8-1990

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August, 1990

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*** Partial funding for this work was provided by contracts from the Michigan Department of Labor and the Michigan Department of Commerce.

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ABSTRACT

This study compares employer unemployment insurance (UI) tax costs and worker UI benefits across the 28 largest industrial states for 1988. The comparison is done using a detailed computerized micro-simulation model which computes the worker UI benefits and employer UI taxes for each state. Assumed characteristics of employers and employees are held constant across the states so that differences in UI costs and benefits among the states can be attributed entirely to differences in UI statutes. The principal findings of this study are: (1) the UI system can be modeled fruitfully at the firm level, (2) there are significant UI tax differentials across states attributable to statutory provisions, (3) UI tax differentials vary by type of employer, and (4) there is at least one significant regional difference: UI taxes are generally lower in Southern states.

I. Introduction

There has recently been a resurgence of interest in the role that state and local taxes play in firm location decisions and industrial growth. The conventional wisdom is that import competition and the general slowdown in the national rate of economic growth in the last decade has induced firms to locate in areas with low production costs. Meanwhile, new technology and the decline in transportation costs has substantially increased the number of locations which might potentially be cost-efficient. The federal government has exacerbated the problem, albeit unintentionally, by lowering marginal tax rates effectively increasing the significance of existing state and local tax differentials while simultaneously reducing the share of federal revenue returned to state and local governments. The bottom line is that states find themselves strapped for funds at the same time that interstate tax competition to attract and retain business firms has intensified. At a recent symposium sponsored by the National Tax Association, John Shannon, the

past Executive Director of the Advisory Commission on Intergovernmental Relations suggested, "...it is time to take a hard new look at this tough old issue."[1]

It has been almost three decades since the frequently referenced survey on state and local taxes by John Due (1961). In that article Due concluded that state and local taxes are relatively unimportant as a site location factor and therefore ineffective as a regional economic development policy tool. It has only been recently that a number of academic economists have challenged the view that state and local taxes are irrelevant to business decision making. These studies have been reviewed by Newman and Sullivan (1988) and McGuire (1986). Whatever the final result of the current debate about the role of state and local taxes, John Due's seminal work has certainly been strongly challenged.

This paper explores one of the taxes which has heretofore received little attention in the research literature on state and local tax differentials; namely, unemployment insurance (UI). UI provides temporary benefits to covered workers during periods of involuntary unemployment from taxes contributed by employers. Established in 1935 by the Social Security Act, the UI system is a cooperative federal-state program in which the states retain broad discretionary powers to determine the specifics of their individual programs. Consequently, the UI system varies widely by state. One of the complicating features of the state systems is the feedback mechanism whereby UI taxes at the firm level are partly experience rated, meaning that the layoff record of the firm impacts taxes due and payable.

Wheaton (1983) is one of the few researchers that includes UI taxes in his study of total state and local tax differentials. In his study aggregate UI tax data by state is utilized to approximate UI taxes for all businesses. The share of total UI taxes paid by the manufacturing sector in each state is also estimated using that sector's share of wages to total state wages. Wheaton's approach or any other similar approach which relies on aggregate UI tax data has serious limitations. UI taxes are neither assessed uniformly on firms in any state, nor are they computed by any simple function of firm wages and unemployment. Furthermore, UI taxes statewide can be pushed upward because of high unemployment in a few key sectors, while some employers may be relatively unaffected because of experience rating provisions.

An earlier study by Barron and Mellow (1981) suggested that differences in UI benefits per worker across states are indicative of differences in UI taxes for employers. They used data from the special May 1976 CPS supplement designed to gather information on job search by the unemployed[2] to estimate the probability that an unemployed person would collect UI and the expected UI benefit amount across 26 areas which included 18 states, 7 regional groupings of states, and the District of Columbia. This approach allowed them to capture the effect of eligibility enforcement standards. However, for the purpose of studying differences in interstate UI tax costs, their approach like Wheaton's suffers from the failure to directly consider the actual tax costs which result under the complicated UI tax regimes of the various states. Barron and Mellow (1981) state that a "direct analysis of

these differences is not possible: parameters of specific UI programs are complex and difficult to quantify."

The limited goal here is to attack this well-known measurement problem inherent in studying UI, a necessary precursor to linking UI to business decision making. Specifically, a simulation model is developed which is then used to compare the total impact of the detailed 1988 UI statutes on employer costs and worker benefits across the 28 largest industrial states for similarly situated employers and employees. In Section II the design of the study is presented. Simulation results for worker benefits are discussed in Section III, and employer cost results are given in Section IV. Finally, conclusions are offered in Section V.

The principal findings of this study are: (1) the UI system can be modeled fruitfully at the firm level, (2) there are significant UI tax differentials across states attributable to statutory provisions, (3) UI tax differentials vary by type of employer, and (4) there is at least one significant regional difference: UI taxes are generally lower in Southern states.

II. Design of the Study

The maintained hypothesis of this paper is that meaningful interstate comparison of UI costs for employers requires firm level analysis. We follow the approach that Papke and Papke (1984) utilize in their innovative AFTAX simulation model. They examine a variety of state and local taxes for

representative firms (using industry data) wherein the assumed characteristics of those firms are identical across states for all non-tax factors. Thus, any differences in the state and local taxes measured are due to statutory differences. UI is not included in their research due to the difficulties of measurement.

The notion of our UI micro-simulation model (UIMSM) is simple: to reproduce as closely as possible the actual process by which an operating firm's UI taxes are determined in each state. In other words, UIMSM isolates the differences in UI costs among the states that can be directly attributed to differences in their UI statutes, holding constant the assumed characteristics of the employers and employees. The focus of UIMSM is squarely on the role that current statutes play in determining UI tax differentials across states. This approach appeals to policy makers who consider historical studies suspect due to rapidly changing economic and legal circumstances. Another attractive feature of UIMSM to policy makers is that it can be used to determine the differential impacts across firms of a given change in statutory provisions in one or more states.

Currently UIMSM contains the UI statutory provisions for calendar year 1988 for 28 states. The 28 states included in this study are the largest states in the U.S. in terms of manufacturing employment.[3] Cumulatively, they accounted for just over 90 percent of all U.S. manufacturing employment in 1987. It is, of course, impossible in a short paper to detail the specific state statutory provisions currently programmed in UIMSM because of the complexities in and differences among the state UI statutes. However, the

significant features of the model are presented in Appendix A, where common approaches and UI tax parameters are emphasized.

