NBER WORKING PAPER SERIES

MULTILEVEL "GENERAL POLICY EQUILIBRIA": EVIDENCE FROM THE AMERICAN UNEMPLOYMENT INSURANCE TAX CEILING

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Working Paper 5578

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
May 1996

Helpful comments were received from Don Fullerton, Derek Neal, Donald Parsons and participants at several seminars. We thank John Benedetto for excellent research assistance. This paper is part of NBER's research program in Labor Studies. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

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ABSTRACT

In a large variety of multilevel political systems changes imposed by a higher authority alter the equilibrium panoply of lower-level policies. The new equilibrium depends on the type of change imposed and on the relative strengths of and differences among interested parties at the lower level. As an example we describe how the equilibrium parameters of American states' unemployment insurance (UI) systems are changed when the federal government raises the minimum annual earnings on which employers are taxed to finance UI benefits. Even though benefits determine total taxes at a point in time within state systems, bargaining among the interested parties alters the equilibrium level of benefits and taxes. We estimate a "difference-in-differences" model describing total system costs in those states where federal increases in 1972, 1978 and 1983 forced increases in the tax ceiling. Holding constant changes in interstate differences in unemployment, where the federal constraint was binding costs rose roughly 20 percent above where they would have been. The increase was larger in those states where unionism, a measure of workers' legislative power, was greater. The theoretical model and the implied empirical analysis suggest themselves as examples for future research on a variety of topics in labor economics, public finance and international trade.

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I. The General Issue

Endogenous policy formation has generated a huge literature that has approached the issue from a variety of viewpoints and has created a variety of analytical frameworks. The general notion of bidding for favors (net subsidies) was discussed by Becker (1983). Tariff-setting as a response to pressures by interested agents has been analyzed by Brock et al (1990), Grossman and Helpman (1994), and others. Macroeconomic policy in the form of feedback rules has a long history, dating back at least to Simons (1936). Much of this literature yields positive implications; but rarely does it contain explicit links between the theoretical notions and any tests or measurements; and nowhere is the endogeneity viewed as part of a general policy equilibrium.

Here we consider how to model the endogeneity of a policy and use the predictions as guidelines for testing. The problem relates to a multilevel policy structure in which some superior agency imposes constraints on the policies set by lower-level agencies. Such structures are federal systems, for examples, states within the United States, or Canadian provinces; counties or localities within an American state; and (increasingly) member countries within the European Union. In all of these examples the superior agency mandates some aspect of the inferior agency's policy and can both shift the particular constrained policy and, most important, indirectly alter outcomes of related policies that were determined at the lower level by bargaining among affected interest groups. Analyzing the outcomes of multilevel policy-making is analogous to studying the impact of a changed constraint in competitive general equilibrium: Because the relative positions of the affected parties are altered when the external policy constraint is altered, their recontracting leads to a new equilibrium set of outcomes on all policies.

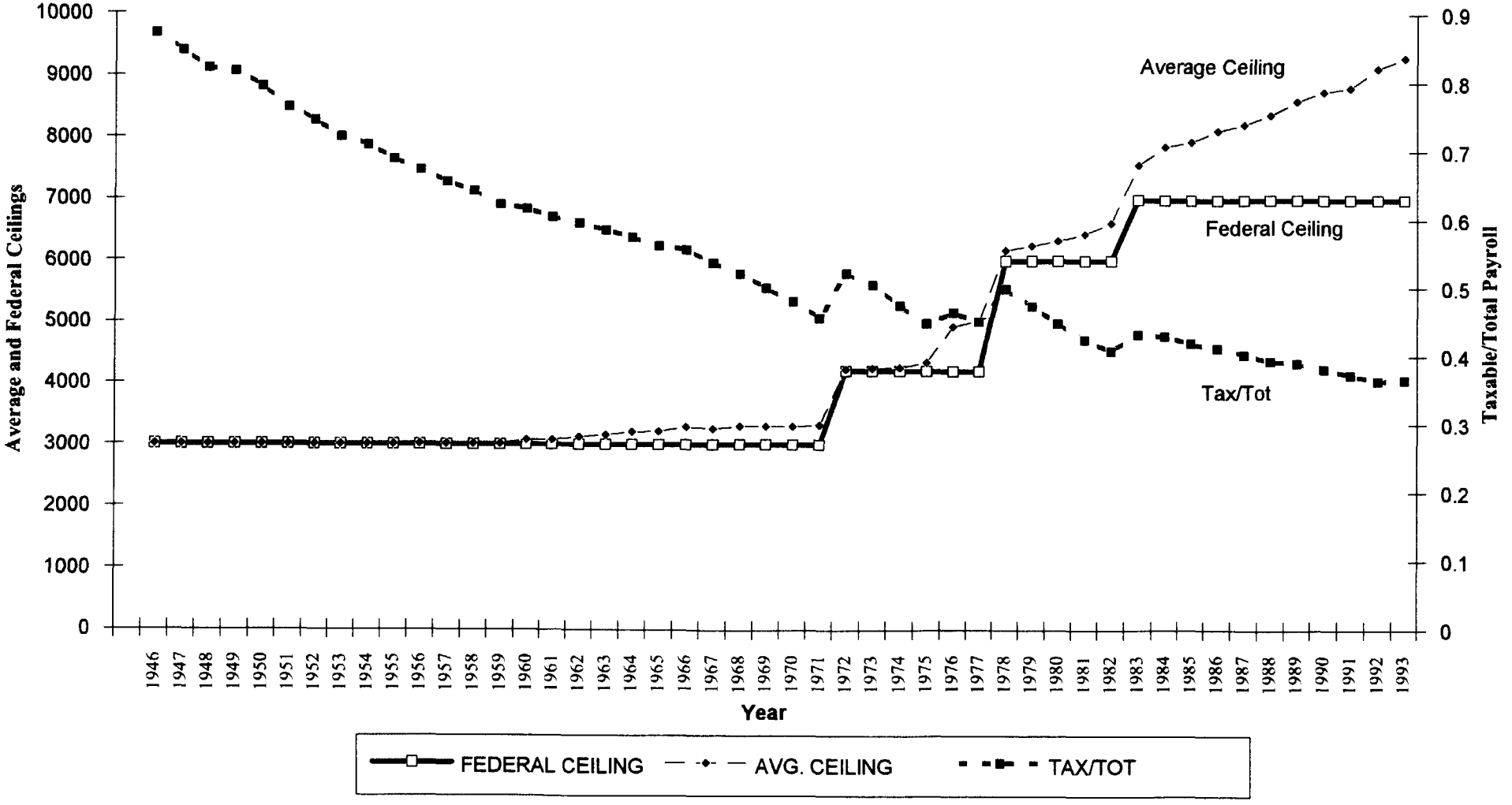
The specific example that we use asks whether federal constraints on one parameter of a tax system lead states to alter other parameters of their local systems. In particular, we consider how changes in federal maxima on the amount of a worker's earnings on which employers in American states are taxed to finance unemployment insurance (UI) benefits alter other aspects of those state systems. Section II presents a brief institutional history and description needed for understanding the issues in this multilevel context. Section III presents the specific bargaining-theoretic model that encompasses the minimally necessary apparatus to allow for possible effects of federal imposition of a higher tax ceiling on state systems. Section IV explores this issue in detail using specific instances of changes in federal constraints on the states.

II. Institutions and Policy Issues

Unemployment insurance benefits, which totalled $23 billion and accounted for 0.4 percent of total personal income in 1994 in the United States, are financed by a payroll tax that is partly related to the amont of benefits paid to a firm's laid-off workers (partly experience-rated). While the states determine the parameters of their own tax systems, their choices are directly affected by the stipulations of the federal government. Under the Federal Unemployment Tax Act (FUTA) each state effectively must choose a set of ranges of tax rates, with a maximum rate of at least 5.4 percent (2.7 percent before 1985) in each set, to finance regular state UI benefits.[1] Those taxes must balance total benefit payments in the state over time, so that each system is ultimately self-financing out of its payroll-tax revenues.

