax. Because the firm must now pay the actual value of claims, which is random, it must take into account the cost of risk bearing in evaluating the desirability of self-insurance.

Let x_k be the proportion of the firm's workers who suffer a loss and receive an indemnity, and $X_k = Nx_k$ the total number of workers who suffer a loss. Then X_k and x_k are random variables with expected values Np_k and p_k, respectively. The firm's risk can be defined either in terms of the properties of X_k, known as absolute risk, or in terms of the properties of x_k, known as relative or per-worker risk. The model below does not rely on any properties of the distribution of either X_k or x_k, so no appeal to the law of large numbers or the central limit theorem is needed. As long as N remains fixed, any model of risk bearing in terms of either type of risk can be redefined in terms of the other type of risk by a linear transformation of variables. As N increases, however, absolute risk increases since the variance of X_k rises, while relative risk de-

creases since the variance of x_k falls. Therefore, the distinction between relative and absolute risk is most important when making statements about increasing firm size.

The following model will be defined in terms of x_k, the proportion of the firm's workers who suffer a loss, so relative risk will be used in this section. Except for statements about increasing firm size, an equivalent model can be constructed in terms of absolute risk by defining $X_k = Nx_k$. Let f_k and F_k be the density and cumulative distribution functions of x_k, respectively. A variety of methods for deriving f_k and F_k are available. Although it is tempting to invoke the central limit theorem, which asserts that x_k is approximately normal for sufficiently large N, it is not appropriate in this problem because the distribution of x_k may be very "risky" and highly skewed, so that its approach to normality will happen only very slowly.[5] In what follows, we work with the firm's actual distributions, f_k and F_k, not approximations to these functions. Exact forms for f_k and F_k are not essential to the derivation of results.

With self-insurance, the actual expense of the package (I_k,W_k) is $W_k + (l^S + x_k)I_k$, but this expense is now uncertain so the firm must take into account the cost of assuming the risk of paying claims. As shown below, it generally will be true that this cost exceeds the expected level of claims; that is,

$$C_k^S(I_k,W_k) > E[W_k + (l^S + x_k)I_k] = W_k + (p_k + l^S)I_k. \qquad (2)$$

To derive $C_k^S(I_k,W_k)$ requires further assumptions about the firm's behavior in the face of uncertainty. It is not necessarily true that a single set of assumptions is appropriate for all firms. Therefore, two alternative models of firm behavior under uncertainty are developed. The first assumes that the firm is risk neutral but faces a cost of financial ruin that could occur, for example, from unusually large insurance claims. Such a firm incurs a cost if it were to file bankruptcy. This model is probably appropriate for large, widely-held firms whose owners are likely to be diversified in their assets (Greenwald and Stiglitz, 1990).

The second model assumes that the firm is risk averse, with its attitudes toward risk described by a vonNeumann-Morgenstern utility function $V(\pi)$, where π is per-worker profit.[6] Being risk averse, the firm would prefer a benefit strategy yielding a sure profit π^* to one where profit was uncertain but on average equal to π^*. Risk aversion may be a reasonable assumption for smaller, privately-held firms that are not publicly traded, since such firms often have only a few owners who are less likely to be diversified (Greenwald and Stiglitz, 1990). Regardless of which model applies, there is an implicit cost

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[5] If we had assumed a more realistic individual loss distribution to begin with, then the distribution of claims per worker per dollar of indemnity might be even more heavy-tailed than that implied by our model. For an examination of density functions that have been used to model real world insurance claims distributions (both individual insurance claims and aggregate claims), see Cummins et al. (1990).

[6] Since π is defined per worker, the utility function V depends on the number of workers N. Equivalently, we can define the firm's vonNeumann-Morgenstern utility function $v(\Pi)$, where Π is total profit, by the transformation $v(\Pi) \equiv V(\Pi/N)$.

associated with self-insuring that the firm will take into account in deciding on its optimal strategy.

Self-insurance for a risk-neutral firm. Consider first a firm that is risk neutral but which faces possible costs if it were forced to file bankruptcy. Assume that if it self-insures, the firm assigns the cost b per worker to the event of bankruptcy. It will incur b in addition to the claims it would be obligated to pay under the terms of its insurance plan. For example, b might represent the foregone future earnings of the firm if forced out of business. Let A be its available resources per worker available to pay claims (e.g., capital assets, cash on hand, lines of credit), so its total resources to pay claims equals NA. Bankruptcy results if actual outlays per worker, $W_k + (l^S + x_k)I_k$, exceed revenues plus assets per worker, R + A. Therefore, the probability of bankruptcy is $1 - F_k[- l^S + (R + A - W_k)/I_k]$, so

$$C_k^S(I_k,W_k) \quad W_k \; I_k(l^S \; p_k) \; b(1 \; F_k\left[\frac{R \; A \; W_k}{I_k} \; l^S\right]). \tag{3}$$

Note that the last term in equation (3) is positive provided b is positive. Thus, even in the case of a risk-neutral enterprise, self-insurance involves a cost beyond the direct cost of operating the plan.

Self-insurance for a risk-averse firm. Now consider the case of a risk-averse firm. Such a firm's expected utility of the package (I_k,W_k) under self-insurance is

$$\int_{\infty}^{\infty} V[R \; W_k \; I_k(l^S \; p_k \; x)]f_k(x)dx. \tag{4}$$

In this case, $C_k^S(I_k,W_k)$ is the per-worker cost of coverage which results in the same expected utility as expression (4). Therefore, $C_k^S(I_k,W_k)$ satisfies the identity

$$V(R \; C_k^S(I_k,W_k)) \equiv \int_{\infty}^{\infty} V[R \; W_k \; I_k(l^S \; p_k \; x)]f_k(x)dx. \tag{5}$$

Given a specific form for $V(\pi)$ and f_k, expression (5) can be solved for $C_k^S(I_k,W_k)$.

For example, suppose the firm has constant absolute risk aversion, so $V(\pi) = -e^{-a\pi}$, where $a > 0$. In addition, suppose the loss distribution of individuals is such that the central limit theorem applies, so x_k is approximately normal with mean p_k and variance $p_k(1-p_k)/N$. Then expression (5) implies

$$C_k^S(I_k,W_k) \quad W_k \; (p_k \; l^S)I_k \; (I_k)^2\left(\frac{ap_k(1 \; p_k)}{2N}\right). \tag{6}$$

In this case, the per-worker compensation cost of self-insuring increases as the degree of risk aversion a rises. The first two terms of equation (6) equal the

expected level of expenditures, and the last term is the additional cost to the firm of bearing risk.

