Experience Rating As an Automatic Stabilizer*

Mark Duggan†, Audrey Guo‡, and Andrew C. Johnston§

September 1, 2022

Abstract

Unemployment insurance taxes are experience-rated to penalize firms that dismiss workers. We examine whether experience rating acts as an automatic stabilizer in the labor market. We exploit the fact that penalties for layoffs vary by state using detailed data on state tax schedules, and we measure whether firms react less to labor-demand shocks in the presence of greater layoff penalties. The average penalty for layoffs ($100 per worker for a 10% layoff) reduces firm adjustment to shocks by 9 percent. The results imply experience rating has a stabilizing influence on labor markets. Suspending experience rating would have, for instance, increased unemployment by 649,000 workers (6 percent increase) in 2008.

*We are especially grateful to Robert Moffitt for helpful comments and conversations about the paper. We are grateful for support from the National Bureau of Economic Research. Views expressed here are those of the author and should not be attributed to our employers or to NBER. Mistakes are our own.

†Stanford University and NBER. Email: mgduggan@stanford.edu

‡Santa Clara University. Email: aguo@scu.edu

§University of California at Merced and NBER. Email: acjohnston@ucmerced.edu

1 Introduction

Unemployment Insurance (UI) is considered an automatic stabilizer because it provides benefits in proportion to unemployment. In the United States, UI may also stabilize the labor market through its unique tax system. Employer UI taxes are *experience rated*, which means firms are penalized with tax hikes when workers claim UI, and firms are rewarded with lower tax rates when they refrain from layoffs. Firms considering whether to dismiss workers during a downturn, therefore, may do more to avoid layoffs in the presence of experience rating, potentially stabilizing the labor market by smoothing labor demand over time.

We examine whether experience rating dampens the effect of macroeconomic shocks on labor demand. To this end, we create measures of the one-year marginal tax cost (MTC) of layoffs and exploit variation in experience rating across industries and states. Exposure to experience rating differs by state primarily because states have (i) different maximum rates that shield high-layoff firms from the full cost of their layoffs, (ii) different tax schedules that vary in the steepness of penalties, and (iii) different benefit generosities, which generate differences in the cost of layoffs. Exposure to experience rating differs also by industry (within a state) because industries vary in their utilization of layoffs. Historical layoff rates place firms at different locations on the tax schedule where marginal penalties differ. We collect detailed information on the tax schedules of each state and the average tax rate of each industry within a state in each year to estimate the marginal tax cost firms face.

To test whether experience rating changes firm responses to shocks, we calculate demand shocks as the national employment change in an employer's (3-digit NAICS) industry. We use a leave-out measure to capture plausibly *exogenous* demand changes outside the employer's own state. Our findings demonstrate that on average, a positive (negative) 10 percentage point national industry shock increases (decreases) employment in an industry by 9 percentage points. We exploit differences in experience rating arising across states and industries, as outlined above, and find that employment is less responsive to national shocks when firms face more exposure to experience rating. The average marginal tax cost (a firing

penalty equal to $100 per worker for a 10 percent layoff) reduces employers' downsizing by 9-11 percent. That is, if a 10 percent shock would have reduced employment by 9 percent without experience rating, the average exposure to experience rating reduces the response to 8 percent.

With the usual caveats about external validity, we use our estimates to calculate how much experience rating stabilizes employment in the United States. We find that experience rating saved 161,000 jobs in the 2001 recession (4 percent of UI claims), and 649,000 jobs in 2008 (12 percent of UI claims). Several states suspended experience rating during pandemic lockdowns. If they had not, experience rating might have saved a total of 832,000 jobs during the pandemic contraction (14 percent of UI claims). There is also substantial variation in experience rating, as the standard deviation in the marginal tax cost is nearly half as large as the mean. If states below the mean increased their experience rating to the mean, the average marginal tax cost would rise and 18 percent more jobs would be saved during contractions.

We also examine dimensions of heterogeneity in the effect of experience rating on firm adjustment. Experience rating dampens adjustments to negative shocks, but not positive shocks. What this suggests is that experience rating increases employment during downturns without a symmetric reduction in employment during expansions. We also find more pronounced dampening effects in *less* risky industries. This suggests that high risk businesses are more likely to ignore marginal UI taxes when making separation decisions. The point estimates are also more than 60 percent larger in benefit-ratio states, compared to reserve ratio states, where our measure is a better approximation of total tax costs. This difference may arise from the greater persistence of tax increases in reserve ratio states, which we discuss in the following section. This also implies our marginal tax cost for reserve-ratio states is measured with some error, so our estimated stabilization effects are likely understated.

We contribute to previous work using quasi-experimental methods to estimate the macroeconomic effects of experience rating on labor demand. Lester and Kidd (1939) first discussed the diverse implications of experience rating in the labor market. The modern lit-

erature begins with Feldstein (1976) who presents a model that imperfect experience rating implicitly subsidizes—and increases—unemployment through temporary layoffs. Feldstein (1978) substantiates the model with data and finds that layoff subsidies through imperfect experience rating are responsible for half of temporary-layoff unemployment (where half of unemployment was from temporary layoffs at the time).

Later work by Topel (1983) and Card and Levine (1994) provides further support to Feldstein's hypothesis. Topel finds that layoff subsidies by incomplete experience rating increase temporary-layoff unemployment by 30 percent. Card and Levine find that experience rating is associated with lower rates of temporary layoff, especially in recessionary years, and less seasonal fluctuation in temporary layoffs. Anderson (1993) expands the scope to look beyond temporary layoffs. She combines a model of employment adjustment with administrative data and documents that greater ER leads to less seasonal adjustments in employment. In later work, Anderson and Meyer (2000) examine Washington state's adoption of experience rating in 1985 on labor demand and wages, finding that industry-level tax hikes are passed on to workers in the form of lower wages and experience rating reduces worker turnover.

One difficulty when studying UI taxes is that major policy changes are rare. Recent literature has sought alternative routes to understand the influence of experience rating in the job market. Guo (2021) examines firms with establishments in multiple states to compare behavior across experience rating regimes. She finds that during downturns, manufacturing plants were more likely to exit states with higher UI tax costs. Johnston (2021) exploits the kink in the UI tax schedule using administrative tax data from Florida. He finds that UI taxes reduce hiring and employment, but have no effect on exit or wages. Auray and Fuller (2020) explores the effect experience rating can have on UI claims. Lachowska et al. (2022) uses administrative data from Washington state to measure firm-level take-up and appeal rates. They find that appeals behavior is negatively correlated with worker claim

rates, suggesting firm influence on claiming.[1]

In summary, the previous literature has found that greater experience rating provides the benefit of reducing the prevalence of temporary layoffs, but imposes a cost during economic recoveries, as tax increases cause employers to be more likely to exit and less likely to hire. In this paper, we explore whether experience rating also produces an automatic stabilizing effect during economic downturns, by dampening firms' response to negative shocks. Our outcome of interest is not the prevalence of layoffs themselves, but rather the responsiveness of firms to economic shocks. We also leverage the fact that MTC across states over the past two decades is substantially greater than it has been previously, as some states have indexed their tax bases to grow with average income while many states have not, leading to declining real tax bases over time.

2 Background

Under federal regulation, each state in the U.S. administers a UI program, under which separated workers can receive weekly benefits while they search for new work. Laid-off workers receive a weekly payment that replaces approximately half of their earnings for up to six months in normal times. While workers receive unemployment compensation, they are required to check in with the state agency each week to update their employment status (whether they have found a new job) and some states require updates about the claimant's job-search activities. In 2019, the year prior to the Covid-19 pandemic, over 5 million Americans received UI benefits, constituting an average weekly payment of $370, with substantial variation across states. And after the onset of the pandemic, 24 million Americans received UI benefits in the first half of 2020.[2]

When workers receive UI benefits, payments to workers are charged to the account of

[1]For interested readers, Guo and Johnston (2021) provide a broader discussion of the literature examining UI experience rating in the labor market.

