Payroll Tax Incidence: Evidence from Unemployment Insurance

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[PRELIMINARY AND INCOMPLETE - Please do not circulate]

Abstract

Payroll taxes act as the primary source of social insurance financing throughout the world. Economic models assume that in the long run payroll tax burdens fall fully on workers, but where does tax incidence fall when taxes are firm-specific and time-varying? Unemployment insurance in the United States has the key feature of varying both across employers and over time, creating the potential for labor demand responses if tax costs cannot be fully passed on to worker wages. Using state variation in tax schedules and matched employer-employee job spells, I study how employment and earnings respond to payroll tax changes. I also focus on the impact to seasonal and part-time workers who bear a larger UI tax burden, and study both increases and decreases in tax costs, to provide a more comprehensive analysis of payroll tax incidence.

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1 Introduction

Taxes on labor earnings are used to fund a variety of social insurance programs, and can be charged to the worker, the employer, or both. In the theory of tax incidence, a payroll tax on employers increases the total cost of labor, and causes the demand curve to shift down. But the resulting employment decline and wage change depends on the elasticities of labor demand and labor supply; because labor demand is assumed to be much more elastic than labor supply (especially in the long run), most models assume payroll tax costs are born entirely by workers, resulting in little to no effect on employment. However, there may be imperfect pass-through in the presence of downward wage rigidities, and existing empirical estimates range from zero to full incidence on workers (Brittain (1971), Hamermesh (1979), Gruber and Krueger (1991), Gruber (1997)).[1]

More recent work with administrative microdata have found clear evidence of imperfect pass-through, but mixed results on employment (Cruces et al. (2010), Saez et al. (2012), Saez et al. (2019), Ku et al. (2020), Saez et al. (2021), Benzarti and Harju (2021*b*)). With imperfect pass-through, payroll taxes impose an additional labor cost on top of employee wages and can be a significant tax burden, especially for new and/or small businesses. Thus many policymakers view payroll tax cuts as a way to stimulate employment, but this may not occur if businesses instead retain these savings as profits. Benzarti and Harju (2021*a*) find evidence that a payroll tax cut in Finland helped treated firms weather the Great Recession. However, none of the recent studies use data from the United States, and given differences in labor market institutions the estimates of tax incidence in one country may not generalize in the same way to another.

This project exploits two different types of tax changes to study the tax incidence of the U.S. Unemployment Insurance (UI) tax, which varies at the state level. I first present findings using state tax increases following the Great Recession, and in future work I will estimate the impact of new employer tax rates. I aim to provide three main contributions. I add to the payroll tax literature by estimating the impact of temporary rather than permanent payroll tax changes, given that UI is a time-varying employer tax that changes from year to year. I also focus on the effects for part-time and low-wage workers, a relatively understudied portion of the labor force. Second, I contribute to the UI literature by studying UI tax incidence in the U.S. Anderson and Meyer (1997, 2000)

[1] Using data from a large payroll processing firm, Grigsby et al. (2021) find very low rates of wage cuts, providing strong evidence for downward nominal wage rigidity. Using Census Bureau data, Murray (2021) estimates that downward nominal wage rigidity accounted for at least 23% of excess job destruction during the financial crisis of 2008.

found evidence of pass-through for long-run industry-specific UI taxes but not firm-specific rates, and Johnston (2021) found little effect of firm-specific rates on earnings. I not only re-examine the role of permanent versus temporary UI tax changes, but also study the impact on new employers and small businesses, a potentially more sensitive subset of firms. Finally, the rich variation in tax schedules across states allows for the study of both tax increases and tax decreases, rather than a singular policy change.

2 Institutional Background

Unemployment insurance in the U.S. is funded solely through payroll taxes on employers.[2] Unlike Social Security or Medicare taxes, which are uniform across all employers, UI is experience-rated and therefore *employer-specific*. This means that employers that lay off workers who then claim UI benefits are assessed a higher future tax rate - up to a maximum - and these tax rates are updated every calendar year.[3] Due to the time-varying nature of UI tax rates, businesses may have more difficulty passing the costs on to their workers. Thus changes in UI tax liabilities have the potential to influence employment as well as earnings.