Choice Between Traditional Coverage and Self-Insurance

We now characterize the firm's optimal choice of compensation package for each type of insurance funding mechanism. If the firm offers traditional insurance, then it is subject to a legal mandate to provide an indemnity of at least $\bar{I}$, the state-mandated minimum level of coverage. The firm's optimal compensation package (I_k^T, W_k^T) solves the problem

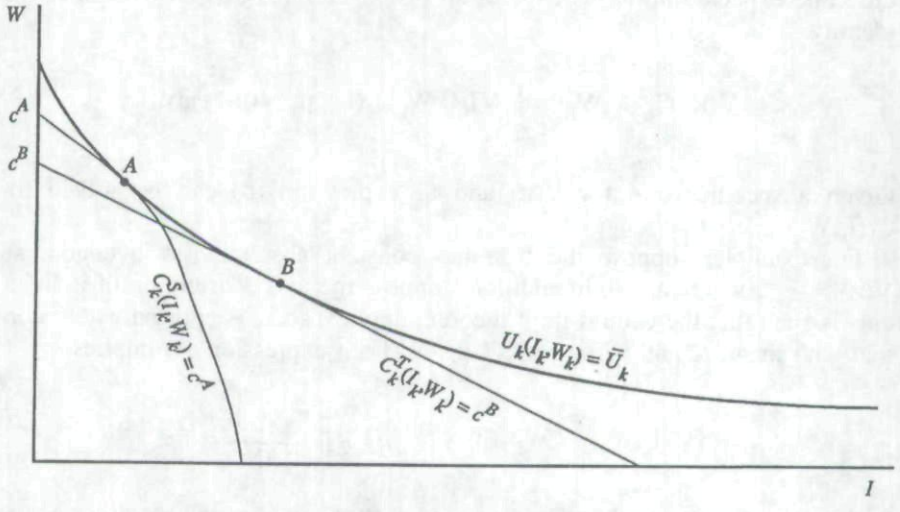
$$\underset{\{I_k,\ W_k\}}{\text{minimize}}\ C_k^T(I_k,W_k) \qquad \text{subject to } U_k(I_k,W_k) \geq \bar{U}_k, I_k \geq \bar{I}. \quad (7)$$

The first-order conditions for a solution (I_k^T, W_k^T) imply

$$\frac{\frac{\partial U_k}{\partial I}(I_k^T,W_k^T)}{\frac{\partial U_k}{\partial W}(I_k^T,W_k^T)} \leq \frac{\frac{\partial C_k^T}{\partial I}(I_k^T,W_k^T)}{\frac{\partial C_k^T}{\partial W}(I_k^T,W_k^T)} \quad 1^T\ t\ p_k \qquad \text{with equality if } I_k^T > \bar{I}. \quad (8)$$

The right-hand side of equation (8) is the marginal cost of an additional dollar of coverage. Referring to Figure 1, let W_k be the wage satisfying $U_k(\bar{I},W_k) = \bar{U}_k$, so W_k is the wage if the firm offers the minimum level of coverage. Equation (8) indicates that the firm will choose $(\bar{I},W_k)$ if the isocost curve at $(\bar{I},W_k)$ is at least as steep as the worker's indifference curve $\bar{U}_k$; otherwise it will choose (I_k^T, W_k^T) such that the isocost curve is tangent to the worker's indifference curve.

Figure 1
Choice of Funding Method with $k^S \geq k^T + t$ and Nonbinding Mandate Constraint



In choosing a self-insured compensation package (I_k^S, W_k^S), the firm calculates its cost function $C_k^S(I_k, W_k)$ as described in the sections above, depending on whether it is risk neutral or risk averse. The firm's choice of a self-insured compensation package (I_k^S, W_k^S) solves the problem

$$\underset{\{I_k, W_k\}}{\text{minimize}}\ C_k^S(I_k, W_k) \text{ subject to } U_k(I_k, W_k) \geq \bar{U}_k. \tag{9}$$

The first-order conditions for a solution (I_k^S, W_k^S) imply

$$\frac{\frac{\partial U_k}{\partial I}(I_k^S, W_k^S)}{\frac{\partial U_k}{\partial W}(I_k^S, W_k^S)} \leq \frac{\frac{\partial C_k^S}{\partial I}(I_k^S, W_k^S)}{\frac{\partial C_k^S}{\partial W}(I_k^S, W_k^S)} \qquad \text{with equality if } I_k^S > 0. \tag{10}$$

The right-hand side of expression (10) is the slope of the isocost curve under self-insurance. It is the amount by which wages would be decreased in order to accommodate an additional dollar of indemnity, holding firm costs constant. Therefore, under self-insurance, the optimal bundle is one such that the firm's isocost curve under self-insurance is tangent to the worker's indifference curve, $\bar{U}_k$. In contrast with the traditional case, this isocost curve will generally be nonlinear, downward sloping, and strictly convex.

In the case of a risk-neutral firm facing a cost of bankruptcy, it follows from equation (6) that the slope of the isocost curve is given by

$$\frac{\frac{\partial C_k^S}{\partial I}(I_k, W_k)}{\frac{\partial C_k^S}{\partial W}(I_k, W_k)} = 1^S + p_k + \left(\frac{bf_k}{I_k(I_k + bf_k)}\right)[R + A - W_k - (1^S + p_k)I_k], \tag{11}$$

where f_k is evaluated at $-l^S + (R + A - W_k)/I_k$. If $R + A \geq W_k + (l^S + p_k)I_k$, so the firm is able to pay an average level of claims out of revenues and assets, then the right-hand side of equation (11) is greater than $l^S + p_k$. Therefore, given either assumption about firm behavior under uncertainty, the slope of the isocost curve will generally be greater than $l^S + p_k$, so the full marginal cost of an additional dollar of indemnity exceeds the additional direct costs.

For a risk-averse firm, it follows from expression (5) that the slope of the isocost curve is

$$\frac{\frac{\partial C_k^S}{\partial I}(I_k, W_k)}{\frac{\partial C_k^S}{\partial W}(I_k, W_k)} = 1^S + \frac{\int_{-\infty}^{\infty} V'[R - W_k - I_k(I_k^S + x)]x f_k(x)dx}{\int_{-\infty}^{\infty} V'[R - W_k - I_k(I_k^S + x)]f_k(x)dx}. \tag{12}$$

Since V' is strictly decreasing for such a firm, the right-hand side of equation (12) is strictly greater than $l^S + p_k$.

Finally, if the firm does not offer insurance at all, then $I_k = 0$ and the wage rate W_k^0 is chosen to satisfy $U(0,W_k^0) = \bar{U}_k$. The choice of no insurance can be viewed as a special case of the self-insurance problem, where the corner solution, $I_k^S = 0$, is obtained. Equations (11) and (12) imply that, for $I_k = 0$, the slope of the isocost curve under self-insurance equals $l^S + p_k$, so some insurance will always be provided ($I_k^S > 0$) as long as $\frac{\partial U_k}{\partial I}(0,W_k^0)/\frac{\partial U_k}{\partial W}(0,W_k^0) > 1^S p_k$, in which case the worker's willingness to pay for the first dollar of indemnity exceeds $l^S + p_k$. A risk-averse worker's willingness to pay for a dollar of indemnity is greater than p_k, so an interior solution is likely unless the worker is nearly risk neutral or the loading charge for self-insurance is high. Assume from this point on that $\frac{\partial U_k}{\partial I}(0,W_k^0)/\frac{\partial U_k}{\partial W}(0,W_k^0) > 1^S p_k$, so the self-insurance solution is interior and the firm will always choose some insurance. Note, however, that the amount of insurance offered may be very small.

When will the firm choose traditional coverage over self-insurance? It will always choose the compensation package that has the lowest total cost along the worker's indifference curve, $\bar{U}_k$. Suppose first that $l^S \geq l^T+t$, so the administrative cost of self-insuring is greater than the loading charge plus tax it faces for purchased insurance. By equations (11) and (12), $l^S \geq l^T+t$ implies that each self-insured isocost curve is steeper than each traditional insurance isocost curve. One immediate result is that the firm's traditional compensation package (I_k^T,W_k^T) is further down on the worker's indifference curve than its compensation package under self-insurance (I_k^S,W_k^S), so $I_k^T > I_k^S$ and $W_k^T < W_k^S$ and traditional insurance entails more coverage than self-insurance. In particular, the mandate constraint is not binding for traditional insurance if $I_k^S > \bar{I}$, that is, the firm offers more than the mandated minimum, even under self-insurance.