The FUTA currently requires that states tax at least the first $7,000 of a worker's annual earnings, an amount that states can exceed if they wish. The history of this federally-imposed ceiling since 1946 is shown by the solid line in Figure 1. It was raised three times from the $3000 at which

Figure 1. *UI* Ceilings and Taxable/Total Payrolls (Weighted)



it settled shortly after the program's inception, to $4200 in 1972, to $6000 in 1978, and to its current value in 1983.

The dashed line in Figure 1 shows the employment-weighted average of the tax ceilings that states have chosen. Clearly, not all states treat the federal ceiling as a maximum as well as a minimum. Just as clearly, however, some states do, for the weighted average of states' ceilings rises sharply at those points when the federal ceiling is raised. The dotted line in Figure 1 shows the employment-weighted ratio of taxable to total payroll, where the numerator is earnings below each state's ceiling and thus subject to the state's UI tax on employers. While states are free to raise their ceilings above the federal ceiling, and many have done so (in 1995, 40 out of 51 jurisdictions), they have not raised them sufficiently rapidly to prevent the tax from becoming essentially a lump-sum tax on payrolls. (Appendix Table 1 lists the jurisdictions' UI tax ceilings in 1995.) Thus by 1995 the ratio of taxable to total payroll was probably down to 35.5 percent.[2]

Despite the slow but extremely pronounced change in the nature of taxation to finance this program there has been very little study of the tax ceiling. One author (Brechling, 1977) focused on the nature of the ceiling in relation to voluntary turnover; another (Hamermesh, 1990) examined the time-series relationships between taxes and UI benefits, but did so using national totals, thus preventing any study of the political economy of states' setting the taxable ceiling.

The policy question we focus on is the effect of raising the federal minimum ceiling above $7,000.[3] Since state UI systems are essentially self-financing, and since a higher federal minimum ceiling implies more earnings are taxable by states, one would immediately think that net revenues would be unchanged, with a fall in tax rates commensurate with the rise in earnings below the tax ceiling. In a general policy equilibrium (GPE) context, however, we show that this need not be the

case. The model we develop provides testable insights about where we should expect to observe greater departures from what would appear initially to be a simple shift between ways of raising earmarked revenue.

III. Interest Bargaining under a Superior Mandate

State unemployment insurance systems are expected to be self-funded through payroll taxes on the state's employers. The GPE question on which we focus is whether, in the context of a federal system of state programs, federal mandates on the tax ceiling lead states to restructure the parameters determining benefits and taxes in such a way as to alter total spending, and total taxes under their UI programs. Just as important, where might we expect such behavior to be more likely? While several studies (e.g., Inman, 1989; Courant and Gramlich, 1990) have examined the impact of federal tax changes on state revenues, none has done so for a specific program (and none has derived predictions about the impact from a behavioral model).[4]

We stylize each state's UI system by four parameters: The weekly benefit, b; the tax rate, t; the (admittedly simplified) constant fraction of b that is charged to the firm generating the insured unemployment (the level of experience-rating), e; and the tax ceiling, C. We assume that C is set at the federal level by a process separable from that by which each state's parameters are set, and, following institutional practice in the United States, that b, e, and t are determined solely at the state level. These latter parameters are chosen subject to the balanced-budget constraint within each state:

$$bU = tY + ebU=T,$$

where U is the total number of weeks of insured unemployment, Y is taxable wages and T are total UI taxes.[5] Implicit in this set of accounting identities is the notion that a higher taxable maximum

effectively increases the experience-rated nature of the system if nothing else changes (FitzRoy and Hart, 1985). We assume that the state sets the tax rate t to ensure fund balance:

$$t = [1 - e]bU/Y \,. \tag{1}$$

This leaves (b,e) to be set by each state's political process. The rest of this section analyzes this process. We make a number of simplifying assumptions, the more important of which are discussed in Section III.E. For ease of notation we focus on a representative lower-level jurisdiction. We set out the preferences of the parties in the negotiation and characterize an equilibrium in which a version of the median-voter theorem holds. No coalition can form to outvote the (b,e) outcome chosen by the workers and the median firm.

A. Firms

Every state in the federation contains a continuum of profit-maximizing firms, each of which employs a single worker with a fixed-length workweek. Firms have two defining characteristics, the wage they pay and the proportion of time their employee is not employed. Each firm's profit maximization can be separated into two components. The first comprises day-to-day operational decisions, such as product pricing and staffing, which are made conditional on the parameters of the UI system. Over the longer term, however, firms are also involved in the political process that sets the UI parameters. Our interest lies in these latter activities.

Firms face stochastic prices: With probability ρ_i firm i's product price is p_i, and with probability $[1-\rho_i]$ it is q_i, where $p_i > q_i$. During periods when its price is high each firm produces one unit of output by employing one worker at the going wage w_i, which in general depends on the type of activity engaged in by the firm. During periods when its price is low each firm that currently has an employee must decide whether or not to retain the worker. If it retains the worker, it must pay

both the wage and the payroll tax. If it lets the worker go, it may do so in one of two ways. The first allows the worker to qualify for UI and permits the firm to avoid the wage and payroll tax, but results in a liability to the UI system equalling the experience-rated share of one period's benefit, eb. Alternatively, the firm can "fire" the worker, preventing him or her from qualifying for unemployment insurance.

Firing avoids wages, taxes, and UI liabilities but entails a range of other costs, which we denote as k. These include dissipation of goodwill with future workers and perhaps the anticipated costs of retraining new workers. We assume that these costs are random across episodes of employment, and vary according to the distribution F(k) on the interval [0,K]. Finally, during periods of low prices when a firm does not currently have an employee, we assume that it remains committed to whichever decision it made in the first period of reduced prices. For simplicity, we assume that k recurs in each period of unemployment. The firm's decision about whether to contest its worker's claim to UI depends on the comparison between eb and k: The higher is eb, the more likely is the firm to fire the worker.[6]

Since policy determines profits, firms engage in the political process to maximize their long-run average per-period profit. This assumption implies that firm i's political preferences are independent of both its current UI account balance and its current state of employment. Long-run average profits for firm i are:

$$\Pi^i(t,e,b,C) = \rho_i[p_i - w_i - t\min\{w_i,C\}] + [1-\rho_i][-E\min\{eb,k\}] , \tag{2}$$

where:

$$E\min\{eb,k\} = \int_0^{eb} k\,dF(k) + \int_{eb}^{K} eb\,dF(k) .$$

Implicit in (2) is the assumption that firms never retain a worker when prices are low, i.e., $eb < w_i - q_i$. (On the other hand, since it may well be that $k > w_i$, in the absence of UI firms may choose to hoard labor.) Substituting (1) into (2), profits are given by:

$$\Pi^i(t,e,b,C) = p_i - w_i - \left[[1-e]bU/Y\right]\min\{w_i,C\} - u^i E\min\{eb,k\} ,$$

where $u^i = [1-\rho_i]/\rho_i$ is the proportion of time firm i's worker is not employed. For convenience u^i is referred to as firm i's rate of unemployment.

Because of the ceiling C, total wages do not equal taxable wages. To simplify the calculation of taxable wages we assume that the wage a firm pays is a decreasing function of its unemployment level, $w(u^i)$, $w' < 0$. We discuss this assumption in Section III.E. Taxable wages are:

$$Y = \int_0^{\hat{u}} C d\mu + \int_{\hat{u}}^{\infty} w d\mu ,$$

where $\hat{u}$ is defined implicitly by $w(\hat{u}) = C$ and denotes the proportion of time the worker earning exactly C experiences insurable unemployment, and $\mu(u^i)$ is a measure on the unemployment rates of firms. We call firms paying wages above C high-wage firms, those paying less, low-wage firms.