Another unique aspect of UI is the low taxable wage base in most states. Throughout the last half-century, taxable wage bases have not kept up with inflation, leading to an errosion of the tax base. In 1965 the federally mandated UI tax base was $3000, and among the 35 states with a $3000 base, taxable wages covered 58% of total payroll. As of 2014, the last year of my data, the median UI tax base was only $13,000 – with the median state's taxable wages covering only 33% of total payroll. Currently four states still have tax bases equal to the federally mandated minimum of $7,000 a year. This low tax base causes UI taxation to be regressive in the sense that seasonal, part-time, and low-wage workers are taxed at a higher effective tax rate (as a share of earnings), and these types of workers become relatively more costly for a business facing high UI tax rates.

In states with low taxable wage bases, UI also imposes an uneven distribution of tax burdens throughout the calendar year. Tax payments are highest in Q1 when all earnings are still under the taxable wage base, and fall throughout the year as earnings gradually exceed the UI tax base. Table 1 provides an illustration of this phenomenon for two states at opposite ends of the UI spec-

[2]With the exception of New Jersey, which also charges workers a uniform payroll tax of 0.5%.

[3]Guo and Johnston (2021) provides a brief history of U.S. unemployment insurance, which was modeled after the experience rating in workers' compensation. Since its inception, policymakers have recognized the tradeoff between disincentivizing layoffs, and the cyclical tax burdens that dynamic experience rating would create.

trum. California's tax base is at the federally mandated minimum of $7000, while Washington's is automatically indexed to increase with wage growth, resulting in the highest in the nation. For a high-utilization sector such as Construction, in a year when experience rating was at its peak, both states have large UI tax burdens in the first quarter. However, California's tax burden quickly drops off as earnings exceed the $7000 tax base, while Washington's remain elevated (though still decreasing as the share of taxable payroll falls).

Table 1: UI Tax Contributions for Construction Sector (2011)

	California - $7,000 base			Washington - $37,000 base	
	Contrib. per Worker	Taxable Payroll		Contrib. per Worker	Taxable Payroll
Q1	$433	55%	Q1	$556	96%
Q2	$81	11%	Q2	$499	84%
Q3	$79	10%	Q3	$376	59%
Q4	$60	7%	Q4	$237	38%

Source: *Quarterly Census of Employment and Wages*. Contributions per worker calculated as quarterly contributions divided by monthly employment. Taxable payroll equals taxable quarterly wages divided by total quarterly wages.

3 Research Design

There is substantial variation in UI tax schedules across states, and a tax increase in one state raises payroll costs for incumbent employers, without affecting tax regimes in any other. Many state UI programs are underfunded, leading them to deplete their UI trust funds during recessions and implement subsequent tax increases during the recovery.[4] A number of UI tax increases were implemented following the Great Recession, when many states recognized the need to update their UI tax schedules to replenish trust funds. The timing of these tax increases, which occurred in states with ex ante low UI tax burdens, was arguably exogenous to local economic conditions.

