Layoffs and Experience Rating of the Unemployment Insurance Payroll Tax: Panel Data Analysis of Employers in Three States

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Layoffs and Experience Rating of the Unemployment Insurance Payroll Tax: Panel Data Analysis of Employers in Three States (Abstract)

To what extent does incomplete experience rating of the unemployment insurance (UI) payroll tax influence the layoff behavior of employers? The question has been a topic of empirical research for over two decades, and most researchers have found substantial impacts. For example, Topel has estimated that full experience rating would reduce temporary layoff unemployment by between 20 and 30 percent, and Card and Levine have estimated that complete experience rating would reduce the temporary layoff rate by 50 percent in the trough of a recession.

Many have noted that the employer is the natural unit of observation to use in examining this question. Accordingly, this research uses panel data on employers in Missouri, Washington, and Pennsylvania to examine the extent to which various measures of employers' layoff behavior are related to the marginal tax cost of laying off an additional worker. The approach has three main features. First, the unit of observation is the employer rather than the worker or some industry subaggregate. Second, the UI administrative data used allow direct observation of the tax rates and layoff incentives facing each employer. Third, the panels of 6 to 10 years potentially allow one to control for unobserved employer fixed-effects as correlates of layoff behavior.

An interesting problem that arises in estimation is that the key independent variable — individual employer tax rates — cannot be assumed strictly exogenous. This is because an employer's past layoff behavior affects its future tax rate and because UI payroll tax schedules shift and change slope automatically over the business cycle, increasing the marginal tax cost of a layoff during recessions. This perversity requires adoption of an estimator along the lines of those proposed by Anderson and Hsiao (1981, 1982) and others, in which first differencing and instrumental variables are used to obtain consistent estimates. The results suggest that increased experience rating significantly reduces layoffs, although the estimated impacts are somewhat more modest than those found in much existing research.

1. Introduction

In the United States, Unemployment Insurance (UI) is financed through a payroll tax (collected from employers) that is "experience rated," meaning the tax rate paid by an employer is linked to the past layoff experience of the employer (more layoffs lead to a higher tax rate). The idea behind experience rating is to attain an efficient allocation of unemployment risk, which arguably implies placing the burden of financing UI benefits on risk-neutral employers rather than on risk-averse workers. Imposing costs on employers who lay off workers internalizes the social costs of unemployment and gives employers an incentive to adopt an organization of production that avoids temporary layoffs (Becker 1972; Mortensen 1983; Deere 1991).

Under complete experience rating, every dollar of UI benefit paid to a job loser would be charged to the employer from whom the worker separated (Brechling and Laurence 1995; Karni 1999). However, experience rating of the UI payroll tax is incomplete for two main reasons. First, some benefits — such as those paid to workers who have quit voluntarily or been discharged for cause — are not charged to any employer on the grounds that the employer did not "cause" the unemployment. (In addition, dependents' allowances, half of the benefits paid under the standby Extended Benefits program, and federal emergency extended benefits are not charged to any employer.) Second, some benefits that *are* charged to an employer cannot be recovered through future taxes. The reason is all states cap the UI payroll tax rate, and once an employer reaches the maximum tax rate, further layoffs (although charged to the employer) cannot result in a higher tax rate. (Also, it is impossible to collect UI payroll taxes to cover charged benefits from firms that go out of business.[1])

Incomplete experience rating of the UI payroll tax has two implications that have been examined in past research. First, it results in transfers and subsidies among employers and across

[1] For more on incomplete experience rating, see Advisory Council on Unemployment (1995, chapter 6) and Vroman (1996).

industries (Becker 1972; Munts and Asher 1980; Marks 1984; Anderson and Meyer 1993a,b; Lawrence 1993). Second, it creates a situation where employers who are at the maximum tax rate can lay off workers without incurring increased benefit charges. Even when payroll taxes rise as a result of some additional layoffs, the increase may be less than enough to cover the cost of the benefits paid to the laid off workers. As a result, the UI benefits paid to one employer's workers will be subsidized by other employers, creating an incentive for the employer to lay off more workers than it would if it had to pay the full cost of the benefits. These effects were first spelled out by Feldstein (1976), Baily (1977), and Brechling (1977a,b).

This paper uses panel data on employers in three states over a full business cycle to examine the layoff incentives created by incomplete experience rating of the UI payroll tax. Section 2 describes the structure of the UI payroll tax, with special attention to the three states examined in the empirical analysis — Missouri, Washington, and Pennsylvania. Section 3 briefly reviews past research, both theoretical and empirical, on the effects of incomplete experience rating on layoffs. Section 4 describes the data, with special attention to construction of the dependent variables, and discusses estimation problems. Section 5 describes the empirical results, which suggest impacts of experience rating on employers' layoff behavior that are statistically significant but somewhat smaller than most existing estimates. Section 6 elaborates on the estimates, using them to simulate the impact of increases in the degree of experience rating.

2. Experience Rating in Missouri, Washington, and Pennsylvania

Institutional details of UI experience rating have an important bearing on estimating the effects of experience rating. Accordingly, this section briefly describes the UI payroll tax systems in Missouri, Washington, and Pennsylvania.[2] Like any tax, the UI payroll tax comprises a tax base and a tax rate. The tax base (or "taxable wage base") must by federal mandate be at least the

[2] For more complete treatments of UI financing, see Mackin (1978), Vroman (1990), and Levine (1997).

first $7,000 paid to a worker in a given year. In the three states examined here, the taxable wage base was often greater than $7,000 during the years examined. In Missouri, it ranged from $7,000 to $8,500 between 1985 and 1994. In Pennsylvania, it was constant at $8,000 during 1986 to 1994. In Washington, where the wage base is indexed, it ranged from $16,800 to $19,900 between 1991 and 1995.

All but three states use either a *reserve-ratio* method or a *benefit-ratio* method to set the tax rate that is applied to the base. Both methods generate a measure of an employer's layoff experience and map this measure into a tax rate that is higher for employers whose workers have drawn more UI benefits in the past (Vroman 1996). States' tax schedules change annually according to the size of the UI trust fund, shifting up and becoming steeper when the economy goes into recession (see below).

Missouri uses the reserve-ratio method, which measures an employer's layoff experience by creating a "reserve account" for each employer. From the time an employer is covered by the UI system, UI payroll taxes paid by the employer (*taxpd*) are credited to the employer's reserve account, and chargeable benefits paid to the employer's laid off employees (*bnchrg*) are debited. The "reserve balance" in each employer's account is divided by average taxable payroll (*txpayrll*) during the past three years to obtain the reserve ratio. It follows that the reserve ratio of employer *i* in year *t* can be written:

$$RR_{it} = \frac{\sum_{r=1} \left(taxpd_{i,t-r} - bnchrg_{i,t-r} \right)}{\sum_{r=1}^{3} txpayrll_{i,t-r} \Big/ 3} \qquad (1)$$

This ratio (expressed as a percentage) is applied to a tax table to obtain a "basic tax rate" (also in percentage terms). The total tax rate is obtained by making two adjustments to the basic tax rate. First, a surcharge is calculated by multiplying the basic tax rate by a percentage that varies annually depending on the solvency of the state's UI trust fund. Second, an additional surtax (or

fund builder) is occasionally added. Increases in the surcharge increase the slope of the payroll tax schedule; increases in the surtax shift it up.

Figure 1 shows the Missouri UI payroll tax schedules for 1985 through 1995, the years used in the empirical work below. Note that the tax rate was capped at between 5.6 and 8.75 percent over the years in question, so that employers whose reserve ratio fell below –12 percent would not face a higher tax rate if their reserve ratio fell still lower. Also, as the economy went into recession in the early 1990s, the slope of the tax schedule increased.

Washington State uses a benefit ratio to quantify an employer's layoff experience. The benefit ratio of employer i in year t (BR_{it}) equals the sum of UI benefits charged to the employer during the previous 4 years divided by the employer's average taxable payroll over the same period:

$$BR_{it} = \frac{\sum_{r=1}^{4} bnchrg_{i,t-r}}{\sum_{r=1}^{4} txpayrll_{i,t-r} \Big/ 4} \tag{2}$$

The benefit ratio has a shorter memory than the reserve ratio because it takes account only of benefits charged to an employer's account over the last 4 years. Figure 2 shows the Washington UI payroll tax schedules in 1989 (the dashed line), 1992 (the gray line), and 1995 (the dark line). Again, the tax rate was capped in each year, so employers whose benefit ratio went over a threshold (between 4.5 and 6.0 percent) would not face a higher tax rate regardless of how high their benefit ratio became. And again, the slope of the schedule was higher in the recession year of 1992 than in the years of economic recovery.