[2]Quarterly data on First Payments from the US Department of Labor (`https://oui.doleta.gov/unemploy/data_summary/DataSum.asp`).

their former employer, operated by each state's department of labor. The firm pays a *variable* payroll tax that is designed, approximately, to recover the cost of benefits paid out to the firm's former employees.

Figure 1 illustrates a sample UI tax schedule for the state of Florida, which uses a Benefit Ratio formula. Tax rates rise linearly with the benefit ratio until the rate would exceed the maximum, generating a kink in the tax schedule. The slope is defined by a yearly updated parameter that state bureaucrats select, and in some years the slope increases dramatically to stabilize a flagging trust fund. The slope of the tax schedule denotes the rise in UI tax rates for each percentage point increase in the employer's Benefit Ratio, defined below.

$$BR_{ft} = \frac{\sum_{i=-3}^{-1} Claims_{f,t-i}}{\sum_{j=-3}^{-1} TaxablePayroll_{f,t-j}}$$

The numerator sums the total UI benefits claimed by the firm's employees over the last three years, and the denominator sums the total taxable payroll in the last three years. Intuitively, firms with relatively more workers who claim UI benefits for a long time will have large values in the numerator, while their counterparts with few layoffs have low values. As this equation shows, a layoff will typically increase a firm's tax rate for three years. Some benefit-ratio states have a longer five-year look-back period, meaning a layoff will elevate a firm's tax rate for five years. After the look-back period has passed, the layoff no longer affects firm tax rates in benefit-ratio states.

Another experience-rating regime many states use is the Reserve Ratio system, defined below. The key difference from the Benefit Ratio is the persistence of UI claims in the numerator of the tax formula.

$$RR_{ft} = \frac{\sum_i Contributions_i - \sum_i Claims_{f,t-i}}{\frac{1}{3}\sum_{j=-3}^{-1} TaxablePayroll_{f,t-j}}$$

In Reserve Ratio states, each employer has a running reserve balance, equal to all previous UI contributions (taxes paid) minus all previous UI claims. This balance can be

positive or negative, with negative balances resulting in tax rates close to the maximum. This means that a large layoff will increase a firm's tax bill for many more years than in benefit ratio states, where claim history is automatically erased after the three year look-back period. Figure 2 illustrates a sample UI tax schedule for Missouri, which uses a Reserve Ratio formula. Here and in other Reserve Ratio states, the tax changes in a step function with the Reserve Ratio, with larger discontinuities if the firm's account is negative. Either the Benefit or Reserve Ratio formulas are used in all but three states in the U.S.

Thus experience rating in UI presents policymakers with a tradeoff. The benefits of experience rating centers on the fact that layoff taxes serve as a Pigouvian tax that corrects the fiscal externality of layoffs. Experience rating stabilizes employment, gives employers an incentive to flag ineligible UI claims, and prevents employers from using unemployment insurance to provide paid vacation for employees at the expense of the community (Doornik and Schoenherr, 2020). The costs of experience rating is that it tends to increase taxes on firms that are already struggling, that taxes fall most heavily on middle-class employing employers (like construction and manufacturing), and that firms may discourage eligible workers from claiming benefits (Auray and Fuller, 2020; Lachowska et al., 2022). Another concern is that experience rating may cause employers to avoid hiring workers that are prone to layoff, or those that when dismissed are likely to remain unemployed for long periods of time and thus accrue a large tax bill. A core criticism of experience rating is that it internalizes the negative externality of layoffs but fails to internalize the positive externality of employment.

Penalties for layoffs vary substantially, primarily due to (1) differences in state policy and (2) a firm's placement on the tax schedule.

First, because UI is administered at the state rather than federal level, states vary considerably in the way they tax firms to finance UI. Chief among these factors is the taxable wage base and the maximum tax rate.[3]. A simple measure of exposure to experience

[3]States also can vary in the slope of their tax schedule, and either "overcharge" or "undercharge" relative to the costs of marginal layoffs. States are brought to overcharging when their funds are strained.

rating is the state's maximum rate multiplied by its taxable wage base. This product reflects the highest possible per-worker penalty born by individual firms in the state. For example, California currently has the lowest possible taxable wage base ($7,000 per worker per year) and maximum rate (5.4 percent). Therefore, the maximum penalty a Californian firm can pay for layoffs is $7,000 \times 5.4\% = \$378$ per worker. By contrast, neighboring Oregon has a taxable wage base of $47,700 and a maximum rate of 5.4 percent, so the maximum a penalty a firm in Oregon can pay is $47,700 \times 5.4\% = \$2,576$ per worker—seven times more than the penalty possible in California. Raising either the maximum tax rate or the taxable wage increases the possible penalty proportionately. Another state-specific factor affecting the potential penalties employers face is the generosity of UI benefits— more generous benefits mechanically translate into higher potential benefit charges from laid off workers. In 2019, maximum weekly benefits ranged from a low of $235 in Mississippi to a high of $795 in Massachusetts.

Second, exposure to experience rating varies substantially, even within a state, based on a firm's placement on the tax schedule. Firms close to the minimum rate can face the full penalty, and potential penalties fall as the firm approaches the maximum rate. Once a firm is at the maximum rate, added layoffs impose no immediate marginal tax cost.[4] Thus firms that routinely lay off workers (including seasonal employment) will consistently be close to the maximum rate, leading to minimal threat of additional tax increases. We harness both dimensions of variation in experience rating to understand how it affects the firm decision to downsize.

Experience rating acts as a classic Pigouvian tax, internalizing the fiscal costs of unemployment insurance to the firms that generate layoffs, which encourages more socially efficient decisions. In the presence of exogenous negative shocks, firms may have strong private incentives to reduce costs by downsizing their workforce. It may be, however, that

[4]In states that use a benefit ratio system to assign tax rates, charges fall off a firm's balance usually after three years. A firm could be at the maximum rate this year, so additional layoffs wouldn't have an immediate impact on the firm's tax rate, but it could have an effect after old charges are removed from the firm's account.

experience rating helps to blunt the influence of downturns by encouraging firms to maintain some of the employees that they would have otherwise let go. Understanding the degree to which experience rating buttresses employment during downturns is the object of this paper.

3 Data

We use employment data from the public-use Quarterly Census of Employment and Wages (QCEW), for the period 2001 to 2019. We start in 2001 because it is the first available year of UI tax data by NAICS industry, and we end our analysis with the last year prior to the Covid-19 pandemic. The QCEW is sourced from state unemployment insurance programs, and reports establishment counts, employment, UI tax contributions, and taxable wages. Dividing tax contributions by taxable wages allows us to calculate average industry tax rates for each geographic area.

Observations are reported at multiple levels of aggregation, and for our analysis we use employment counts at the state-by-3 digit NAICS level. Cells with too few establishments to pass disclosure requirements are withheld, and we also exclude Public Administration. To prevent industries from entering and exiting the sample endogenously, we drop any state-industry cells that do not have a continuous panel of non-missing data. We also drop any industry for which a single state ever accounts for more than 30% of national employment. This drops a total of 14 (15% of) industries, most of which are very small and/or industries with missing data, and results in 79 3-digit industries remaining in our analysis.

While our QCEW data spans all 50 states plus Washington D.C, empirical tax schedules are sourced from the Department of Labor's ETA 204 Experience Rating Reports, and are not available for all years and states.[5] Thus our analysis sample of QCEW data matched to state tax schedules includes 46 out of 51 states, and 85% of state-years, as some states failed to report in certain years. Completely missing states are Alaska, Delaware, North Carolina, North Dakota, and Oklahoma; Because Alaska, Delaware, and Oklahoma use neither a

[5]ETA 204 reports can be accessed at `https://oui.doleta.gov/unemploy/DataDownloads.asp`.

