New Employer Payroll Taxes and Entrepreneurship

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August 2024

Abstract

How costly are taxes for young firms? In this paper, we demonstrate that even small payroll taxes significantly distort entry, growth, and hiring decisions. First, leveraging cross-sectional variation in the tax rates faced by new employers, we find that higher taxes discourage new firms from hiring their first workers, with an elasticity of the number of new employers to taxes of -0.11. Second, studying changes in tax rates after entry, we find that higher taxes lead more firms to exit, while also reducing employment for those who survive and leading some firms to avoid taxes by using non-taxable contract labor.

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1 Introduction

Over the past several decades, there has been a striking decline in business dynamism in the United States, characterized by declining firm entry and a shift of employment towards older and larger firms (Decker et al. (2014)). Since the 1970s, firm entry rates have fallen from 13% to a low of 7.2% in 2010, before stabilizing around 8% after 2016 (Figure A.1). Given that young businesses are important contributors to both aggregate employment growth (Haltiwanger et al. (2013)) and innovation (Klenow and Li (2021)), it is important to understand factors that may contribute to this declining business dynamism.

A crucial potential barrier for new firm entry and growth is the cost of running a business: starting and growing a new firm is expensive. Not only are startup capital requirements large — Adelino et al. (2015) estimate a median startup capital need of $215,000 — but many firms face large expenses that curtail their profitability. Robb and Robinson (2014) estimate that more than 50% of new firms report losses, with nearly 60% of new firms having more than $10,000 in expenses.[1] When firms start to employ workers, they face costs beyond simply salaries: with workers come employee benefits and — as we study in this paper — payroll taxes. Piled atop all the other costs firms face, these employment costs may be too much for an entrepreneur to afford.

In this paper, we study how sensitive cash-constrained young firms are to relatively small employment costs. We do this by studying new employer payroll taxes, which help finance state unemployment insurance (UI) benefits. When firms start employing workers, they face an annual per-worker payroll tax that depends on their state and sector; this tax ranges widely, but most firms face a tax between $200-$400 per worker per year. These taxes are effectively a surcharge on employment, and — unlike income taxes — firms face these tax burdens even if they are not profitable. This means that cash-constrained young firms may see these taxes as significant barriers to hiring workers and growing their businesses.

Using administrative microdata from the U.S. Census Bureau, we estimate how payroll

[1] Adelino et al. (2015) use 2007 Survey of Business Owners microdata. Robb and Robinson (2014) use 2004-2007 microdata from the Kauffman Firm Survey.

taxes for new employers affect entry decisions and outcomes conditional on entry, where we consider entry to be when a firm starts to employ workers. Our research design leverages both cross-sectional and time variation in new employer taxes to analyze whether higher tax rates discourage firm entry and growth. While tax policy is not randomly determined, we exploit exogenous variation in the tax regimes established by historic state policies and control for concurrent economic conditions.[2] We find that higher tax costs deter firm entry and initial hiring, particularly for sectors in which these costs are relatively more expensive — and thus likely more salient — due to high labor usage and turnover. On average, a doubling of the per-worker tax burden for new employers predicts 10% fewer new entrants in a given state and sector. In sectors like construction, where seasonality and high worker turnover implies higher tax payments, this number nearly doubles. In sectors with high part-time and labor shares like retail trade, the firms that do enter in higher tax regimes enter with fewer employees: for those sectors, a doubling of the per-worker tax predicts 2% fewer initial employees for the average new firm.[3]

Even after entry, these taxes prove costly for firms: we find that young firms operating in higher tax regimes are less likely to survive and tend to stay small conditional on survival. For example, a one standard deviation increase in the maximum per-worker payroll tax faced by a five-year-old firm predicts a 6% higher likelihood of exit by the end of the year, relative to the mean. Amongst surviving firms in high-tax cost sectors like retail and accommodation and food services, a one standard deviation in the new employer tax predicts 1 to 2% lower employment in the first few years the firms operate; at age 5, when these new employer taxes have been replaced by firm-specific ones, a one standard deviation in the maximum tax firms may face predicts 0.5% lower employment. Throughout these results, we consistently

[2]In robustness analyses, we follow Dube et al. (2010) and compare firm entry in neighboring counties at state borders that likely face similar economic conditions except for taxes. Additionally, we perform robustness analyses to exclude cases of tax variation arising alongside poor economic conditions, such as following the Great Recession.

[3]About 70% of new firms employ fewer than 5 employees in their first full year, so this 2% average reduction in initial employees reflects some firms responding to higher taxes by, e.g., hiring one fewer employee, while other firms do not reduce employment.

see a greater role for payroll taxes compared to corporate or personal income taxes. This is intuitive, as many of the new and young firms we study are still working towards profitability; while they are not liable for income taxes if they are making losses, they *are* still liable for payroll taxes.