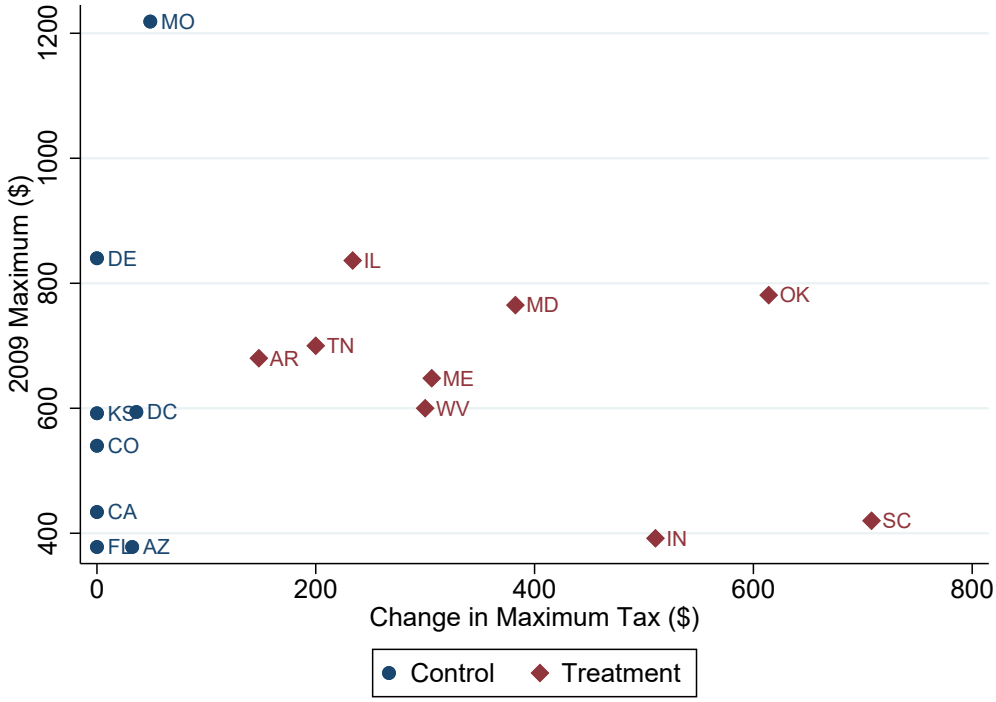
In 2010 and 2011, a number of states increased their UI tax base and/or maximum tax rate in order to replenish their trust funds. Coupled with the mechanical increase in employer-specific

[4]During the Great Recession, 36 states depleted their UI trust funds and were forced to take out loans from the federal government; this occurred again to 18 states during the height of the COVID-19 pandemic.

tax rates due to experience rating, these tax hikes could amount to a 2-5% increase in effective tax rates. This could impose a significant financial burden on cash-constrained firms and firms that rely on part-time/seasonal workers.

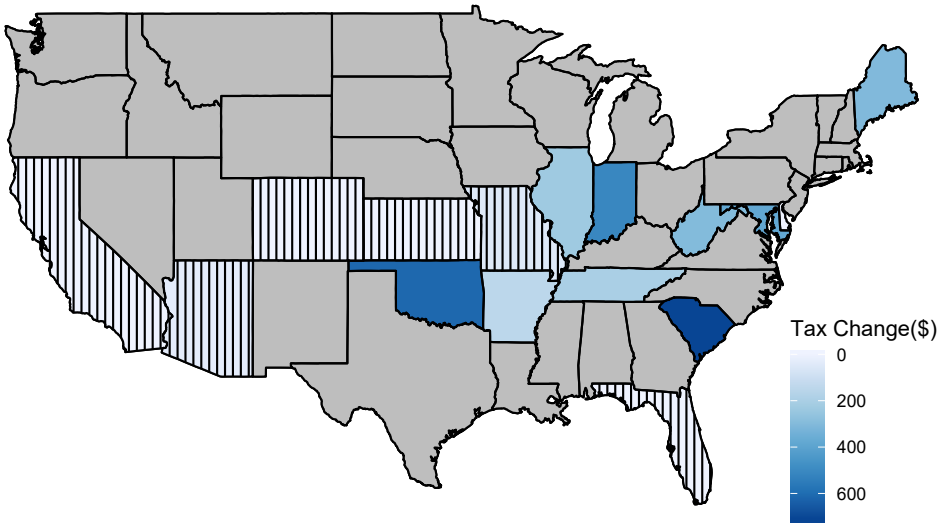
I identify 9 treatment states within my LEHD subsample whose statutory maximum UI taxes rose from 2009 to 2011. As control states, I include the remaining LEHD states with the exception of six states with indexed wage bases that automatically increase year after year (as these could be viewed as another type of treatment). These six excluded states are IA, MT, NV, NM, OR, and WA. I also exclude Pennsylvania, which actually experienced a UI tax *decrease* in 2011-12. Figure 1 graphs the distribution of tax increases across the 9 treatment and 8 control states I study. From 2009 to 2011, treatment states experienced maximum UI tax increases ranging from just under $200 to over $600, and the average increase was $378. In percentage terms, maximums increased by 67% on average, and the largest tax increase was experienced by South Carolina (in both level and percentage terms). Figure 2 plots the locations of these 17 LEHD states, and the change in maximum UI taxes from 2009 to 2011.