Benefit Ratio nor Reserve Ratio formula, they are not required to report to the Dept of Labor.

Figure A.1 illustrates the composition of our analysis sample, by state. Of the 46 states in our sample, nine have full industry coverage throughout the sample period (79 industries up to 2006, and 78 industries thereafter), and only nine states have more than 10% of industry-years missing. Missing industry-years is highly correlated with state population, as there is a disclosure threshold for the public-use QCEW. However, full coverage of MTC information is only available for 26 states. Figure A.2 illustrates the composition of our analysis sample, by NAICS sector. Agriculture is the most underrepresented sector, with only 63% of its industries reporting employment at the state level; Mining is the second most underrepresented, with 81%, following by Information with 83%.

Table 1 provides summary statistics of our state-industry analysis sample. There are a total of 226,687 state-industry-year-quarter cells, comprised of 46 states, up to 72 quarters, and up to 79 industries. There is substantial variation in employment counts, both due to state population and industry size. Therefore, we estimate regressions weighting by employment, since state-industry cells with greater employment will reflect the employment decisions of a greater number of employers. Taxable wages are also relatively low, making up only 36% of earnings on average; this is because while average annual earnings are around $52,000, the average state tax base is only $16,524. Recall how California has the lowest possible tax base of $7000, while Oregon's tax base is $47,700.

4 Research Design

Our goal is to estimate whether a firm's employment decisions are influenced by the degree of experience rating in their UI tax rates. If laying off workers subjects the firm to large potential tax increases, will this dampen their responses to negative labor demand shocks?

4.1 Measuring Marginal Tax Costs

To create a well-defined measure of experience rating, we calculate the one-year marginal tax cost (MTC) of laying off 10% of average employment. This definition of a MTC is consistent with the measure proposed by Pavosevich (2020), which combines the state tax formula with expected UI benefit claims. It is important to note that because the MTC is only calculated for the first year, this measure is a *lower bound* of the potential UI tax costs from a layoff; in actuality, a layoff resulting in UI claims will result in tax increases for at least three consecutive years (in benefit ratio states) if not longer (in reserve ratio states). However, should employers heavily discount the future, this one-year MTC is a good indication of the short-run tax increases they expect to face, and will be strongly positively related to the actual present value of the tax cost.

Because both the BR and the RR are only a function of actual UI benefit claims, there does not exist a one-to-one relationship between layoffs and tax increases. Therefore, we make assumptions about how likely laid off workers are to claim UI benefits, and for what benefit duration. Although UI benefit claiming will vary across states and across the business cycle, our baseline calculation assumes benefit-eligible weekly earnings of \$870 (the nominal average in our sample), a constant 32% take-up rate, and a duration of 16 weeks (both of which are chosen to equal the US average during our sample period).[6]

Assuming stable employment over the past 3 years, the one-year MTC for industry k in state s at time t is then calculated as follows:

$$\begin{aligned} MTC(\tau)_{skt} &= \Delta BR_{st} * slope(\tau)_{skt} * TaxBase_{st} \\ &= \frac{0.1 * Emp * E[Claims]}{3 * TaxBase * Emp} * slope(\tau) * TaxBase \\ &= \frac{0.1 * E[Claims]_{st}}{3} * slope(\tau)_{skt} \quad \text{where } E[Claims] = 0.32 * benefit_{st} * 16 \end{aligned} \tag{1}$$

[6]Quarterly UI Data from: `https://oui.doleta.gov/unemploy/data_summary/`

The ΔBR denotes the change in benefit ratio from a 10% layoff, which produces expected UI claims of $E[Claims]$. States with Reserve Ratio formulas will have a similar calculation, using ΔRR instead of ΔBR, except the denominator is made up of *average* payroll over the last three years, rather than the total. The MTC is a function of the current tax rate τ because $slope(\tau)$ depends on the employer's current position on the UI tax schedule (which we define as the average industry tax rate).

Using empirical tax schedules collected from states by the U.S. Department of Labor, we estimate the slope of the tax schedule at each tax rate τ (in 10th's of a percent). Figure 3 displays the variation in tax schedule slopes across Benefit Ratio states in 2014, as a function of the tax rate. While the majority of these tax schedules have a constant slope, like the example graph shown for Florida, some states - such as Iowa, South Carolina, and Vermont - have nonlinear schedules that are a function of a firm's current tax rate. The slopes of state tax schedules may also vary over time; for example, in 2014 Florida's tax schedule had a constant slope of 1.75 for firms that fall below the maximum tax rate, but in 2018, the slope was close to 1.

Figure 4 displays the variation in slopes for Reserve Ratio states, which tend to have flatter slopes. While Benefit Ratio slopes range from 1 to 3, Reserve Ratio slopes rarely exceed 1. This is largely due to the persistence of benefit claims in Reserve Ratio formulas. While Benefit Ratio formulas only include UI claims made in the last three years (and in some states up to five years), UI claims appear permanently in Reserve Ratio formulas, as firms will continue to have a negative reserve balance until all of their previous UI charges have been repaid through tax contributions; this disparity is not captured by the simple one-year MTC measures we calculate.

Employers already at the maximum rate will experience a slope of zero despite an increase in their benefit ratio. And for τ close to the maximum, we bound the MTC by the distance to the state maximum tax rate. Thus, states with a steep tax schedule and/or with high maximum tax rates will have higher values of MTC on average. Moreover, within

the same state, a firm that is close to the maximum tax rate will have a lower potential penalty. In our analysis sample, approximately 1.6% of state-industry cells are impacted by the maximum rate cutoff in any given year; the share impacted is highest in 2010-2011 when it was over 4%, and is lowest in 2001-2003 (less than 0.5%).

There is considerable variation in the value of the MTC, from a 10th percentile of $40 to a 90th percentile of $143 (in 2018 dollars). In our analysis sample, the mean employment-weighted one-year MTC from a 10% layoff is $92. This means that on average, a 10% layoff is expected to increase next year's UI tax costs by $92 per worker in 2018 dollars. Figure 5 plots the mean per-worker UI tax and MTC, by NAICS sector. Averaging across all states, there is not much correlation between MTC and average taxes paid. This is because the majority of states have constant slopes, and in most years very few industries are close enough to the maximum for it to be binding. But in Indiana, which has a nonlinear tax schedule (Panel B), we see that industries close to the maximum tax rate also have lower MTC's. Manufacturing, mining, and construction industries pay the highest average UI taxes per worker, and also have the lowest per-worker marginal tax costs, as these firms are bound by the maximum tax rate. Meanwhile, stable industries such as education and health care tend to have high MTC's because their tax rates are close to the minimum. For high turnover sectors such as hospitality, food, and retail trade, the low UI tax costs are primarily due to low take-up rates of UI.

4.2 Calculating economic shocks

To estimate firms' responses to an exogenous shock to labor demand, we also construct national measures of industry employment change. For each state-by-3-digit NAICS industry, we generate leave-one-out national measures of employment change using monthly employment from the QCEW. We define $ownind_{skm}$, which measures the shock to a given 3-digit industry k in state s based on the rest of the nation's year-over-year industry growth

from month t in a given year to month $t+1$ in the following year.

$$ownind_{skt} = 100 * \frac{E_{sk,t+1} - E_{skt}}{(E_{skt})} \quad \text{where } E_{skt} = \sum_{i!=s}(employment_{ikt})$$

Thus $ownind_{skt}$ calculates year-over-year percentage changes of national employment, leaving out the own state's employment in that industry. These measures are initially constructed at the monthly level, before quarterly measures are calculated by taking the average of the monthly measures. In the rest of the analysis, t refers to a given year-quarter rather than year-month. Figure 6 assesses the correlation between the calculated industry employment shocks and the actual industry employment change in each geographic area. The two measures are highly correlated; a one percentage point national industry shock results in 89% pass-through to industry employment at the state level. This suggests that local industry employment is highly responsive to the industry's national employment shocks.