At the micro-level the layoff experience and wage rates of the firm are the principal determinants of UI costs. Therefore, two key variables characterize a hypothetical firm in this study: the insured unemployment rate and the average annual wage level. Nine basic simulations are conducted for an employer with a given workforce using three separate wage levels and three separate firm unemployment rates in all possible combinations.

The five year, 1983-87, national average weekly insured unemployment rate of 2.9 percent is defined as average for this study, double that figure as high, and one-half of it as low. Average annual wages for this study are $20,200, this is the estimated national average wage for all UI covered workers in private employment in 1987.[4] Estimated in a similar fashion, high average annual wages are $32,700, and low average annual wages are $11,300, these are the highest and lowest average annual wages for industries covered by UI data. The hypothetical firms considered in this study are therefore representative of actual industry data, and provide a broad range of wages and unemployment for the simulations.

It is important to understand what is being estimated with the simulation model. First, the total cost of benefit payments under the 1988 statutory provisions is estimated rather than the actual UI tax bills for 1988. Benefit payments during 1988 do not affect 1988 taxes, because current tax rates are a function of the firm's experience in prior years. However,

1988 benefit payments do affect future taxes through the experience rating system. Therefore, the full impact of UI in a given year is the total cost after all interim adjustments have taken place.[5]

Second, this study focuses exclusively on the UI statutes actually in place and effective during 1988. It is beyond the scope of this study to evaluate legislated changes and automatic provisions for change that are scheduled to be effective in future years. Concomitantly, various so-called temporary or emergency taxes are included in this study because they are actually effective in 1988 regardless of the fact that they may expire at a future date.

Third, throughout this study total UI taxes include both the state and federal taxes payable in order to provide a more complete picture of the total UI tax burden faced by firms. Federal penalty taxes may also be due from employers in certain states with federal loans outstanding.

Finally, it should be emphasized that there is no simple way to aggregate the micro estimates from this study to arrive at statewide estimates of UI costs and benefits. Similarly, there is no reason to think that any one of the benefit or tax cost simulations is more significant than the others. In short, one should examine the general trends in UI tax costs and benefits across the simulations of this study rather than focus on the estimates from any individual simulation.

III. Worker Benefits

Weekly UI benefit payments provide covered workers with partial wage replacement during spells of unemployment. The weekly benefit in all states amounts to some fraction of prior wages up to a specified maximum. The number of weeks that a claimant can receive benefits is limited, and the claimant may also be subject to a waiting week, meaning that benefits are not paid during the first week of unemployment. Finally, there may be an allowance for dependents.

The UI benefit provisions vary widely among the states.[6] The simulation model includes the detailed rules used by the states themselves to compute a claimant's benefits. The simulation model assumes that all workers are earning the average wage in their firm and that one-half of the workers are married with a working spouse and two dependents, except for low wage simulations where it is assumed that none of the workers have dependents.[7] Furthermore, all workers are assumed to be eligible for the maximum duration of benefits and to actually apply for benefits if laid off. There is no specific accounting for state eligibility rules, generally stated in terms of weeks of work and some minimum earnings requirement. However, these criteria tend to be quite modest, even in states with more stringent qualifying requirements, so it is not a significant limitation, unless one is interested in studying firms in which the bulk of employees are part-timers and being paid at or very near the federal minimum wage.[8]

The model is highly stylized, accounting only for the most significant characteristics of state UI systems that affect individual benefit levels. The model does not include extended benefits, monetary and nonmonetary eligibility requirements, or special provisions for part-time workers, work-sharing, and seasonal workers, among others. Turnover is limited to that implied by the firm's unemployment rate. Thus, UIMSM is applicable only to firms with a stable work force and permanent on-going operations.

Table 1 presents the weekly benefit amounts calculated by the simulation model that correspond to low, average, and high wages. Because benefits are sensitive to dependency status in some states, weekly benefit amounts for average and high wage workers are listed for those with no dependents and those with two dependents. Simulated weekly benefit amounts which are at the state maximum are indicated with an asterisk. Also given in Table 1 are index numbers and rankings of weekly benefit amounts across the 28 states.

For the low wage simulations the weekly benefit amount ranges from $96 in Indiana and Tennessee to $141 in Oregon. The variation in benefit amount across states is smaller for the low wage level than for average or high wages. The weekly benefit amount is $108 in 8 states, and 13 states have a weekly benefit amount in the range $107 to $109. The mean weekly benefit amount for the low wage group is $113 with a standard deviation of 10.3. Among the low wage simulations, the maximum weekly benefit amount is paid in only one state, Indiana. These results confirm the generally accepted notion that below the maximum weekly benefit amount UI benefits replace roughly one-half of the worker's previous wages, yet the rather significant outliers also

Table 1. Estimated Weekly Benefit Amount, Index, and Rank by State Relative to the 28-State Average, 1988.

