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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 reduces firm adjustment to negative shocks by 11 percent. The results imply experience rating has a stabilizing influence on labor markets. Experience rating saved, for instance, nearly a million jobs in the Great Recession.

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A data appendix is available at <http://www.nber.org/data-appendix/w30651>

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.

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 generosity, 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 \$89 per worker for a 10 percent layoff) reduces employers' downsizing by 9 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.

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 estimated effects are also larger and more statistically significant in benefit ratio states, compared to reserve ratio states, where our measure is a better approximation of total tax costs. This also implies our marginal tax cost for reserve-ratio states is measured with some error, so our estimated stabilization effects are likely understated. Back-of-the-envelope estimates imply that experience rating prevented the layoffs of 852,000 workers in 2008, which was about 8 percent of the unemployed population. Thus it appears that experience rating is a stabilizing force over the business cycle.

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 literature 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 in-

crease 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.

Recent work on UI taxation is relatively sparse, because major policy changes are rare and administrative data is decentralized. 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. 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. Guo (2022) analyzes a set of state-level tax increases that occurred after the Great Recession, and finds that tax increases lowered employment growth within exposed firms. Auray and Fuller (2020) explores the effect experience rating can have on UI claims, and 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. Huang (2022) and Duggan et al. (2022) find that larger UI tax bases increase labor demand for part-time and low-wage workers.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

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

hire. In this paper, we explore whether experience rating also provides the benefit of 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. Another contribution is to create updated measures of the MTC for the last two decades. Variation in UI tax costs has grown substantially since the 1980's and 90's, 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. In order to receive benefits, workers are supposed to substantiate that they are unemployed “for no fault of their own,” usually requiring that the worker was laid off for economic reasons, and neither quit nor was fired for cause.² In 2019, the year prior to the covid-19 pandemic, over 5 million Americans received UI benefits, with 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 2020.³

When workers receive UI benefits, payments to workers are charged to the account of 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. Past work typically finds that the portion of UI taxes that is stable over time and market-wide is borne by employees in the form of lower wages, while the

²Judges often overrule this requirement in practice if the claimant argues that their quit was justified or firing was unjustified.

³Quarterly data on First Payments from the US Department of Labor (https://oui.doleta.gov/unemploy/data_summary/DataSum.asp).

portions of UI taxes that changes over time or varies by firm within a market is born by the firm in lower profits.

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, while a small layoff may only increase taxes for a year. 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 et al., 2022). 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 new hires.

Penalties for layoffs vary substantially across states, because UI is administered at the state rather than federal level. States vary considerably in the way they tax firms to finance UI, primarily through differences in the taxable wage base and the maximum tax rate.⁴ A simple measure of exposure to experience 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

⁴States 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.

possible taxable wage base (\$7,000 per worker per year), with a maximum rate of only 6.2 percent. Therefore, it is easy for firms to hit the maximum rate, and the maximum penalty a Californian firm can pay for layoffs is only $7,000 \times 6.2\% = \$434$ 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—almost six times 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. Meanwhile, minimum benefit eligibility is more similar across states, as most states require less than \$5000 of earnings within the preceding year to qualify for benefits.

Exposure to experience rating also varies, 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.⁵ 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 experience rating helps to blunt the influence of downturns by encouraging firms to maintain

⁵In 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.

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.⁶ Thus our analysis sample of QCEW data matched to state tax schedules includes 46 out of 51 states, and 86% 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 Benefit Ratio nor Reserve Ratio formula, they are not required to report to the Dept of

⁶ETA 204 reports can be accessed at <https://oui.doleta.gov/unemploy/DataDownloads.asp>.

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. Meanwhile, full coverage of MTC information is available for 28 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%, followed by Information with 84%.

Table 1 provides summary statistics of our state-industry analysis sample. There are a total of 228,799 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 \$14,300. Recall how California has the lowest possible tax base of \$7000, while Oregon's tax base is currently \$47,700 as of 2022.

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).⁷

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:

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

⁷Quarterly 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 both the distance to the maximum rate and $slope(\tau)$ depend on the employer’s current position on the UI tax schedule (which we define as the average industry tax rate). We also show robustness to using a measure with full take-up of UI benefits, and any other adjustments to $E[Claims]$, such as increases in duration or benefit generosity, would scale analogously.⁸

Using empirical tax schedules collected from states by the U.S. Department of Labor, we estimate either a linear or cubic best fit line for each UI tax schedule, with the possibility of a discontinuity. Figure 3 displays the variation in tax schedules across Benefit Ratio states in 2014. We plot the empirical average reported by states, as well as the fitted average, as a function of the Benefit Ratio. While the majority of these tax schedules have a constant slope, like the example graph shown for Florida, some states - such as Pennsylvania, South Carolina, and Vermont - have nonlinear schedules. 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. We chose to estimate a constant linear slope for all states, because our analysis is at the industry rather than employer level. With nonlinear schedules, employers within an industry face different slopes depending on where they are located on the tax schedule, so the industry’s average MTC would not be able to capture this non-linearity in slope.