4.3 Estimating Equation

To identify the impact of experience rating on the sensitivity of employment to economic shocks, we measure year-over-year employment changes (from quarter t to the same quarter the following year) for each quarter in our sample period from 2001 to 2018. We then estimate the following regression specification:

$$Emp\Delta_{skt} = \alpha_k + \delta_s + \gamma_t + \beta_0 ownind_{skt} + \beta_1 MTC_{skt} + \beta_2(MTC_{skt} \cdot ownind_{skt}) + \varepsilon_{skt} \quad (2)$$

Here t denotes year-quarter, k denotes industry, and s denotes state. MTC_{kst} varies not only by state and quarter but also by industry, because we use average industry tax rates from the QCEW to identify where the average firm lies on the tax schedule. The coefficient of interest is β_2, which measures the additive response from facing a higher marginal tax cost (ie: greater experience rating). The baseline response to a 1 percentage point national industry shock is estimated by β_0. A key identifying assumption of this approach is that

the value of the current MTC is orthogonal to other unobserved factors that might influence employment changes in the state-industry cell, after controlling for state, industry, and year-quarter fixed effects. To the extent that an industry's position on the tax schedule (and thus MTC) is influenced by current economic conditions, we also test robustness to the inclusion of industry-by-year fixed effects.

5 Results

Table 2 reports regression estimates from Equation 2. Column 1 estimates that the average one-year MTC of $92 lowers responsiveness to national shocks by 0.083 percentage points, or 9% relative to the β_0 estimate ((0.92*0.0906)/0.964). Additionally, one standard deviation increase in MTC lowers responsiveness to national shocks by 0.04pp, or 4%. To account for potential correlation between MTC and economic conditions, as downturns move firms up the UI tax schedule, we include industry-by-year fixed effects in the following columns. We also estimate specifications with state-by-industry and state-by-year fixed effects, and our estimates of β_2 remain quite stable across these additional specifications, providing additional evidence that in states where industries face high marginal tax costs, responsiveness to the national economic shock is dampened.

We also explore heterogeneity of firm responses using subgroup analysis. Table 3 reports regression estimates along three dimensions of heterogeneity: (1) how experience rating affects adjustment when shocks are positive or negative, (2) in high- and low-risk industries (based on average tax rates), and (3) whether the state uses a Reserve Ratio or Benefit Ratio formula.

Columns 1 and 2 show that the impact of the MTC is asymmetric: UI reduces downsizing during contractions, but does not reduce growth during expansions. Whereas a standard model of the labor market would imply that firing costs reduce employment in equilibrium, this finding suggests that experience rating actually increases employment over the business

cycle. The coefficient difference in the two samples is significant at the 10 percent level with a t-statistic of 1.8.

In Columns 3 and 4 we compare industries that are at greater risk of layoffs to those that have more stable employment. We define a quarter of industries as high risk by whether their UI tax rates fell within the top quartile of industry rates. Examples of high risk industries include all industries in the construction sector, ground transportation (which includes school bus drivers), and administrative and support services (which includes temporary help services). These high risk industries, which tend to be seasonal in nature, are undeterred by experience rating; they downsize when needed regardless of the MTC. Removing them from the sample actually magnifies the impact of the MTC in deterring layoffs. Among low risk industries, the average one-year MTC of $94 lowers responsiveness to national shocks by 0.14 percentage points, an over fifty percent increase in magnitude relative to our baseline estimate.

Finally, Columns 5 and 6 test for differential responses to Benefit Ratio versus Reserve Ratio formulas. The estimated magnitude is larger for Benefit Ratio states, but the estimate is more statistically significant in Reserve Ratio states. As previously discussed, we expect the MTC to be underestimated for Reserve Ratio states, as the persistence of tax increases cannot be captured by our one-year measure.

A potential concern with our MTC measure is that it does not fully capture the impact of a state's maximum tax rate on experience rating, as it does not account for larger layoffs (our measure is defined for a 10% layoff with incomplete take-up). To account for this, we construct an alternative one-year MTC that now assumes full take-up of UI benefits. This essentially magnifies the marginal tax cost of layoffs, making it easier for firms to hit the maximum tax rate and face no additional increases. Whereas distance from the maximum only affected 1.6% of observations in our previous MTC measure, distance from the maximum now affects 12% of state-industry cells. The mean MTC is now $266, over double the size of the original mean. Table A.1 reports estimates using this alternative MTC measure, and

our previous conclusion still holds. For the average industry, experience rating dampens the responsiveness to economic shocks by 0.13 percentage points (2.66*0.0521), a larger effect than our baseline estimates.

A final exercise we undertake is to estimate a horse race comparing the impact of marginal tax costs with two other dimensions of the state tax schedule, the maximum tax or the taxable base. We calculate the maximum tax by multiplying the tax base by the maximum rate, and consider it a measure of the costliness of large layoffs. Likewise, the tax base could potentially influence employment decisions, as previous work has shown higher tax bases increases low-wage employment (Huang (2020), Duggan et al. (2022)). Table A.2 reports estimates for both the original employment change outcome, as well as the change in quarterly establishment counts. Columns 1 and 2 show that after including either the maximum tax or the tax base as additional interactions, the coefficient on the MTC interaction is still significant and virtually unchanged in magnitude (compared to Column 1 of Table 2). Columns 3 and 4 test for impacts on establishment entry or exit by estimating regressions of year-over-year percentage change in the number of establishments in each state-industry cell. We find no significant impact of the MTC, and there is suggestive evidence that greater maximum taxes and tax bases amplify the impact of industry shocks on establishment growth, although the estimates are not statistically significant. This is consistent with the finding in Guo (2021) that firms are more likely to exit from high tax states during economic downturns.

6 Conclusion

In the United States, unemployment insurance is financed with experience-rated employer payroll taxes that increase to reflect the cost of UI benefits claimed by laid off workers. Experience rating internalizes the fiscal costs of laying off workers to the firms who choose to lay them off. On the other hand, state maximum tax rates cap the potential penalty firms

face, in order to insure them from particularly negative shocks (which results in a zero MTC beyond a certain point). Insurance versus Internalization is a key trade-off governments face when designing UI financing schemes. In this paper, we examine whether the internalization of layoffs helps stabilize labor demand during economic contractions. Precisely, whether experience rating reduces firm responses to exogenous shocks.

We combine detailed tax-schedule data for each state with the average tax rates of firms in each state-industry cell to calculate the marginal tax cost of an additional 10% layoff. This measure allows us to compare how firms react to exogenous shocks in environments with higher and lower penalties for layoffs. As a benchmark, we find that a 10 percent (negative) shock reduces employment by 9 percent. In the presence of the average level of experience rating ($100 per worker for a 10% layoff), employment reductions are 9 percent smaller, therefore aiding in stabilizing employment. Back-of-the-envelope estimates imply that experience rating prevented the layoffs of 649,000 workers in 2008, which was about 12 percent of claims or 6 percent of the unemployed population. It appears that experience rating is a stabilizing force over the business cycle.

There are two key limitations of our work. The first is that marginal tax costs are measured with error. In some states, tax increases last for no more than three years whereas in other states tax increases can last indefinitely, until the employer has paid back the cost of benefits. Our measure does not account for these differences in the *time* a firm's rate is elevated, which means that we likely suffer a kind of measurement error that biases our estimates toward zero. It may be that we underestimate the true effect of experience rating in attenuating firm responses to shocks.

The second limitation is that we are not able to fully examine potential costs of experience rating that could be destabilizing. For instance, experience rating allows taxes to rise more on ailing businesses that dismiss workers. It may be that experience rating increases the exit rates of firms that would otherwise be viable producers and employers. We explore this by measuring whether experience rating also lowers establishment growth in the wake

of negative shocks, but are unable to find conclusive evidence.