Wages[a] / Dependents	Low None			Average None			Average Two			High None			High Two		
State	WBA[b]	Index	Rank[c]	WBA	Index	Rank	WBA	Index	Rank	WBA	Index	Rank	WBA	Index	Rank
Alabama	$118	104	(6)	$120*	67	(27)	$120*	65	(28)	$120*	63	(27)	$120*	60	(28)
Arkansas	108	96	(13)	194	109	(8)	194	104	(11)	209*	110	(10)	209*	105	(12)
California	98	87	(26)	152	85	(22)	152	82	(22)	166*	87	(19)	166*	83	(20)
Connecticut	109	96	(13)	195	110	(7)	215	116	(6)	234*	123	(6)	254*	128	(2)
Florida	108	96	(13)	194	109	(8)	194	104	(11)	200*	105	(13)	200*	101	(15)
Georgia	113	100	(9)	165*	93	(19)	165*	89	(20)	165*	87	(19)	165*	83	(20)
Illinois	107	95	(25)	176*	99	(16)	230*	124	(3)	176*	93	(16)	230*	116	(8)
Indiana	96*	85	(27)	96*	54	(28)	129*	69	(27)	96*	51	(28)	129*	65	(27)
Iowa	122	108	(5)	174*	98	(18)	188*	101	(17)	174*	92	(18)	188*	94	(17)
Kentucky	134	119	(2)	166*	93	(19)	166*	89	(20)	166*	87	(19)	166*	83	(20)
Maryland	118	104	(6)	205*	115	(3)	205*	110	(7)	205*	108	(12)	205*	103	(14)
Massachusetts	108	96	(13)	194	109	(8)	244	131	(1)	252*	133	(2)	302*	152	(1)
Michigan	118	104	(6)	205	115	(3)	224	120	(5)	242*	127	(3)	242*	122	(5)
Minnesota	108	96	(13)	194	109	(8)	194	104	(11)	254*	134	(1)	254*	128	(2)
Mississippi	108	96	(13)	145*	81	(25)	145*	78	(28)	145*	76	(25)	145*	73	(25)
Missouri	127	112	(4)	140*	79	(26)	140*	75	(26)	140*	74	(26)	140*	70	(26)
New Jersey	130	115	(3)	233	131	(1)	241*	130	(2)	241*	127	(3)	241*	121	(6)
New York	109	96	(13)	180*	101	(15)	180*	97	(18)	180*	95	(15)	180*	90	(18)
North Carolina	108	96	(13)	194	109	(8)	194	104	(11)	228*	120	(8)	228*	115	(9)
Ohio	108	96	(13)	157*	88	(21)	194	104	(11)	157*	83	(22)	238*	120	(7)
Oregon	141	125	(1)	229*	129	(2)	229	123	(4)	229*	121	(7)	229*	115	(9)
Pennsylvania	109	96	(13)	193	108	(14)	201	108	(10)	239*	126	(5)	247*	124	(4)
South Carolina	108	96	(13)	147*	83	(24)	147*	79	(24)	147*	77	(24)	147*	74	(24)
Tennessee	96	85	(27)	151	85	(22)	151	81	(23)	155*	82	(23)	155*	78	(23)
Texas	113	100	(9)	202	113	(5)	202	109	(8)	210*	111	(9)	210*	106	(11)
Virginia	113	100	(9)	176*	99	(16)	176*	95	(19)	176*	93	(16)	176*	88	(19)
Washington	113	100	(9)	202	113	(5)	202	109	(8)	209*	110	(10)	209*	105	(12)
Wisconsin	108	96	(13)	194	109	(8)	194	104	(11)	200*	105	(13)	200*	101	(15)

[a] Wages: Low = $11,300, Average = $20,200, High = 32,700.
[b] WBA is weekly benefit amount.
[c] The numbers in parentheses are the states rank relative to the average of all 28 states in the study. In this paper rankings are ordered from high to low.
* An asterisk indicates the weekly benefit is at the state maximum.

demonstrate the dangers of applying rules of thumb carte blanche to state statutory systems.

The bigger differences across states in benefits for the average and high wage simulations are due primarily to the maximum WBA limitation. For the high wage simulations with two dependents the weekly benefit amount ranges from $120 in Alabama to $302 in Massachusetts, the state maximum benefit ceilings are binding for all high wage simulations. For simulations with no dependents, ceiling benefit amounts are paid in only one state (Indiana) given low wages, 14 states given average wages, and all states given high wages. A review of Table 1 should leave no doubt that identically situated workers in terms of wages and dependency status receive much different benefits depending on the state in which they are located.

IV. Employer Costs

Employers pay two types of taxes to finance the UI system. Federal UI taxes fund all of the administrative expenses of the federal-state UI system. This includes the direct administration of UI and the provision of a variety of employment-related services through the state employment security agencies. The federal UI taxes also support one-half the cost of extended benefits and the federal loan account from which states may borrow to pay worker benefits should the state UI trust fund be exhausted.

One portion of each employer's state UI tax is related to layoff experience. There may also be one or more additional uniform tax or other

variable charges. These additional taxes might help fund benefit payments to workers whose firms no longer exist or whose firms are already subject to the maximum permissible state tax rates. Some states may also wish to more aggressively replenish state reserves that have become depleted during a period of high unemployment.

The individual state UI tax structures, especially their experience rated elements, are complex and differ considerably across the states.[9] The simulation model incorporates the detailed tax provisions, specific tax schedules, and computation methods used to compute an employer's tax rate in the various states. Among other features, the tax calculations include the charging provisions for each element of the tax, the lag between the data available on tax computation dates and the effective dates of those rates, rounding provisions, the effects of the waiting week on employer costs, write-down procedures and tax limiters. In the simulation model, the employer's UI record is maintained as would the states themselves to facilitate the iteration of the model for any number of one-year periods. The ability to iterate the model is one of its advantages, permitting the determination of the total impact of the UI system on employer costs.

While the simulation model incorporates most of the complex state tax provisions it is not complete. The model deals only with the general state tax rates, ignoring any special rate provisions for particular types of employers by size, industry, or other factors. It also does not include the special tax provisions for new firms.[10] Benefit charges for extended

benefits are not modeled,[11] nor is there any specific accounting for each state's noncharging provisions or appeal procedures.

Simulations were performed for all nine combinations of three different levels of unemployment and three levels of wages. UI tax cost estimates are presented as index numbers together with rankings in Table 2. The highest tax cost states are Texas, Washington, Oregon, Minnesota, and Iowa. Among these Oregon is the only one also ranked near the top of the list in terms of weekly benefit amounts computed by the simulation model. Texas tax rates were high in the 1980s because the state UI trust fund had been nearly depleted. New Jersey is interesting in that UI tax costs and ranking are much lower at low unemployment rates than at higher unemployment rates.

Three of the top tax cost states Washington, Oregon, and Iowa are the only states among the 28 to be benefit ratio ranking states. Under this approach firms are ranked by benefit ratio, grouped so that each cluster contains the same proportion of the state's total UI taxable wage base, and then different tax rates are assigned to each group. Given that Oregon, Washington, and Iowa have had relatively low unemployment rates in recent years, a firm experiencing the insured unemployment rates simulated here, even those with an average IUR of 1.45, would be near the top of the state distribution, and therefore have high taxes, far higher than the benefit payments received by the workers in those firms. The implication is that a firm in a state with a benefit ratio ranking system may have UI tax costs that are more responsive to the overall state's unemployment record than the firm's own layoff record.