In Pennsylvania, the third state examined below, each employer's UI payroll tax rate has two components, one a function of the employer's reserve ratio (as in Missouri), the other a function of the employer's benefit ratio (as in Washington). The tax schedules that translated Pennsylvania employers' reserve and benefit ratios into a tax rate between 1986 and 1994 can be

seen in Figures 3 and 4, which illustrate three points. First, most of the variation in the Pennsylvania tax rate comes from the benefit-ratio component. Second, both components are capped, so again, beyond some point, employers do not face a higher UI payroll tax rate when they lay off additional workers. Third, both tax schedules steepen during a recession and flatten during a recovery.

3. The UI Payroll Tax and Layoffs: Previous Research

The Feldstein–Baily equilibrium model has been the starting point for nearly all empirical work on experience rating of the UI payroll tax (Feldstein 1976; Baily 1977). In this model, employers offer workers a compensation package that includes wages, hours, and a probability of layoff (including a layoff duration). Labor markets are assumed competitive, so the utility derived from the employment package is a constraint to the employer, but the employer can trade off one component of compensation within the total utility constraint. Different workers and employers negotiate different combinations of wages, hours, and layoff probabilities, so that, in the absence of a UI system, workers in jobs with a higher layoff probability receive a compensating differential in the form of a higher wage.

In the Feldstein–Baily set up, a UI system that is not experience rated results in a windfall to high-layoff employers and their workers and creates an incentive for employers to lay workers off: Because at least part of the compensating differential for layoff is paid by the UI system, the marginal tax cost (*mtc*) of laying off a worker is less than it would be if the employer had to bear the full cost of the compensating differential.

The Feldstein-Baily model has two main implications for empirical work and policy. First, increases in the degree of experience rating (that is, a reduction in the subsidy to layoffs or an increase in *mtc*) will reduce temporary layoffs during periods of economic slack. Second,

increases in UI benefits in an incompletely experience rated system will increase the layoff subsidy and hence increase layoffs during periods of economic slack.[3] The model does not consider disequilibrium behavior, adjustment processes, or decisions about the level of employment (or, by implication, permanent layoffs).

In the late 1990s, papers by Alvi (1998) and Albrecht and Vroman (1999) considered the effects of experience rating in the context of two modern approaches to involuntary unemployment — the efficiency wage model and (in the case of Alvi) the insider-outsider model. The conclusions of Alvi and Albrecht and Vroman are striking because they suggest that the implications of the Feldstein-Baily equilibrium model do not carry over to models in which unemployment is involuntary.

In the standard efficiency wage model, monitoring costs exist, and employers induce workers to work hard by paying wages above the market-clearing level. But wages above the market-clearing level imply involuntary unemployment. When an experience-rated UI payroll tax is introduced in such a model, the efficiency wage rises because laying off a worker becomes more costly — UI benefit costs are charged back to the employer and collected by means of a higher payroll tax rate.[4] As a result, employers must rely more on paying high wages to induce effort and less on the threat of permanent layoff because the later is now more costly. When employers pay higher efficiency wages, involuntary unemployment increases. This "effort-information" effect (Alvi 1998) of experience rating on unemployment suggests that greater experience rating results in higher efficiency wages, which implies in turn a lower equilibrium level of employment and a higher level of unemployment.

[3] In a different model, Frank Brechling (1977a,b) assumes that the total compensation package is independent of UI benefits. This alternative assumption yields the implication that an increase in UI benefits reduces equilibrium layoffs, rather than increasing them as in the Feldstein-Baily model. The relationship between the level of UI benefits and layoffs, then, is ambiguous in theory. Other studies have extended the theory to incorporate dynamic considerations — for example, Wolcowitz (1984).

[4] Millard and Mortensen (1997) discuss experience rating as a firing cost in a model that has some similarities to that of Albrecht and Vroman (1999).

Albrecht and Vroman follow similar reasoning, noting that increased experience rating reduces the hiring rate but also reduces the exit rate of workers from employment. In the Albrecht and Vroman model, the effect of an increase in experience rating on employment and unemployment could be either positive or negative, depending on parameterization of the model. The impact of experience rating on equilibrium employment becomes an empirical question.

Empirical work on the impact of experience rating on layoff behavior has proceeded by regressing a measure of the layoff rate (or layoff probability) on either the parameters of the UI payroll tax system or a single summary measure of experience rating. These studies are summarized in Table 1 and have varied in three broad ways. First, they have varied in their choice of a unit of observation. Most have used data in which the unit of observation is either the individual worker or the industry (typically within a state, observed over a period of months or years). Second, they have used different dependent variables to capture layoff activity. Studies that use individual worker data generally use a dummy dependent variable equal to 1 if a worker is observed on layoff, 0 otherwise. Studies that use an industry subaggregate as the unit of observation typically use the layoff rate in the industry as the dependent variable. Third, they have used different variables to model the UI payroll tax and the degree of experience rating. Early work used particular features of the UI payroll tax facing the worker's industry or the average employer in an industry to capture the UI payroll tax and the degree of experience rating. Starting with Topel (1983), most studies have used a measure of the marginal tax cost (*mtc*) of layoffs, mentioned above and discussed further below, to capture the degree of experience rating and the incentive for an employer to lay off workers.

The studies can be summed up in three broad statements. First, those using several parameters of the UI system to capture experience rating consistently find that changes in the system that imply greater experience rating do reduce turnover and temporary layoffs. However,

the diversity of parameters used to estimate the impact of experience rating makes it difficult to compare these studies or to characterize their estimated impacts.

Second, studies that impute *mtc* of each observation to estimate the impact of experience rating are consistent in finding an impact of experience rating on layoffs that is both statistically significant and quite large. For example, Topel's estimates suggest that full experience rating would reduce temporary layoff unemployment by between 20 and 30 percent (Topel 1983, 1984a, 1985). Similarly, Card and Levine (1994) estimate that complete experience rating would reduce the temporary layoff rate by 50 percent in the trough of a recession.

Third, the two studies that directly observe *mtc* of each observation — either the employer (Anderson 1993) or the individual worker (Anderson and Meyer 1994) — find a significant impact of experience rating on seasonal employment variability (Anderson 1993) or temporary layoffs of individual workers (Anderson and Meyer 1994). However, these latter studies find impacts that could be characterized as relatively small. Anderson (1993) finds that the elasticity of seasonal employment variability with respect to *mtc* is about –0.1. Anderson and Meyer (1994) obtain a range of estimates; however, their differenced estimates (obtained by OLS and reported in their Table 5) suggest that under 10 percent of temporary layoffs can be accounted for by incomplete experience rating.

The existing literature, then, is consistent in finding a significant impact of experience rating on temporary layoff activity, but offers a rather wide range of estimates of the size of the impact. Studies that impute the *mtc* associated with an observation have tended to obtain larger estimates of the impact of experience rating than have the two studies that observe *mtc* directly.

4. Data and Estimation

The models discussed above take the employer as the decision-making unit, which makes

the employer the natural unit of observation in estimating the effect of experience rating on layoffs. Accordingly, I have assembled employer-level panel data from the UI administrative records of Missouri, Washington, and Pennsylvania. The raw data include complete UI payroll tax records, annual data on payroll (both total and taxable), employment, UI benefit charges, and UI payroll taxes paid by the population of employers covered by the UI program in each state. The data either include or allow one to derive the relevant aspects of the UI payroll tax for each employer, including the benefit ratio and/or the reserve ratio (as appropriate) and the UI payroll tax rate. The data also identify the primary industry of each employer and the number of years the employer has been in existence (as far back as 1937, when the UI system started).

The Missouri data cover 1985 through 1994, the Washington data cover 1989 through 1995, and the Pennsylvania data cover 1986 through 1994. Because the populations are very large, I drew stratified random samples of employers active (or reporting positive wages) in all years for which data are available. The stratification is based on the average number of workers employed by the employer during the years observed. All employers with an average of 50 or more workers are included; a random 20 percent of employers with fewer than 50 workers are included.

From these samples, I drop any employer that either acquired another employer (or part of another employer) or spun off part of itself during the years we observe. This is done to eliminate problems of measuring layoffs of employers that had acquisitions and spinoffs. I also drop employers ever *in*eligible for an experience rated UI payroll tax rate during the years observed. This includes new employers and employers delinquent in paying UI payroll taxes during the years observed. I also drop employers that directly reimbursed the state UI agency for charged UI benefits. Most of these employers are nonprofit organizations, and those that are not may differ in other unobserved ways from other employers. Finally, I drop employers whose

average annual employment was less than 5, employers whose average annual wages per worker exceeded $500,000, Missouri employers that ever participated in the short-time compensation program, and employers with missing data.[5]

The above choices yield balanced panels of 6,812 Missouri employers active in the ten years from 1985–1994 (out of a population of 23,692 Missouri employers meeting the selection criteria); 6,609 Washington employers active in the seven years from 1989–1995 (out of a population of 22,773 Washington employers); and 12,792 Pennsylvania employers active in the nine years from 1986–1994 (out of a population of 42,720 Pennsylvania employers).