Figure 4 displays the variation in schedules for Reserve Ratio states, which tend to have flatter slopes. While Benefit Ratio slopes range from roughly 0.3 to 3, Reserve Ratio slopes rarely exceed 1. This is largely due to the persistence of benefit claims in Reserve

⁸In robustness checks not reported in the paper, we also scale UI take-up by the benefit generosity in the state (defined as the ratio of the state’s maximum benefit to the average \$435 eligibility). Our results are robust to including this inverse relationship between generosity and take-up.

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. Reserve Ratio states are also more likely to have nonlinear tax schedules with kinks and discontinuous jumps around zero (when a firm moves from a positive to a negative reserve balance). We are not able to capture the impact of being close to this discontinuity, as our analysis averages all employers within an industry; this produces another potential dimension of measurement error in the MTC for Reserve Ratio states.

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 0.5% 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 1.6%, and was close to zero in 2001-2003.

There is considerable variation in the value of the MTC, from a 10th percentile of \$39 to a 90th percentile of \$135 (in 2018 dollars). In our analysis sample, the mean employment-weighted one-year MTC from a 10% layoff is \$89. This means that on average, a 10% layoff is expected to increase next year's UI tax costs by \$89 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, as most tax schedules are linear and very few industries are close enough to the maximum for it to be binding. The construction industry pays by far the highest UI taxes, at over \$700 per worker annually. Meanwhile, stable industries such as education and health care have some of the lowest costs

per worker. 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 m in a given year to month m in the following year.

$$shock_{skmy} = 100 * \frac{E_{skm,y+1} - E_{skmy}}{E_{skmy}} \quad \text{where } E_{skmy} = \sum_{i! = s} (employment_{ikmy})$$

Thus $shock_{skmy}$ 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 $shocks_{skt}$ are calculated by taking the average of the monthly measures (t refers to a given year-quarter). 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:

$$Emp\Delta_{skt} = \alpha_s + \delta_t + \gamma_k * year_t + \beta_0 shock_{skt} + \beta_1 MTC_{skt} + \beta_2 (MTC_{skt} \cdot shock_{skt}) + \varepsilon_{skt} \quad (2)$$

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 how far firms are from the maximum tax rate. 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 . To the extent that an industry’s position on the tax schedule (and thus MTC) is influenced by current economic conditions, we also include industry-by-year fixed effects. 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-year, and year-quarter fixed effects.

Our analysis also assumes that firms bear some of the UI tax burden. If employers were able to pass 100% of UI tax increases through to workers in the form of lower wages, they may not respond at all to experience rating. However, the existing literature on UI tax incidence (Anderson and Meyer (2000), Johnston (2021), Guo (2021)) has found clear evidence of imperfect pass-through at the firm level. In theory, the assignment of firm-specific tax rates prevent firms from fully passing on tax increases in a competitive labor market where there are other firms facing lower rates.

5 Results

Table 2 reports regression estimates from Equation 2. Our preferred specification in Column 2 estimates that the average one-year MTC of \$89 lowers responsiveness to national shocks by 0.09 percentage points, or 9% relative to the β_0 estimate from column 1 $((0.89*0.0986)/0.958)$. Additionally, one standard deviation increase in MTC lowers respon-

siveness to national shocks by 0.04pp, or 4%. Columns 3 and 4 estimate specifications with state-by-industry and state-by-year fixed effects; because our MTC measures do not vary much within a given state and year, the inclusion of state-by-year fixed effects absorbs much of our identifying variation. Nevertheless, the magnitudes 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. Restricting to negative shocks, the average one-year MTC of \$90 lowers responsiveness to national shocks by 0.11 percentage points, an increase in magnitude relative to our baseline estimate.

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 lower risk industries, the average one-year MTC of \$90 lowers responsiveness to national shocks by 0.15 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 and more statistically significant for Benefit Ratio states. As previously discusses, we expect the MTC to be less accurately measured for Reserve Ratio states. Many tax schedules have discontinuous jumps around a reserve ratio of zero, and because reserves are a stock rather than flow, differential 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 or full take-up of UI benefits (our measure is defined for a 10% layoff with a 32% take-up rate). 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 0.5% of observations in our previous MTC measure, distance from the maximum now affects 10% of state-industry cells. The mean MTC is now \$262, almost triple the size of the original mean. Table 4 reports estimates using this magnified 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 (2.62×0.0498), a substantially 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 (2022), Duggan et al. (2022)). Restricting to quarters with negative shocks, Appendix Table A.1 reports estimates for both the original employment change outcome, as well as the change in quarterly establishment counts (to account for exit). 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 statistically significant and very similar in magnitude (compared to Column 2 of Table 3). Columns 3 and 4 test for impacts on establishment exit by estimating regressions of year-over-year percentage change in the number of establishments in each state-industry cell. While we find no impact of the MTC on establishment change, Column 4 suggests that greater tax bases are correlated with greater rates of establishment exit. 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 unemployed 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 industries within a given state are highly responsive to national shocks; a negative (positive) 10 percent national shock reduces (increases) state-level employment by 9 percent. In the presence of the average level of experience rating (\$89 per worker for a 10% layoff), employment reductions are 9

percent smaller, therefore aiding in stabilizing employment. This is also an asymmetric effect, as experience rating preserves employment in response to negative shocks, but does not reduce hiring in the face of positive shocks.