For any level of e all firms prefer lower benefits. For a given level of benefits, however, they do not agree on the optimal amount of experience rating. To see this consider a representative firm's isoprofit line in (b,e) policy space, $e^i(b)$. Differentiating the profit function:

$$e^i_b(b) = \left[[1 - e^i(b)]U\min\{C,w^i\} + e^i(b)u^i Y\pi\right] \Big/ b[U\min\{C,w^i\} - u^i Y\pi] ,$$

with $e^i_{bb} \leq 0$, where $\pi = 1 - F(eb)$ is the probability that the firm lays off rather than fires the worker.

The sign of the slope of firm i's isoprofit line depends on the sign of :

$$\rho_i \min\{C, w_i\}/Y - [1-\rho_i]\pi/U .$$

If its relative insured unemployment level is less than its relative share of taxable wages, an increase in e lowers its share of the total cost of UI. To keep its profits constant benefits must rise, and hence the isoprofit line is positively sloped. If its share of insured unemployment is exactly the same as its share of taxable wages, an increase in e simply shifts the form in which it pays its share of the cost of UI but does not affect its profits, and the isoprofit line is vertical. Finally, if its share of unemployment is greater than its share of taxable wages, its cost share rises with e, so benefits must fall to leave its profits unchanged, and the isoprofit line is negatively sloped. One isoprofit curve, e^m, for one firm is shown in Figure 2. In all cases the isoprofit curve is convex, and profits increase as isoprofit curves shift leftward.

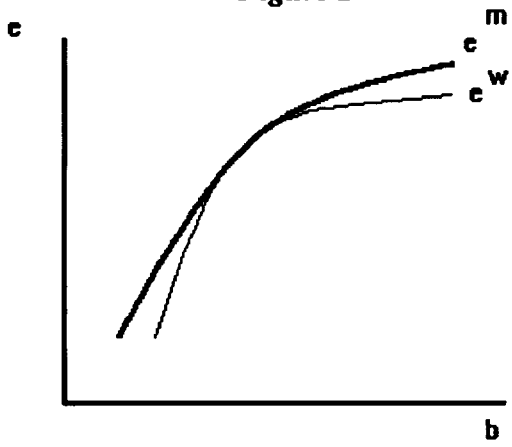
B. Workers

UI benefits provide workers with income only if they are laid off. The probability of layoff comes from the firms' profit-maximization calculations. Workers value only income and engage in the political process to maximize their long-run expected utility. We assume that every worker anticipates the same long-run prospects of employment at each firm in the economy. They seek to maximize:

$$V = \gamma EU(w) + (1-\gamma)\left[\pi(eb)v(b) + [1 - \pi(eb)]v(\bar{w})\right],$$

where v is the worker's von Neumann-Morgenstern utility function, γ is the proportion of time a worker expects to be employed, and EU(w) is the long-run average expected utility of wages, which

Figure 2



depends on the probability of employment across firms. We assume that all workers receive the same wage $\bar{w}$ if they are fired, which for convenience we normalize to zero.

Workers' indifference curves in policy space are defined implicitly by $V(e^w(b),b) = \bar{V}$. An increase in experience rating always reduces the expected utility of workers, since it raises the probability of firing.[7] An increase in benefits may increase or decrease utility depending on whether the higher payment in the event of a layoff outweighs the attendant increase in the probability of firing. Assuming, as seems reasonable, that the first effect dominates the second, the workers' indifference curves are upward-sloping:

$$e^w_b(b) = [\pi v'(b) - ev(b)f(eb)] \Big/ bv(b)f(eb) .$$

A typical worker's indifference curve, e^w, is shown in Figure 2.

C. Equilibrium

A candidate equilibrium policy must by supported by a majority of firms and workers. If any feasible alternative is preferred by a coalition with sufficient political power to impose its will, the candidate is rejected as an equilibrium. A number of types of equilibria might arise from the political process. For example, if any subset of the firms could apply sufficient political pressure to impose the system's parameters unilaterally, benefits would be driven to zero. On the other hand, if workers alone could set the system's parameters, experience rating would be eliminated, and, since we have ignored the implicit non-negativity constraint on profits, benefits would approach infinity. Because neither of these is consistent with the facts, we focus instead on the more interesting and plausible class of equilibria that require cooperation between workers and some of the firms to garner sufficient political power to determine b and e.[8]

These cooperative equilibria are characterized by the following proposition:

Proposition 1. If neither the firms alone nor the workers alone can impose a policy, then the equilibrium policy will lie in the set of efficient agreements between the workers and the median firm. The reason firms can be divided so that the decisive vote lies with the median firm is that firms' ranking of any two policy pairs is monotonic in firm type, as the following lemma demonstrates:

Lemma 1. Monotonicity. Let i, j, and n be any three firms such that $u^i < u^j < u^n$. If the outcome (b",e") is preferred to (b',e') by both firms i and n, then it must also be preferred by firm j .

Lemma 1 shows that low- and high-unemployment firms will never be able to form a coalition to support a policy alternative that is not also preferred by all firms with intermediate unemployment rates. If a policy is neither at a boundary nor a point of tangency between the isoprofit line of the median firm, $e^m(b)$, and the indifference curve of workers, $e^w(b)$, then the median firm can propose a new policy that reduces its costs, preserves (or increases) the utility of workers, and attracts the support of enough additional firms to win against all possible alternative policies. Specifically, if the proposed policy requires increasing experience rating, all firms with lower unemployment rates will prefer it to the status quo, while firms with higher unemployment rates will prefer the status quo. To block the proposed policy these high-unemployment firms need the support of some additional firms. If the median firm preferred the counterproposal, it would have made it itself. Monotonicity of preferences guarantees that if the high-unemployment firms' counterproposal lacks the median firm's support, it is also less preferred by all firms with lower unemployment. Thus as Proposition 1 asserts, the equilibrium agreement will lie in the set of efficient agreements between the workers and the median firm.

The contract curve can found by maximizing the median firm's profit, subject to the provision of a fixed level of utility for workers. At an interior solution this requires:

$$(3) \qquad [\pi v'\text{-}evf(eb)]/bvf(eb) = \left[[1\text{-}e]Umin\{C,w^m\} + eu^mY\pi\right]/b[Umin\{C,w^m\} - u^mY\pi],$$

or $e_b^w(b) = e_b^m(b)$. For an interior solution the median firm must have positively-sloped isoprofit lines, as in Figure 2. If the median firm preferred less experience rating, the equilibrium policy would involve no experience rating.[9] An equilibrium is depicted as the tangency in Figure 2.

D. Comparative Statics

We now can examine how the total cost of the UI system changes when the federally mandated ceiling C is increased exogenously. In the absence of changes to (b,e) workers are unaffected by an increase in C, so it is natural to think of the changes as resulting from new policy proposals from the high-wage firms. Which firm proposes the change is not important: The equilibrium must be efficient with respect to workers and the median firm, so we can imagine that the policy revision is selected by that firm. We first assume that the median firm proposes a new policy that leaves the workers with the same level of utility as the status quo.

The change in C creates a surplus for the workers and the median firm that can be exploited by revising (b,e). Note that this does not mean the median firm is better off with the higher C, but simply that the increase in cost is the minimum compatible with securing the workers' agreement with the policy change. Consider the effect of workers and the median firm sharing the surplus from renegotiation.

Proposition 2. If the median firm is high-wage ($w^m > C$), the level of benefits is non-decreasing in C. If the median firm is not high-wage ($w^m < C$), the level of benefits is non-increasing in C.