Figure 1: Maximum UI Tax Increase from 2009 to 2011



Source: *Significant Measures of State UI Tax Systems*. Maximum tax calculated as taxable wage base multiplied by maximum tax rate.

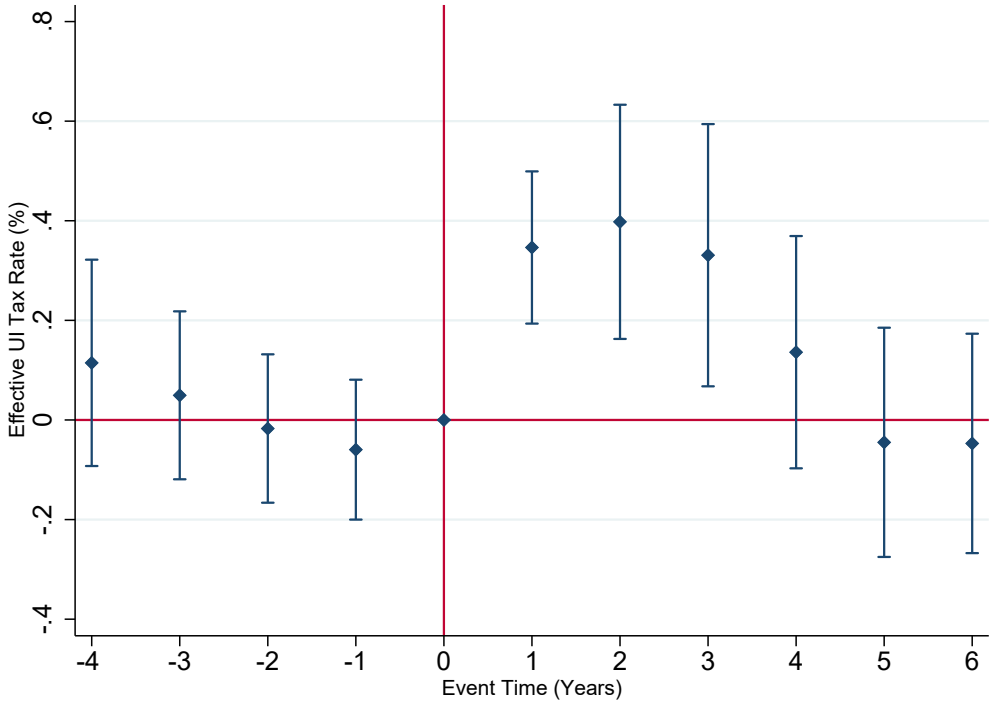
Figure 2: UI Tax Policy Variation



Source: *Significant Measures of State UI Tax Systems*. The 8 control states are shaded with vertical lines (and also include Delaware and District of Columbia).

For firms that laid off workers during the recession, these statutory maximum tax increases led to an increase in actual UI tax payments as well. Using construction industries as a proxy for high-layoff firms, Figure 4 graphs an event study of effective UI tax rates in each calendar year, where event time is defined as the year relative to the initial tax increas (either 2010 or 2011). In the years after the tax change, UI taxes cost construction firms in treatment states an extra 0.33–0.4% of total payroll, and these increases last for about 3 years. However, this average effect masks substantial heterogeneity in effective tax rates at the worker level, especially for workers that earn below the taxable wage base.