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 231,000 jobs in the 2001 recession, and 852,000 jobs in 2008 (8 percent of the unemployed population).⁹ Several states suspended experience rating during pandemic lockdowns. If they had not, experience rating might have had a similar stabilizing effect during the pandemic contraction.

There are two key limitations of our work. The first is that marginal tax costs are measured with error, especially in states with nonlinear tax schedules. And in some states, tax increases last for no more than three years whereas in other states tax increases persist until the employer has paid back the full cost of benefits. Our measure also 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.

The state-level determination of tax regimes and benefit generosity is beyond the scope of this paper, but one major determinant is the choice of whether to index UI tax bases to average earnings. In the 1970s and 80s, 17 states adopted flexible tax bases that automati-

⁹We arrive at the 2008 estimate by multiplying total civilian employment by our treatment coefficient for negative shocks, mean MTC in 2008, and mean industry shock in 2008. $146,000,000 \times -0.122 \times .87 \times -0.055 = 852,304$. For 2001, the calculation is $129,700,000 \times -0.122 \times 0.975 \times -0.015 = 231,417$

cally increase with earnings growth, and to this day indexed states have significantly larger tax bases than the rest of the nation. Generous UI benefits are also correlated with greater experience rating, although there is substantial excess variation; states that do not collect enough revenues relative to benefits paid end up with insufficiently funded trust funds. By the end of 2020, due to the Covid-19 pandemic, 17 states had depleted their UI trust funds and were required to borrow from the federal government.

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.

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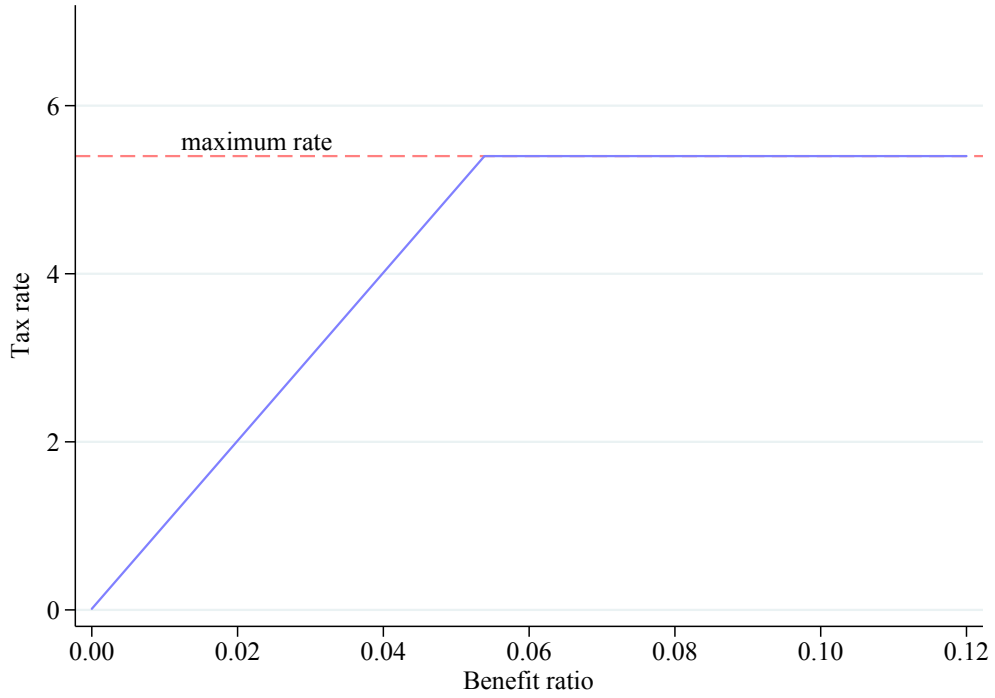
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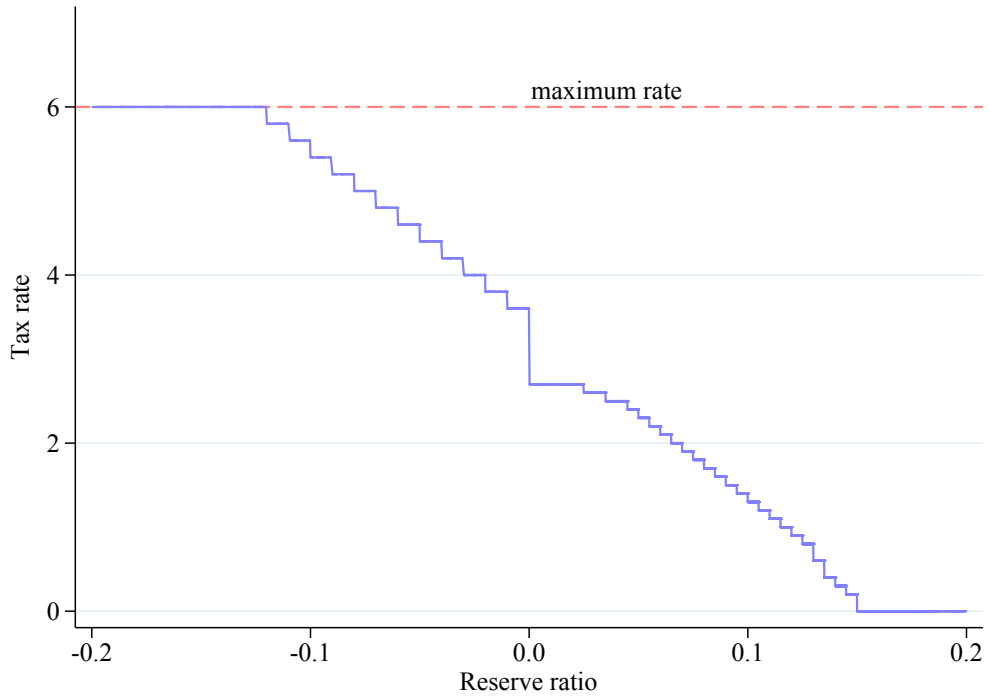
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Figure 1: Sample Benefit-Ratio UI Tax Formula