Proof: Differentiating equation (3) with respect to C at an interior solution yields:

$$(4) \qquad \partial b/\partial C = bUu^m\pi[Y_C\min\{C,w^m\} - Y\chi\{w^m>C\}]\Big/\Big[[bU\min\{C,w^m\} - u^mY\pi]\Big]^2[e^w_{bb} - e^m_{bb}],$$

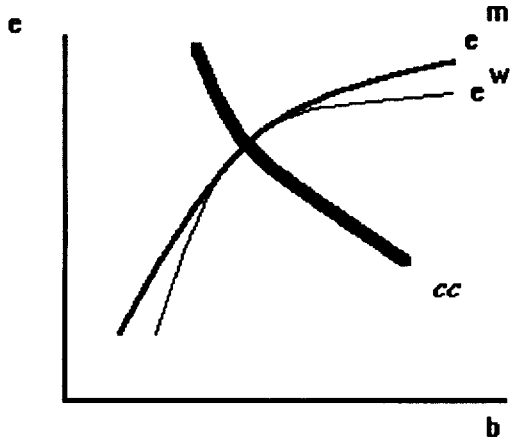
where $Y_C = \partial Y/\partial C > 0$, and χ is the indicator function. The denominator is negative by the second-order conditions (see footnote 9). If $w^m < C$, the indicator function is zero and the bracketed term in the numerator is positive. If $w^m > C$, the indicator function is one and the bracketed term is $Y\text{-}CY_C = \int_{\wedge U}^{\infty} w\,d\mu > 0$. On the boundaries either e is unaffected by C or e moves to the interior.

Since in fact the large majority of payroll is currently above C in the United States, it is likely that the median firm is a high-wage firm. This restriction is even more sensible if political power increases with payroll rather than simply with employment. Nevertheless, the model predicts that, if C were to become high enough, further increases would lead to a drop in benefits. Note that, since in the long run total taxes equal total benefits, $\text{sgn}\{\partial T/\partial C\} = \text{sgn}\{\partial b/\partial C\}$.

We can now examine how $\partial b/\partial C$ is affected by interjurisdictional differences among firms and workers. Consider first the role of workers' bargaining power. Although convenient, the assumption that the median firm can make take-it-or-leave-it offers is too strong. More generally, workers extract a share of the surplus gained by moving onto the contract curve, and the new policy makes both parties strictly better off. The model predicts that benefits will rise more in states where workers have more political power. For this to happen the slope of the contract curve must be less than that of the isoprofit at the original equilibrium, as in Figure 3.

Recall that, holding b constant, workers' expected utility increases as e falls, while the median firm's expected profits rise as e rises. Thus more favorable equilibria for workers lie at points southeast on the contract curve. In Figure 3 these points entail both lower experience rating and

Figure 3



higher benefits. The slope of the contact curve depends, among other things, on the distribution of firing costs and the identity of the median firm. Differentiating (3) shows that sufficient conditions for the contract curve to have a negative slope are that $f'(eb) \geq 0$ and $UC - 2\pi Yu^m > 0$. In the perverse case that the contract curve has a positive slope and is steeper than the isoprofit line workers will use their bargaining strength to obtain less experience rating even at the expense of lower benefits. Observed behavior of workers and their representatives suggests that this possibility is just a mathematical curiosity.

If workers have more power firms have less, so the previous reasoning suggests that increases in the dispersion of firms' characteristics would also produce larger effects when C increases. Even when firms capture all the surplus from renegotiation, however, dispersion may still affect the magnitude of the increase in benefits. It is clear from equation (4) that if all firms are high-wage, $\hat{U} \rightarrow \infty$, so that increasing C has no effect. This is because the rise in C is offset identically at every firm by the reduction in t. On the other hand, holding everything else constant (in particular total taxable wages), as Y_C, the number of high-wage firms, decreases, the redistributive burden of an increase in C rises, and if the median firm remains high-wage this leads to a greater increase in benefits.

It is tempting to conjecture that, the lower e is before an increase in C, the greater will be the effect of higher C on the level of benefits. It is true that, since $e \leq 1$, there is a limit to renegotiation. Furthermore, jurisdictions with initially low levels of experience rating are likely to be those where workers require significant increases in benefits to agree to further increases in e. To construct a model of bargaining that predicted a particular outcome would require, among other things, defining threat points for the bargaining partners. In the present context it is unclear what these would be,

which is why we have focused on comparative statics. In the absence of a complete model no analytic results on the effect of initial level of experience rating are possible.

E. Discussion

In deriving our conclusions we have made a number of simplifying assumptions. This subsection explains our rationale for some of the stronger of these and explores some alternatives we chose not to use. We assumed that the tax ceiling C is set completely exogenously to the policy process at the state level. Since the participants in the federal policy process are presumably just the aggregation of the players in the various states, a more plausible approach would be to model all of the interactions at both levels simultaneously. This would also allow for consideration of policy spillovers between states arising from interstate competition for workers and firms. Such a model would also account for some states choosing to set tax ceilings above the federally mandated minimum. An increase in the ceiling, induced perhaps by a change in the magnitude of interstate spillovers, represents a movement toward the preferred level of the high-ceiling states and away from that of states where the mandatory minimum binds. An increase in C would affect the latter states in the manner modeled above but necessitate no policy change in states where the federal mandate does not bind. It is precisely these differences that we examine in the empirical work below.

Our assumption that all workers expect the same long-run unemployment experience is clearly incorrect. Workers are not identical; their reservation wages vary, and once unemployed all workers are not equally likely to find employment in every job. More important, our assumption that firms' wages are negatively correlated with the probability of unemployment is inconsistent with compensating differentials for the risk of unemployment arising in a competitive labor market. In fact, low-wage workers do experience more unemployment than high-wage workers. This is because

employers compete for workers of similar skill levels; within the market for a given skill level there could well be a wage differential to compensate for a higher chance of unemployment, but in aggregate this is outweighed by the negative intergroup differential.

If we allowed individual workers with heterogeneous preferences to enter the policy negotiations, many more coalitions would need to be considered. Allowing any possible coalition of firms and workers to propose a policy is not only difficult to model, but is highly unrealistic. Assuming instead that firms and workers separately choose representatives who then negotiate with each other leads to an interpretation of the workers' indifference curves in the model above as those of the "median worker," selected to represent workers at large. This two-stage policy making procedure looks like two-party democracy, and the reason for the internal cohesion of the parties lies not in any single issue, but in the broader policy-making context. If we accept this wider interpretation, and maintain the assumption that changes in C do not directly affect the preferences of the representative worker, then explicitly modeling the determination of workers' preferences is unnecessary.

Finally, the assumption of exogenous wages could itself be relaxed, and an equilibrium condition could be added to ensure that workers are indifferent between employers. The simplest variant of this model would hold all workers at their reservation level (which would vary systematically with skills to provide a negative relationship between wages and unemployment). Workers are also then indifferent to all policy changes: The policy game reduces to one between different types of employers, and UI amounts to a pure interfirm transfer. The difficulty with this formulation is that any given level of transfer could be implemented with a whole range of benefit and experience-rating levels. Changes in benefits and experience rating are offset by changes in wages

and imply nothing about the total cost of the system. Workers, or some third party, need to be involved in the policy process.

IV. Direct Tests of Higher Tax Ceilings

Our analysis of the nature of the process determining the structure of each state's UI system and how it changes in response to an imposed increase in the taxable ceiling offers explicit testable predictions about the impact of the increase on states. Most important, it suggests that the federal increase will cause UI systems to expand in those states where it is binding. This inference could not have been apparent without this analysis. The expansion will be greater where: 1) Workers have relatively more bargaining power. Thus measures of workers' power to affect legislation should be associated with higher benefit costs after the imposition of a binding increase in the ceiling. 2) There is more dispersion of the ratio of taxable to total wages across firms. 3) Perhaps too the extent of experience rating of taxes is less.