Table 2. Estimate of Index of Total Unemployment Insurance Taxes by State Relative to the 28-State Average and Rank of State.

State	Low Wages[a]			Average Wages			High Wages		
	Low IUR[b] (Rank)[c]	Average IUR (Rank)	High IUR (Rank)	Low IUR (Rank)	Average IUR (Rank)	High IUR (Rank)	Low IUR (Rank)	Average IUR (Rank)	High IUR (Rank)
Alabama	42 (27)	52 (28)	56 (28)	30 (28)	36 (28)	43 (28)	28 (28)	34 (28)	41 (28)
Arkansas	79 (13)	81 (16)	86 (20)	87 (16)	90 (16)	96 (13)	88 (15)	93 (17)	93 (13)
California	53 (24)	63 (24)	69 (26)	57 (22)	64 (22)	75 (22)	59 (21)	67 (22)	72 (25)
Connecticut	94 (11)	92 (11)	94 (14)	99 (10)	103 (10)	86 (18)	108 (10)	114 (9)	82 (18)
Florida	58 (23)	70 (22)	80 (22)	74 (18)	85 (18)	75 (25)	70 (18)	83 (18)	72 (23)
Georgia	60 (22)	73 (21)	83 (21)	62 (20)	72 (21)	91 (15)	59 (20)	68 (21)	87 (15)
Illinois	149 (5)	170 (3)	173 (2)	108 (9)	115 (9)	134 (6)	103 (11)	109 (11)	129 (8)
Indiana	47 (26)	58 (25)	58 (27)	40 (26)	46 (27)	44 (27)	40 (26)	44 (27)	43 (27)
Iowa	141 (6)	161 (5)	174 (1)	135 (5)	178 (2)	159 (1)	129 (7)	169 (3)	154 (2)
Kentucky	70 (16)	84 (14)	98 (10)	61 (21)	74 (20)	92 (14)	58 (22)	70 (20)	88 (14)
Maryland	73 (15)	85 (13)	98 (11)	88 (15)	100 (13)	75 (24)	83 (17)	95 (14)	72 (24)
Massachusetts	75 (14)	79 (18)	88 (18)	97 (12)	101 (11)	79 (19)	114 (9)	113 (10)	77 (20)
Michigan	131 (8)	118 (9)	111 (8)	128 (8)	121 (8)	137 (5)	131 (6)	126 (8)	147 (3)
Minnesota	132 (7)	120 (8)	118 (6)	134 (6)	128 (7)	147 (2)	150 (5)	148 (4)	178 (1)
Mississippi	39 (28)	55 (27)	71 (24)	39 (27)	54 (26)	72 (26)	37 (27)	51 (26)	69 (26)
Missouri	63 (20)	80 (17)	93 (15)	49 (25)	60 (24)	78 (21)	47 (25)	57 (24)	75 (21)
New Jersey	64 (18)	82 (15)	95 (13)	88 (14)	101 (12)	131 (8)	84 (16)	98 (13)	128 (9)
New York	102 (10)	97 (10)	96 (12)	98 (11)	98 (14)	89 (16)	93 (12)	93 (15)	85 (16)
North Carolina	64 (17)	78 (19)	90 (16)	82 (17)	97 (15)	122 (9)	92 (14)	106 (12)	132 (6)
Ohio	91 (12)	90 (12)	90 (17)	90 (13)	89 (17)	104 (12)	93 (13)	93 (16)	110 (11)
Oregon	233 (2)	167 (4)	106 (9)	223 (2)	148 (4)	106 (11)	213 (2)	142 (5)	104 (12)
Pennsylvania	167 (4)	135 (6)	117 (7)	148 (4)	128 (6)	111 (10)	156 (4)	140 (6)	123 (10)
South Carolina	63 (19)	67 (23)	74 (23)	55 (23)	59 (25)	75 (23)	52 (24)	56 (25)	72 (22)
Tennessee	49 (25)	58 (26)	69 (25)	54 (24)	63 (23)	79 (20)	53 (23)	61 (23)	78 (19)
Texas	231 (3)	189 (2)	164 (3)	207 (3)	177 (3)	139 (4)	200 (3)	173 (2)	134 (5)
Virginia	61 (21)	73 (20)	88 (19)	66 (19)	78 (19)	86 (17)	63 (19)	75 (19)	83 (17)
Washington	249 (1)	201 (1)	137 (4)	270 (1)	204 (1)	145 (3)	272 (1)	195 (1)	143 (4)
Wisconsin	119 (9)	122 (7)	123 (5)	131 (7)	131 (5)	132 (7)	128 (8)	128 (7)	129 (7)

[a] Low wages = $11,300, Average wages = $20,200, High wages = $32,700

[b] Firm unemployment rates: Low = 1.45%, Average = 2.9%, High = 5.8%

[c] The numbers in parentheses are each state's rank relative to the other 27 states. In this paper rankings are ordered from high to low.

Finally, there is at least one regional UI tax cost difference which should be mentioned. Omitting the three western states of California, Oregon, and Washington the remainder of the twenty-eight states can be readily grouped into two regions consisting of twelve southern states and thirteen northern states.[12] The index of UI tax costs across the southern states averages 82.5, while it is 109.1 for the northern states. The average for the three omitted western states is 130.6, but it is unknown whether these results are indicative of the entire western region. Nevertheless, it is clear that UI tax costs are generally lower in the south, at least for the largest manufacturing states included in this study.

V. Conclusions

We conclude that the simulation model developed for this study is a step in the right direction for constructing more meaningful interstate comparisons of UI costs for employers. UIMSM is a detailed, computerized micro-simulation model which reproduces the manner in which both worker benefits and employer UI taxes are determined in each state. The total impact of the 1988 UI statutes is approximated, after all the provisions of the 1988 statutes are fully reflected in firm costs. Since the interstate comparisons are made for hypothetical situations in which the firm and worker characteristics are identical across states, differences in benefits and costs among the states in this study can be attributed entirely to differences in state UI statutes. Benefits were found to vary considerably across states for identically situated claimants. Similarly UI taxes for the

hypothetical firms considered also varied widely. Finally, it appears that UI taxes are generally lower in the southern states. The obvious conclusion is that the complicated state UI tax systems, heretofore ignored in most studies of state and local taxes, do indeed contribute to the overall state and local tax differentials of employers.