Figure 3: Effective UI Tax Rates for Treatment versus Control States



Source: *Quarterly Census of Employment and Wages.* (N = 2,013) Sample limited to ten 4-digit construction industries and years 2005 to 2016 (cells too small to meet disclosure requirements are missing). Effective tax rates calculated by dividing total state quarterly UI contributions by total quarterly payroll within the calendar year. Event study estimated with state, industry, and year fixed effects, and error bars denote 95% CI for standard errors clustered at state level.

In order to focus on employers for whom these tax increases would be binding, I create a sample of firms that are likely to be close to the maximum tax rate following the Great Recession. I then estimate both event study and difference-in-differences regressions to study the impact of UI tax increases. To establish a consistent sample for both regression specifications, I restrict to the period 2008 to 2012. I stop in 2012 because beginning in 2013, some control states start to experience tax increases while some treatment states experience tax decreases.

Estimating an event study is somewhat tricky in that states experienced a range of tax increases, with some occuring all at once and others a more gradual increase from 2010 to 2012. The difference-in-differences design will be able to incorporate this variation, but for the event study I simply use an indicator for treatment, and define event time to be the quarter in which the largest tax increase occurs (either Q1 of 2010 or Q1 of 2011). I then estimate the following regression

specification:

$$Y_{ft} = \alpha_f + \sum_{k=-9}^{12} \beta_k * Treat_f + NAICS * \delta_t + \epsilon_{ft}$$

Here f indexes employer (SEIN), t indexes year-quarter, and k indexes the quarter relative to the policy change. I group all quarters more than two years before the policy change together into one estimate $k = -9$, and the first quarter of the tax change is labeled $k = 1$. Fixed effects are included for the SEIN, as well as the year-quarter interacted with 2-digit NAICS sector. The outcomes of interest include the log of average quarterly earnings for stable employees (excludes hires and separations), as well as employment growth and hiring rates.

I also estimate a difference-in-differences regression with a continuous treatment variable, $Taxchange_{st}$, defined as the change in maximum UI tax relative to 2009 (which is defined to equal zero in 2009 and earlier). The baseline regression specification is as follows:

$$Y_{ft} = \alpha_f + \sum_{q=1}^{4} \beta_q * Taxchange_{st} + NAICS * \delta_t + \epsilon_{ft}$$

Here f indexes employer, t indexes year-quarter, and s indexes state. I estimate four coefficients of interest β_1 to β_4 to allow for differential responses by calendar quarter, because UI tax burdens are largest in Q1. The identifying assumption is that in the absence of UI tax policy changes, firms in treatment states and control states would have evolved similarly in the years following the Great Recession.

4 Data

This project uses the Census Bureau's Longitudinal Employment and Household Dynamics (LEHD), an administrative employer-employee matched dataset of quarterly earnings, directly sourced from state UI records. Each employer in the LEHD is assigned a state EIN number (SEIN), and this will be my firm definition. An SEIN is the level at which UI tax rates are assigned to employers; it can encompass multiple establishments within a state, but no employment outside the state.

The primary outcome of interest is quarterly earnings at the worker level. No information on hours is collected, so incidence on earnings may also reflect effects on hours. I will also test for differential effects for stayers versus new hires, given that new hires may be expected to face

lower wage rigidities, and part-time/seasonal versus full-time workers, given the low UI tax bases. The LEHD allows for the study of multiple states' UI tax regimes, but I do not directly observe firm-specific payroll taxes. Therefore, I impute tax costs based on the observation of job separations. Employers who never lay off workers into non-employment are inferred to have a low UI tax rate, and employers who lay off a significant share of workers will be inferred to have a tax rate close to the state maximum.

4.1 Calculating Layoff History

Because we cannot observe employer-specific UI tax rates in the LEHD, I impute layoff history for each employer using observed job separations. I first limit the scope of consideration to workers with at least 2 consecutive quarters of earnings, high quarter earnings of at least $1500 (to be eligible for UI benefits in most states), and who are 18 or older (to abstract from job separations driven by schooling) and younger than 60 (to abstract from retirement timing). I then impute a layoff as a job separation in quarter t that results in at least one quarter of zero earnings from t+1 to t+3.