One way of implementing the discussion in Section III would be to examine how each state's benefit provisions changed in response to increases in the federal ceiling. The difficulty with that approach is that legislation describing benefits is quite complex. Even a political analysis would require some summary measures of benefit liberality in each state. An alternative approach that we follow here is to recognize the complexity of state UI laws and examine how, independent of whatever mechanisms states may use, total UI costs change when the federal ceiling is changed.

We can tie the model directly to the evidence and focus on the impact of changes in the federal ceiling by examining the three occasions when the federal government mandated a higher ceiling for state UI taxes. One might view these changes as "natural experiments," but they are neither. We assume that the agents were not completely surprised by them; and, since we do not

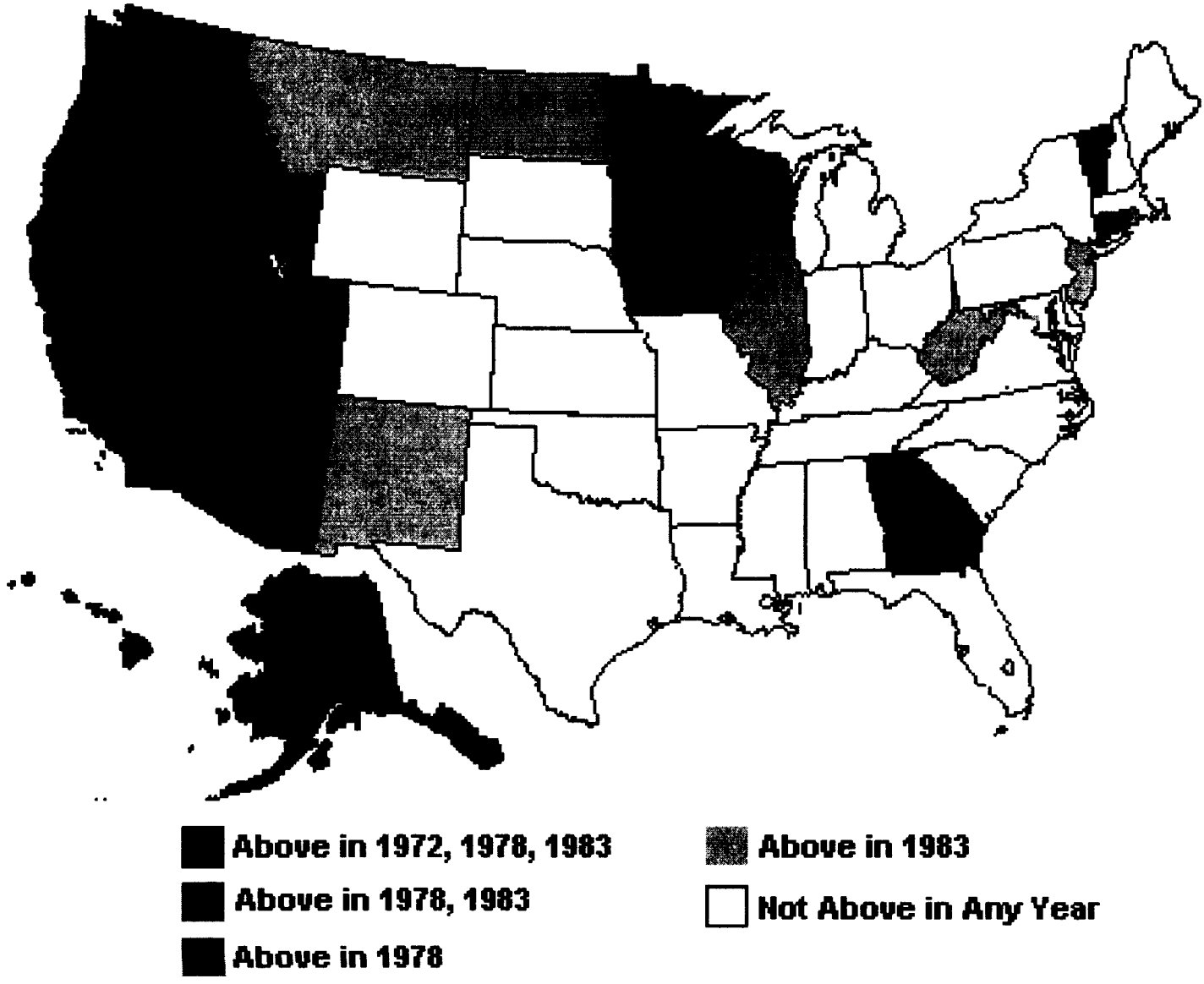
believe that other causes produce identical changes in behavior in unconstrained and constrained jurisdictions, we also model the determinants of interstate differences in the time paths of total taxes.[10]

The basic data used throughout this Section are from UI Financial Handbook, 1994. The data set includes information for each jurisdiction on the taxable ceiling, total taxes, taxable and total payroll and the state's insured unemployment rate. All the estimation in this section is based on annual observations extending up through 1993. The sample consists of the 50 states and the District of Columbia. Let T denote a year when a federally-imposed higher tax ceiling became effective, so that T = 1972, 1978 or 1983. (In each instance the increase in the ceiling became effective on January 1.) We divide jurisdictions at each time T into two groups, those where the state's ceiling at T-1 was below the new federally mandated C* that became effective at time T and those that already had a ceiling of at least C*.

The map in Figure 4 shades each state according to whether or not its ceiling at T-1 was ABOVE or BELOW the new ceiling C* . States that are unshaded in the map had ceilings $C_{T-1} < C^*$ at all three times T-1; other states were ABOVE only in 1978, only in 1983, in both of those years, or in all three years. Except in 1972 the Figure shows that there is substantial scope for comparing behavior in those states where the federal law might have disturbed a political equilibrium to those where it could not have done so (since the law did not constrain behavior). At the time of the increase in 1972 46 of the 51 jurisdictions had ceilings below the newly-imposed ceiling; 36 had low ceilings at the time of the 1978 increase, and 32 did before 1983.[11]

We focus on differences in the time paths of taxes at and after time T in states classified BELOW and ABOVE. Since the joint setting of benefits and taxes is of interest, we do not want to