A more comprehensive analysis of the benefits and costs of alternative UI financing represents an important direction for future research. The design of UI financing may be just as important for labor market outcomes over the business cycle as that of UI benefits. A voluminous literature has explored this issue on the benefit side – for example the tradeoffs of a high versus low replacement rate or maximum duration of benefits. However, the current variation in UI financing across the United States is even greater than the variation in UI benefits. This is likely driven by policy uncertainty over the optimal design, and has resulted in large funding shortfalls in many states that are not sustainable in the long term.

References

Anderson, P. M. (1993), Linear adjustment costs and seasonal labor demand: Evidence from retail trade firms, *Quarterly Journal of Economics* **108**(4), 1015–1042.

Anderson, P. M. and Meyer, B. D. (2000), The effects of the unemployment insurance payroll tax on wages, employment, claims and denials, *Journal of Public Economics* **78**(1), 81–106.

Auray, S. and Fuller, D. L. (2020), Eligibility, experience rating, and unemployment insurance take-up, *Quantitative Economics* .

Card, D. and Levine, P. B. (1994), Unemployment insurance taxes and the cyclical and seasonal properties of unemployment, *Journal of Public Economics* **53**(1), 1–29.

Doornik, B. V. and Schoenherr, D. (2020), Strategic formal layoffs: unemployment insurance and informal labor markets, *Working Paper* .

Duggan, M., Guo, A. and Johnston, A. C. (2022), Would broadening the ui tax base help low-income workers?, *AEA Papers and Proceedings* **112**, 107–11.

Feldstein, M. (1976), Temporary layoffs in the theory of unemployment, *Journal of Political Economy* **84**(5), 937–957.

Feldstein, M. (1978), The effect of unemployment insurance on temporary layoff unemployment, *American Economic Review* **68**(5), 834–846.

Guo, A. (2021), The effects of unemployment insurance taxation on multi-establishment firms, *Forthcoming at Review of Economics and Statistics* .

Guo, A. and Johnston, A. C. (2021), The finance of unemployment compensation and its consequences, *Public Finance Review* **49**(3), 392–434.

Huang, P.-C. (2020), Employment effects of the unemployment insurance tax base, *Working Paper* .

Johnston, A. C. (2021), Unemployment insurance taxes and labor demand: Quasi-experimental evidence from administrative data, *American Economic Journal: Economic Policy* **13**(1), 266–93.

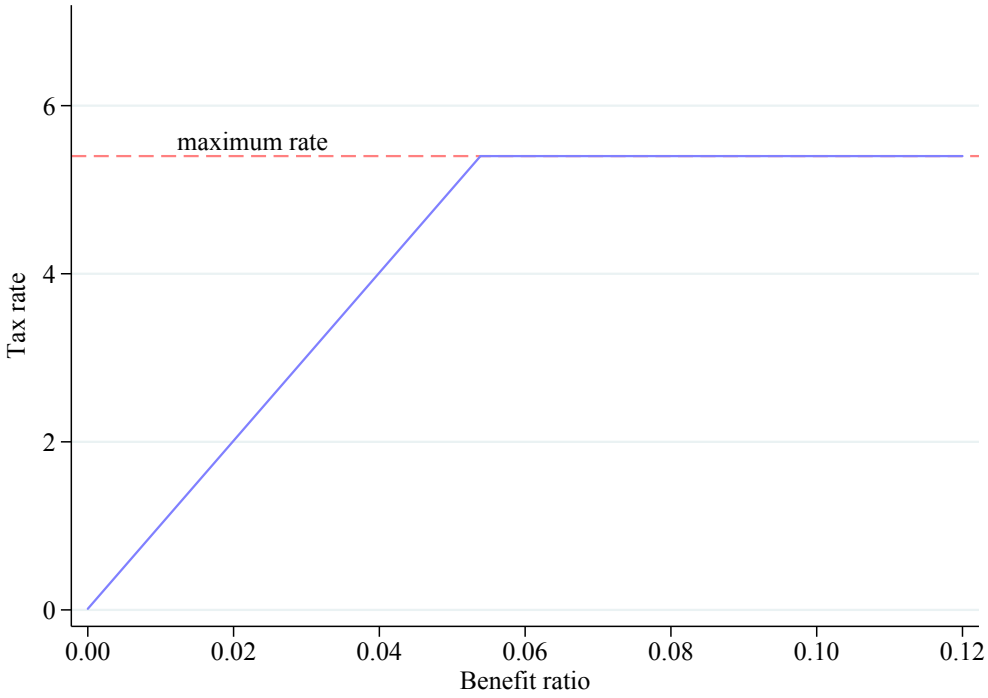
Lachowska, M., Sorkin, I. and Woodbury, S. A. (2022), Firms and unemployment insurance take-up, *NBER Working Paper w30266* .

Lester, R. A. and Kidd, C. V. (1939), *The Case against Experience Rating in Unemployment Compensation*, Princeton University Press, Princeton, New Jersey.

Pavosevich, R. (2020), The cost of layoffs in unemployment insurance taxes, *Monthly Labor Review* .

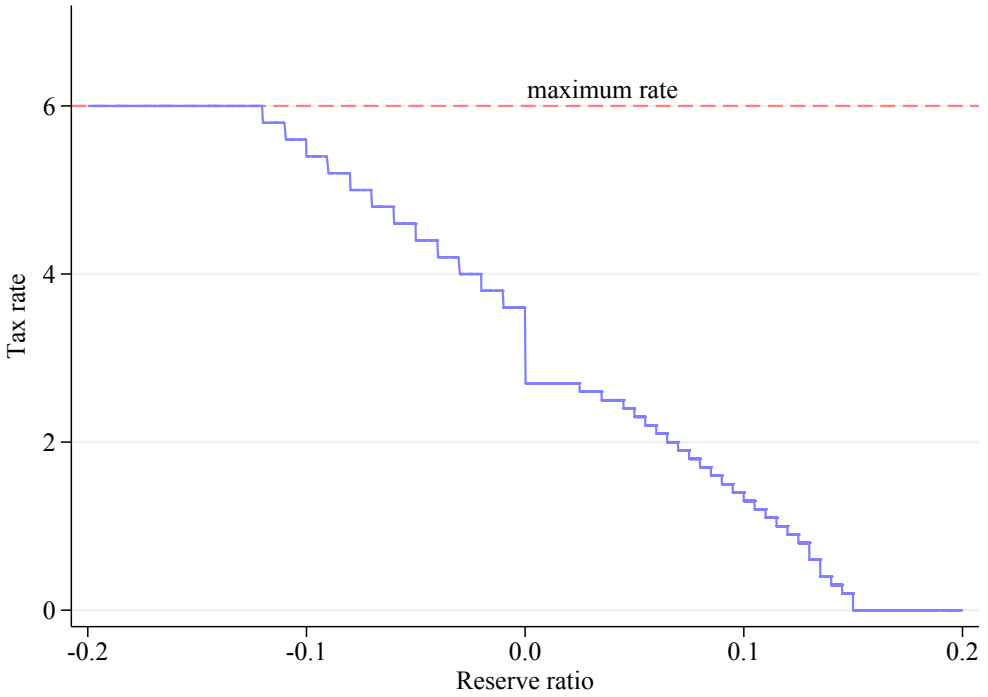
Topel, R. (1983), On layoffs and unemployment insurance, *American Economic Review* **73**(4), 541–559.