4.1. Estimation

Let y_{it} denote a measure of layoffs by employer *i* in year *t*, mtc_{it} the marginal tax cost of layoffs, c_i an employer-specific unobserved effect, and δ_t a time-varying intercept. The model of interest can then be written:

$$y_{it} = \beta_1 mtc_{it} + c_i + \delta_t + u_{it} \tag{3}$$

where β_1 is a parameter to be estimated, and u_{it} is an idiosyncratic error. Given the availability of panel data, standard methods are available for eliminating the employer-specific unobserved effect (c_i) — the data can be de-meaned in order to estimate a fixed-effects model (FE) or first-differences can be taken and OLS applied (FD). Such approaches are attractive because the existence of an employer unobserved effect is highly plausible in this setting — once an employer chooses an organization of production, it is likely that it will exhibit similar layoff behavior year after year.

However, FE or FD applied to (3) will yield inconsistent estimates of β_1 if *mtc* is not

[5] Results obtained using samples that include employers that were new, were ever delinquent, were ever reimbursable, had average employment less than than 5, had average annual wages per worker over $500,000, or ever participated in short-time compensation were essentially similar to those reported below. (Appropriate controls for each of these characteristics were included in the specifications.)

strictly exogenous; that is, if $u_{it} \neq 0$, conditional on past, present, and future values of *mtc*. It is almost surely the case that *mtc* is not strictly exogenous. First, if an employer lays off more workers this year, *mtc* will rise next year, a type of feedback that violates strict exogeneity. Second, as seen in Figures 1 through 4, employers' aggregate behavior in a recession (that is, laying off more workers) causes the UI payroll tax schedule to shift and become steeper in subsequent years. As a result, when employers increase layoffs, experience rating and *mtc* rise for all employers in later years.

If we are willing to assume that *mtc* is sequentially exogenous — that is, that $u_{it} = 0$ conditional on c_i and contemporaneous and past values of *mtc* — then a possible solution is to estimate a model in first differences using lags of available variables as instruments for *mtc* (Anderson and Hsiao 1982; Arellano and Bond 1991; Blundell and Bond 1998, Wooldridge 2002, chapter 11). Sequential exogeneity seems reasonable in this context. It requires that, once mtc_{it} and c_i have been controlled for, past values of *mtc* do not affect y_{it}. The solution adopted here, then, is to first-difference equation (3) and use as instruments for *y* the first and second lagged differences of *mtc* and the first lagged difference of *y*. (The later should be a valid instrument because it is correlated by construction with mtc_{it} and uncorrelated with the contemporaneous error.)

If equation (3) were correctly specified and strict exogeneity held, then FE and FD estimates should give similar results, and there would presumably be no cause for concern. Accordingly, I report FE and FD results below as well as the FD-IV results that are likely more convincing. As it turns out, the FE and FD estimators do produce quite different results, which suggests a rationale for an alternative estimator.

4.2. Construction of Key Variables

The dependent variables examined represent six alternative layoff measures, each of which could be affected by experience rating (see Table 2 for a brief description of each). The central dependent variable is UI benefits charged to the employer in year *t* divided by the employer's total payroll in the same year, or $(bnchrg / payrll)_{it}$. This measures the extent to which the employer lays off workers who subsequently claim UI benefits. Note that $(bnchrg / payrll)_{it}$ is an incomplete measure of an employer's layoffs because it does not include layoffs that result in UI benefit payments that are never charged to the employer, because some laid off workers are ineligible for benefits, and because some who may be eligible never claim UI benefits. However, $(bnchrg / payrll)_{it}$ does capture exactly the outcome that experience rating is most likely to affect. The theoretical models of experience rating depend on layoffs having financial consequences for the employer. If experience rating does have an effect on employer behavior, it must be through benefit charges, which makes the ratio of benefit charges to total payroll an attractive dependent variable.

The next two dependent variables attempt to capture the employer's cyclical layoff behavior by measuring the *negative deviation from trend employment in year t*. The first uses annual employment data to fit a linear employment trend for each employer, then takes the (absolute value of the) negative deviation of actual employment from the fitted trend (in proportional terms) as an estimate of cyclical layoffs. (Using a midpoints formula keeps changes in the employment of small employers from distorting the measure.) The second is deviations from a fitted quadratic employment trend. These measures are potentially useful because the data cover roughly a full business cycle for each employer in the three samples. However, these are unlikely to be pure measures of temporary layoffs because it is unclear whether a full cycle is observed for each employer. Also, permanent layoffs may be mixed with the temporary layoffs

these measures intend to capture.

The fourth dependent variable is an attempt to obtain a *direct measure of temporary layoffs*. Brechling and Laurence (1995, chapter 3) suggest evaluating whether a decline in employment between years t-1 and t is temporary or permanent by examining employment two years later. If employment in year t+2 is lower than in year t, then the decline between t-1 and t is considered permanent. If employment in year t+2 is higher than in year t, then part or all of the decline between t-1 and t (depending on the extent of recovery) is considered temporary. This measure of temporary layoffs may be useful even without observing a full business cycle, although it may also be sensitive to the time one waits before deciding whether an employment decline is temporary or permanent. In the results below, the dependent variable used is temporary layoffs between years t-1 and t as a proportion of employment in year t, with employment in year t+2 used to decide whether an employment drop is temporary or permanent.

The Brechling-Laurence approach also yields a *measure of permanent layoffs*. Specifically, any portion of an employment decline between years t-1 and t that is not made up by year t+2 (and is hence temporary) is considered permanent. This employment decline, in proportional terms, is the fifth dependent variable used below.

The sixth and last dependent variable attempts to isolate the seasonal component of each employer's time series of employment. Here I follow Anderson (1993) and use quarterly data on total wages paid (in Missouri) or total employment (in Washington and Pennsylvania) to estimate a log-linear employment trend for each employer. The range of quarterly residuals within a year is an estimate of employer i's *seasonal variation in employment* within that year.

The key independent variable is *mtc*, which provides a concise measure of the degree to which an employer is subject to experience rating. The *mtc* measures are based on the slope of the UI payroll tax schedule facing each employer in each year. For a reserve-ratio system, *mtc*

depends on the slope of the UI payroll tax schedule (β) and the interest rate (i) (Topel 1983; Card and Levine 1994):

$$mtc = \beta / (\beta + i) \tag{4}$$

For a benefit-ratio system, the *mtc* depends on the slope of the UI payroll tax schedule (β), the interest rate (i), and the number of years used in calculating each employer's benefit ratio (T):

$$mtc = (\beta / iT)[1 - 1/(1+i)^T] \tag{5}$$

Several additional independent variables are available in each of the three samples, and these are summarized in Table 2. Only a few vary over time — the reserve and benefit ratios, average weekly benefit amount (WBA), average annual wages, and the taxable wage base. The estimates discussed below are from models that do not include these time-varying covariates, although estimates that do include them are essentially similar. The variables are included in Table 2 to give a sense of the characteristics of the employers in the three samples.

Table 3 displays overall standard deviations of *mtc* and the dependent variables, and decomposes these overall standard deviations into between-employer and within-employer components. (The between- and within-employer components are normalized to make them comparable.) The figures in Table 3 suggest that the year-to-year shifts of the UI payroll tax schedules shown in Figures 1 through 4, along with employers' behaviors, generate substantial within-employer variation over time. In all three states, within-employer variability of *mtc* is close to or exceeds between-employer variability. Similarly, for all the dependent variables except seasonal variation in layoffs, within-employer variability exceeds between-employer variability.

5. Results of Estimation

Table 4 displays estimated coefficients on *mtc* from equation (3), along with standard errors and the implied elasticities at the sample means. Each of the three panels shows estimates

from one of the three states. Results from the three alternative estimators discussed above (FE, FD, and FD-IV) and for each of the six dependent variables are shown. Each coefficient displayed in the table comes from a separately estimated equation.

Consider first the FE and FD estimates. For Missouri, only two of the FE estimates are negative, and one (for permanent layoffs) is positive with an elasticity close to 1. In contrast, the Missouri FD estimates are uniformly positive with p-values less than 0.05, which conflicts with most theory and all previous empirical work. The results for Washington and Pennsylvania are strikingly similar — a smattering of the FE estimates are negative, several FE estimates are positive, and all of the FD estimates are positive. The sharp differences between the FE and FD estimates strongly suggests specification error, as discussed above.