Figure 4. States Position at Times T-1



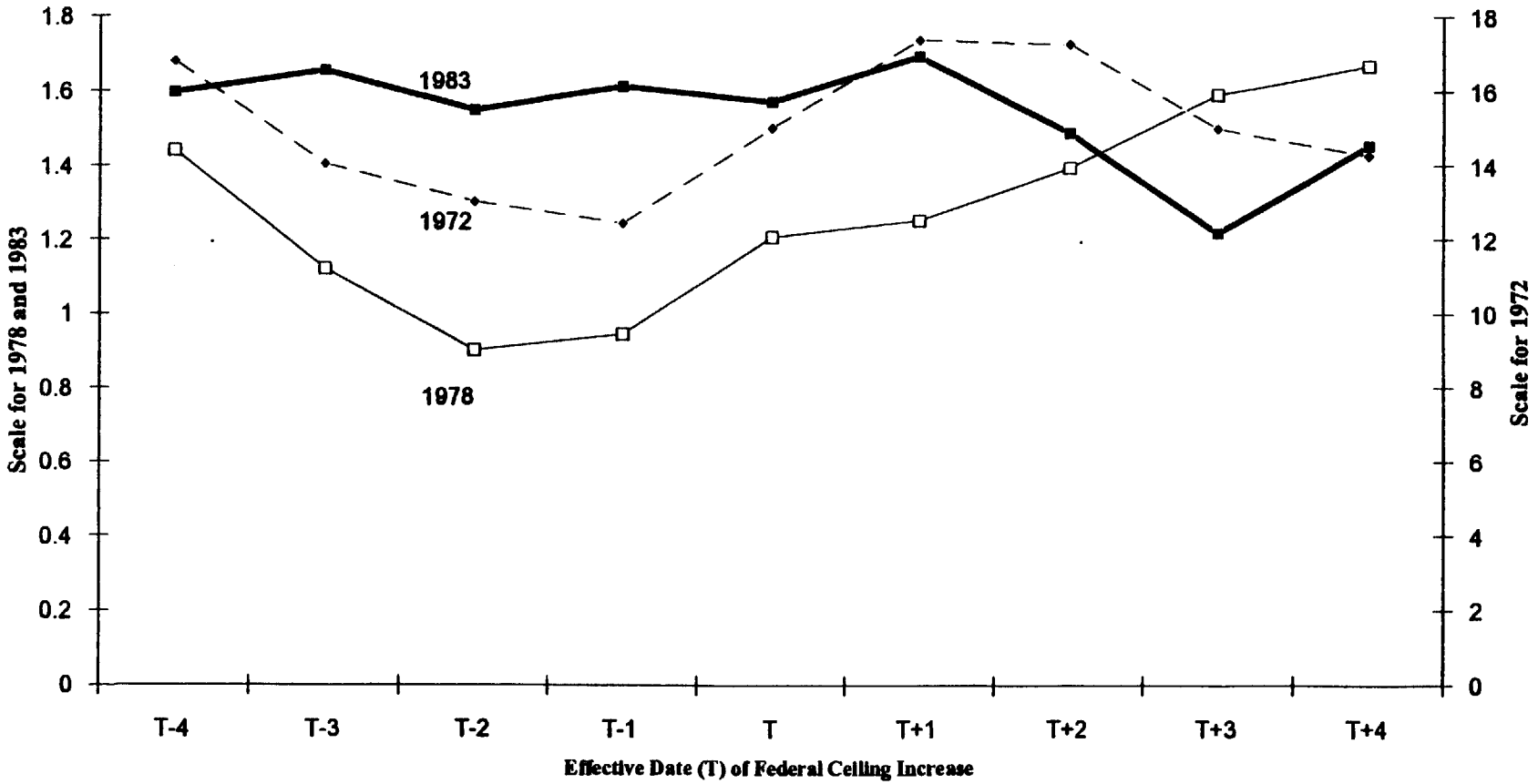
hold post-T UI benefits constant. Instead, post-T benefits and taxes are the joint result of the states' responses to higher C. The estimating model that allows testing the theory of Section III is:

(5) $TAXES_{T+t,j} = \alpha_0 + \Sigma\ \alpha_{1i}TAXES_{T-i,j} + \Sigma\ \alpha_{2i}IUR_{T+t-i,j} + \alpha_3 BELOW_{T,j}$, i=1,...,4 , t=0,...,4 ,

where j is a jurisdiction, IUR is its insured unemployment rate, and TAXES measures total UI tax payments by employers under the state's program of regular benefits (the size of the system's direct burden on employer/taxpayers). The estimated α_3 directly measures $\partial T/\partial C$ and indicates whether states that must raise their tax ceilings in response to a federal mandate tend to increase the costs of their UI systems in the short and long run as a result. Including IUR accounts for interstate differences in the single biggest determinant of time-series variation in UI benefits. The coefficients α_3 are thus not simply measures of "differences-in-differences" before and after T, but instead reflect an attempt to account for factors that might have changed interstate differences in tax costs around time T.

Before examining the estimates, consider Figure 5, which presents the ratios, $(TAXES_{BELOW} - TAXES_{ABOVE})/TAXES_{ABOVE}$ for all nine years T-4, ..., T+4 around each of the three times T. If the federal mandate caused states to alter benefit amounts as they raised their own tax ceilings, we would expect the values of this ratio to be higher at and after time T than they were before. For T = 1972 and T = 1983 there is no evidence of this (although in 1972 so few jurisdictions were classified as ABOVE as to make it unlikely that we would find any effect). For T = 1978, however, the Figure does suggest that total taxes were differentially higher at time T and later in those states where the new federal mandate was effective and might have been expected to lead to a renegotiation of UI system parameters that raised total benefit costs.

Figure 5. {TAX(below)-TAX(above) } / TAX(above)



A more exacting test of the effect of the constraint is provided by the estimates of α_3 for each of the five years after each T-1, based on seemingly unrelated (SUR) estimation of the five equations implicit in (5). These are presented in the first three rows of Table 1. The parameter estimates are in thousands of dollars; e.g., for Year T+4 for T= 1978, the Table shows that total taxes in the typical constrained jurisdiction were (a statistically insignificant) $28.2 million above where they would have been without the federal mandate. In none of the separate estimates for the three events can we even come near to rejecting the hypothesis that there is no difference in taxes at any time T+t between states where $C_{T-1} < C^*$ and those where $C_{T-1} \geq C^*$. Moreover, the vectors of α_3 are also not significantly nonzero.

The results change greatly when we pool the three cases (and thus include a larger number of ABOVE jurisdictions, 39, in one set of equations). The estimates of (5) for all three years T pooled (including time dummy variables) are shown in the final row of Table 1. Each of the estimated individual α_3 is significantly positive; and the difference between the constrained and unconstrained jurisdictions rises initially and then levels off one year after the mandated increase becomes effective. With the larger sample of "controls" we find substantial evidence that taxes are eventually increased in jurisdictions that were constrained.[12]

Table 2 presents estimates of sets of equations like (5), but with a variable AMTBELOW = $\max\{0, C^* - C_{T-1}\}$. The estimates in Table 2 are qualitatively quite similar to those in Table 1. While the estimated α_3 are not significantly positive in any of the three individual sets of estimates, they are in the pooled estimates. Since by construction the variables BELOW and AMTBELOW are highly correlated ($r = 0.79$), it is hardly surprising that including both in the SUR model leads to each vector of coefficients alone becoming insignificantly different from zero. The small number of degrees of

Table 1. Estimates of α_3 Based on Seemingly Unrelated Estimates of (5), Based on Dummy Variable BELOW[a]

	Year					
T	T	T+1	T+2	T+3	T+4	Probability that α_3 vector = 0
1972	-1432	-917	-536	-44	899	0.999
	(11418)	(4093)	(12496)	(11662)	(21667)	
1978	5529	2735	11675	19216	28244	0.850
	(9793)	(12364)	(20352)	(17064)	(22433)	
1983	18778	64801	59298	39295	31862	0.383
	(10583)	(34503)	(40211)	(42392)	(43049)	
Pooled[b]	27188	44547	40514	44118	41903	0.030
	(7965)	(15906)	(17926)	(19371)	(22894)	

[a]Standard errors in parentheses below the estimated α_3 here and in Tables 5 and 6.
[b]Also includes dummy variables for each year.

Table 2. Estimates of α_3 Based on Seemingly Unrelated Estimates of (5), Based on the AMOUNT BELOW

	Year					
	T	T+1	T+2	T+3	T+4	Probability that α_3 vector = 0
1972	0.974	0.831	-1.113	-1.353	22.621	0.755
	(8.958)	(11.331)	(10.457)	(9.793)	(16.788)	
1978	6.477	4.570	16.381	17.743	23.178	0.449
	(5.697)	(7.187)	(11.607)	(9.480)	(12.506)	
1983	18.272	65.513	59.562	42.713	37.865	0.537
	(11.419)	(37.012)	(43.196)	(45.482)	(46.107)	
Pooled	16.682	27.370	29.647	33.437	31.974	0.117
	(5.942)	(11.709)	(13.157)	(14.133)	(16.693)	

freedom prevents us from distinguishing the hypothesis that constrained states behave differently from that hypothesis and the additional one that the tightness of the constraint affects the magnitude of their responses.