Figure 1 illustrates the situation for a firm for which the mandate constraint is not binding. With self-insurance, its best offer is package A with cost c^A; for traditional insurance, it is package B with cost c^B. The worker's indifference curve $\bar{U}_k$ lies above the traditional isocost curve, including point A. Since the self-insured isocost curve is steeper, it must intersect the W axis above the traditional isocost curve. Each intercept measures the cost of the respective compensation package, so for this firm $c^B > c^A$, and, hence, the firm would choose purchased insurance. Since this argument applies to each worker type k, we have the following result:

Proposition 1: If $l^S \geq l^T+t$ and the mandate constraint is not binding for the worker type chosen by the firm, then the firm always chooses purchased insurance over self-insurance.

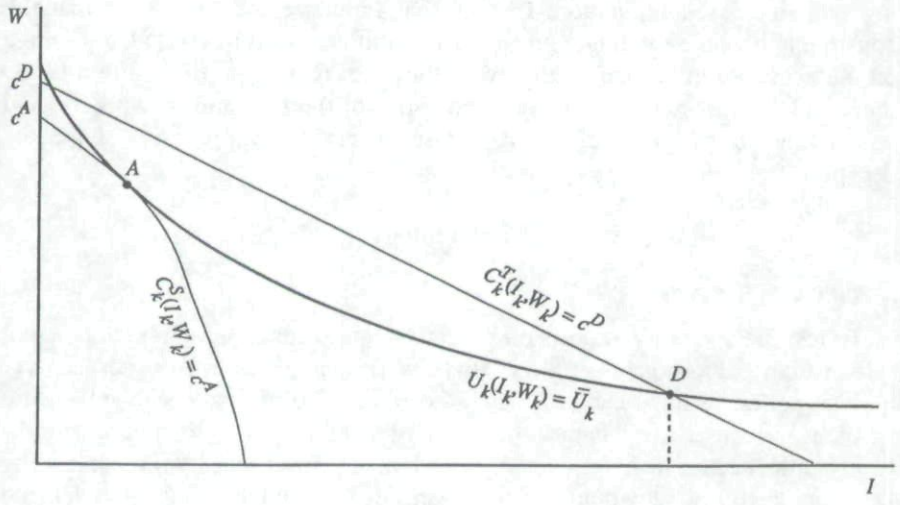
In other words, *ceteris paribus,* a firm chooses self-insurance only if either $l^S < l^T+t$ or its mandate constraint is binding under traditional insurance for its chosen worker type.

Suppose now that $l^S \geq l^T+t$ and the mandate constraint is binding, as depicted in Figure 2. The minimum mandated bundle in this case is given by point D, with purchased cost c^D. Then the indifference curve would no longer lie

above the traditional isocost curve, so self-insurance would become less expensive for the firm than traditional insurance. In addition, raising the mandated level of coverage $\bar{I}$ or the premium tax t raises the cost of traditional insurance, making it more attractive to convert to self-insurance. Since this argument applies to each worker type, we have the following result:

Proposition 2: As the mandated level of coverage or the premium tax rises, the cost of the optimal purchased insurance compensation package rises, so self-insurance becomes more attractive.

Figure 2
Choice of Funding Method with $k^S \geq k^T + t$ and Binding Mandate Constraint



It is also clear from this model that to test the statement in Proposition 2 we must control for a number of factors besides mandates and premium taxes. Other factors that may influence the firm's decision include the average size of a worker's loss, the size of the firm, the firm's attitude toward risk, its loading charges for purchased and self-insured coverage, and its real and potential assets to cover claims. Each of these factors affects the shape of one or more of the relevant curves depicted in Figures 1 and 2. In particular, an increase in the average size of a worker's loss or degree of firm risk aversion will make self-insurance more costly, while an increase in the firm's potential assets per worker will make self-insurance less costly. As explained above, the effect of an increase in the number of workers N is ambiguous, since the firm's absolute risk and relative risk are affected differently. On one hand, the firm's risk per worker is reduced due to the law of large numbers, reducing the cost of self-insurance. However, the firm's total risk is increased, possibly raising the cost of insurance. In the case of a risk-neutral firm facing a cost of bankruptcy, an increase in N with fixed *per-worker* assets A (so the firm's total

assets rise in proportion to the increase in N) leads to a lower probability of bankruptcy and therefore lower cost of self-insurance. In the case of a risk-averse firm, the effect of an increase in N is ambiguous, since the firm's vonNeumann-Morgenstern utility function of per-worker profit will change. However, if overall assets are fixed when N increases (so that per-worker assets fall with an increase in N), increasing N leads to a higher probability of bankruptcy and therefore a higher cost of self-insurance.

To summarize, this model predicts that a firm's decision to self-insure may be correlated with an increase in the burden of insurance regulation. In particular, an increase in the number of mandated benefits the firm would have to satisfy if it offered purchased coverage, or the taxes it would have to pay on the plan, may positively correlate with a decision to convert to self-insurance. The decision hinges on whether mandate constraints become sufficiently binding with increased regulation. Factors that influence the likelihood that the constraints become binding, and the firm's attitudes toward risk, also impinge on the decision. In particular, the overall level of regulation (in addition to the magnitude of the increase), the characteristics of the firm and its workers, and its loading charges for purchased and self-insured coverage also shape the decision.

Methodology

Econometric Framework

To test the above hypothesis empirically requires data on employers' actual self-insurance decisions over the 1980s. Given a sample of firms observed over a given period of time, each of which faced a choice of whether to self-insure its plan, we can assess whether the scope of state insurance regulation significantly influenced a firm's propensity to adopt self-insurance, while controlling for other factors that would have influenced that choice. If firms that faced more burdensome mandates and state premium taxes were more likely to self-insure, *ceteris paribus*, then the hypothesis regarding regulation avoidance would be supported.

We have two samples of mid- to large-size businesses for the analysis. One is a set of firms observed over the early part of the decade, from 1981 to 1984/1985, and the other is a set of firms observed during the middle part of the decade, from 1984 to 1987. Both samples comprise only businesses that offered health insurance over the entire period of observation. There are no firms that chose to drop coverage during the period, that did not offer coverage at all over the period, or that newly offered coverage over the period.[7] Our

[7] As a result of these exclusions, both of our samples, strictly speaking, can be viewed as "self-selected" because a firm's decision to not offer coverage at any time during the period, and thereby be excluded from our sample, also depends on state insurance regulation. The practical consequences of this sample selection should be minimal, however, given our focus on mid- and large-size firms, specifically those with 50 or more workers. Nationally, 96 percent of firms with 50–199 workers offer health insurance, and, among larger firms, the percentage is closer to 100.

model predicts that conversions to self-insurance may have been due to an increasing burden of state insurance regulation. We test this hypothesis in the context of the following model:

$$S^*_{is} = \beta_1 + \beta_2 R_i + \beta_3 Z_{is} + \varepsilon_{is}, \tag{13}$$

where S^*_{is} = the propensity of firm i in state s to covert to self-insurance,
R_i = a vector describing the increase in mandates over the period and also the general scope of insurance regulations affecting the firm,
Z_{is} = a vector of other factors that influence S^*_{is}, and
ε_{is} = a random disturbance.

Variables in Z_{is} include worker and firm characteristics (that may have affected worker preferences over wage-insurance bundles or employer attitudes toward risk), and area characteristics (that may have influenced the firm's per-unit prices for self-insured and purchased coverage, respectively). Without loss of generality, assume that, if $S^*_{is} > 0$, then the firm converts to self-insurance; otherwise it remains with purchased coverage.