ENDNOTES

1. Shannon (1986), p. 339.

2. For a description of this data see Rosenfeld (1977).

3. In appendix Table B.1 all states are ranked using manufacturing employment data.

4. This estimate results from applying expected wage growth for nonsupervisory workers as published in Employment and Earnings, U.S. Bureau of Labor Statistics, 1988, to the annual average wage in UI covered employment as reported in News: Average Annual Pay by State and Industry, 1986, U.S. Bureau of Labor Statistics.

5. The model is iterated for 20 periods (years) because UI taxes in some states with wide steps in their tax schedule may continue to fluctuate indefinitely. Thus, in this study a 20-period average of total UI tax costs is used to approximate the full impact of UI payments in a given year.

6. The benefit provisions for the 28 states in the simulation model are summarized in appendix Table B.2.

7. It is well-known that dependency status varies significantly with wage levels. In 1978, the last year for which data on dependency allowances are available from the UI system (U.S. Employment and Training Administration, 1979:22-24), only about one-third of all beneficiaries claimed any dependents (in those states that had dependency allowances, of course), while that figure jumped to about one-half for workers receiving the maximum weekly benefit amount. Furthermore, of those workers claiming dependents, only 15 percent had a dependent spouse, while 94 percent claimed from one to three total dependents. It turns out that at national average wages many workers qualify for near maximum benefit amounts. Thus, the wage/dependency combinations selected for this study are arbitrary but consistent with available data.

8. For instance, Michigan, which has one of the more stringent criteria, requires 20 credit weeks in the most recent 52 weeks, where a credit week is defined as $100.50 of earnings. That translates into 30 hours of work per week for 20 weeks for someone earning the federal minimum wage, for a total minimum earnings of $2,010. For higher wage workers Michigan also has an alternative earnings requirement for workers with at least 14 weeks of employment.

9. The general provisions for each state's experience rating system and any uniform rate additions for all 28 states in the simulation model are presented in appendix Table B.3.

10. Most states assign a new firm a given tax rate for a year or so and then phase in experience rating. Notice that the total impact of the UI system on new employers over time asymptotically approaches that for a permanent ongoing employer, exactly the type of firm which is included in the model.

11. It should be noted that no state paid extended benefits during 1988. Furthermore, the U.S. Unemployment Insurance Service does not expect extended benefits to be paid in the near future (U.S. Employment and Training Administration, September 1987:2).

12. The southern states are: Alabama, Arkansas, Florida, Georgia, Kentucky, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia. The northern states are: Connecticut, Illinois, Indiana, Iowa, Massachusetts, Minnesota, Missouri, New Jersey, New York, Ohio, Pennsylvania, and Wisconsin.

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APPENDIX A

Technical Documentation

The purpose of this technical documentation is to summarize the general features of the individual state UI systems which are represented in the unemployment insurance micro-simulation model (UIMSM). UIMSM is a structural model that closely reproduces the actual process by which a worker's benefits and an operating firm's UI taxes are determined in each state. In UIMSM the basic unit of observation is the firm on an annual basis. There are 28 states in UIMSM.[1]

UIMSM has three basic parts. The firm specific parameters which generally are common to all states are estimated first. Worker benefits and associated variables are then determined. Finally, the firm's tax contributions are estimated. In the following exposition, common approaches and parameters are emphasized at the expense of state specific statutory provisions because of the complexities in and differences among the state UI statutes.

Firm Specific Variables

There are two sets of exogenous variables in this first part of the model. One set of three variables defines the firm specific unemployment experience: average weekly insured unemployment rate (iu), average exhaustion

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[1] These 28 states are the largest in terms of manufacturing employment, cumulatively accounting for just over 90 percent of all manufacturing employment. The 28 states are: AL, AR, CA, CT, FL, GA, IL, IN, IA, KY, MD, MA, MI, MN, MS, MO, NJ, NY, NC, OH, OR, PA, SC, TN, TX, VA, WA, AND WI.

rate (exh) and average duration of regular insured unemployment in weeks (DUR). Another pair of variables: average annual employment (AAE) and average weekly wage (AWW), define the size and wage level of the firm. Throughout this presentation variables expressed as rates or proportions are identified by small letters, all other variables are labeled with capital letters.

It should be emphasized that the five exogenous variables listed above are drivers of the model. They may take on any value specified, say those from an actual firm or perhaps those based on national averages. By specifying the values of exogenous variables to be identical across the states, we isolate the role of statutes in explaining differences in important items like UI benefits, UI costs, and the degree of experience rating.

In UIMSM it is assumed that all unemployed workers are laid off involuntarily, they are eligible for the maximum duration of regular benefits, and they apply for UI benefits. UIMSM does not deal with extended benefits currently nor is there any other labor turnover besides the employer's assumed layoff experience. Under these conditions,[2] the total number of covered workers (TCW), the total weeks of unemployment (TWU), and the total number of covered workers who experience a spell of regular insured unemployment during the year (IU) are calculated as:

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[2] Except for the usual time and budget constraints, there is no reason why additional UI administrative provisions and other labor market conditions could not be incorporated in UIMSM.

(1) TCW = AAE + iu*AAE

(2) TWU = iu*AAE*52

(3) IU = TWU/DUR

Since the UI system taxes wages earned up to a specified limit (which itself varies across states), the number of employees who are full year workers (FYW), exhaustees (EXH), and nonexhaustees (NEXH) plus the average annual wages (AAW) of each group of workers are estimated separately as:

(4) FYW = TCW - IU

(5) EXH = exh*IU

(6) NEXH = IU - EXH

(7) AAW_{FYW} = AWW*52

(8) AAW_{EXH} = AWW*25

(9) AAW_{NEXH} = AWW*(52 - ((TWU - EXH*27)/NEXH))

An exhaustee is defined as a worker who experiences 27 weeks of regular insured unemployment (therefore working 25 weeks), because most states do not compensate the first week of regular insured unemployment, commonly called

the waiting week, and thereafter pay a maximum of 26 weeks of regular benefits.[3] Note that this definition of an exhaustee is technically correct in states without a waiting week only if the worker does not find employment in the 27th week of unemployment.