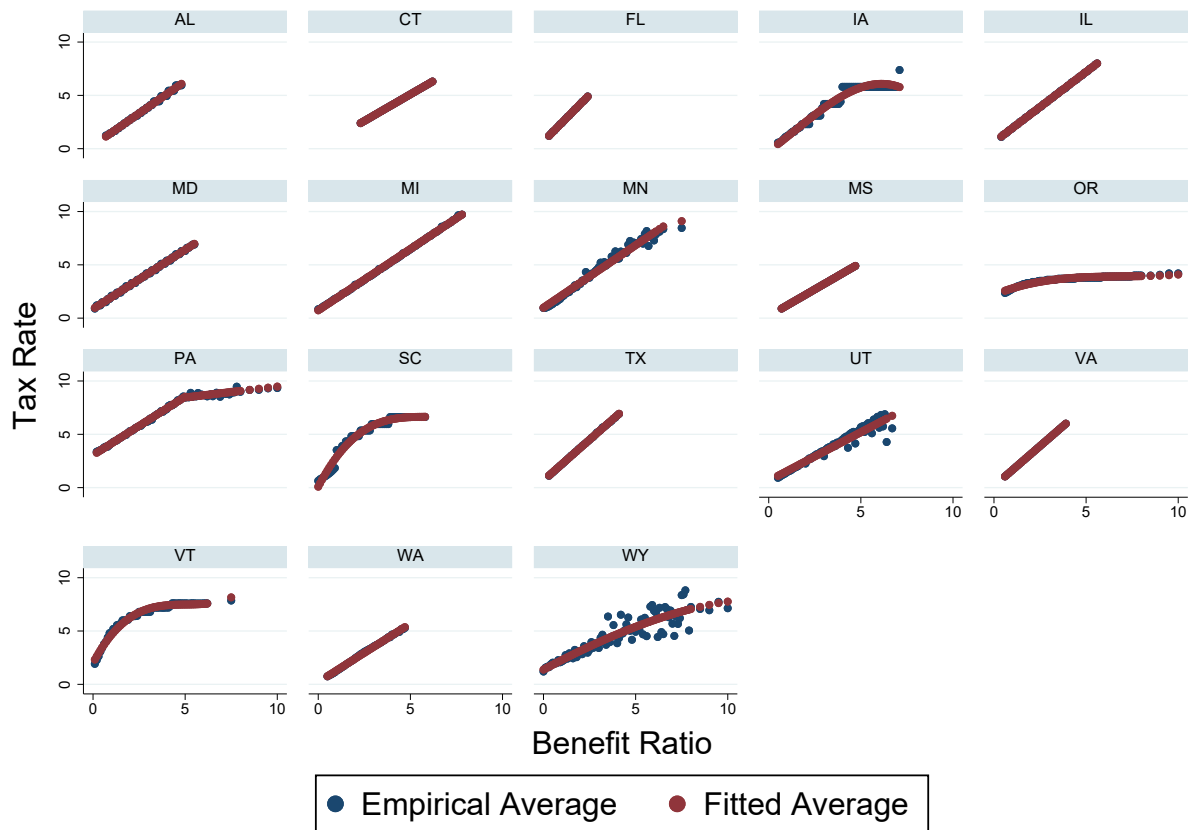
Source: Administrative data from Florida's Department of Economic Opportunity.