Define for each firm the dichotomous indicator S_{is} as follows: $S_{is} = 1$ iff $S^*_{is} > 0$ (the firm converts to self-insurance), and $S_{is} = 0$ iff $S^*_{is} \leq 0$ (the firm remains with purchased coverage). In both data sets, S_{is} is observable, but S^*_{is} is not. The probability that a firm switches to self-insurance is

$$P(S_{is} = 1) = P(S^*_{is} > 0) = P(\varepsilon_{is} < \beta_1 + \beta_2 R_i + \beta_3 Z_{is}) = F(\beta_1 + \beta_2 R_i + \beta_3 Z_{is}), \tag{14}$$

where F is the distribution function of ε_{is}. Assuming ε_{is} follows a logistic distribution, we estimate the parameters of equations (13) and (14) by the method of maximum likelihood.[8]

Note that in equation (13) R is defined to vary across firms. For a firm that operates in a single state, it should be the case that $R_i = R_s$; that is, the relevant regulations are those in that state. For a multistate firm, however, it is less clear how R_i should be defined, and the answer may depend on how the firm chooses to set up its plan. If it offers a standardized plan across different states

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Among mid- and large-size firms, there is also much permanency in the decision to offer insurance, that is, once a firm offers coverage it continues with that choice. The implication is that our "self-selected" sample is likely to closely represent the population of interest. Thus, selection bias arising from these restrictions should be minimal.

One can also view the issue in the context of a sample selection model. If we had a representative set of all firms with 50 or more workers (as a point of fact, we do not), and were to formally model selection into the sample, then the equation to self-insure conditional on selection into the sample, would contain a "self-selection" term, specifically, the inverse Mills ratio associated with the probability of inclusion in the sample (Maddala, 1983, chap. 9). If we were to estimate the model, the imputed Mills ratio would almost surely be very near zero for most observations, because so few firms in this size range ever decline to offer coverage. Therefore, the model that includes the term is nearly identical with one that assumes *a priori* that it is zero.

[8] Specifically, we maximize the log likelihood function:

$$\sum_{i,s} I_{is} \log[F(\beta_1 \ \beta_2 R_i \ \beta_3 Z_{is})] \qquad \sum_{i,s} (1 \ I_{is}) \log[1 \ F(\beta_1 \ \beta_2 R_i \ \beta_3 Z_{is})].$$

in which it operates, then with purchased insurance it must satisfy the standards of *all* of those states, in which case the appropriate R_i is the union of all applicable mandates. On the other hand, if it tailors purchased coverage on a state-by-state basis, then plausibly the relevant R_i will correspond to the regulations of the most stringent state in which it operates.[9] In either case, it is likely that R_i will not be the same as R_s, and inappropriately measuring R for multistate firms could introduce some bias toward zero in the estimated coefficients for these variables due to "errors-in-variables." We return to this issue below.

In principle, since our focus is on modeling "dynamic change"—in this case, in the firm's funding method for insurance—there is an issue of whether we should include all explanatory variables in change form as well as level form. Additionally, one can argue that our model should allow for a full set of interactions between the change-in-mandates variable and all other components of R_i and Z_{is}. This is because, as shown in the previous section, these other factors may influence whether the mandate constraint becomes sufficiently binding. As a practical matter, neither of our data sets are large enough, nor do they show sufficient variation in most variables over time, to support a generalized specification of the conversion model. Therefore, the following equations should be interpreted as first-order approximations to the more general functions.

Data Sources and Variable Measurement

We have data from two separate and independent data sets that can be used to estimate the model and test the regulation hypothesis. If the econometric evidence from the two on the role of mandates leads to a similar inference, then we can be more confident in our conclusions from this analysis.[10] Our first sample comprises 274 medium and large private business establishments that were surveyed regarding their health benefits in 1981 and then again in either 1984 or 1985. When they were surveyed in 1981, all of the establishments were offering a purchased fee-for-service group plan from a commercial insurer or BCBS. In other words, none had yet adopted self-insurance, but each could have done so between 1981 and when they were later surveyed. Of the 274 establishments, 48 converted to self-insurance during the period between interviews.[11] These data are from the Bureau of Labor Statistics (BLS)

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[9] This presumes that if it were to self-insure in that state, it would likely do so across its other locations as well. The Bureau of Labor Statistics, which collects health insurance data from some multistate firms in its periodic Employee Benefits Survey, indicates that many firms indeed vary the conventional coverage provided according to the different states in which they operate (Bureau of Labor Statistics, 1994). Thus, this second scenario may be more prevalent.

[10] In statistical terms, agreement of the two makes it less likely that an error of either the Type 1 or Type 2 variety has occurred.

[11] In addition to these 274 establishments, 137 other establishments were also surveyed in 1981 and then again in 1984 or 1985. All 137 had already adopted self-insurance by 1981. Since our focus is on the decision to newly adopt self-funding, we exclude these establishments from our analysis. Within this group, nearly all (114) were still self-insured by the time of their second

Employee Benefit Surveys (EBS) conducted in 1981, 1984, and 1985.[12] The EBS is an establishment-level survey, which is administered through face-to-face interviews with benefits managers across the country. It provides detailed data on the insurance plans offered by private establishments but only limited information about the characteristics of the workers and the organization itself.[13] In response to a special data request for this research, the BLS identified the state in which each establishment was located, thus allowing us to append information on the insurance regulations in that state. We use this sample to estimate a model of conversions to self-insurance during the early 1980s.[14]

For the model based on EBS data, our unit of observation is an establishment, which in some instances is not an entire firm. For multiestablishment firms (e.g., ones that operate multiple plants in different states) their different sites are represented as distinct observations in this data set, and it is possible that the BLS surveyed some but not all establishments in these firms. Establishments that are part of larger firms cannot be identified, creating a dilemma for the appropriate measurement of R_i, as discussed earlier. For all observations, we assign to R_i the regulations of the state in which that establishment is located. Based on information supplied by the BLS, any mismeasurement arising from this assignment rule should be limited, at most, to a quarter of the sample. The BLS (1994) indicates that no more than 20 to 25 percent of EBS establishments were part of a multistate firm.

Our second sample comes from two firm-level surveys conducted in the middle part of the decade, the 1984 Health Insurance Benchmark Survey, conducted by the Health Care Financing Administration (HCFA), and the 1987 Health Insurance Association of America's (HIAA) Employer Health Insurance Survey.[15] Although carried out by different organizations, these two surveys used related samples. Many of the firms surveyed by HIAA had participated in HCFA's survey three years earlier. By linking the two data sets, it is possible to observe changes in health insurance funding methods over time for firms that participated in both data collection efforts. The sampling frame for both surveys consisted of all private and public employers (excluding the federal government) that offered health insurance at the time. Both surveys gathered detailed information about the characteristics of the firm, including the state in which it was located, its insurance plans, and some characteristics of its work

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interview; only 23 had switched to purchased coverage.

[12] The EBS was restricted to private sector U.S. firms (excluding those in Alaska and Hawaii) that employed at least 50, 100, or 250 workers, depending on the industry.

[13] For more information on the EBS's sampling frame, survey methods, and descriptive statistics, see Bureau of Labor Statistics (1982, 1985).

[14] Beginning in 1986, the BLS stopped using unique firm identifying codes on its EBS, so for that year and subsequent years one cannot identify firms that responded to the survey in other years. Thus, examination of employer behavior over time using EBS data is limited to the early 1980s.