In Table 1 the estimated long-term rise in total taxes in the constrained jurisdictions, roughly $40 million, represents an increase of 18.5 percent over the average level of taxes in those states. Despite the absence of any legislation that compels a state to set higher taxes in the long run when it is forced to raise its tax base, total taxes do rise, presumably because total benefit spending increases (in a system that must remain in long-term balance). This is consistent with the model of Section III that suggested that opening up the opportunity for new legislation on this issue results in interested parties restriking the bargains that determined other parameters of the UI system. That the full effect is not felt immediately and is permanent (or at least lasts four years) suggest that the estimates do not simply reflect a mechanical increase in tax revenues arising from lags in cutting tax rates as states are forced by the federal mandate to increase their tax ceilings.

One might argue that behavior in the jurisdictions that are unconstrained by the imposed mandate is itself altered by the mandate. Perhaps, for example, interstate competition leads states nearby those that must alter their UI policies when the mandate is imposed to change their policies too. This may be so; but to the extent that interstate competition produces such behavior, the unconstrained jurisdictions will in part mimic the behavior of their constrained neighbors. Such mimicry means that, if anything, the estimates of α_3 understate the impact of the mandate.

We can extend (5) by considering whether there are interstate differences in how the federal mandate affects state UI taxes. We interact the variable BELOW in equation (5) with a vector of state-specific characteristics suggested by the theory in Section III. Each measure is also included

as a main effect as well. A test of the implications of the model in Section III about the correlates of the impact of a higher federal ceiling on state UI taxes is whether the vectors of interactions are significantly nonzero. We construct several empirical counterparts to the variables that the theory indicates might lead states to increase their UI taxes by a greater amount after time T. These are:

1. Two measures of the legislative power of workers in the jurisdiction. The first is the fraction of workers unionized in state j at time T (from Freeman and Medoff, 1979, for the first increase; Kokkelenberg and Sockell, 1985, for the second increase, and from Curme et al, 1990, for 1983).[13] The second is a variable equalling 1 if the governor of the state is a Democrat and Democrats control both houses of the state legislature, and zero if Republicans control all three.[14] The theory implies that both of these will have positive interactions with BELOW.

2. A measure of the dispersion of employment across industries. We calculate a Herfindahl index (ranging from zero to 100 percent) over 14 industry groups in each state using data from the Current Population Survey Outgoing Rotation Groups for 1979-83. The theory suggests that the coefficient on the interaction of the index with BELOW will be negative.

3. Although the theory gave no prediction about how experience rating affects $\partial TAXES/\partial C$, we experiment with a measure of the extent of experience rating in a state in 1973-76 (from Topel, 1984), ranging from zero to 100 percent. Since this measure is available only for some states, the regressions including it are based only on those 19 states. We might expect the interaction term to be negative.

Table 3 shows the coefficients of the interactions of these measures with AMTBELOW for the expanded versions of equations (5) at t=0, ..., 4 after the three mandated increases at times T for all three events pooled (with dummy variables for each time T included in each equation). Also shown is the F-statistic testing whether the interaction of each measure with AMTBELOW is signficantly different from zero. None of the four sets of interaction terms is jointly significantly different from zero. For that reason, and because of the paucity of degrees of freedom, we do not present results that include several vectors of interactions terms.

Table 3. Estimates of Coefficients on Interaction Terms in Expanded Pooled Versions of (5)

	Variable Interacted with AMTBELOW:			
	Percent Union	Democrat	Emplt. Dispersion	Exper.-Rating[a]
T	1.752	2.514	-1.939	-0.395
	(0.696)	(15.016)	(3.045)	(0.734)
T+1	2.276	7.531	-0.732	-1.545
	(1.440)	(30.293)	(6.137)	(1.671)
T+2	2.878	8.643	1.541	-1.813
	(1.611)	(34.331)	(6.937)	(1.972)
T+3	3.036	16.834	0.631	-1.477
	(1.741)	(37.069)	(7.522)	(2.107)
T+4	2.486	35.877	-3.231	0.146
	(2.078)	(43.536)	(8.878)	(2.611)
P-value on interactions	0.139	0.956	0.927	0.723

[a]Estimated over the reduced sample of 19 states.

While none of the vectors of interactions with α_3 is significant, the coefficients in three of the four vectors (all but the interaction with the measure of employment dispersion) generally have the expected signs (positive in the first two columns, since workers' power should increase their share of the expanded potential set of gains, perhaps negative in the last column, since greater experience-rating may reduce the burden of any increase in C). Moreover, the interaction terms with the percent unionized in the state are each positive at least at the 10-percent level of significance. Despite the extremely stringent predictions that we derived and the small sample that was dictated by our need to examine the behavior of entire states, there is some, admittedly fairly weak evidence, that raising the federal UI tax ceiling has a bigger impact on state UI taxes where the theory predicted larger effects.

VI. Conclusions and Other Applications

Most of this study has dealt with one particular issue, the fiscal role of the payroll tax ceiling in American unemployment insurance. We have derived what we have called a general policy equilibrium model that shows how an imposed change in this one parameter can be expected to affect other parameters of economic policy. The model yields very strong and readily testable predictions for interjurisdictional differences in the paths of these other parameters. Those were tested using a "difference-in-difference" method (adjusted for other causes) and were strongly supported. One might believe that a rise in the amount of payroll that is taxed would lead to a commensurate decline in the tax rate in a system where benefit payments determine total taxes; but we have shown that within the current range of parameters one can expect and one observes that imposed changes in the base lead to increases in the total tax bill.

The analysis speaks to the issue of evaluating the impact of federal (more generally, superior governmental) mandates on outcomes at the state level (at inferior jurisdictions). While a recent burgeoning empirical literature (e.g., Gruber, 1994) has used the same "difference-in-differences" method to perform such evaluations, the approach here offers two potential general improvements. First, the theory makes it clear that superior-government mandates do not affect local outcomes only along the mandated dimension: Because the agents who jointly determine lower-government policy will recontract after the mandate is imposed, other policies will change. Thus other outcomes too will be affected. Second, modeling the process of policy determination gives explicit guidelines for empirical work about where to look for larger or smaller impacts of the federal mandate. Just as these comments apply to federal mandates, so too do they apply to the obverse, the devolution of previously federal activities onto lower-level jurisdictions.

A broad range of policy changes is amenable mutatis mutandis to the same kind of modeling and testing that we have done here. Among the possible topics are:

> The impact of changing federal standards for state AFDC payments. While the federal government mandates minimum benefits and implicit taxes, states are free to augment these. What is the impact on states' policy choices when federal constraints have changed? The answer, and the appropriate empirical analysis, will depend on the interaction of the interested agents -- social workers; welfare-rights advocates; taxpayers' groups; and others.[15]
>
> The Tax Reform Act of 1986 abolished the deductibility of state sales taxes from federal personal taxable income. States' responses, in terms of how they changed their reliance on sales versus other taxes, should have depended on the legislative bargaining by agents for groups representing those interests that were most affected by the various taxes used to raise revenue at the state level. Some states will not have been affected by the change, with the impact in other states determined by interactions among these agents.
>
> Several American states have enacted some kind of local tax limitation, in most cases limits on property taxes. These mandates will have different impacts on localities' GPE reliance on alternative sources of revenue depending in predictable ways on how

interested parties at the local levels bargain over responses to them. Unlike the example in this study and the two examples listed above, this example offers the possibility of large numbers of lower-level jurisdictions over which to test the hypothesis.

Going further afield, the Netherlands has put in place a policy that will devolve part of the costs of social welfare spending onto the over 600 gemeenten (municipalities) over a four-year period. How this devolution affects the mix of other policies and revenue-raising methods in each locality will be depend on identifiable power relations among groups whose importance varies across municipalities.