Finally, some firms adapt to higher taxes by changing their production inputs. While many sectors in this paper are sufficiently labor-intensive such that new firms cannot simply substitute to capital, some firms can switch to a type of labor that is *not* subject to these payroll taxes: contract labor. Since contract laborers are not technically on a firm's payroll, firms employing these workers do not directly owe payroll taxes on them. We find evidence of this tax "avoidance" in the construction sector, where young construction firms in higher tax regimes are significantly more likely to hire temporary contract labor: a one standard deviation increase in taxes predicts a 25% increase in the likelihood of using this non-taxed labor, relative to the mean. Taken together, these results provide evidence that taxes on new employers can significantly influence how firms enter and grow.

This paper contributes to three main strands of literature. First, our work relates to the literature on how government policy affects entrepreneurship. Numerous papers document that entrepreneurship can be a costly endeavor, and many new firms are not profitable (see, for example, Adelino et al. (2015) and Robb and Robinson (2014)). For example, Brown and Earle (2017) and Hackney (2022) argue that the Small Business Administration (SBA) loan program helps alleviate small firms' constraints to growing their firms. Taxes can also distort firm entry and incorporation through income shifting: several papers have studied how tax regimes may influence individuals to start firms or incorporate businesses in order to shift income towards lower tax sources (see, e.g., DeBacker et al. (2019) and Tazhitdinova (2020)).[4] Additionally, Benzarti et al. (2020) finds that when mandated social insurance

[4]More broadly, tax policies — including tax subsidies, deduction allowances, and structures that allow for pass-through of business income taxes to individual income taxes — have been argued to potentially increase or decrease firm entry (or have no effect). Furthermore, the relative taxation of labor and business income may matter: for example, Cullen and Gordon (2007) and Gersbach et al. (2019) argue that higher taxes on labor earnings and lower taxes on firm profits combine to generate more entrepreneurship. See Bruce et al. (2020) for a survey of the literature on taxes and entrepreneurship.

contributions are relaxed, entrepreneurs reduce their contributions in order to channel more cash into their firms. We contribute to this literature by studying relatively small payroll taxes, which we find to still have a role in deterring entry and growth of new firms.

Second, a complementary literature studies how corporate income taxation and place-based policies affect the location decisions of firms. Globally, Djankov et al. (2010) find that countries with larger effective corporate tax rates have lower aggregate investment and entrepreneurial activity. Within the United States, Giroud and Rauh (2019)) shows that increases in state corporate taxes drive multi-state firms to reallocate production to lower-tax states.[5] Meanwhile, Mast (2020) and Slattery (2022) show that local governments' awards of business subsidies bestow rents on firms without meaningful changes in business location. We contribute to this literature by studying a new employer tax that affects small and large firms alike, regardless of profitability, and thus affects a broader population than just pre-existing firms and high-tech entrepreneurs.

Finally, our work adds directly to the literature studying the impacts of payroll taxes that finance unemployment insurance. Work by Anderson (1993), Anderson and Meyer (1997), Johnston (2021), and Guo (2022), among others, provides evidence for significant labor demand responses when UI tax rates rise for mature firms. Guo (2023) shows that firms are also more likely to exit from high-tax states, leading to the question of whether tax costs also impact the location decision on the entry margin. Relative to this literature, we turn to the entry and growth behavior of young firms, which are both understudied in this context and potentially subject to different effects, as the taxes paid by new employers differ from those faced by mature employers, as detailed below.

The remainder of this paper is organized as follows. Section 2 describes how UI taxes are administered and presents a conceptual framework on how these payroll taxes may affect young firm behavior. Section 3 discusses our data on UI tax schedules and firm outcomes;

[5]See also Bartik (1985), Carlton (1983), Papke (1991), Suárez Serrato and Zidar (2016), van der List (2024). In a related vein, Moretti and Wilson (2017) study how personal income taxation affects the location decisions of star scientists.

in this section, we discuss the key sources of variation for this paper, namely how UI taxes vary across states, industries, and firm ages. Sections 4 and 5 present our empirical analyses, and Section 6 concludes.

2 Background and Conceptual Framework

Payroll taxes on employers are widely used to fund social insurance programs. In the U.S., these taxes include Social Security, Medicare, and state UI taxes.[6] While other payroll tax rates are uniform across employers, UI tax rates are employer-specific and experience-rated: If firms lay off workers who then claim UI benefits, they are charged a higher future tax rate — up to a maximum. However, when firms first start employing workers, they have no experience upon which tax rates can be based; consequently, they are assigned a statutory "new employer" rate specific to their state and sector.

States determine their own new employer rules in line with federal regulations. These require a minimum of one year and a maximum of three years of new employer rates before experience rating begins, and that new employer rates cannot be lower than 1 percent. Because UI is administered at the state rather than federal level, there is considerable variation in new employer tax costs across states, for otherwise similar firms.