Figure 2: Sample Reserve-Ratio UI Tax Formula



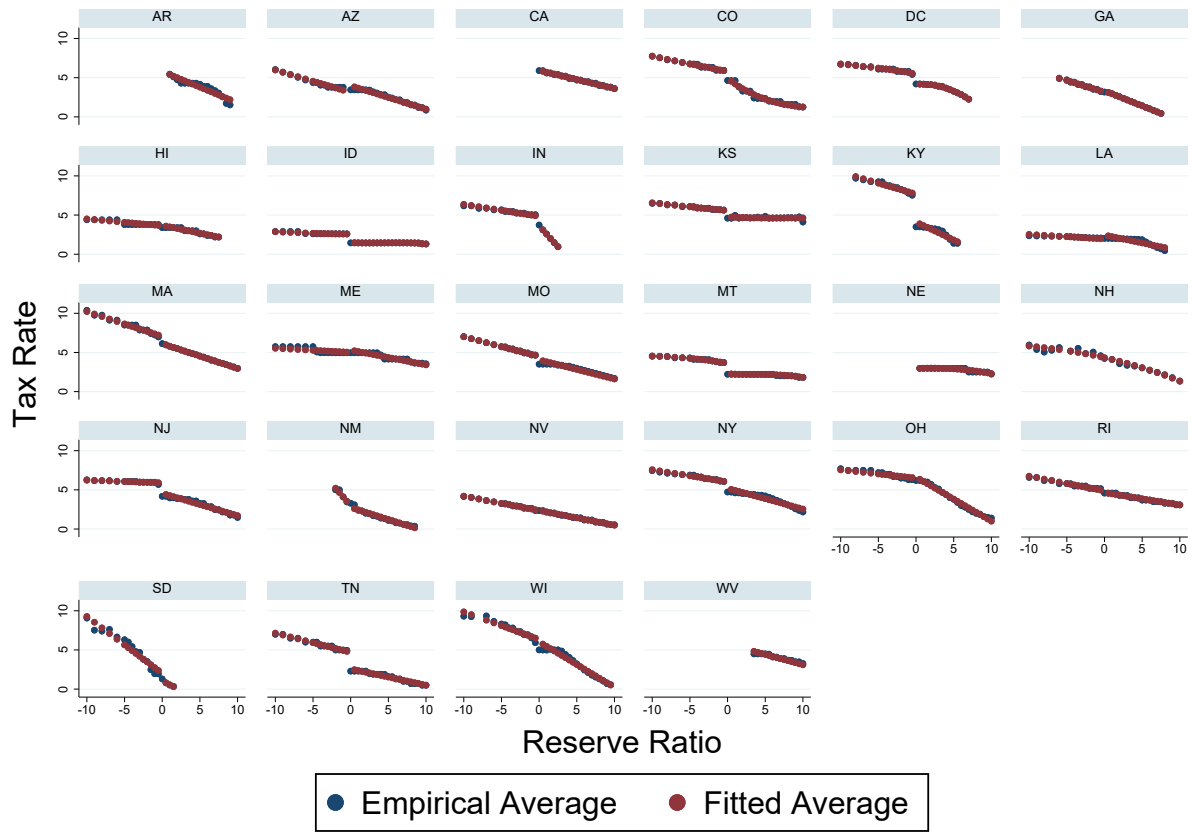
Source: Administrative data from Missouri's Department of Economic Opportunity.

Figure 3: Empirical Tax Schedules (2014) - Benefit Ratio States



Source: Dept of Labor 204 Experience Rating Reports. UI tax rates are an increasing function of employer's Benefit Ratio. Fitted average based on either linear or cubic best fit line.