[15] For detailed descriptions of the HCFA and HIAA surveys, see McConnell et al. (1986) and Gabel et al. (1988), respectively.

force. The HCFA survey asked firms to describe their health plans as of year-end 1984, and in HIAA's survey, they described their current plans, which would have been those as of spring 1987.

As with the first data set, we limit our focus to businesses for whom converting to self-insurance was a viable choice. Specifically, we restrict attention to 219 firms which employed 50 or more workers by 1987 and which were offering purchased FFS coverage when they were first surveyed in 1984. Of these firms that could have newly adopted self-insurance by 1987, 64 actually did.[16] This second data set allows us to model conversion decisions during the mid-1980s.

For this sample, too, we have the problem that multistate firms are not identified. However, the data should contain few such firms. Most U.S. firms (95 percent) are single-state one-establishment enterprises (Zarkin et al., 1994). Although there may be some multistate organizations in the HCFA/HIAA data, there should certainly be fewer than in the EBS data, since the HCFA and HIAA surveys were conducted at the higher tier of the business hierarchy—firm headquarters rather than establishments (as in the EBS) were used as the sampling frame for both.[17] For firms in the sample, we measure R_i as the regulations of the state in which the firm's headquarters are located.[18]

In both data sets, state-mandated benefits are measured by two sets of variables. First, we control for the number of recently enacted state-mandated coverages, specifically, the number newly enacted between interviews with the business.[19] We also control for the cumulative number of mandates enacted by the time of the second interview.[20] Second, five dummy variables measure the

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[16] In addition to these 219 firms, 261 firms responded to both the 1984 and 1987 surveys. All were already self-insured by 1984. Of the 261 additional firms, 228 were still self-insured three years later, and 33 had switched back to purchased insurance.

[17] Compared to the population of establishments, there should be proportionately fewer multistate observations in the population of firm headquarters because, in the population of establishments, each multistate firm appears as multiple observations (one for each site the firm maintains), whereas in the population of firm headquarters, the firm is a single observation. To illustrate, suppose that in a population of 100 firms, 20 are multistate two-establishment firms, and the other 80 are single-state single-establishment enterprises. The proportion of multistate observations is then 0.2 (20/100) within the set of firms and 0.33 (40/120) within the set of establishments. Thus, a frame of headquarters should contain fewer instances of multistate organizations.

[18] This definition of R_i could bias the effects of the regulatory variables to zero if multistate firms represent any significant portion of the sample and such firms routinely separate home office and plant locations, with plant location choice sensitive to the labor/regulatory climate of the *plant location* state(s). These data, unfortunately, allow us to identify only the location of the firm's headquarters.

[19] Between 1981 and 1984 new mandated benefits were often in the areas of coverage of nurse midwives (11 states), the extension of continuation rights to individuals separated from the plan (7 states), coverage of psychologists (5 states), and coverage of alcoholism treatment (5 states). Between 1984 and 1987, new mandates were commonly for coverage of nurse midwives (7 states), the extension of continuation rights to persons separated from the group plan (7 states), coverage of chiropractors (6 states), and coverage of nurse practitioners (5 states).

[20] In defining all of our mandate variables, a state requirement that a coverage *be made available for sale* was not considered to be a mandate; rather, the regulation had to require that the benefit

presence or absence (by the close of the period) of mandates for psychologists' clinical services, inpatient mental health, alcoholism treatment coverage, drug abuse treatment coverage, and continuation-of-coverage rights for terminated and laid off workers. The last variable specifically refers to the presence of a state law that allowed workers separated from the firm to remain in the company plan for an established period after leaving the firm, provided they paid the group rate themselves. The first four are included because they have been singled out by employers as being especially troublesome and costly (Horwitz, 1985, and Stipp, 1988) and because other studies have found them to be influential in employers' insurance offerings (Jensen and Gabel, 1992). The last is considered separately because of its similarity to COBRA, the 1985 federal law which mandated that all firms which provided health insurance and which employed 20 or more workers extend continuation rights to workers and their dependents who were separated from the company plan.[21] COBRA took effect for all plans beginning July 1, 1986 (Fuchs, 1990), about two-thirds of the way through the period covered by our 1984–1987 data set. Conversions during the period may nonetheless have been affected by the states' pre-COBRA continuation laws.

Information on these mandates was obtained from two sources, the *Mandated Benefits Manual* (1992) and a report of each state's initial enactment dates for mandates prepared by the Blue Cross and Blue Shield Association (1989). To our knowledge, the *Mandated Benefits Manual* (1992) is the most authoritative source available on state-mandated benefits legislation.[22] It has a minor drawback, however, in that its recorded enactment date for each mandate in a state refers to the state's most recent year of legislative action, rather than to the year when legislation was first enacted. Thus, if a state passed a mandate, say for alcoholism treatment coverage, in 1984 but then amended the law in 1988, the date recorded would be 1988. To address this aspect, we took the *Manual*'s recorded year as our date of enactment, unless the BCBS report indicated that enactment occurred earlier, in which case we assumed the latter source to be accurate.[23] Ideally, for firms that switched to self-insurance, we

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be included in the purchased plan.

[21] We would have preferred to measure each of these five mandate variables in "change form," that is, as (0,1) indicators for the introduction of mandates in these areas during the period between interviews, but the data did not permit this approach. In particular, most states enacted their mandates in these areas in the late 1970s (Blue Cross and Blue Shield Association, 1989), so that in "change form" the dummy variables took on nearly all zeros, thus resulting in multicollinearity.

[22] The manual corroborated data on mandated benefit laws using a number of different sources, including Blue Cross and Blue Shield plans, commercial insurers, trade and professional associations, legislative tracking services, and other sources. Any discrepancies among these different sources were reconciled by contacting state insurance departments directly. In addition to indicating the year of legislation, the manual provides the actual legal citation for each mandated benefit reported.

[23] Few mandates were affected by this problem. Of the 513 mandates in effect by 1984, 36 had been amended at some point prior to 1984, and, of the 596 mandates in effect by 1987, 54 had been amended prior to that time.

would have liked to measure these variables for the year in which the conversion decision was made. Neither data set, however, provides information on exactly when the conversion decision was made; we know only that it was made sometime during the period.

State taxes imposed on purchased plans are measured by three variables: the premium tax on BCBS coverage, the premium tax on commercial coverage, and a dichotomous indicator of whether the state taxed insured plans to help finance a risk pool for so-called "uninsurables."[24] Since the first two variables are continuous and the last is a dummy, we enter these tax measures separately. The premium tax data are from the National Association of Life Underwriters (1985, 1987), and the data on uninsurable risk pools are from Demkovich (1986) and the Health Insurance Association of America (1988). We expect that higher taxes of any kind would have made self-insurance more attractive.

Our data sets control for a number of other variables intended to capture variation in worker preferences over wage-insurance packages, the risk associated with self-insuring the group plan, the firm's attitude toward risk, and the loading charges for insurance. The variables available to proxy these factors differ somewhat across the two data sets because the questionnaires were different. Essentially, for each data set we have incorporated the available information on workers' characteristics, the sponsoring firm, and the local market for purchased coverage. Measuring worker characteristics is somewhat problematic with the Employee Benefit Survey data because, as noted earlier, the survey did not ask much about workers. We include dummy indicators for whether employees were predominantly professional or administrative, technical or clerical, or production workers (the omitted category), and measures of their sex and racial composition (appended at the industry-region level). The occupational descriptors may capture income differences across workers, which in turn may have influenced preferences over compensation packages. For the 1984–1987 data set, we include measures of the percent of workers who were unionized, the employees' average age, and the income distribution of employees, each of which were reported on the HIAA survey. The last of these is measured by two variables, the percentage of workers earning under $10,000 annually and the percentage earning over $20,000.