Tariff reductions under GATT alter the relative gains to different industry groups differently in each signatory country. Because of these changes in their relative bargaining positions they will reach new domestic GPE levels of tariffs and non-tariff barriers on many commodities, not only those directly affected by the GATT reductions. Those equilbria will differ across countries in ways that are predictable.

In any instance where a higher authority changes rules that affect lower authorities the agents involved in determining those and related rules at the lower level will renegotiate a new equilibrium set of outcomes among themselves. The results of the change can be studied by considering bargaining relationships among the interested parties at the lower levels. The outcomes of that bargaining should in turn inform us about the empirical correlates of interjurisdictional differences in responses to a particular superior-government mandate and should thus condition how we study behavior at the level of the lower government.

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Appendix

Proof of Lemma 1: For all positive levels of benefits the slope of a representative firm's isoprofit line increases in its unemployment rate. For $u^i=0$, $e^i_b = [1-e]/b$. As u^i rises, e^i_b approaches infinity. At $u^i = Umin\{C,w^j\}/\pi Y$ it is undefined. For higher rates, e^i_b increases from negative infinity and approaches zero asymptotically. This means that any two isoprofit lines of firms with different unemployment rates cross at most once, and from this fact the lemma follows.

There are six logical possibilities for the intersection of the three isoprofit lines. Two can be ruled out because if $e^i_b<0$, then $e^j_b<0$ for all firms j with unemployment rates higher than i's. We consider the remaining four cases in turn.

1) First assume that all three isoprofit curves are positively sloped: e^i_b, e^j_b, $e^n_b > 0$, so all three firms prefer more experience-rating.

i) If b" > b', then since (b",e") is preferred by firm n, it must be that e">e^n(b"), where e^n(b") is firm n's isoprofit line through b' evaluated at b". Since firm j's isoprofit line through (b',e') is everywhere less positively sloped than firm n's, for b>b', $e^n(b) > e^j(b)$; so e">e^j(b") and firm j must also prefer (b",e").
ii) If b" < b', then firm i's preference implies e">e^i(b"), and, since firm j's isoprofit line through (b',e') is everywhere more positively sloped than firm i's, e">e^j(b").

2) If e^i_b, $e^j_b > 0$, but $e^n_b < 0$, then the only way that higher benefits can be preferred by firm n is in combination with less experience-rating. But this will never be preferred by firm i. If b"<b', then Case (1(ii)) applies.

3) If $e^i_b > 0$ and $e^j_b < 0$, then for n and i to agree it must be that b"<b'. Firm n's preferences imply that e"<e^n_b(b"). Since $e^j_b<e^n_b<0$, for b"<b', it must be that e"<e^j(b").

4) If e^i_b, e^j_b, $e^n_b < 0$, the situation is similar to that of Case (1), except here all three firms prefer less experience rating.

Appendix Table 1. State Unemployment Insurance Tax Base, 1995

State	Base
Alaska	$23800
Alabama	8000
Arizona	7000
Arkansas	9000
California	7000
Colorado	10000
Connecticut	10000
District of Columbia	10000
Delaware	8500
Florida	7000
Georgia	8500
Hawaii	25500
Idaho	21000
Illinois	9000
Indiana	7000
Iowa	14200
Kansas	8000
Kentucky	8000
Louisiana	8500
Maine	7000
Maryland	8500
Massachusetts	10800
Michigan	9500
Minnesota	15300
Mississippi	7000
Missouri	8500
Montana	15500
Nebraksa	7000
Nevada	16400
New Hampshire	8000
New Jersey	17600
New Mexico	13500
New York	7000
North Carolina	13500
North Dakota	13400
Ohio	9000
Oklahoma	10700
Oregon	19000
Pennsyslvania	8000
Rhode Island	16800
South Carolina	7000
South Dakota	7000
Tennessee	7000
Texas	9000
Utah	16500
Vermont	8000
Virginia	8000
Washington	19900
Wisconsin	10500
West Virginia	8000
Wyoming	11900

FOOTNOTES

1. A detailed discussion of the mechanics of these laws is contained in Hamermesh (1977).

2. Data on taxable and total earnings are not yet available for 1995, so this calculation is based on the assumption that total covered earnings grew from 1993, the last year for which data are available, at the same rate as total private average weekly earnings, while taxable earnings rose in proportion to the weighted increase in states' tax ceilings.

3. An increase was proposed in 101st Congress, H.R. 3896, and in 102nd Congress, H.R. 1367 and 4727 respectively, and, most recently, in a very modest change recommended by the Advisory Council on Unemployment Compensation (1996).

4. Adams (1986) examined the determination of the parameters of states' UI tax policy generally, treating each state as a laboratory independent of any effects of federal mandates.

5. That partial experience rating generates cross-subsidies is clear from evidence in Anderson and Meyer (1993) and elsewhere. What is less clear is the direction of those subsidies, which doubtless differs among jurisdictions depending on exactly the kind of bargaining that we outline in this Section.

6. Halpin (1978) provides evidence that greater experience rating leads employers to contest more claims.

7. For some direct evidence that workers recognize this effect see AFL-CIO (1975), which adopted a resolution recommending, "Eliminating experience rating altogether or, at the very least, reducing the minimum range between maximum and minimum tax rates, prohibiting zero rates...."

8. We also normalize political power with employment, implicitly assuming that each firm has one vote in the policy process.

9. The second-order condition requires that the worker's indifference curve be more concave than the median firm's isoprofit line. The more risk-averse workers are, the more likely it is that this condition will be satisfied.

10. Compared to truly exogenous events or mandates, such as those evaluated by Card (1990), it is hardly natural or experimental. It is, however, no less natural or experimental than many of the events that have been analyzed in this literature.

11. It is worth noting that in North Dakota in 1972; Alabama, New Jersey and New Mexico in 1978; and Arkansas, Delaware, Michigan, Vermont and Wisconsin in 1983 the state tax ceiling was raised from C_{T-1} to a level above C^* at T. Such behavior is inconsistent with the model in Section III, but it may be consistent with the solution to a temporary problem of state UI systems in the late 1970s and early 1980s, namely the very high indebtedness of some state systems to the federal government. By the 1980s these debts carried increasingly substantial penalties. With rigidities in state tax systems, raising the base by more than was mandated could have been viewed by all employers as a way of raising additional taxes to pay off the debt to the federal UI trust funds and reduce interest penalties.

To examine this hypothesis we estimated a probit relating whether the state raised its ceiling by more than required to the ratio of its outstanding debt to its annual UI taxes (with time dummy variables included). The sample includes all states where $C_{T-1} < C^*$ in 1978 and 1983. The results showed that a higher debt made constrained jurisdictions significantly more likely to raise the ceiling by more than the federal government required. Indeed, while a constrained (BELOW) state with no debt had only a 7 percent probability of going beyond the required increase, the state with the largest proportional debt had a 50

probability of raising its ceiling beyond the federal mandate.

12. These results and those in Tables 2 and 3 are changed only minutely if the District of Columbia is dropped from the analysis in recognition of its unusual position in the American federal system.

13. Freeman and Medoff's data are for private-sector unionism only, while Kokkelenberg and Sockell present data only for all unionism. We use these data as they are, along with Curme et al's data on all unionism, and circumvent the problem of comparability by including dummy variables for each of the years in the pooled equations, as in Tables 1 and 2. For T-1=1971 we use Freeman and Medoff's data for 1973-75; for T-1=1977 we Kokkelenberg and Sockell's data; and for T-1=1982 we take a weighted average of their data for 1979 and Curme et al's data for 1983.

14. The variable is defined as 0.5 if one party controls the governorship and the other controls both houses of the legislature, and as 0.75 (0.25) if the governorship and one house are Democratic (Republican).

15. We are indebted to Becky Blank for these insights into the arcana of the American AFDC system.