Figure 4: Empirical Tax Schedules (2014) - Reserve Ratio States



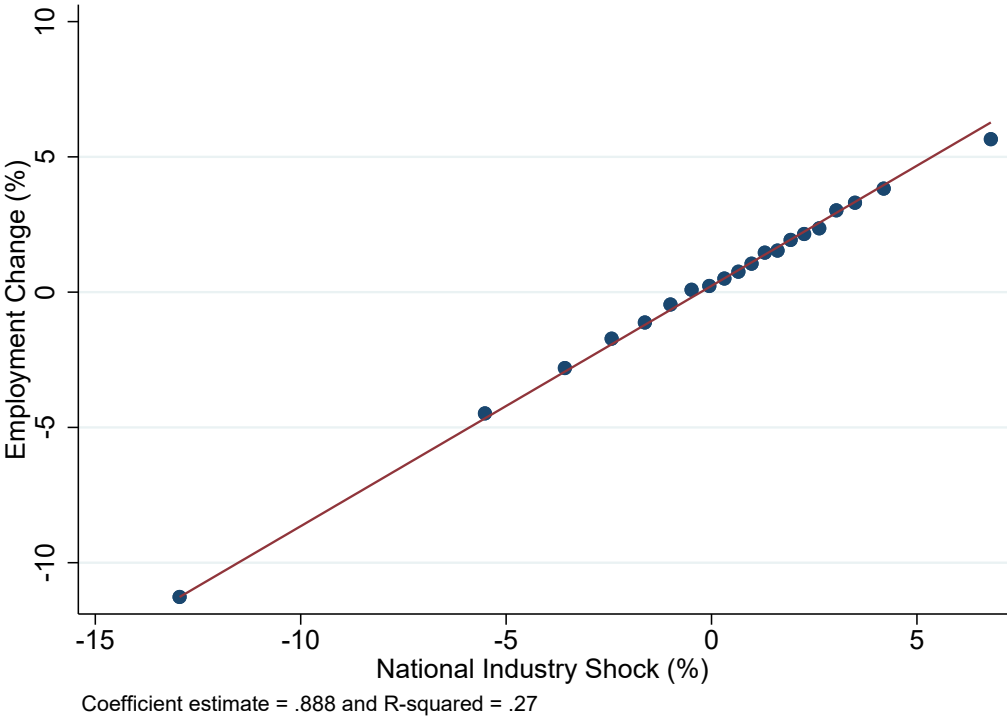
Source: Dept of Labor 204 Experience Rating Reports. UI tax rates are a decreasing function of employer's Reserve Ratio. Fitted average based on either linear or cubic best fit line, with possible discontinuities at zero.

Figure 5: Mean One-Year Per-Capita UI Tax and MTC by NAICS Sector



Average per-capita tax calculated by dividing quarterly UI contributions by employment, and then summing over Q1-Q4. Values are inflation-adjusted to 2018 dollars.

Figure 6: Correlation Between National Industry Shock and Employment Change Measures



N = 228,799. Binned scatterplot and linear best fit line of national industry shock by year-over-year employment change.

Table 1: Summary Statistics (2001-2018)

	Mean	SD
Total Employment	31,584	67,875
Total Establishments	2,266	7,253
Average Weekly Earnings (2018\$)	1,007	528
Employment Change (%)	0.30	7.96
Own Industry Shock (%)	0.072	4.66
Marginal Tax Cost (2018\$)	83.77	43.64
Tax Base (2018\$)	14,266	8,788
Taxable Wages (%)	35.90	29.55
UI Tax Rate (%)	2.41	1.47
<i>N</i>	228,799	

Observations are at the state, 3-digit industry, year, quarter level. Includes 46 states, up to 79 industries, and up to 72 quarters.

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

	Dependent Variable: Employment Change (%)			
	(1)	(2)	(3)	(4)
Industry Shock	0.958*** (0.0472)	0.139 (0.236)	0.199 (0.230)	0.182 (0.221)
MTC × Shock (100's)	-0.0798* (0.0426)	-0.0986** (0.0429)	-0.107** (0.0477)	-0.0839* (0.0433)
MTC (100's)	0.101 (0.100)	0.155 (0.0950)	0.271*** (0.0984)	-0.179 (0.180)
R^2	0.501	0.527	0.563	0.559
Mean of Dep Variable	0.870	0.870	0.870	0.870
Industry-by-Year FE		X	X	X
State-by-Industry FE			X	
State-by-Year FE				X
<i>N</i>	228799	228799	228797	228799

Observations at state, 3-digit industry, year, quarter level. Includes state, industry, and year-quarter FEs; weighted by employment. Mean (weighted) MTC = 0.89 and SD = 0.38, 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) Positive Shock	(2) Negative Shock	(3) High Risk	(4) Not High Risk	(5) Benefit Ratio	(6) Reserve Ratio
Industry Shock	-1.304** (0.611)	0.523*** (0.0785)	-0.121 (0.174)	0.0982 (0.356)	0.426*** (0.133)	0.138 (0.332)
MTC × Shock	0.0503 (0.106)	-0.122*** (0.0473)	-0.0553 (0.0710)	-0.164*** (0.0633)	-0.140* (0.0812)	-0.0815 (0.0496)
MTC (100's)	-0.159 (0.245)	0.232 (0.216)	0.292 (0.280)	0.317*** (0.108)	0.369** (0.152)	0.129 (0.135)
R^2	0.367	0.657	0.635	0.526	0.600	0.563
EmpChange Mean	2.324	-3.152	0.170	1.045	0.957	0.801
MTC Mean	0.890	0.895	0.843	0.904	1.065	0.754
Industry-by-Year FE	X	X	X	X	X	X
State-by-Industry FE	X	X	X	X	X	X
N	141259	87466	52406	176391	89950	138847

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 * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Interaction of Industry Shocks with Magnified Marginal Tax Cost (2001–2018)