Firm characteristics in each data set include the overall size of the firm and the industry to which it belongs. In the 1981–1984/1985 data set, we additionally control for the size of the particular plan that was converted; this plan-specific information, however, was not available in the later data set. Information on the firm's assets and its cost of risk bearing was not available in either data set.[25] Although firm size and our industry dummy variables may

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[24] Although we know which states taxed insured plans to offset the costs of their uninsurable risk pools, we do not know the actual tax rate.

[25] We tried unsuccessfully to append asset data to the HCFA/HIAA file. Using information on the names and addresses of the 219 firms in the sample, we tried to locate each in Standard & Poor's Compustat data base. (This source maintains a wealth of financial information on U.S. companies that are publicly traded in any significant way.) Only 14 firms in the sample were

partially control for these factors, we would have preferred more direct measures. Our inability to control for these variables does introduce an omitted variables problem for the estimated models. However, to the extent that these firm-specific characteristics are uncorrelated with state insurance regulations, we should be able to obtain unbiased estimates of the effects of regulation (Amemiya, 1986).

Two variables describe the local insurance market. The first measures the price of medical services in the firm's area, specifically the statewide average cost of hospital room and board, measured as of 1985 for the 1981–1984/1985 data set, and as of 1987 for the 1984–1987 data set (U.S. Department of Commerce, 1990, 1992). Higher medical care prices increase the potential loss to employees. As explained in the previous section, this causes workers to desire more insurance, which might make it less likely that the constraints imposed by mandates are binding. As a result, self-insurance might be less attractive.

Our second variable is a proxy for the extent of the BCBS hospital "discount" in the state. The discount refers to price concessions that a BCBS plan negotiates with area hospitals that may give it a price advantage over other types of insurance, including self-insurance. Blue Cross and Blue Shield usually negotiate these discounts as a flat percentage markdown from a hospital's posted charges. In the 1980s, nearly all BCBS plans negotiated these discounts with the hospitals they served. Our proxy for the BCBS discount is the share of all hospital revenue in the state received from BCBS plan enrollees, measured in 1982 for the 1981–1984/1985 data set and in 1985 for the 1984–1987 data set.[26] Holding hospital prices constant, BCBS plans with a higher market share should have been able to secure larger discounts, thereby making self-insurance a less desirable choice for area firms.[27] Both models control for hospital prices as well as the size of the BCBS hospital discount.

Tests of the Regulation Hypothesis

Upon estimating each of these conversion models, we test for the effects of state insurance regulation in three ways. First, for each model we examine whether individual components of our array of regulation variables, R_i, significantly influenced a firm's conversion propensity. Second, we examine whether these variables, when considered collectively, significantly spurred conversions. It is conceivable, for example, that individual regulations had very small effects, yet the total effect was substantial. We use a likelihood ratio test (Amemiya, 1986, p. 142) to test for the overall significance of state regulation. Third, we use each model to simulate the fraction of workers newly covered

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listed in the Compustat data base. We were unable to conduct a similar search for firms represented in the EBS sample. The survey does not identify the names of individual firms because the Bureau of Labor Statistics considers such information confidential.

[26] We thank Frank Sloan for generously providing these data.

[27] For more discussion of the link between the BCBS market share and the hospital discount, see Feldman and Greenberg (1981).

by self-insurance due to regulation and test if these fractions significantly differ from zero.

This last test has two advantages over the more conventional likelihood ratio test for the collective significance of the variables. First, it provides a quantitative answer to the question of just how much self-insurance can be attributed to the presence of state insurance regulation. Second, the test better addresses the "net effect" of regulation, rather than the joint significance of the variables, the former being more relevant in this study. Imagine, for example, that some regulations have a positive and significant effect on conversion while others have a negative and significant effect; yet, on balance, the net effect of all of them is very near zero. In this situation, this test would likely indicate no effect of regulation, whereas the likelihood ratio test likely would suggest the opposite. Thus, the third test is better at avoiding a Type 1 error if, in fact, the net effect of regulation is negligible.

To conduct the third test, we predict for each firm its probability of adopting self-insurance by the close of the period given actual state insurance regulations, and then we predict its probability given the absence of those regulations. (To the extent that a firm's particular values for the model's independent variables are unique, so too are its predicted probabilities.) The proportion of people newly covered by self-insurance over the period because of regulation is then calculated as the sum across all firms of the difference between these two probabilities, weighted by the number of persons employed by each firm, divided by the total number of persons in self-insured plans. More precisely, let $\hat{F}_{is}$ be the predicted probability of conversion for firm i in state s given its actual values for R_i and Z_{is}, $\hat{F}_{is}|R_i^{hyp}$ the firm's probability conditional on the absence of state insurance regulations, S_{is} the dichotomous (0,1) indicator of conversion, and W_{is} the size of the firm at the close of the period. The vector R_i^{hyp} describes state regulation absent mandates and premium taxes. We estimate the proportion of people newly covered by self-insurance because of regulation by

$$\hat{\theta} = \left[\sum_{i,s} W_{is}(\hat{F}_{is}|R_s^{hyp} - \hat{F}_{is})\right] / \left[\sum_{i,s} W_{is}S_{is}\right], \tag{17}$$

where the summation is over all firms in the sample. We evaluate $\hat{\theta}$ for each sample.

We need to know the distribution of $\hat{\theta}$ in order to test statistically whether mandates and taxation, when taken together, actually encouraged conversions. The formula for $\hat{\theta}$ is sufficiently complicated to make the derivation of its theoretical distribution far too intractable. We can, however, evaluate it empirically using the "bootstrap" procedure (see Efron, 1982, or Efron and Gong, 1983). The bootstrap is a nonparametric statistical technique that permits an assessment of the distribution of any sample statistic using just the data at hand. It is particularly helpful when the theoretical distribution of the statistic is unknown. Specifically, we generate the empirical distribution of $\hat{\theta}$ by first drawing 100 random "resamples" of size m from our data set, each drawn with

replacement, where m is the size of the original sample. For each of these resamples, the logit model in equation (13) is estimated by maximum likelihood and θ is then computed using equation (17). This generates 100 bootstrap estimates of θ, enough to calculate the standard error of this estimator and test for its statistical significance.

Results

Tables 1 and 2 present the estimated logit models describing firms' decisions to convert to self-insurance for the two observation periods. The two models are comparable in terms of how well they fit the data; the McFadden R-squares are 0.185 and 0.168 for the 1981–1984/1985 and the 1984–1987 periods, respectively. The results indicate that state insurance regulation had a mixed effect on conversion decisions during the early 1980s but had no effect during the middle part of the decade. The estimated coefficient of the "newly enacted mandates" variable is insignificant in both equations and has the "wrong" sign in the 1981–1984/1985 model. Several other regulatory variables in the early period, however, are statistically significant. The total number of mandated benefits, the presence of a mandate for mental health coverage, and the presence of a state continuation-of-coverage option for terminated workers each significantly increased the likelihood that a firm converted to self-insurance during the early 1980s.