In contrast, the FD-IV estimates accord with theoretical expectations and existing empirical work. In particular, the estimated elasticities of $(bnchrg / payrll)_{it}$ with respect to *mtc* are close to –1 in Missouri and Washington, and exceed –1 in Pennsylvania. As discussed above, $(bnchrg / payrll)_{it}$ is the outcome that is most likely to be affected by experience rating and should be accurately measured in the data, so these results are central.

The other dependent variables yield results that are less consistent across the three states. The FD-IV estimates suggest that deviations from trend employment are affected by *mtc* in Missouri and Pennsylvania (with most elasticities in the neighborhood of –1) but not in Washington. The direct measure of temporary layoffs tends to be affected by *mtc* in Missouri (with an elasticity of about –1) and in Washington (with an elasticity of just –0.27), but not in Pennsylvania. Why the relationship between *mtc* and these alternative layoff measures should be so weak in Washington [given the strong relationship between *mtc* and $(bnchrg / payrll)_{it}$] is a

puzzle.[6]

The main puzzle, however, concerns seasonal variation in employment. The estimates suggest that the impact of experience rating on seasonal variation is nil in Missouri and quite small in Washington and Pennsylvania (with elasticities of –0.07 and –0.22). The findings contrast with many earlier findings, some of which have found rather dramatic impacts of experience rating on seasonal employment variability. It is possible that the response to experience rating varies by industry, so the estimates in Table 4 suffer from aggregation bias. I have also estimated responses to experience rating for groups of employers disaggregated in various ways. The preliminary results suggest that disaggregation may be a useful approach and opens the way to further work.

Overall, the estimates in Table 4 and implied elasticities suggest that benefit charges, cyclical layoffs, and temporary layoffs are strongly affected by experience rating, with elasticities with respect to *mtc* in the neighborhood of –1. (Some question arise, however, about the impacts of experience rating on cyclical layoffs in Washington.) In contrast, the estimated impacts of experience rating on seasonal employment variation are quite modest compared with existing research and suggest a need for further specification tests.

6. Policy Simulations

Microsimulation is helpful in interpreting the results and gauging the impact of changes in the level of experience rating on layoffs. Accordingly, this section uses the FD-IV estimates to simulate the impact of changes in UI payroll tax policy on employers' layoff behavior.

The FD-IV estimates and the underlying distribution of employers in the samples can be

[6] However, there are at least two possible explanations. First, experience rating may indeed affect layoffs, as suggested by the estimated impacts of *mtc* on benefit charges, but the alternative layoff measures are weak. Second, the alternative layoff measures may indeed capture employers' responses to increased experience rating. If so, then the results suggest that employers may respond to increased experience rating by reducing or managing benefit charges but not layoffs. This could be done, for example, by disputing benefit claims so as to reduce charges.

used to examine the impact of two different increases in experience rating of the UI payroll tax::

- First, increasing *mtc* of employers below the average *mtc* to the (unconditional) average *mtc*. Employers currently at or above average *mtc* remain at their current level of experience rating.
- Second, increasing *mtc* of all employers for whom *mtc* < 1 to 1. Employers with *mtc* ≥ 1 remain at their current *mtc*.

I refer to the first change as *increased experience rating*, and to the second as *full experience rating*.

For each employer, the simulated change in the dependent variable resulting from a policy change ($\Delta\tilde{y}_{it}$) is computed as:

$$\Delta\tilde{y}_{it} = \hat{\beta}_{FD\text{-}IV}(\tilde{mtc}_{it} - mtc_{it}) \tag{6}$$

where $\hat{\beta}_{FD\text{-}IV}$ is the estimated coefficient on *mtc*, $\tilde{mtc}_{it}$ is the *mtc* that would face employer *i* in year *t* under the simulated policy change, and mtc_{it} is the actual *mtc* facing employer *i* in year *t*. To simulate the aggregate impact of a policy change, I compute the sample-weighted sum of $\Delta\tilde{y}_{it}$ over all *i* and *t* and compare this aggregate change with the originally observed aggregate *y*.

The simulations accord with the general impression left by the FD-IV elasticities displayed in Table 4 — that increasing the degree of experience rating would have a significant but modest impact on employers' layoff behavior. In particular, the simulations suggest that full experience rating would reduce benefit charges as a proportion of payroll by between 10 and 17 percent in the three states, and could reduce temporary layoffs by 5 percent in Pennsylvania and by well over 10 percent In Missouri. (The impacts of increased experience rating and full experience rating are similar in Washington and Pennsylvania because the average *mtc* in those

states is close to 1.[7]) The results for seasonal layoffs are again weak, suggesting at best a very modest impact of increased or full experience rating. And again, the results for Washington are curious, suggesting little or no impact of increased experience rating on temporary layoffs even though it would reduce benefits charges.

7. Summary and Discussion

This paper has attempted a new look at an old question — the extent to which experience rating of the UI payroll tax affects the propensity of employers to lay off workers. The approach has three main features. First, it examines panel data on employers in Missouri, Washington, and Pennsylvania, so the unit of observation is the employer rather than the worker or an industry subaggregate. Second, the UI administrative data used allow direct observation of the tax rates and layoff incentives facing each employer. Third, the panel data arguably allow one to distinguish between employer fixed-effects (that is, heterogeneity) and experience rating of the UI payroll tax as determinants of layoffs.

We estimate models in which various measures of a employer's layoffs are regressed on measures of the extent to which the employer will be burdened by additional tax costs if it lays off an additional worker. The dependent variables used are the ratio of benefit charges to payroll, negative deviations from linear and quadratic employment trends, a direct measure of temporary layoffs, a direct measure of permanent layoffs, and a measure of seasonal employment variation. The key independent variable is the marginal tax cost of layoffs (*mtc*) facing a employer in a given year.

An interesting problem that arises in estimation is that the key independent variable — *mtc* — cannot be assumed strictly exogenous. This is because UI payroll tax schedules shift and

[7] In Washington, full experience rating has a smaller impact on the various measures of layoff activity than increased experience rating. This occur because in Washington, the average *mtc* exceeded 1 in most of the years observed. As a result, "full" experience rating actually increases experience rating less than "increased" experience rating (that is, "increased" experience rating imposes *mtc* > 1, whereas full experience rating imposes *mtc* = 1).

change slope automatically over the business cycle, increasing *mtc* during a recession. This perversity requires adoption of an estimator along the lines of those proposed by Anderson and Hsiao (1981, 1982) and others, in which first differencing and instrumental variables are used to obtain consistent estimates.

The results suggest that increased experience rating significantly reduces benefit charges that employers incur and temporary layoffs. The results regarding the impact of experience rating on benefit charges are strongest and most consistent across the three states, with estimated elasticities with respect to *mtc* of 1 or more. Policy simulations suggest that full experience rating of the UI payroll tax would reduce benefit charges by between 10 and 17 percent in the three states examined. Simulated impacts of full experience rating on cyclical and temporary layoffs are more modest. The results are puzzling, however, in finding impacts of experience rating on seasonal layoffs that are quite small compared with previous research.

An obvious question is, "Why are these estimates of experience rating's effect on layoffs lower than earlier estimates?" One possibility is that layoffs have become less common over the last 30 years. If so, then the scope for experience rating to alter employers' behavior would be less now than in the past, and lower estimates of the impact of experience rating would be a natural consequence. Current Population Survey data tend to support this notion: The layoff rate — the number of workers on layoff as a percentage of the civilian labor force — has trended downward since the Bureau of Labor Statistics began publishing layoff data in 1976. During the last three recessions, the layoff rate has peaked at successively lower levels — nearly 2 percent in 1982, 1 percent in 1991, and 0.78 percent in 2002. A linear trend fitted through the layoff rate suggests that the rate has trended downward at about 0.02 percentage points annually, or by more than half a percentage point between 1976 and 2003.

Another possibility is that, since 1985, federal law has required each state to set a

maximum UI payroll tax rate of at least 5.4 percent. Failure to do so disqualifies employers in the state from the FUTA tax credit (Advisory Council on Unemployment Compensation 1995, chapter 6). This requirement induced many states to increase the maximum UI payroll tax rate, and hence the degree of experience rating. To the extent that employers have adjusted to increased experience rating since the mid 1980s, we may now be observing employers on a different segment of their layoff functions than in the past. Lower estimates of the impact of experience rating could be an outcome of that change.

The above explanations rely on employers having changed their organization of production so that temporary layoffs are less important than in the past. Is such a change plausible? Anecdotal evidence suggests that management practices may well have changed in a manner consistent with reduced temporary layoffs. Modern methods of supply chain and logistics management, plants designed for flexibility and rapid changeovers from one product to another, and improved inventory controls are examples of how employers have changed and smoothed the flow of production so as to reduce the need for temporary layoffs.