The literature studying mass layoffs typically defines mass layoff events as a separation of 30% or more of the workforce. However, within the LEHD these events are rare enough that I am not confident that they would constitute a generalizable sample (especially for larger employers). Flaaen et al. (2019) links LEHD to SIPP responses, and finds that only 28% of SIPP-identified layoffs are captured by this type of mass layoff definition. Instead, I aggregate my imputed layoffs from two separate pre-periods. The first runs from Q1 of 2006 to Q4 of 2007, and the second runs from Q1 of 2008 to Q2 of 2009 (the Great Recession began in December 2007 and ended in June 2009). I use the number of imputed layoffs over these two periods to define my analysis sample.

4.2 Summary Statistics

To construct my analysis sample, I include 9 treatment states and 8 control states, and the time period from 2008 to 2012. I then restrict to a subsample of SEINs imputed to have had sufficient layoff history to face binding UI tax increases in the years following the Great Recession. Using employment in Q3 of 2009 as the baseline, I drop firms with less than 20 and greater than 500 workers. I further restrict to firms that in each of the two pre-periods (2006:Q1-2007:Q4 and 2008:Q1-2009:Q2) experienced total layoffs of 33-100% of their baseline employment in Q3 of 2009.

Given that separation rates themselves are an imperfect predictor of eventual experience rating - because of imperfect take-up rates and substantial variation in UI duration - I view this exercise as accepting there will be Type I error, in favor of minimizing Type II error. In new work using administrative data from Washington, Lachowska et al. (2021) find that the take-up of UI among workers plays as important a role as the separation rate in determining a given firm's future UI tax rate.

Table 1 reports summary statistics for my sample of treatment and control firms at baseline.

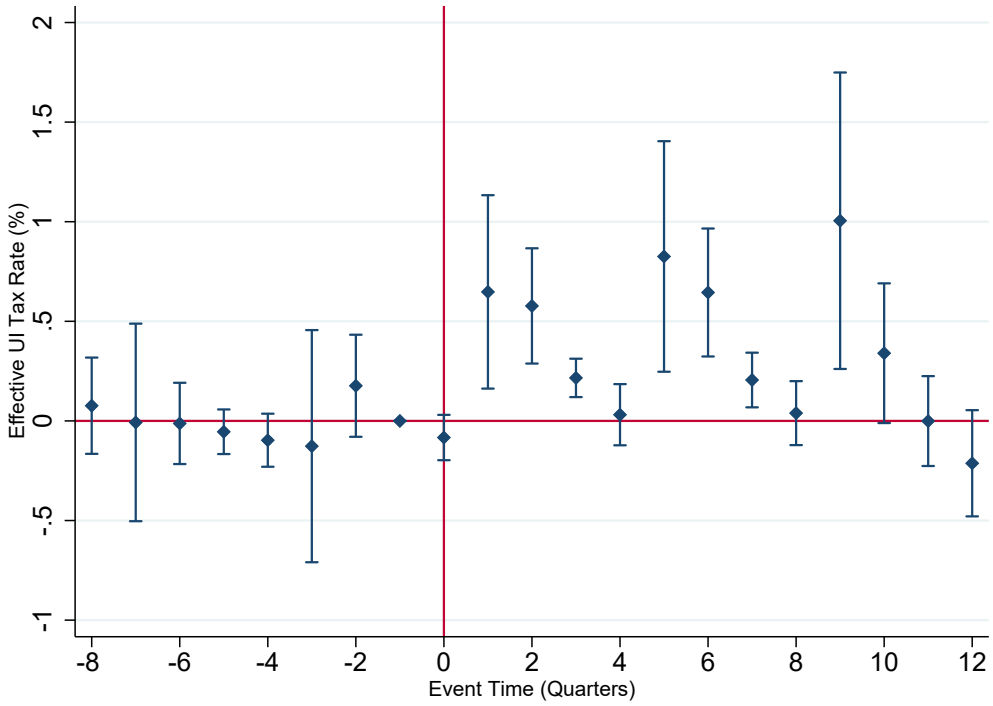
[Table 1 here - still awaiting clearance of results]