At the same time, other regulations apparently made it much less likely that a firm converted, including mandates for the coverage of psychologists' services and alcoholism treatment and the presence of a state-levied risk pool tax on purchased insurance. On one hand, these results are surprising because many employers have complained that coverages for psychologists' services and chemical dependency treatments are expensive (Horwitz, 1985, and Stipp, 1988), and there is evidence that at least some self-insured firms avoid these coverages (Morrisey and Jensen, 1993). On the other hand, it is conceivable that mandates for these coverages actually lowered the market price of these benefits, thereby providing less of an incentive for some firms to self-insure. This might have occurred, for example, if the market for these benefits tends to be characterized by adverse selection, absent a mandate. In this case, the prices for these benefits where they were not mandated may have been high (reflecting the claims experience of high-risk purchasers) and some low-risk groups might have self-insured as a way to obtain lower marginal prices. With adverse selection, mandates would tend to reduce prices, as low risks who previously chose not to buy the coverages were forced to buy them if they wanted to offer a plan. Lower market prices would tend to dilute the motive among low-risk groups to self-insure. We know of no study that provides evidence of adverse selection in the market for special coverages or, for that matter, in the group coverage market, so this explanation should be viewed as speculative. Our findings regarding these variables apparently are not due to multicollinearity; we find no evidence for it in either data set.

Table 1
Logit Model for the Decision to Convert to Self-Insurance Between 1981 and 1984/1985

	Sample Statistics		*Logit Model Estimates*	
Variable	*Variable Mean*	*Standard Error*	*Coefficient*	*Standard Error*
Newly Enacted Mandates Over the Period	2.898	2.153	-0.163	0.182
Total Number of State Mandates	12.573	4.152	0.260**	0.110
Mental Health Coverage Mandated (0,1)	0.358	0.480	2.632**	1.094
Psychologists' Coverage Mandated (0,1)	0.788	0.409	-2.563**	1.287
Alcoholism Coverage Mandated (0,1)	0.412	0.493	-3.767*	1.294
Drug Abuse Coverage Mandated (0,1)	0.193	0.396	1.023	0.961
Continuation-of-Coverage Rights Mandated (0,1)	0.423	0.495	1.218***	0.661
BCBS Premium Tax Rate	0.447	0.838	0.176	0.331
Commercial Premium Tax Rate	2.110	0.555	0.530	0.489
State Levies a Risk Pool Tax (0,1)	0.182	0.387	-1.733***	1.032
Participants in the Plan (in hundreds)	4.367	7.369	0.002	0.030
500-999 Workers in the Firm (0,1)	0.179	0.384	-0.865	0.595
1,000-2,499 Workers in the Firm (0,1)	0.179	0.384	-0.728	0.711
2,500 or More Workers in the Firm (0,1)	0.252	0.435	-0.074	0.058
Percentage of Male Workers	0.600	0.129	-1.710	3.915
Percentage of Black and Hispanic Workers	0.144	0.051	-4.186	5.671
Professional or Administrative Workers (0,1)	0.358	0.480	0.264	0.468
Technical or Clerical Workers (0,1)	0.369	0.483	0.235	0.466
Medical Services Price Index	204.670	39.420	-0.020**	0.008
BCBS Local Market Share	22.357	8.313	0.155*	0.038
Mining, Construction, or Transportation	0.128	0.334	-0.123	0.792
Wholesale or Retail Trade	0.073	0.260	1.633**	0.749
Finance, Insurance, or Real Estate	0.266	0.443	-0.498	1.198
Constant			-1.473	3.807
Sample Size	274			
Sample Proportion of 1s	0.175			
McFadden R-Squared	0.185			
Proportion of Correct Predictions	0.861			
Overall Likelihood Ratio Test (d.f. = 23)	47.084*			

* Significant at the $\alpha = 0.01$ level.
** Significant at the $\alpha = 0.05$ level.
*** Significant at the $\alpha = 0.10$ level.

In the model covering the 1984–1987 period, all state regulatory variables lack statistical significance, and there is not even a clear pattern of positive association with a firm's decision to convert, since many of the mandates have negative coefficients.

The combined effects of regulation are addressed in Table 3. Panel A reports our likelihood ratio tests for the joint hypothesis that the coefficients of the regulatory variables are all zero. The findings indicate that their collective influence was highly significant in the early period but not significant in the later one. Panel B reports our simulation tests for the hypothesis that a significant portion of self-insurance can be attributed to regulation. These tests con-

Table 2
Logit Model for the Decision to Convert to Self-Insurance Between 1984 and 1987

	Sample Statistics		*Logit Model Estimates*	
	Variable Mean	*Standard Error*	*Coefficient*	*Standard Error*
Newly Enacted Mandates Over the Period	2.35	2.07	0.003	0.073
Total Number of State Mandates	15.19	3.75	-0.100	0.121
Mental Health Coverage Mandated (0,1)	0.29	0.46	-0.511	0.538
Psychologists' Coverage Mandated (0,1)	0.84	0.37	0.749	0.678
Alcoholism Coverage Mandated (0,1)	0.58	0.49	-0.331	0.488
Drug Abuse Coverage Mandated (0,1)	0.25	0.43	0.070	0.552
Continuation-of-Coverage Rights Mandated (0,1)	0.68	0.47	-0.169	0.491
BCBS Premium Tax Rate	0.48	0.81	0.268	0.284
Commercial Premium Tax Rate	2.13	0.61	-0.044	0.311
State Levies a Risk Pool Tax (0,1)	0.21	0.41	0.762	0.565
Employment of the Firm (Full-Time-Equivalents in hundreds)	18.22	72.29	0.010***	0.007
Percentage of Unionized Workers	17.90	29.17	0.003	0.007
Average Age of Workers	36.01	5.26	0.012	0.036
Percentage of Workers Earning Under $10,000	13.89	21.66	0.021**	0.009
Percentage of Workers Earning Over $20,000	43.41	26.97	0.008	0.008
Medical Services Price Index	231.77	49.99	-0.008***	0.005
BCBS Local Market Share	14.36	7.89	0.003	0.003
Agriculture or Forestry (0,1)	0.04	0.20	0.275	0.851
Mining (0,1)	0.07	0.25	-0.506	0.872
Construction (0,1)	0.10	0.30	-2.015**	1.131
Manufacturing (0,1)	0.11	0.31	0.178	0.647
Transportation or Utilities (0,1)	0.10	0.30	0.009	0.660
Wholesale Trade (0,1)	0.05	0.23	0.334	0.765
Retail Trade (0,1)	0.12	0.33	0.250	0.608
Finance, Insurance, or Real Estate (0,1)	0.16	0.36	0.822	0.559
Constant			0.948	1.981
Sample Size	219			
Sample Proportion of 1s	0.292			
McFadden R-Squared	0.168			
Proportion of Correct Predictions	0.776			
Overall Likelihood Ratio Test (d.f. = 25)	44.533*			

* Significant at the $\alpha = 0.01$ level.
** Significant at the $\alpha = 0.05$ level.
*** Significant at the $\alpha = 0.10$ level.

firm what the likelihood ratio tests indicate—that state insurance regulation in the early 1980s contributed significantly to decisions to self-insure at that time, but by the middle part of the decade, regulations' role was insignificant. The net effect of mandates *alone* during the early 1980s, however, was negligible. Rather, it was premium tax avoidance, in combination with mandates, that spurred the conversions that occurred during this period. Overall, we estimate

Table 3
Tests for the Effects of State Regulation
on Decisions to Convert to Self-Insurance During the 1980s

	1981–1984/85	*1984–1987*
Panel A: Likelihood Ratio Tests		
χ^2-statistic for Test of H_0: $ß_2 = 0$, H_a: $ß_2 = 0$, where $ß_2$ is the vector of coefficients for all the regulatory variables	22.24*	7.06
Panel B: Simulation/Bootstrapping Tests		
T-statistic for Test of H_0: $\theta_1 = 0$, H_a: $\theta_1 = 0$, where θ_1 = proportion of self-insurance attributable to all state regulation	1.770***	0.275
Mean of 100 Bootstrap Estimates of θ_1	0.685	0.097
Bootstrap Standard Error of θ_1	0.387	0.352
T-statistic for Test of H_0: $\theta_2 = 0$, H_a: $\theta_2 = 0$, where θ_2 = proportion of self-insurance attributable to state mandated benefits alone	0.689	0.161
Mean of 100 Bootstrap Estimates of θ_2	0.311	0.057
Bootstrap Standard Error of θ_2	0.381	0.354

* Significant at the $\alpha = 0.01$ level.
*** Significant at the $\alpha = 0.10$ level.

that about two-thirds (68.5 percent) of new self-insurance between 1981 and 1985 is attributable to state insurance regulation.