Worker Benefits and Associated Variables

In general, weekly benefit amounts (WBA) are determined as some proportion, wr (the wage replacement ratio), of AWW[4] plus an allowance for dependents (DEP), when applicable, subject to a ceiling or maximum WBA (Max WBA). The typical relationship in state, s, for a worker with dependents, d, is

$$(10)\quad WBA_{d,s} = \min\{[wr_{d,s} * AWW + DEP_{d,s}], \text{Max } WBA_{d,s}\}$$

WBA's are currently calculated for only two types of workers, one with no dependents (d=0) and the other with a working spouse and two dependents (d=2).[5] Some states pay an absolute dollar amount for dependents (DEP>0), other states increase wr above what it would otherwise be for a single

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[3] Massachusetts and Washington pay a maximum of 30 weeks of regular benefits.

[4] For instance, it is common for states to replace 1/26th of the worker's high quarter wages (13 weeks), making wr=0.5. In Michigan, wr is a function of after-tax earnings, defined as income after federal income taxes, state income taxes, and social security taxes. In Tennessee and California a table must be used to relate AWW and WBA.

[5] This assumption is arbitrary, but 94 percent of workers with dependents claimed from one to three dependents in 1978, the last year for which data on dependents are available from the UI system (U.S. Employment and Training Administration, 1979:22-24).

worker, and still other states raise the maximum WBA for workers with dependents leaving DEP=0 and wr unchanged.

The benefits charged (BC) to the firm are the product of the total weeks of unemployment compensated (TWUC) and the weekly benefits paid as follows:

$$(11)\quad TWUC_s = TWU_s - EXH - WAIT_s*NEXH$$

$$(12)\quad BC_s = TWUC_s * ((1-mar)*WBA_{0,s} + mar*WBA_{2,s})$$

TWUC differs from TWU because there are certain weeks of regular insured unemployment that are not compensated and therefore should not be included in calculating benefits: one week for each nonexhaustee in states with a waiting week provision (WAIT) and one week for each exhaustee in all states (the first week in waiting week states and the twenty-seventh week in nonwaiting week states). The last term in equation (12) weights the WBA's in states with dependency allowances to reflect the proportion of the firm's workforce which is married with two dependents (mar).[6] For the states which have no dependency allowances, of course, $WBA_{0,s} = WBA_{2,s}$.

Finally the total taxable wage base (TTWB) of the firm is the sum of the

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[6] For most simulations it is assumed that one-half of the unemployed workers are married with a working spouse and two dependents. Note that at national average wages most workers qualify for maximum or near maximum benefit amounts, and that the most recently available UI data (Employment and Training Administration, 1979: 22-24) show that nearly one-half of workers receiving the maximum weekly benefit amount also claim dependents. Thus, it is arbitrary but reasonable to initially set mar=0.5.

wages of the three different types of workers subject to an upper limit on the wages taxable for each worker (TWB) specified by statute in each state.

$$
\begin{aligned}
TTWB_S = {} & FYW*\min\{AAW_{FYW}, TWB_S\} + \\
(13) \qquad & EXH*\min\{AAW_{EXH}, TWB_S\} + \\
& NEXH*\min\{AAW_{NEXH}, TWB_S\}
\end{aligned}
$$

Tax Contributions

Employers pay federal and state UI taxes.[7] A minimum federal tax rate (fx) is imposed on all employers nationwide plus a penalty tax rate (px) may be imposed on employers in certain states which have loans outstanding from the federal loan fund.[8] All federal taxes are payable on the total federal taxable wage base of the firm (TTWBF) subject to an upper limit on the taxable wage base per worker (TWBF) similar to TWB_S. Total state UI taxes, of course, are the product of the state tax rate (tx) and TTWB from equation (13). Thus, total federal and state UI taxes (UITX) are obtained as

$$(14) \quad UITX_S = fx*TTWBF + px*TTWBF + tx_S*TTWB_S$$

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[7] Total UI taxes include both the federal and state components of the tax to capture the total costs of the cooperative federal-state program and to properly account for the interdependence of the system.

[8] Per federal statutory provisions the penalty tax rate (px) rises annually for all employers in states with loans from the federal loan fund. By meeting certain conditions, however, and paying an equivalent sum from state trust funds, debtor states can qualify their employers for a zero penalty rate, effectively redistributing a non-experience rated tax ($px > 0$) to the state experience rating system. The manner in which a state chooses to discharge its obligation to the federal loan fund can have significant differential impacts on employers across states.

The state UI tax rate of an employer (tx_s) is far more complicated than its federal counterpart. It consists of an experience rated component, meaning that the layoff experience of the firm at least partially influences the tax rate, and generally a non-experience rated component. The two most common approaches to experience rating are the benefit ratio method and the reserve ratio method.[9]

The benefit ratio system uses a moving average of the past n years of BC relative to TTWB to determine the firm's basic benefit ratio (br). The most recent benefit ratio available for rate making would theoretically be, br_{t-1}, but there is a further lag in months, m, (stated as a part-year proportion in UIMSM), in most states between the computation date and the effective date for new rates.[10] The basic benefit ratio for rate making, br_{t-1-ms}, may be multiplied by a statewide adjustment factor (adj), there may be one or more statewide additional taxes (ADD), and there may be a maximum allowable change in the tax rate (Max Δ tx_s). Finally, the total state UI tax rate (tx) is subject to a statutory maximum (Max tx) in all states.[11] The following two equations summarize a typical benefit-ratio system where t

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[9] Michigan and Pennsylvania actually have combined reserve ratio-benefit ratio systems. Two states in the model, Alabama and Illinois, utilize the benefit-wage ratio method.

[10] BC and TTWB are not necessarily lagged the same number of months, ms, within a state. A few states either do not use January 1 as the effective date for new rates or compute rates more than once a year.