Although the above arguments may explain the lower estimates reported here, they would need to be backed by similar findings from other data before we revise downward our estimate of the degree to which experience rating affects layoffs. It could be useful, for example, to reexamine recent CPS data using the approaches developed and used by Topel (1983, 1983a, 1985) and Card and Levine (1994) to examine earlier CPS data. It might then be possible to say whether differences in data or estimating technique, as opposed to a change in the population from which the samples are drawn, are responsible for the results.

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Table 1
Summary of Selected Studies of Unemployment Resulting from Incomplete Experience Rating of the UI Payroll Tax

Study	Data	Dependent Variable(s)	Main Independent Variable(s)	Main Findings
Feldstein (1978)	24,545 individuals from March 1971 CPS	0-1 dummy variable = 1 if worker is on temporary layoff	Imputed UI replacement rate	10% increase in UI replacement rate leads to about a 5% increase in temporary layoff unemployment
Halpin (1979)	Monthly data (by state) for three seasonal 3-digit SIC industries, 1960-1974	Spectral measure of seasonal variation in unemployment	Ratio of taxable to total wages, minimum and maximum tax rates, % of taxable wages at state's maximum tax rate	Seasonal variation in unemployment falls with higher ratio of taxable to total wages, rises with higher minimum tax rate
Halpin (1980)	40,868 individuals in 30 states from 1977 Survey of Income and Education	0-1 dummy variable = 1 if worker is on temporary layoff	Ratio of taxable to total wages, MAXGAP (gap between maximum tax rate and rate needed to fund benefits of negative balance firms), minimum and maximum tax rates, % of benefits noncharged	10 %age point increase in ratio of taxable to total wages lowers incidence of layoffs by 5 %age points; 1 %age point reduction in MAXGAP lowers incidence of layoffs by 15 %age points
Brechling (1981)	170 state-year observations on manufacturing (reserve-ratio states only), 1962-1969	Annual layoff rate, annual rehire rate, average weekly hours, average unemployment duration	Negative balance, minimum, and maximum tax rates; slope of tax schedule; reserve ratio where maximum tax rate is reached	Increases in minimum tax, maximum tax, and slope of schedule increase turnover, hours, duration; increase in negative balance tax reduces turnover, hours, duration
Saffer (1982)	468 state-year observations on industries (all states), 1967-1975	Annual layoff rate (linear or logarithmic)	Difference between minimum and maximum payroll tax rates, average weekly benefit and wage, taxable wage base	Increases in difference between minimum and maximum payroll tax rates lower layoffs (elasticity = -.63)
Saffer (1983)	14,899 individuals from March 1975 CPS, linked to 2-digit SIC industry data from ES202	0-1 dummy variables = 1 if worker is on temporary layoff or if worker is on permanent layoff	Proportional deviation of industry average UI tax rate from schedule midpoint, imputed UI replacement rate, state taxable wage base	Increases in estimated degree of experience rating increase probability of temporary layoff

Table 1 (continued)

Study	Data	Dependent Variable(s)	Main Independent Variable(s)	Main Findings
Topel (1983)	8,280 individuals from March 1975 CPS, linked to 2-digit SIC industry data	Probability of temporary layoff	UI subsidy as % of weekly earnings (imputed for 551 state/2-digit SIC cells), benefit replacement rate (imputed)	Increases in subsidy reduce probability of temporary layoff; full experience rating would reduce temporary layoffs by 31%
Topel (1984a)	33,653 individuals from March CPS, 1973-1976, linked to 2-digit SIC industry data	0-1 dummy variables = 1 if worker on temporary layoff (or permanently laid off)	UI subsidy as % of weekly earnings (imputed for each state/2-digit SIC cell), benefit replacement rate (imputed)	Increases in subsidy reduce probability of temporary layoff; smaller effect of subsidy on permanent layoff
Topel (1985)	76,106 men from March CPS, 1977-1981, linked to 2-digit SIC industry data	0-1 dummy variables = 1 if worker on temporary layoff (or permanently laid off, or quit)	UI subsidy as % of weekly earnings (imputed for each state/2-digit SIC cell), benefit replacement rate (imputed)	Increases in subsidy reduce probability of temporary layoff; full experience rating would reduce unemployment rate from 5.1% to 3.7%
Kaiser (1987)	Annual data (for reserve-ratio states) for 15 2-digit SIC industries, 1964-1969	Log annual layoff rate, log average annual hours per worker	Maximum and minimum tax rates, ratio of maximum to negative balance tax rates (RATIO), slope of tax schedule, WBA, taxable wage base	Layoff rates fall with increases in maximum tax rate, RATIO, and taxable wage base; average hours rise with increases in GAP and maximum tax rate
Deere (1991)	State-year observations on 7 one-digit industries in 31 reserve ratio states, 1962-1967	Industry's share of state employment	Minimum and maximum UI payroll tax per worker in state, MTC in state	10% decrease in MTC lowers construction employment by 1.7%, service employment by 1%; layoff unemployment up by 5% due to employment shifts
Anderson (1993)	Quarterly observations of 8,278 retail firms in six states, 1978-1984	Seasonal employment variability	Marginal tax cost of layoff (MTC), year, and firm fixed effects	Elasticity of seasonal variability w.r.t. MTC is -0.1; full experience rating would reduce seasonal variability by 14%

Table 1 (continued)

Study	Data	Dependent Variable(s)	Main Independent Variable(s)	Main Findings
Card and Levine (1994)	187,598 individuals from CPS outgoing rotation group, 1979-1987, linked to 2-digit SIC industry data	0-1 dummy variables = 1 if worker on temporary layoff (or permanently laid off, or other unemployment)	Marginal tax cost of layoff (MTC) imputed for each state/2-digit SIC cell)	Complete experience rating would reduce temporary layoff rate by 50% (1 %age point) in trough of a recession
Anderson and Meyer (1994)	Over 300,000 quarterly wage records from GA, ID, LA, MO, NM, and SC, matched to UI claims records	0-1 dummy variable = 1 if worker laid off during the quarter	Marginal tax cost of layoff (MTC) measured at the firm level; amount and potential duration of benefits for which worker eligible, other controls	Estimates vary; between 13% and 23% of temporary layoffs (8% of all layoffs) accounted for by incomplete experience rating
Betcherman and Leckie (1995)	Mail survey of 331 establishments in Ontario, Minnesota, Pennsylvania, and Wisconsin	Firm-specific layoff rate in 1993	Marginal tax cost of layoff (MTC) measured at the level of the province/state and industry	No evidence of an impact of experience rating on the layoff rate
Anderson and Meyer (1998)	State-year observations on 51 states, 1972-1997	Monthly claim rate (UI claims/ employment) and range of claim rate	Change to experience rating in WA in 1985; impact obtained by difference-in-differences estimator	Point estimates suggest move to full experience rating lowers claim rate 10 to 18 percent (p-values > 10%)

Table 2
Brief descriptions and summary statistics of key variables

		Missouri	Washington	Pennsylvania
Variable	Brief Description	Mean (Std. dev.) [Min./Max.]	Mean (Std. dev.) [Min./Max.]	Mean (Std. dev.) [Min./Max.]
Charges/ payroll	Benefit charges incurred by the firm as a proportion of payroll, year t	0.0075 (0.0339) [0/4.446]	0.0147 (0.0846) [0/13.16]	0.0134 (0.0538) [0/6.74]
Deviation from linear trend	Negative deviation of employment in year t from estimated linear trend (absolute value, proportional terms)	0.071 (0.155) [0/1.99]	0.063 (0.134) [0/1.91]	0.063 (0.133) [0/1.98]
Deviation from quadratic trend	Negative deviation of employment in year t from estimated quadratic trend (absolute value, proportional terms)	0.059 (0.131) [0/1.99]	0.056 (0.119) [0/1.93]	0.050 (0.111) [0/1.97]
Temporary layoffs	Temporary drop in employment between years t-1 and t, in proportional terms (Brechling and Laurence 1995)	0.022 (.069) [0/2.00]	0.026 (0.080) [0/1.86]	0.019 (0.064) [0/1.92]
Permanent layoffs	Permanent drop in employment between years t-1 and t, in proportional terms (Brechling and Laurence 1995)	0.035 (0.107) [0/1.99]	0.035 (0.105) [0/1.96]	0.033 (0.098) [0/1.97]
Seasonal variation	Seasonal employment variation in year t, measured as range of residuals from a regression of log employment on a time trend (Anderson 1993)	0.396 (0.412) [0/10.688]	0.359 (0.478) [0/6.542]	0.252 (0.392) [0/7.212]
Marginal tax cost of layoff (*mtc*)	Proportion of marginal dollar of UI benefits charged to firm in year t that it can expect to repay through increased future payroll taxes	0.611 (0.245) [0/.878]	1.086 (0.767) [0/3.162]	0.960 (0.321) [0/1.419]
Tax rate	Firm's UI payroll tax rate in year t	1.71 (1.65) [0.00/8.70]	2.46 (1.46) [0.36/5.42]	3.64 (2.18) [1.00/9.90]
Reserve ratio	Firm's reserve ratio in year t	8.21 (14.06) [-99.9/99.9]	na	13.99 (70.26) [-16,753/2,722]
Benefit Ratio	Firm's benefit ratio in year t	na	1.71 (7.70) [0/1,590]	2.32 (5.88) [0/814]
Average WBA	Average weekly UI benefit amount payable to a firm's workers, estimated from average quarterly earnings per worker (1994 dollars)	158.67 (38.13) [19.28/191.23]	185.59 (83.75) [68.0/342.0]	214.21 (89.95) [35.0/329.0]
Average annual wages	Natural log of average annual wage of firm's employees (1994 dollars)	9.90 (0.67) [5.69/13.10]	9.71 (0.72) [5.70/12.52]	9.93 (0.68) [4.97/13.06]
Taxable wage base	Annual wages per worker subject to the unemployment insurance tax (1994 dollars)	8,790 (1,249) [7,394/11,018]	18,873 (539) [18,280/19,900]	9,253 (954) [8,000/10,818]
Firm size	Firm's average monthly employment over years observed	77 (251) [1/14,045]	108 (1254) [1/108,061]	87 (378) [1/26,512]