Figure 1: Sample Benefit-Ratio UI Tax Formula



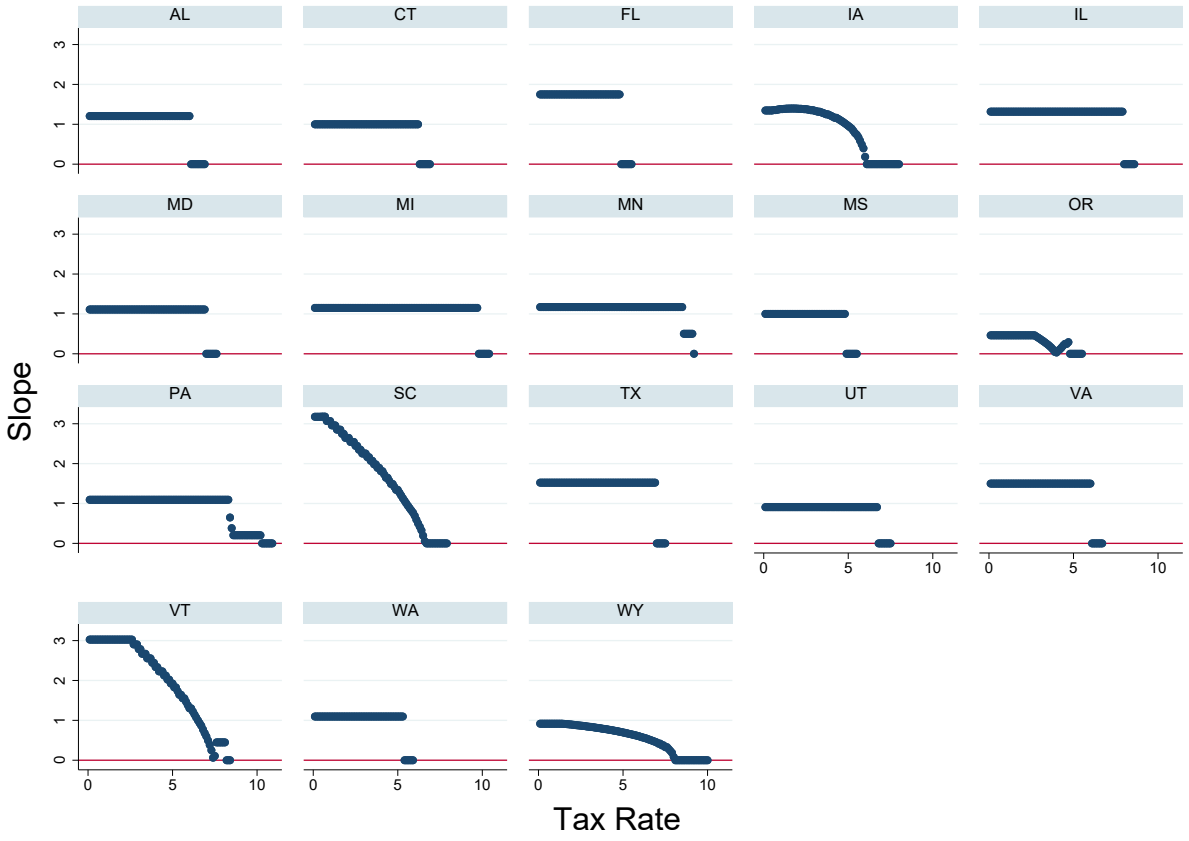
Source: Administrative data from Florida's Department of Economic Opportunity.

Figure 2: Sample Reserve-Ratio UI Tax Formula



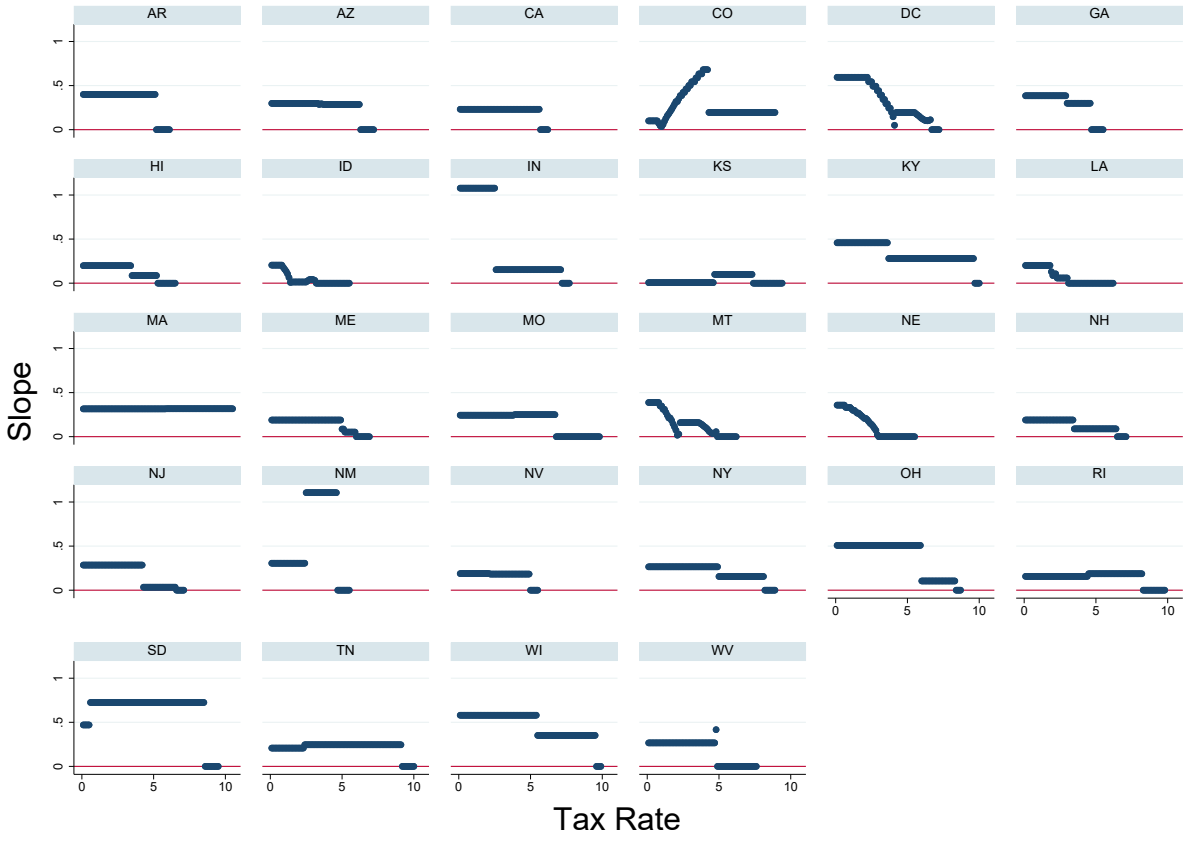
Source: Administrative data from Missouri's Department of Economic Opportunity.

Figure 3: Slopes of Empirical Tax Schedules - Benefit Ratio States, 2014



Source: Dept of Labor 204 Experience Rating Reports. We fit flexible polynomials to each state's empirical tax schedule, and for each potential tax rate (in 0.1% intervals) up to the maximum rate, the corresponding slope is plotted on the y-axis. In tax rate intervals with missing data, slopes are calculated by taking the linear average.

Figure 4: Slopes of Empirical Tax Schedules - Reserve Ratio States, 2014



Source: Dept of Labor 204 Experience Rating Reports. We fit flexible polynomials to each state's empirical tax schedule, and for each potential tax rate (in 0.1% intervals) up to the maximum rate, the corresponding slope is plotted on the y-axis. In tax rate intervals with missing data, slopes are calculated by taking the linear average.

Figure 5: Mean Per-Capita UI Tax and MTC by NAICS Sector - Quarter 1

A. All States



B. Indiana



Average per-capita tax calculated by dividing quarterly UI contributions by employment, in the first quarter of each year. Values are inflation-adjusted to 2018 dollars.