5 Results

5.1 Event Study

In the absence of employer-specific tax rates, I first provide evidence of the impact of statutory maximum UI tax increases by estimating an event study regression using the public-use QCEW. The treatment effects are estimated relative to the outcome two quarters prior to the tax change (ie: if a state increased taxes in 2010, the baseline would be Q3 of 2009). Using effective UI tax rates calculated for construction industries, Figure 4 shows that the policy changes in treatment states led to an increase in UI tax costs, predominantly in the first two quarters of the calendar year. On average Q1 tax rates in treatment states increased by 0.65, 0.83, and 1 percentage points over the three years following a policy change, relative to control states.

Figure 4: Effective UI Tax Rates (2008-2012)



Source: *Quarterly Census of Employment and Wages.* (N = 3,386) Sample limited to ten 4-digit construction industries and years 2008 to 2012 (cells too small to meet disclosure requirements are missing). Effective tax rates calculated by dividing state quarterly UI contributions by state quarterly payroll. Event study estimated with state, industry, and year-quarter fixed effects, and error bars denote 95% CI for standard errors clustered at state level.

Next, Figure 5 plots event study estimates using log quarterly earnings as the outcome. Log earnings are calculated by taking the natural log of the average quarterly earnings for all stable employees – which excludes new hires and separations. These results show that prior to the policy changes, firms in treatment states paid lower wages than those in control states. One potential reason for this is state-level differences in cost-of-living and minimum wages. Federal mininum wage increases occurred in July of 2007, 2008, and 2009, and treatment states were differentially more likely to have faced binding minimum wage increases. Although minimum wage alone does not explain the differential pre-trend in earnings, in subsequent regressions I include a control for the state minimum wage.

[Figure 5 here - still awaiting clearance of results]

Turning next to the hiring margin, Figure 6 shows estimates for the share of new hires (quarterly

new hires divided by quarterly employment). I also find that the impact on hiring is concentrated in the hiring of low-earning employees. I define a low-earning new hire as any new hire that earned less than $5000 (in 2015 dollars) the following quarter, and is meant to identify both part-time and seasonal workers whose earnings would bear a disproportionate share of the UI tax burden.

[Figure 6 here - still awaiting clearance of results]

5.2 Difference-in-Differences

While event studies are useful to provide nonparametric evidence and assess pre-trends, I next turn to a difference-in-differences estimation strategy to estimate treatment magnitudes. In these specifications I now use a continuous treatment measure equal to the change in the maximum UI tax schedule between year t and 2009, and equal to zero prior to 2009. Table 2 reports estimates for my outcomes of interest.

[Table 2 here - still awaiting clearance of results]

5.3 Robustness

I also explore the sensitivity of my results to the definition of the analysis sample. Because I do not observe actual employer-specific tax rates, I measure expected UI tax costs based on imputed layoff histories. Varying the cutoff of layoff shares that warrant inclusion in my main analysis sample had no qualitative effect on my estimates. Additionally, I estimate my specifications on a placebo sample of firms that experienced very few layoffs during the period 2006-2009, and thus would be expected to face very little UI tax burden. The results are not reported here, but I do not find evidence of any differential effects for this alternate sample.

6 Work in Progress Studying New Employers

New employers (SEINs) with no experience in the state's UI system are automatically assigned a fixed new employer tax rate for a period of 2-3 years while they build their employment history. SEINs that were 2-3 years of age accounted for 4.5% of total U.S. employment from 2003 up until the Great Recession, before dropping to 3.6% from 2010 to 2014. And in the construction industry,

these shares were 7.2% and 4.8% respectively.[5] A business that experiences a lot of layoffs during the first few years of operation will be pushed to the maximum UI tax rate after their new employer rate expires. On the other hand, if the business never lays off workers during this initial period their experience rating will decrease to the minimum tax rate. Thus new employers often experience a discontinuous change in their UI tax rates once they become qualified for experience rating.