	Dependent Variable: Employment Change (%)			
	(1)	(2)	(3)	(4)
Industry Shock	1.006*** (0.0556)	0.182 (0.220)	0.249 (0.214)	0.214 (0.203)
MTC × Shock (100's)	-0.0459*** (0.0174)	-0.0498*** (0.0175)	-0.0555*** (0.0188)	-0.0407** (0.0194)
MTC (100's)	-0.0273 (0.0377)	-0.00274 (0.0353)	-0.0000381 (0.0396)	-0.0318 (0.0562)
R^2	0.502	0.527	0.564	0.559
Mean of Dep Variable	0.870	0.870	0.870	0.870
Industry-by-Year FE		X	X	X
State-by-Industry FE			X	
State-by-Year FE				X
N	228799	228799	228797	228799

Observations at state, 3-digit industry, year, quarter level. Includes state, industry, and year-quarter FEs; weighted by employment. Mean (weighted) MTC = 2.62 and SD = 1.16, 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

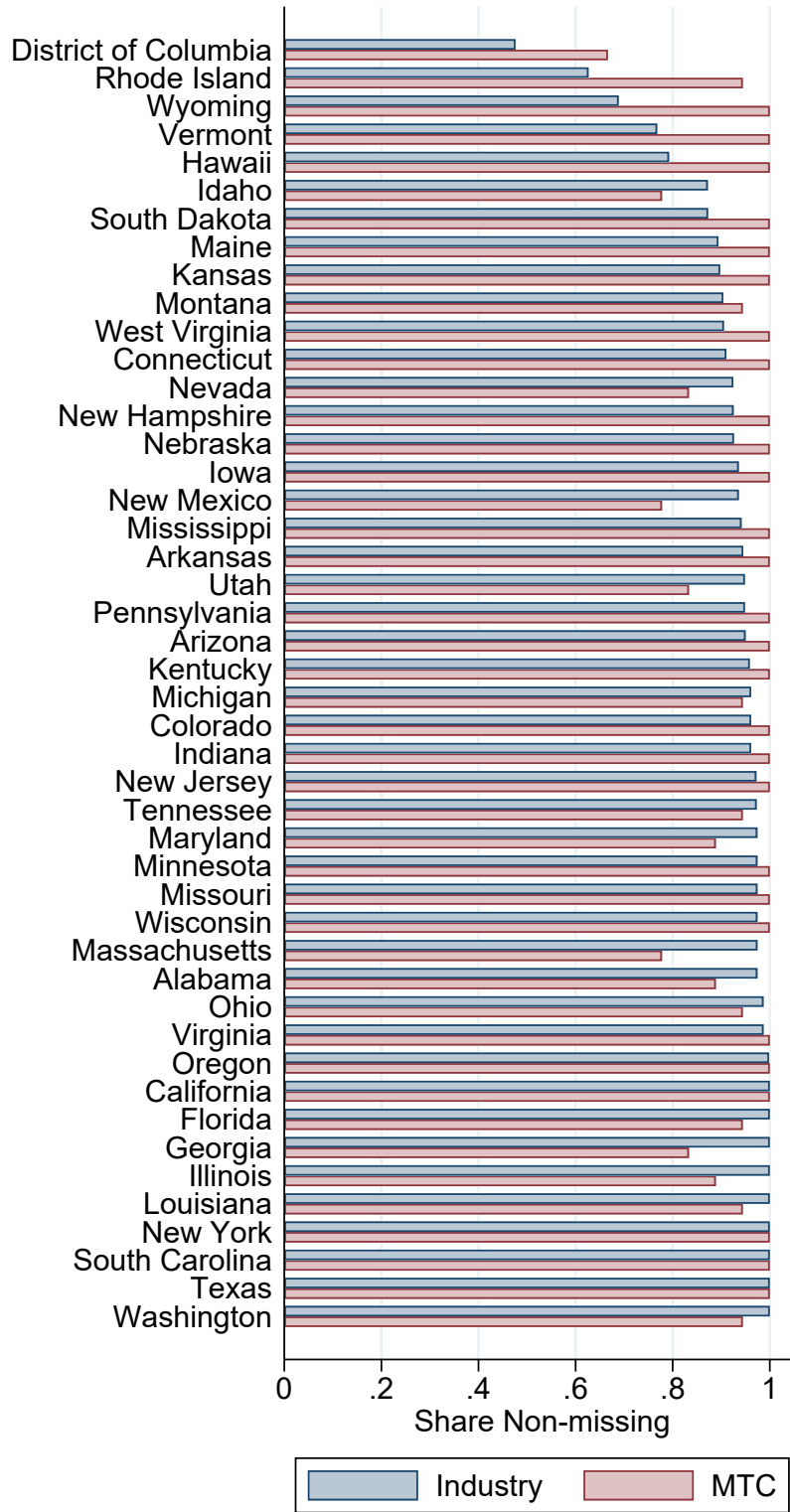
Table A.1: Horse Race Between MTC and Max Tax or Tax Base (2001–2018)