Firm age	Difference between last year of data and year in which the firm's UI account began.	25.4 (14.7) [2/57]	17.1 (11.0) [1/58]	21.0 (13.7) [1/58]
Industry Agriculture	=1 if firm's 1-digit SIC industry in the first year of data is agriculture; else = 0	0.016 (0.124) [0/1]	0.049 (0.216) [0/1]	0.015 (0.121) [0/1]
Mining	=1 if the firm's 1-digit SIC industry is mining ; else = 0	0.003 (0.055) [0/1]	0.002 (0.046) [0/1]	0.007 (0.082) [0/1]
Construc-tion	=1 if the firm's 1-digit SIC industry is construction; else = 0	0.085 (0.280) [0/1]	0.097 (0.295) [0/1]	0.074 (0.261) [0/1]
Manufac-turing	=1 if the firm's 1-digit SIC industry is manufacturing; else = 0	0.162 (0.368) [0/1]	0.128 (0.334) [0/1]	0.188 (0.391) [0/1]
Transpor-tation	=1 if the firm's 1-digit SIC industry is transportation, communications, and utilities; else = 0	0.044 (0.206) [0/1]	0.050 (0.217) [0/1]	0.042 (0.201) [0/1]
Wholesale Trade	=1 if the firm's 1-digit SIC industry is wholesale trade; else = 0	0.120 (0.325) [0/1]	0.110 (0.313) [0/1]	0.104 (0.305) [0/1]
Retail Trade	=1 if the firm's 1-digit SIC industry is retail trade; else = 0	0.220 (0.415) [0/1]	0.197 (0.397) [0/1]	0.209 (0.406) [0/1]
Finance Insurance, Real Estate	=1 if the firm's 1-digit SIC industry is finance, insurance, and real estate; else = 0	0.070 (0.255) [0/1]	0.067 (0.251) [0/1]	0.064 (0.244) [0/1]
Services	=1 if the firm's 1-digit SIC industry is services; else = 0	0.264 (0.441) [0/1]	0.297 (0.457) [0/1]	0.295 (0.456) [0/1]
Public Admin.	=1 if the firm's 1-digit SIC industry is public administration; else = 0	0.015 (0.120) [0/1]	0.003 (0.059) [0/1]	0.003 (0.055) [0/1]

Notes: Tabulations of stratified random samples of 6,812 Missouri firms active in each of 10 years from 1985-1994 (nT = 68,120); 6,609 Washington firms active in each of 7 years from 1989-1995 (nT = 46,263); and 12,792 Pennsylvania firms active in each of 9 years from 1986-1994 (nT = 115,128). See text for further details of the samples.

Table 3
Variation between and within firms for selected variables, Missouri, Washington, and Pennsylvania firm panels

Variable	Missouri	Washington	Pennsylvania
Marginal Tax Cost (*mtc*)			
overall variation	0.245	0.767	0.321
between variation	0.163	0.552	0.251
within variation	0.183	0.532	0.200
Charges/payroll			
overall variation	0.034	0.084	0.054
between variation	0.017	0.039	0.029
within variation	0.029	0.075	0.045
Deviation from linear trend			
overall variation	0.155	0.134	0.133
between variation	0.078	0.069	0.062
within variation	0.133	0.115	0.117
Deviation from quadratic trend			
overall variation	0.131	0.119	0.111
between variation	0.059	0.055	0.048
within variation	0.117	0.105	0.101
Temporary layoffs			
overall variation	0.069	0.080	0.064
between variation	0.025	0.033	0.025
within variation	0.064	0.073	0.059
Permanent layoffs			
overall variation	0.107	0.105	0.098
between variation	0.046	0.051	0.046
within variation	0.097	0.092	0.086
Seasonal variation			
overall variation	0.412	0.478	0.392
between variation	0.320	0.410	0.235
within variation	0.260	0.246	0.314

Source: Tabulated from samples described in Table 2.

Table 4
Estimated responsiveness of employer layoffs to experience rating of the UI payroll tax, Missouri (1985-1994), Washington (1989-1995), and Pennsylvania (1986-1994)

	Dependent Variable					
	Charges/	Deviation from trend		Temporary	Permanent	Seasonal
State and estimator	payroll	linear	quadratic	layoffs	layoffs	variation
Missouri:						
Fixed Effects	0.0010	-0.0319*	-0.0040	0.0025	0.0469*	-0.0300*
	(0.0007)	(0.0030)	(0.0026)	(0.0016)	(0.0024)	(0.0058)
	[0.0775]	[-0.2748]	[-0.0418]	[0.0695]	[0.8289]	[-0.0463]
First Differenced	0.0036*	0.0211*	0.0350*	0.0089*	0.0338*	0.0137*
	(0.0010)	(0.0032)	(0.0031)	(0.0024)	(0.0034)	(0.0079)
	[0.2888]	[0.1813]	[0.3637]	[0.2511]	[0.5983]	[0.0211]
First Differenced-IV	-0.0117*	-0.0838*	-0.0973*	-0.0413*	0.0120	0.0411
	(0.0036)	(0.0117)	(0.0116)	(0.0090)	(0.0124)	(0.0287)
	[-0.9459]	[-0.7219]	[-1.0128]	[-1.1720]	[0.2117]	[0.0634]
Washington:						
Fixed Effects	-0.0075*	-0.0046*	-0.0023*	0.0022*	0.0030*	-0.0087*
	(0.0007)	(0.0011)	(0.0011)	(0.0008)	(0.0010)	(0.0024)
	[-0.5511]	[-0.0796]	[-0.0441]	[0.0897]	[0.0905]	[-0.0264]
First Differenced	-0.0101*	0.0018	0.0037*	0.0050*	0.0082*	-0.0049
	(0.0013)	(0.0015)	(0.0015)	(0.0014)	(0.0017)	(0.0036)
	[-0.7427]	[0.0305]	[0.0717]	[0.2051]	[0.2505]	[-0.0147]
First Differenced-IV	-0.0184*	0.0050	-0.0037	-0.0066	-0.0175*	-0.0221*
	(0.0049)	(0.0056)	(0.0055)	(0.0066)	(0.0079)	(0.0133)
	[-1.3612]	[0.0875]	[-0.0714]	[-0.2730]	[-0.5355]	[-0.0667]
Pennsylvania:						
Fixed Effects	-0.0031*	-0.0331*	-0.0019	0.0027*	0.0261*	-0.0107*
	(0.0007)	(0.0018)	(0.0016)	(0.0013)	(0.0018)	(0.0049)
	[-0.2198]	[-0.5055]	[-0.0369]	[0.1319]	[0.7715]	[-0.0409]
First Differenced	0.0090*	0.0129*	0.0310*	0.0161*	0.0447*	0.0301*
	(0.0011)	(0.0023)	(0.0022)	(0.0020)	(0.0029)	(0.0075)
	[0.6475]	[0.1968]	[0.5908]	[0.7925]	[1.3182]	[0.1147]
First Differenced-IV	-0.0348*	-0.0845*	-0.1268*	0.0056	-0.0023	-0.0564*
	(0.0048)	(0.0102)	(0.0100)	(0.0088)	(0.0123)	(0.0333)
	[-2.5039]	[-1.2902]	[-2.4160]	[0.2761]	[-0.0674]	[-0.2151]