To study the behavior of new employers and their transition into experience rating, I identify new employers in the LEHD from 2003 to 2011. I calculate their layoff history in the first two years of operation to estimate whether they are expected to receive a tax increase or decrease after experience rating begins. To ensure the businesses I identify experience maximal changes to their tax rates, I restrict to the two extremes of layoff history - firms with almost no imputed layoffs and firms with a large share of imputed layoffs. I estimate event study regressions of the following form:

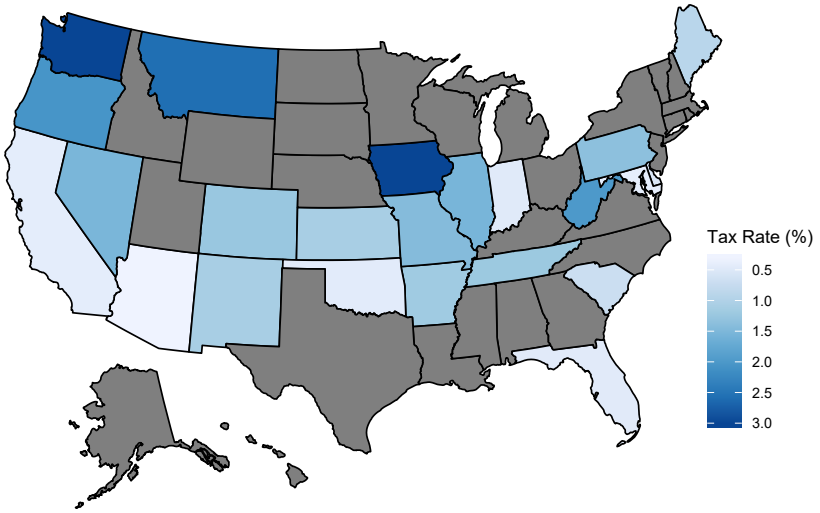
$$Y_{ft} = \alpha_f + \sum_{k=-4}^{12} \beta_k * \Delta\tau_f + \gamma age_{ft} + NAICS * \delta_t + \epsilon_{ft}$$

Here f indexes employer (SEIN), t indexes year-quarter, and k indexes the quarter relative to the transition to experience rating. $\Delta\tau_f$ is a continuous variable equal to the estimated change in an employer's experience-rated UI tax relative to their new employer tax. Fixed effects are included for the SEIN, as well as the year-quarter interacted with 2-digit NAICS sector. The outcomes of interest include the log of average quarterly earnings for stable employees (excludes hires and separations), as well as employment growth and hiring rates.

My preliminary analyses have focused on the construction sector, as ten LEHD states assign a *higher* new employer rate specifically for this industry. These higher rates are either fixed at a given rate, or calculated by taking the average of the sector's experience rating in that year. This reflects the greater costs construction imposes on the UI system, as an industry that has higher unemployment risk and employer entry/exit than the national average. The construction sector also relies on the use of seasonal workers, who bear a larger UI tax burden due to low taxable wage bases. Figure 5 illustrates, for my LEHD subsample, estimated effective new employer tax rates in the construction industry in a given year. These effective tax rates are calculated using an annualized wage measure, and would be even higher for part-time or seasonal workers.

[5] Calculated using aggregate data from the Census Bureau's Quarterly Workforce Indicators.

Figure 5: Construction New Employer Tax Variation (2011)



Source: Tax schedules from *Significant Measures of State UI Tax Systems*, and average weekly wages from QCEW. Effective tax rate calculated as new employer tax rate multiplied by taxable wage base, divided by 50*average weekly wage. For readability, effective rates are topcoded at 3%.

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