Figure 6: Correlation Between Economic Shock and Employment Change Measures

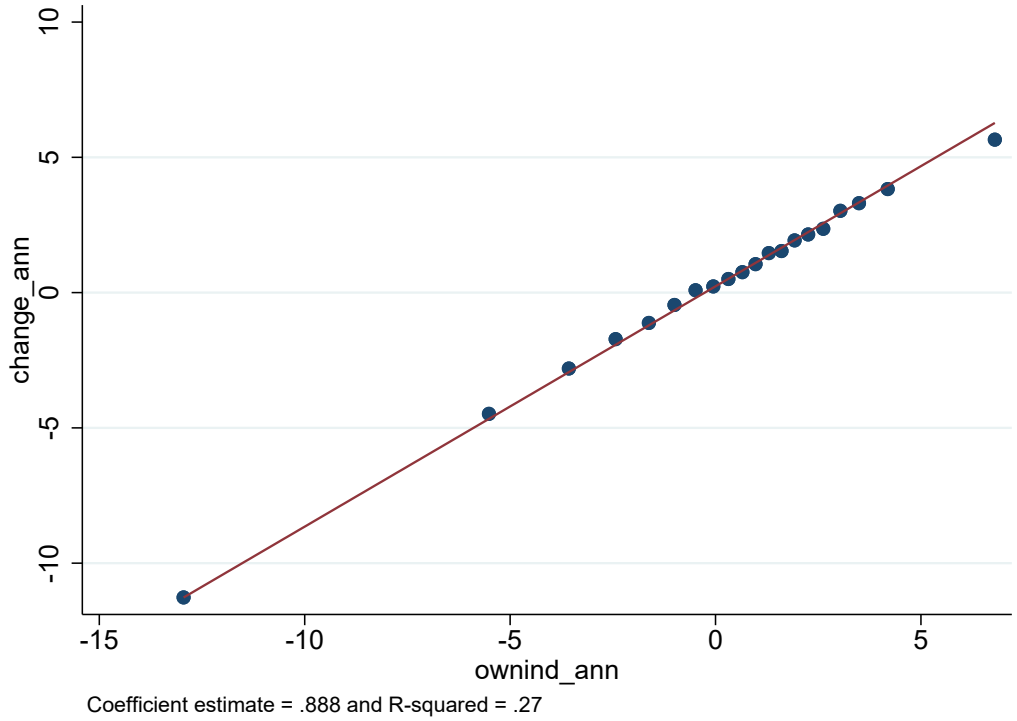


Table 1: Summary Statistics (2001-2018)

	Mean	SD
Total Employment	31,189	66,630
Total Establishments	2,241	7,196
Average Weekly Earnings (2018$)	1,007	528
Employment Change (%)	0.30	7.96
Own Industry Shock (%)	0.077	4.66
Marginal Tax Cost (2018$)	89.38	51.52
Tax Base (2018$)	16,524	9,883
Taxable Wages (%)	35.86	29.54
UI Tax Rate (%)	2.41	0.015
N	226,687	

Observations are at the state, 3-digit industry, year, quarter level.

Table 2: Interaction of Industry Shocks with Marginal Tax Cost (2001–2018)

	Dependent Variable: Employment Change (%)			
	(1)	(2)	(3)	(4)
Industry Shock	0.964***	0.165	0.220	0.205
	(0.0446)	(0.241)	(0.234)	(0.227)
MTC × Shock (100's)	-0.0906**	-0.105***	-0.106***	-0.0860**
	(0.0365)	(0.0364)	(0.0405)	(0.0359)
MTC (100's)	0.0227	0.0652	0.159*	-0.140
	(0.0804)	(0.0756)	(0.0828)	(0.103)
R^2	0.500	0.526	0.563	0.558
Mean of Dep Variable	0.896	0.896	0.896	0.896
ind_year		X	X	X
state_year				X
state_ind			X	
N	226687	226687	226687	226687

Observations at state, 3-digit industry, year, quarter level. Includes state, industry, and year-quarter FEs; weighted by employment. Mean (weighted) MTC = 0.92 and SD = 0.44, inflation-adjusted to 2018 dollars. Robust standard errors clustered at state-industry level in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Subgroup Analysis (2001–2018)

	Dependent Variable: Employment Change (%)					
	(1)	(2)	(3)	(4)	(5)	(6)
	Positive Shock	Negative Shock	High Risk	Low Risk	Benefit Ratio	Reserve Ratio
Industry Shock	-1.276**	0.549***	-0.111	0.114	0.429***	0.170
	(0.633)	(0.0777)	(0.180)	(0.364)	(0.133)	(0.344)
MTC × Shock	0.0538	-0.114***	-0.0591	-0.145***	-0.143*	-0.0873**
	(0.0854)	(0.0402)	(0.0710)	(0.0473)	(0.0804)	(0.0350)
MTC (100's)	-0.214	0.145	0.0243	0.236***	0.418***	-0.00347
	(0.199)	(0.193)	(0.236)	(0.0856)	(0.157)	(0.0974)
R^2	0.368	0.660	0.636	0.525	0.600	0.561
ymean	2.326	-3.152	0.185	1.074	0.960	0.844
mtc_mean	0.920	0.936	0.861	0.939	1.063	0.810
ind_year	X	X	X	X	X	X
state_ind	X	X	X	X	X	X
N	140139	86476	51906	174779	88770	137915

Observations at the state, 3-digit industry, year, quarter level. Includes state, industry, and year-quarter FEs, and weighted by employment. MTC inflation-adjusted to 2018 dollars. Robust standard errors clustered at state-industry level in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

A APPENDIX TABLES AND FIGURES

Table A.1: Interaction of Industry Shocks with Alternate Marginal Tax Cost (2001–2018)

	Dependent Variable: Employment Change (%)			
	(1)	(2)	(3)	(4)
Industry Shock	1.018***	0.217	0.278	0.242
	(0.0572)	(0.224)	(0.217)	(0.207)
MTC × Shock (100's)	-0.0521***	-0.0558***	-0.0587***	-0.0439**
	(0.0177)	(0.0177)	(0.0186)	(0.0195)
MTC (100's)	-0.0213	0.00174	0.00627	-0.0212
	(0.0325)	(0.0309)	(0.0337)	(0.0495)
R^2	0.501	0.527	0.564	0.559
ymean	0.896	0.896	0.896	0.896
ind_year		X	X	X
state_year				X
state_ind			X	
N	226687	226687	226685	226687