	Employment Change (%)		Establishment Change (%)	
	(1)	(2)	(3)	(4)
Industry Shock	1.089*** (0.0642)	1.056*** (0.0684)	0.394*** (0.0591)	0.405*** (0.0609)
MTC \times Shock (100's)	-0.136*** (0.0516)	-0.132** (0.0524)	-0.0272 (0.0450)	-0.0252 (0.0456)
MTC (100's)	-0.233 (0.210)	-0.186 (0.213)	0.0270 (0.218)	0.0628 (0.219)
Max Tax \times Shock (100's)	-0.00235 (0.00302)		0.00505 (0.00377)	
Maximum Tax (100's)	0.00488 (0.0238)		0.00805 (0.0236)	
Tax Base \times Shock (1000's)		0.000413 (0.00242)		0.00280 (0.00212)
Tax Base (1000's)		-0.0239 (0.0215)		-0.0489** (0.0243)
R^2	0.541	0.541	0.273	0.273
Mean of Dep Variable	-3.150	-3.150	-0.537	-0.537
N	87484	87484	87484	87484

Observations at state, 3-digit industry, year, quarter level. Includes state, industry-year, and year-quarter FEs, and regressions weighted by employment. Mean (weighted) MTC = 0.90 and SD = 0.38; Mean Max Tax = 9.85 and SD = 5.9; Mean Base = 13.7 and SD = 8.1; all are inflation-adjusted to 2018 dollars.

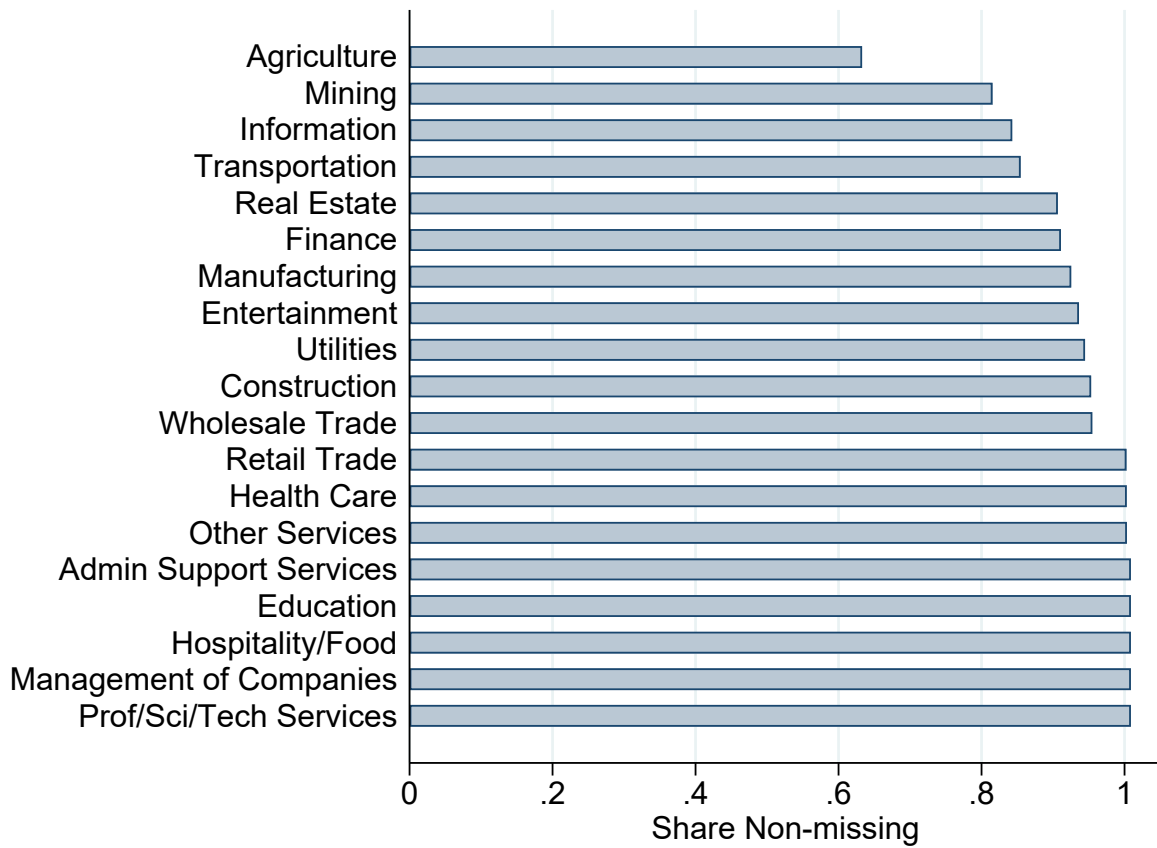
Robust standard errors clustered at state-industry level in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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.