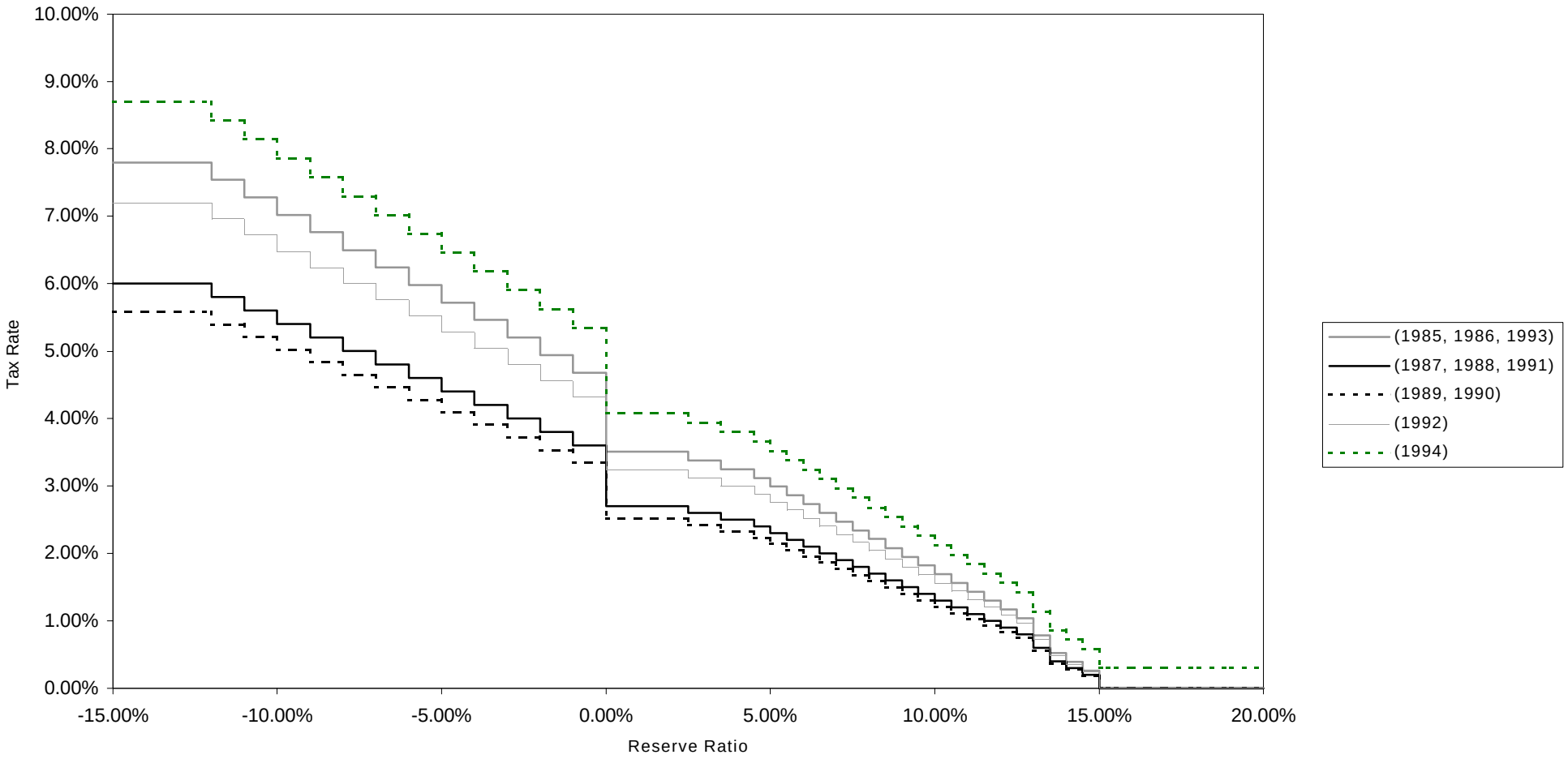
Notes: First entry in each cell is the estimated β_1 (coefficient on the marginal tax cost of layoffs, *mtc*) from equation (3). Standard errors in parentheses; elasticities at sample means in square brackets. See text for further discussion. Starred estimates have a p-value of .10 or less.

Table 5
Microsimulations of changes in UI payroll tax policy, Missouri (1985-1994), Washington (1989-1995), and Pennsylvania (1986-1994)
(percentage change in outcome variable resulting from specified policy change)

	Outcome Variable					
	Charges/	Deviation from trend		Temporary	Permanent	Seasonal
Policy change and state	payroll	linear	quadratic	layoffs	layoffs	variation
Increased experience rating: MTC of firms with below-average MTC raised to average MTC						
Missouri	-4.02	-2.93	-2.97	-5.91	1.35	0.92
Washington	-13.57	1.73	-1.40	-4.43	-6.50	-2.49
Pennsylvania	-10.39	-5.22	-5.24	2.45	-0.60	-2.41
Full experience rating: MTC of firms with MTC < 1 raised to MTC = 1						
Missouri	-11.97	-14.63	-16.30	-23.87	5.12	4.53
Washington	-16.97	1.18	-0.95	-3.72	-5.58	-1.72
Pennsylvania	-10.10	-5.62	-5.55	2.73	-0.68	-2.62

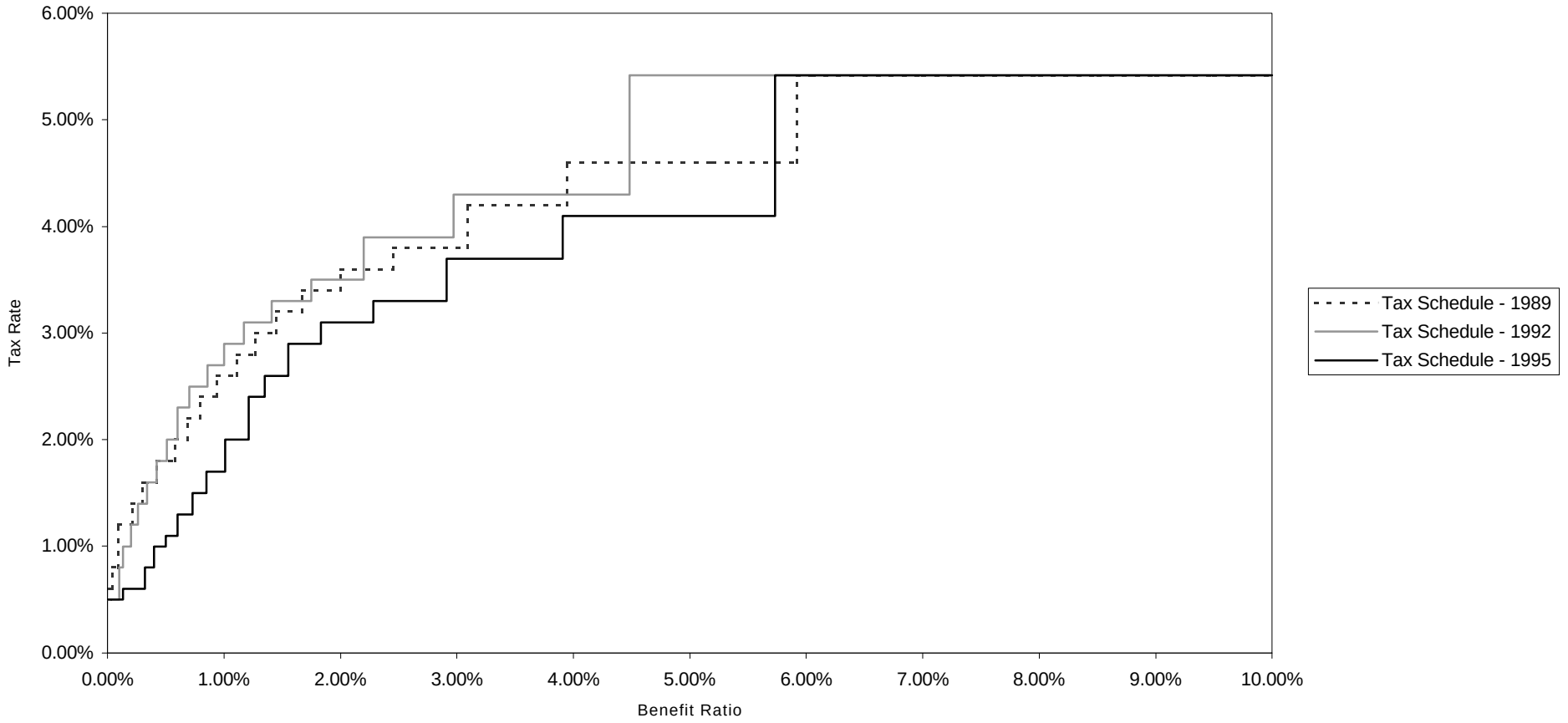
Notes: Microsimulations based on FD-IV estimates displayed in Table 4. See text for details.