[11] The maximum tax rate may be applicable to the state's overall tax rate or to its components.

is the current calendar year and k is the total number of constant additions to the state UI taxes:

$$(15)\quad br_{s,t-1-ms} = \left[\frac{\sum_{i=1}^{n} BC_{s,t-i-ms}}{\sum_{i=1}^{n} TTWB_{s,t-i-ms}} \right]$$

$$(16)\quad tx_s = adj_s * br_{s,t-1-ms} + \sum_{j=1}^{k} ADD_{s,j}$$

$$(17)\quad \Delta\, tx_s = \min\{\Delta[adj_s * br_{s,t-1-ms} + \sum_{j=1}^{k} ADD_{s,j}],\ \text{Max}\ \Delta\ txs\}$$

The key feature of a reserve ratio system is that an experience rating account (ERA) is maintained for each employer which reflects the cumulative past experience of that employer, measured as total tax contributions made (TTCA) less BC. The firm's reserve ratio (rr) for rate making purposes is computed as its ERA relative to its TTWB of the last n years with a lag, m, like a benefit ratio system. A state schedule of rates (SCH) is then consulted wherein firms within specified ranges of rr pay identical tax rates.[12] The firm's final tax rate may be subject to adjustment factors, one or more additions to the basic tax rate, etc., all like a benefit ratio system. Finally, a reserve ratio state may allow the writedown or partial elimination of the negative balance in the ERA. The following equations summarize a typical reserve ratio system:

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[12] In Wisconsin ADD is itself a function of SCH(rr).

$$(18)\quad ERA_{s,t-1-ms} = \sum_{i=1}^{\infty} [(TTCA_{s,t-i-ms}) - (BC_{s,t-i-ms})]$$

$$(19)\quad rr_{s,t-1-ms} = Max\left\{ \left[\frac{ERA_{s,t-1-ms}}{\sum_{i=1}^{n} TTWB_{s,t-i-ms}} \right], \min rr_s \right\}$$

$$(20)\quad tx_s = \min\left\{ \left[adj_s * SCH_s(rr_{s,t-1-ms}) + \sum_{j=1}^{k} ADD_{s,j} \right], Max\ tx_s \right\}$$

$$(21)\quad \Delta tx_s = \min\left\{ \Delta\left[adj_s * SCH_s(rr_{s,t-1-ms}) + \sum_{j=1}^{k} ADD_{s,j} \right], Max\ \Delta tx_s \right\}$$

Since UIMSM does not deal with the past UI statutes, the model is initialized prior to any simulation by finding the taxes due and payable given fixed values for the key drivers of the model.[13] Thus, the firm is in a steady state at the beginning of the simulation period. It should also be noted that currently the model does not project future aggregate conditions, so statewide parameters like adj_s and ADD_s do not change during the simulation period, even though in reality these variables are frequently tied to the cumulative experience of all employers in the state. In other words, UIMSM focuses on the total impact of the statutory tax structure in force in a given year rather than speculating about future conditions.

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[13] For convenience the initialization takes place over 10 periods, although it is obvious that in a benefit ratio state that no more than n periods are actually required. Since tax rates may continue to fluctuate indefinitely between two steps of the tax schedule in reserve ratio states, even with a stable AWW and IUR, UITX is generally computed as the annual average for 20 periods.

APPENDIX B

Supplementary Tables

Table B.1. STATES RANKED BY MANUFACTURING EMPLOYMENT, 1987

States[1]	Manufacturing Employment (thousands)	Cumulative Percent
CALIFORNIA	2104.9	11.10
NEW YORK	1221.9	17.54
OHIO	1095.3	23.31
PENNSYLVANIA	1042.1	28.81
MICHIGAN	966.0	33.90
ILLINOIS	931.7	38.81
TEXAS	928.2	43.71
NORTH CAROLINA	855.3	48.22
NEW JERSEY	676.4	51.78
INDIANA	616.0	55.03
MASSACHUSETTS	597.0	58.18
GEORGIA	569.4	61.18
FLORIDA	529.9	63.97
WISCONSIN	526.4	66.75
TENNESSEE	495.4	69.36
VIRGINIA	429.1	71.62
MISSOURI	419.7	73.84
CONNECTICUT	384.0	75.86
MINNESOTA	374.9	77.84
SOUTH CAROLINA	373.4	79.80
ALABAMA	367.6	81.74
WASHINGTON	316.8	83.41
KENTUCKY	260.2	84.79
MISSISSIPPI	228.0	85.99
ARKANSAS	219.5	87.14
IOWA	213.4	88.27
MARYLAND	207.2	89.36
OREGON	204.9	90.44
Arizona	187.2	91.43
Colorado	184.2	92.40
Kansas	175.9	93.33
Louisiana	163.5	94.19
Oklahoma	154.4	95.00
New Hampshire	118.3	95.63
Rhode Island	116.5	96.24
Maine	103.6	96.79
Utah	92.1	97.27
Nebraska	88.1	97.74
West Virginia	85.8	98.19
Delaware	69.5	98.56
Idaho	54.1	98.84
Vermont	49.3	99.10
New Mexico	38.4	99.30
South Dakota	28.7	99.46
Nevada	23.2	99.58
Hawaii	22.1	99.69
Montana	20.8	99.80
North Dakota	15.7	99.89
Alaska	13.5	99.96
Wyoming	8.0	100.00

Source: Employment and Earnings, U.S. Department of Labor, May, 1988.
[1] States in capital letters have been included in this study.

Table B.2.

SELECTED BENEFIT PROVISIONS OF STATE UNEMPLOYMENT INSURANCE LAWS IN SIMULATION MODEL, 1988

State	Waiting Week	Maximum Regular Benefit Duration (weeks)	Maximum Weekly Benefit Amount[1] (dollars)	Computation of Weekly Benefit Amount up to Maximum Levels
Alabama	0	26	120	1/24 of high quarter wages
Arkansas	1	26	209	1/52 of sum of two highest quarter wages
California	1	26	166	1/24 to 1/33 of high quarter wages
Connecticut	0	26	234-284	1/26 of high quarter wages plus $10 per dependent up to $50 maximum
Florida	1	26	200	50% of average weekly wages
Georgia	1[3]	26	165	1/50 of sum of two highest quarter wages
Illinois	1	26	176-230	49% of average weekly wages in highest two quarters, 8% additional for non-working spouse or 15% for one or more dependent children, whichever greater
Indiana	1	26	96-161	4.3% of high quarter wages
Iowa	0	26	174-214	1/19 to 1/23 high quarter wages varying with dependents
Kentucky	0	26	161	1.185% of annual wages
Maryland	0	26	205	1/24 of high quarter wages plus $8 per dependent up to $32 maximum
Massachusetts	1	30	252-378	1/21 to 1/26 of high quarter wages plus $25 per dependent up to 50% of weekly benefit amount
Michigan	0	26	242	70% of average weekly after-tax earnings[5,6]
Minnesota	1[4]	26	254	1/26 of high quarter wages
Mississippi	1	26	145	1/26 of high quarter wages
Missouri	1[4]	26	140	4.5% of high quarter wages