On balance, these findings show a mixed picture of the effects of regulation. They suggest that the avoidance of regulation was a factor in many of the conversion decisions of the early 1980s, but by the mid-1980s this motive played only a minor role. They also suggest that it was not simply escape from state-mandated benefits that motivated firms to self-insure in the early part of the decade. Indeed, when considered in isolation, mandates were not a significant factor. Premium tax considerations together with mandates, however, were important in driving the self-insurance movement of the early 1980s.

One possible explanation for the finding that mandate avoidance alone was not a key motive is that many self-insured firms actually wanted most of the benefits that the states were mandating during this time period. Theorems 1 and 2 imply that if a mandate constraint is not binding in the choice of insurance, then its imposition should not affect the decision to self-insure. In that case, self-insured plans should often include coverages otherwise mandated for purchased plans.

The EBS data provide enough detail to examine whether this was indeed the case for several areas of coverage that states mandated during this period.[28]

[28] The HCFA/HIAA data are not detailed enough to address this question.

Although self-insured firms were somewhat less likely to offer many mandated coverages, many of them did see value in the benefits (see Table 4). People in self-insured plans in 1985 were almost as likely as those in purchased plans to have coverage for the treatment of alcoholism (64.5 versus 71.6 percent had the benefit), drug abuse (56.4 versus 62.5 percent), clinical psychologists' services (52.8 versus 55.2 percent), a stay in a psychiatric hospital (23.2 versus 32.2 percent), and home health care services (48.4 versus 56.4 percent). For all but one of these five (a stay in a psychiatric hospital), the observed difference in rates is not statistically significant at a 90 percent confidence level. Mandates for alcoholism treatment and psychologists' services were relatively popular in the early 1980s (e.g., see footnote 19). Regarding coverage of a hospital confinement due to a nervous or mental disorder, people in self-insured plans actually had more generous benefits. In particular, 55 percent of enrollees in self-funded plans had psychiatric inpatient coverage comparable to that for other conditions, compared to only 34.5 percent among enrollees in purchased plans, a difference in rates significant at the 99 percent confidence level. EBS data for 1988 additionally show that self-insured plan enrollees also had specific benefits for alcoholism and drug abuse treatment that were no less generous than those held by enrollees in purchased plans (Jensen and Morrisey, 1991).[29] Thus, at least in these special coverage areas, the content of the plans is consistent with the conjecture that, while mandate constraints may have been important to some firms, they were unimportant for most firms in deciding whether to self-insure.

Table 4
Selected Characteristics of Self-Funded and Purchased Plans, 1985

	Percentage of Participants with the Trait Within	
Trait	*Self-Insured Plans*	*Purchased Plans*
Alcoholism Treatment Coverage	64.5	71.6
Drug Abuse Treatment Coverage	56.4	62.5
Home Health Care Coverage	48.4	56.4
Hospital Confinements Due to a Nervous or Mental Disorder Covered	99.8	99.8
Hospital Psychiatric Coverage Identical to Other Inpatient Hospital Confinements	54.7	34.5
Stay in a Psychiatric Hospital Covered	23.2	32.2
Coverage for Psychologists' Services	52.8	55.2

Note: These tabulations of the EBS data describe the coverage of enrollees in fee-for-service plans offered by medium- and large-sized private sector firms throughout the United States in 1985.

Turning to other findings, both data sets indicate that larger firms were more likely to self-insure, a finding consistent with our theory. This effect,

[29] In 1988, the BLS added a special set of detailed questions to the EBS about specific benefits for alcoholism and drug abuse treatment.

however, is statistically significant only for the 1984–1987 data set. This may be because the sample for that model is much more heterogeneous in terms of firm size and, unlike the 1981–1984/1985 sample, includes more firms with 50 to 250 workers. If the size effect was more pronounced in the smaller firms, as one would expect based on our model, then this pattern is not surprising.

Workers' incomes were an important factor in self-insurance. Firms employing more low wage workers (those earning under $10,000 annually) were significantly more likely to adopt self-insurance. Possibly, firms with workers in this income range select "leaner" insurance plans for their employees than firms with higher wage workers, in which case their financial risks of self-insuring are lower.

Firms in areas with higher medical care prices were also significantly less likely to self-insure than firms in areas where prices were low. Since higher prices tend to raise the financial risks of self-insurance, this finding too is consistent with expectations.

The Blue Cross and Blue Shield market share was positively associated with a decision to self-insure, and the effect is statistically significant in the early period. This finding suggests that high BCBS market shares may not have been associated with lower prices for purchased coverage. One possible explanation for this is that BCBS plans with large market shares held some monopoly power which they used to charge higher prices for coverage, thus increasing the incentive for local employers to self-insure. Also, it may be that some employers in BCBS-dominated areas simply *believed* that the insurer was practicing monopoly pricing and switched to self-insurance on that basis. Such a belief may have been fostered by the exceptionally high premium increases posted by many insurers in the early 1980s. Over the 1981–1985 period, premiums for purchased coverage increased by about 20 to 25 percent per year, far in excess of prior norms (Gabel and Jensen, 1992).

Conclusion

This article develops a theory of why an employer would decide to self-insure workers' health benefits. If a firm adopts self-insurance, then either the average cost (loading charge plus premium tax) per dollar of indemnity is lower for self-insurance than for purchased coverage, or the constraint that the firm offer state-mandated benefits (if it purchases coverage) is binding. Using two independent data sources, we find some evidence that the self-insurance movement of the early 1980s was motivated by employer desires to avoid state insurance regulation. By the mid-1980s, however, regulatory considerations played only a minor role. Although regulation was a significant factor in the early years, state-mandated benefits alone were not the driving force for most firms' conversion decisions. Rather, premium tax evasion was important to many firms. Consistent with this conclusion is our finding that many self-insured firms often included in their plans coverages that were mandated.

Why was state insurance regulation important in the early 1980s but not in the middle part of the decade? We offer two explanations. First, the early

1980s was a period of peak legislative activity regarding group health plans. Collectively, states enacted about 37 mandate laws per year between 1981 and 1984, compared to only 28 per year between 1984 and 1987. In addition, it was in the early 1980s that several states began taxing insured plans to help finance risk pools for the medically uninsurable. Because regulatory activity was greater in the earlier years, more firms responded at that time. Second, firms closest to the margin of converting may have already adopted self-insurance by the mid-1980s, in which case our sample for the middle years included firms that were apparently more resistant to self-insuring. For this reason, they were less sensitive to regulation.

Further research exploring the reasons why self-insurance has become the preferred funding method for group health insurance is clearly in order. Although this study has shown that state insurance regulation was a factor during the last decade, its importance was limited to the early 1980s. Other possible explanations for firms' decisions to self-insure their health benefits need to be investigated.

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