Figure 1: Unemployment Insurance Payroll Tax Schedules for Missouri, 1985–1994



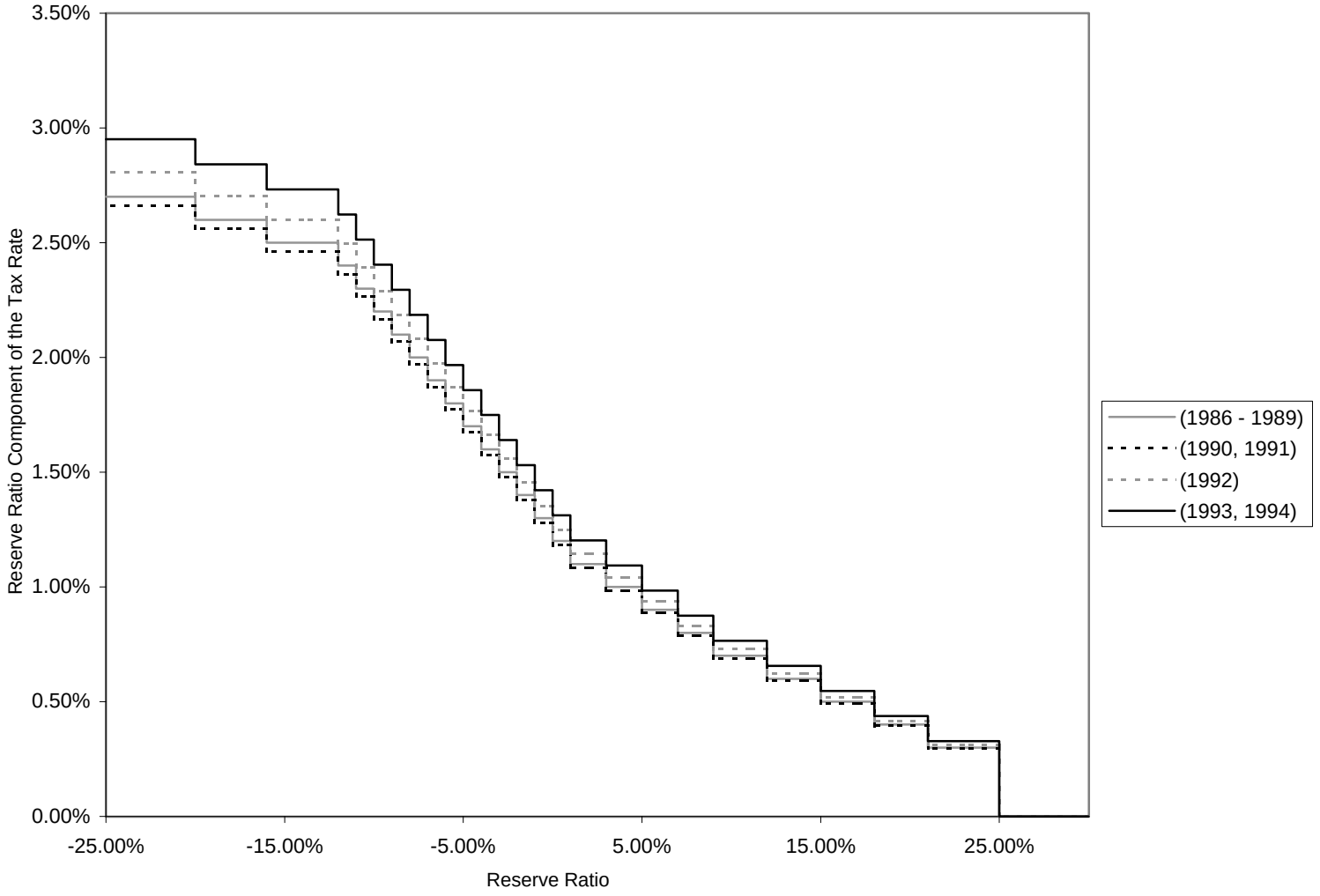
Source: Missouri Department of Labor and Industrial Relations, Division of Employment Security.

Figure 2: Unemployment Insurance Payroll Tax Schedules for Washington, 1989, 1992, 1995



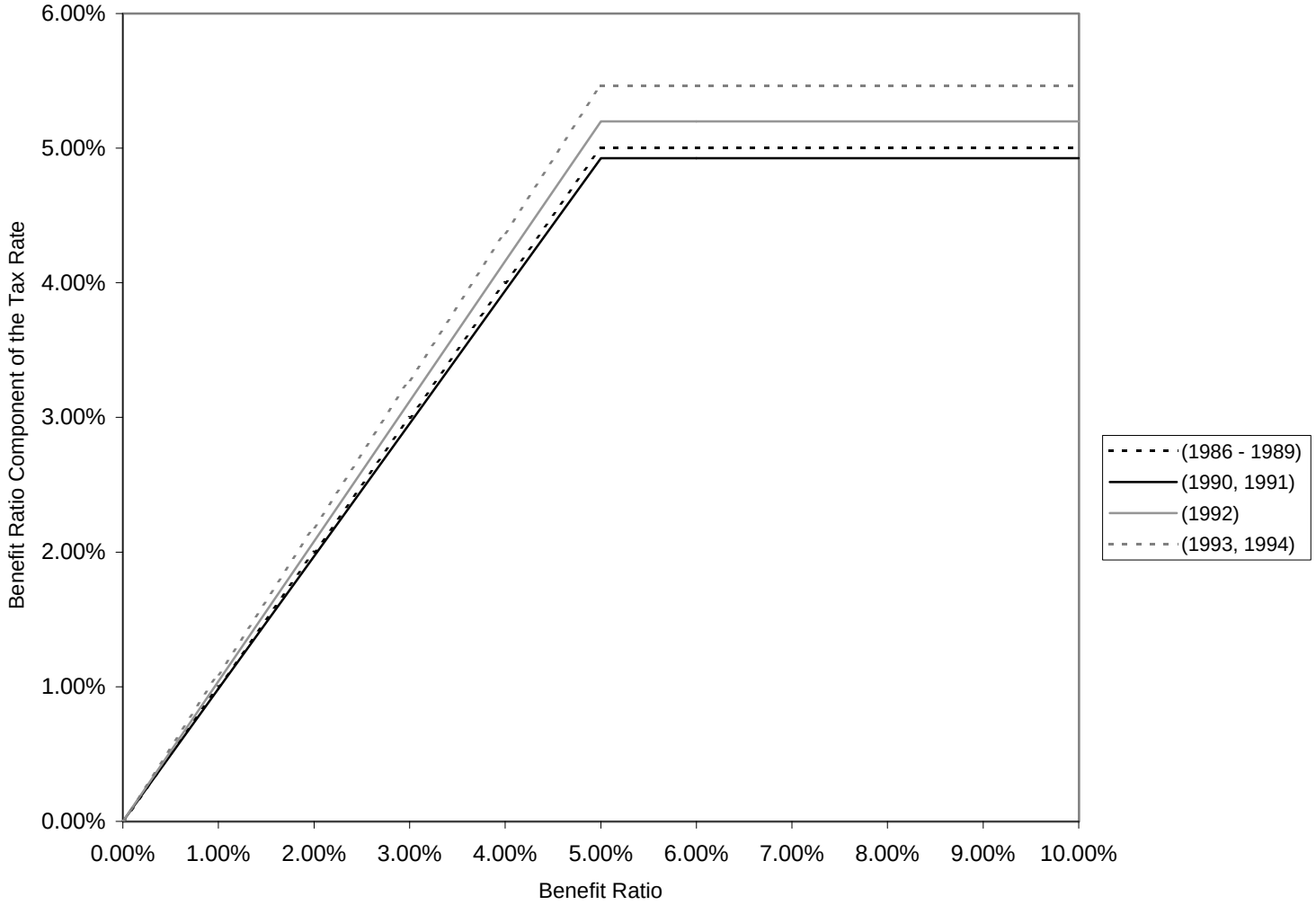
Source: Washington State Unemployment Security Department, Experience Rating System Annual Tax Rate Distribution Reports (1989, 1992, 1995).

Figure 3: Reserve Ratio Component of the Unemployment Insurance Payroll Tax Schedules for Pennsylvania



Source: Pennsylvania Department of Labor and Industry, Employment Security, 1992.

Figure 4: Benefit Ratio Component of the Unemployment Insurance Payroll Tax Schedules for Pennsylvania (1986 - 1994)



Source: Pennsylvania Department of Labor and Industry, Employment Security, 1992.