Table B.2.--Continued

State	Waiting Week	Maximum Regular Benefit Duration (weeks)	Maximum Weekly Benefit Amount[1] (dollars)	Computation of Weekly Benefit Amount up to Maximum Levels
New Jersey	1[4]	26	241	60% of average weekly wages in high quarter plus 7% of weekly benefit amount for first dependent and 4% each for the next two dependents
New York	1	26	180	50% of average weekly wages
North Carolina	1	26	228	1/52 of sum of two highest quarter wages
Ohio	1	26	157-248	50% of average weekly wages in high quarter
Oregon	1	26	229	1.25% of annual wages
Pennsylvania	1	26	239-247[7]	1/23 to 1/25 plus $2-$3 of high quarter wages. Dependency allowance of $5 for first dependent and $3 for the second one. Weekly benefit entitlements are reduced by 5% in 1988 due to state fund conditions.
South Carolina	1	26	147	50% of average weekly wages in high quarter
Tennessee	1	26	155	1/25 to 1/33 of the average of the two highest quarter wages
Texas	1[4]	26	210	1/25 of high quarter wages
Virginia	0	26	176	1/50 of sum of two highest quarter wages
Washington	1	30	209	1/25 of average of two highest quarter wages
Wisconsin	0	26	200	50% of average weekly wages in high quarter

Source: Based on data from the employment security agencies of the individual states and the U.S. Department of Labor.

Table B.2.--Continued

[1] Range shows maximum weekly benefit amount for a worker with no dependents and a worker with maximum dependents allowable.

[2] Estimated using the projections of the employment security agencies of the individual states and/or unpublished UI wage data from the U.S. Department of Labor; effective in July for Arkansas, Iowa, Minnesota, Oregon, South Carolina, and Washington, in August for North Carolina, and in October for Massachusetts.

[3] No waiting week if claimant unemployed not through own fault.

[4] The waiting week is compensable in Minnesota at the fixed rate of $20 when a claimant returns to work, provided benefits have been paid for at least four weeks; it is compensable in Missouri after nine consecutive weeks of unemployment, after three weeks of benefits are payable in New Jersey and Texas.

[5] After-tax earnings are approximated per schedule determined by commission to be a reasonable approximation of applicable federal and state income taxes, social security taxes, and exemptions.

[6] Michigan does not have a dependency allowance per se, but dependents increase the number of federal exemptions allowable, thereby increasing after-tax earnings and weekly benefits payable.

[7] After statutory reduction of weekly benefit entitlement of 5 percent.

Table B.3.

CHARACTERISTICS OF 1988 STATE EXPERIENCE RATING SYSTEMS

State	Type of Experience Rating	State Taxable Wage Base (in dollars)	Range of Experience Rates (percent)	Uniform Rate Additions (percent)
Alabama	BWR	8,000	0.5 to 5.4	None
Arkansas	RR	7,500	0.1 to 6.0	0.5
California	RR	7,000	0.3 to 5.4	0.1[2]
Connecticut	BR	7,100	0.5 to 5.4	0.7
Florida	BR	7,000	0.1 to 5.4	0.01[3,4]
Georgia	RR	7,500	0.06 to 8.64	0.06[3]
Illinois[7]	BWR	9,000	0.2 to 7.1	0.4
Indiana	RR	7,000	0.3 to 5.4	None
Iowa	BR	11,00	0.0 to 9.0	0.06
Kentucky	RR	8,000	0.5 to 9.5	None
Maryland	BR	7,000	0.1 to 5.4	None
Massachusetts	RR	7,000	1.2 to 5.4	0.34
Michigan	BR[1]	9,500	0.0 to 9.0	1.0
Minnesota	BR	11,700	0.0 to 8.0	0.8[3]
Mississippi	BR	7,000	0.1 to 5.4	None
Missouri	RR	7,000	0.0 to 6.0	None
New Jersey[6]	RR	12,000	0.5 to 5.8	None
New York	RR	7,000	0.0 to 5.4	1.0
North Carolina	RR	10,100	0.01 to 5.7	None[5]
Ohio	RR	8,000	0.3 to 7.3	0.7
Oregon	BR	14,000	1.9 to 5.4	0.3[3]
Pennsylvania[6]	BR[1]	8,000	0.0 to 7.7	2.0
South Carolina	RR	7,000	0.19 to 5.4	1.11[2,3]
Tennessee	RR	7,000	0.15 to 10.0	None
Texas	BR	8,000	0.0 to 6.0	0.77[5]
Virginia	BR	7,000	0.1 to 6.2	None
Washington	BR	15,100	1.88 to 5.4	0.02
Wisconsin	RR	10,500	0.27 to 8.9	0.10[5]

Source: Based on data from the employment security agencies of the individual states and the U.S. Department of Labor.

BWR = Benefit Wage Ratio
RR = Reserve Ratio
BR = Benefit Ratio

Note: Footnotes follow on subsequent page.

Table B.3. Footnotes

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[1] Michigan and Pennsylvania also include a reserve ratio in computing a portion of the tax rate.

[2] The rate additions apply only to positive balance employers in California and South Carolina (1.05%).

[3] The rate additions cannot increase the maximum experience tax rates in Florida, Minnesota, Oregon, and South Carolina, or minimum and maximum tax rates in Georgia.

[4] The rate addition does not increase the tax rate unless, when combined with other rating factors, the sum thereof rounds to the next highest one-tenth of one percent. The minimum tax rate is .1%.

[5] There is also a variable, additional tax in North Carolina (0.002 to 1.14%) and Texas (0.64% to 2%) that is determined from the employer's basic experience tax rate. In Wisconsin a variable additional rate of 0.43% to 1.70% applies to employers with total payroll in excess of $200,000; for firms with smaller payrolls the variable additional rate ranges from 0.00% to 1.20%.

[6] Tax rates do not include employee taxes in New Jersey (.625%) and Pennsylvania (.1%).

[7] In Illinois for employers with quarterly payrolls less than $50,000 and regular UI tax rates of 5.1% or higher the maximum tax is 5.0%.