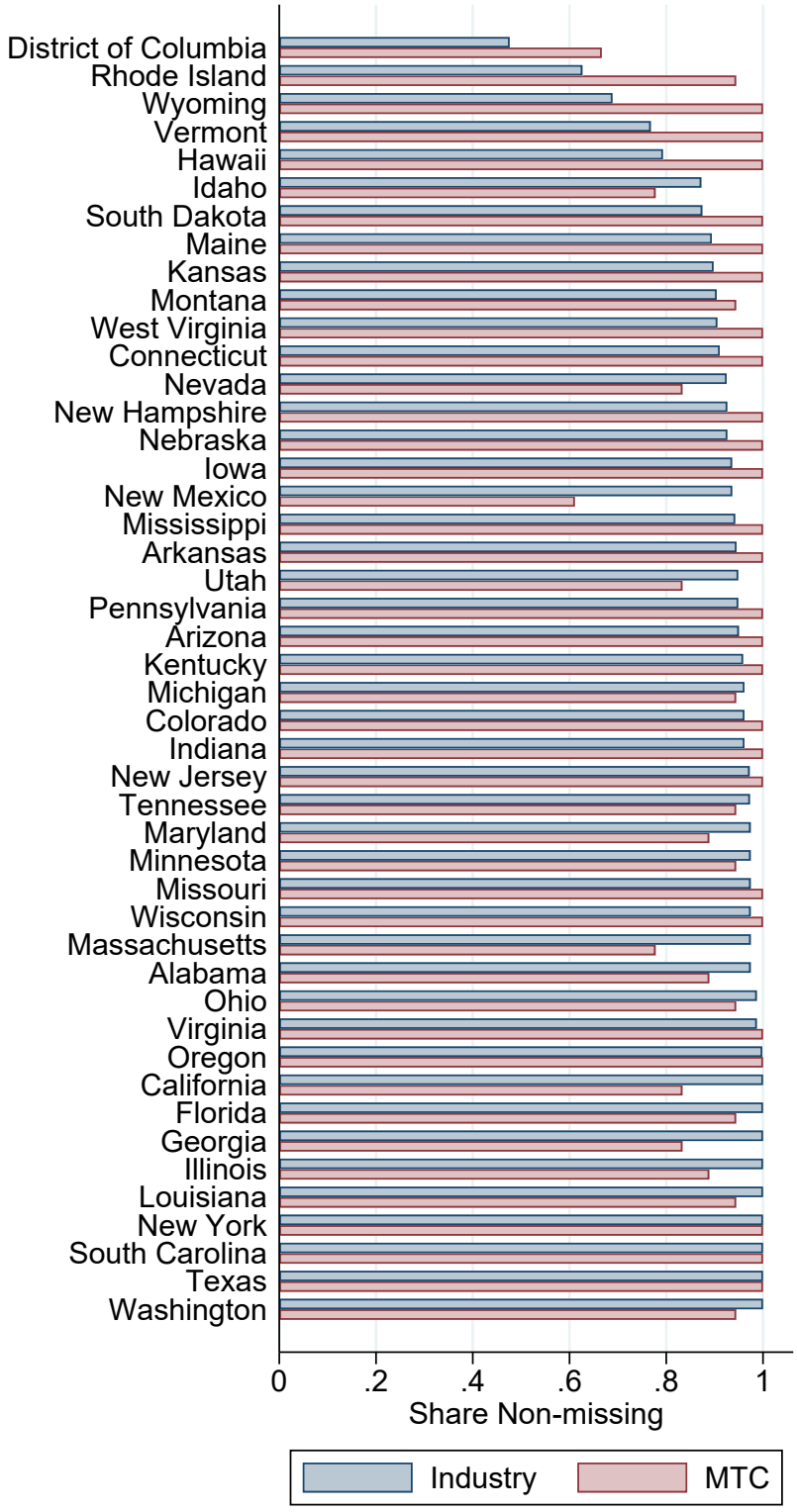
Observations at the state, 3-digit industry, year, quarter level. Includes state, industry, and year-quarter FEs, and regressions are weighted by employment. Alternate MTC measure assumes full takeup of UI benefits. Mean (weighted) MTC = 2.66 and SD = 1.18, and inflation-adjusted to 2018 dollars.
Robust standard errors clustered at state-industry level in parentheses ** $p < 0.05$, *** $p < 0.01$.

Table A.2: Horse Race Between MTC and Max Tax or Tax Base (2001–2018)

	Employment Change (%)		Establishment Change (%)	
	(1)	(2)	(3)	(4)
Industry Shock	1.022***	0.960***	0.353***	0.354***
	(0.0634)	(0.0663)	(0.0521)	(0.0527)
MTC × Shock (100's)	-0.0966***	-0.0899**	0.0140	0.0165
	(0.0370)	(0.0383)	(0.0367)	(0.0367)
MTC (100's)	0.0423	0.0602	0.359***	0.388***
	(0.0812)	(0.0811)	(0.105)	(0.106)
Max Tax × Shock (100's)	-0.00509*		0.00482	
	(0.00287)		(0.00330)	
Maximum Tax (100's)	-0.0103		-0.0220	
	(0.0139)		(0.0211)	
Tax Base × Shock (1000's)		0.000276		0.00340
		(0.00224)		(0.00220)
Tax Base (1000's)		-0.0662***		-0.0930***
		(0.0170)		(0.0237)
R^2	0.501	0.500	0.189	0.190
ymean	0.896	0.896	0.896	0.896
N	226687	226687	226687	226687

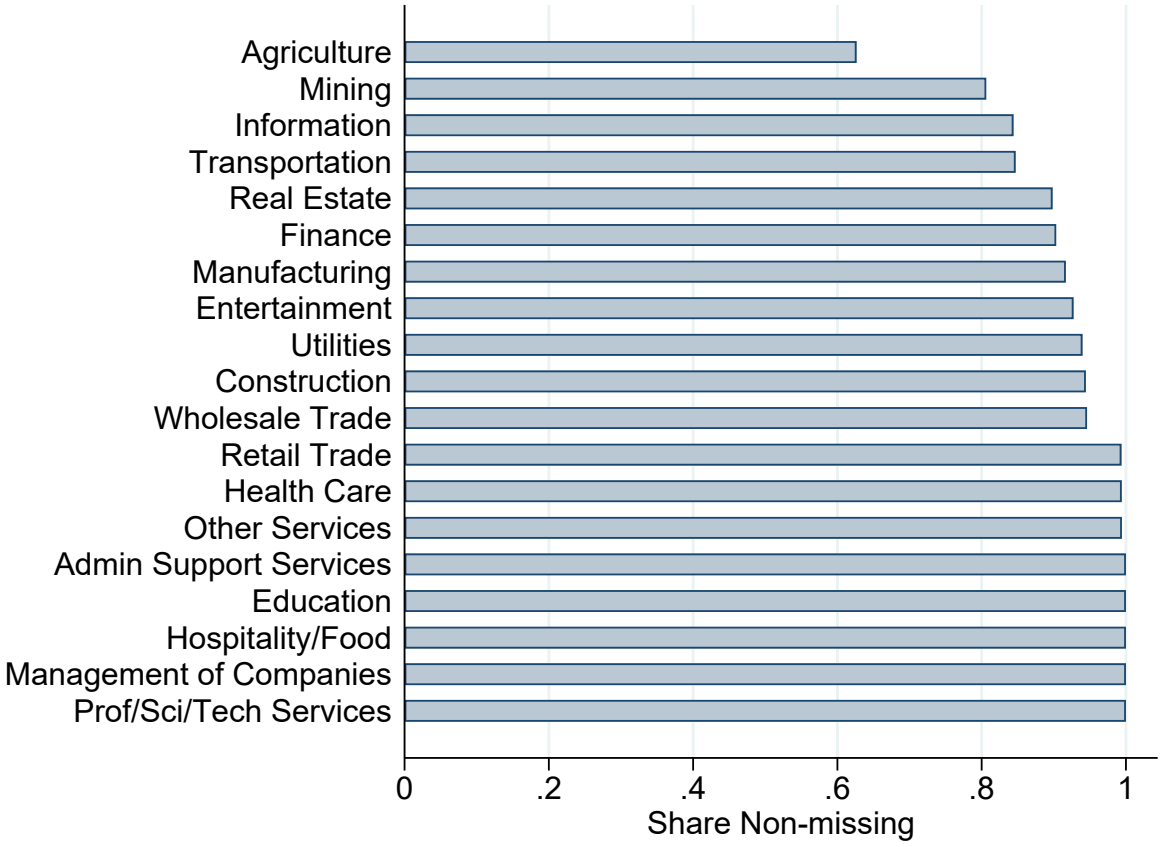
Observations at state, 3-digit industry, year, quarter level. Includes state, industry, and year-quarter FEs, and regressions weighted by employment. Mean (weighted) MTC = 0.92 and SD = 0.44; Mean Max Tax = 10.16 and SD = 6.0; Mean Base = 13.68 and SD = 8.5; all are inflation-adjusted to 2018 dollars. Robust standard errors clustered at state-industry level in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure A.1: Composition of Analysis Sample



For each state in our analysis sample, we plot the share of industries that are non-missing, and the share of years for which MTC information is non-missing.

Figure A.2: Composition of Analysis Sample



We calculate the share of non-missing state-quarters for each 3-digit NAICS industry, and then plot the average of those shares by NAICS sector.