How should new and young firms respond to these new employer payroll taxes? Like all taxes, UI taxes represent a cost for firms and so may deter entry or encourage exit, especially if they cannot pass costs through to the consumer or input suppliers (e.g., workers).[7] Yet, there are several key characteristics of new employer taxes that are unlike other tax costs.

[6]Note that Social Security and Medicare taxes also have an *employee* component that appear on workers' pay stubs and are deducted from workers' pay. UI taxes are employer-only taxes and are not deducted from workers' pay. In this way, firms do not immediately pass through the cost of taxes to workers. Nevertheless, employer payroll taxes, including UI taxes, are a business expense that firms can deduct on their corporate or personal income taxes. While there are both federal and state UI taxes, we focus on state UI taxes in this paper. All employers receive a credit for the federal tax upon payment of state taxes, so net federal UI taxes only amount to $42 per worker (0.06% of $7,000).

[7]With the new employer tax being a firm-specific rather than market-level tax, we assume no pass-through of these tax costs to worker wages. The previous literature on UI tax incidence has found no evidence of firm-specific UI taxes impacting wages (Anderson and Meyer (2000), Johnston (2021), Guo (2022)). Alternatively, if firms were able to pass through UI tax costs to workers, the firm would demand a set level of labor (not influenced by UI taxes) but pay workers less than they would in the absence of UI taxes.

First, these taxes are owed regardless of profitability or sales. While firms only pay income taxes if they are profitable, firms are liable for UI taxes on each worker they employ.[8] With the majority of new firms reporting losses (Robb and Robinson (2014)), these UI taxes could be particularly burdensome for new firms that are still working to generate positive cash flows.

Second, while payroll taxes typically scale proportionally with worker earnings, UI taxes are charged on abnormally low taxable wage bases (i.e., the amount of each workers' pay on which tax is paid) — the median tax base during our study period was only $10,500 annually. Taxable wages are set at the state level, and new firms are charged the fixed new employer rate only up to the tax base, such that new employer taxes are closer to an annual per-capita tax than a true payroll tax. Thus, a firm j operating in state s and sector n employing $N_{j,t}$ workers in year t will pay the following UI tax:

$$\text{UI Tax}_{j,t} = \sum_{i=1}^{N_{j,t}} \min(w_{i,j,t}, base_{t,s})\tau^{u}_{j,t,s,n}, \tag{1}$$

where worker i earns $w_{i,j,t}$, the tax base is $base_{t,s}$, and the firm faces UI tax rate $\tau^{u}_{j,t,s,n}$.

These abnormally low tax bases effectively make low-earning workers disproportionately expensive. Consequently, UI taxes may be particularly costly when a firm employs many low-earning workers, whether due to low hourly wages, high part-time rates, or high worker turnover.

To fix ideas, consider the following comparison between California and Washington, the states with the lowest and highest tax bases respectively. California has a fixed policy through which firms face a new employer rate of 3.4% and a tax base of only $7,000. Meanwhile, Washington has an industry-specific new employer rate and a tax base that is indexed to inflation and was $41,300 in 2014. Suppose a new construction firm in 2014 hires a single employee earning $80,000 a year. The firm pays a total wage bill of $80,000 and a UI tax of

[8]Federal regulations make employers liable for UI tax if they either pay at least $1,500 in wages in any quarter or have at least one employee in each of at least 20 weeks of a year. In this paper, we assume that any firm employing at least one worker satisfies these requirements.

$7,000×3.4% = $238 if they are located in California, versus a UI tax of $41,300×4.3% = $1,776 if they are located in Washington.

Alternatively, suppose worker turnover requires the firm to hire a new employee each calendar quarter, such that the firm hires four employees earning $20,000 each. The firm still pays a total wage bill of $80,000, but the UI tax in California now quadruples to $952 because each new hire incurs a "full" new UI tax charge. Meanwhile, the UI tax in Washington roughly doubles to 4×$20,000×4.3% = $3,440, because each employee earns less than the full tax base.

Conversely, if we consider an industry such as retail trade, where the new employer tax rate in Washington (1.15%) is lower than California's, the firm would owe more new employer taxes in Washington than in California in the first scenario ($41,300×1.15% = $474) yet less than in California in the second (4×$20,000×1.15% = $920). As this example shows, not only does a firm's state and sector affect its UI tax liability, it also crucially matters how the firm organizes its labor.

Third, since firms' UI tax rates evolve to become based on their layoff experience after the first few years, UI taxes generate dynamic considerations: firms expanding their workforce face the risk of higher future taxes if they subsequently lay off workers that are likely to claim UI benefits. This means that these taxes inherently amplify the risk of risky investments that involve expanding employment.

Finally, all three of the characteristics above amplify firms' incentives to substitute away from labor towards non-taxed inputs: if firms can produce the same output with alternative inputs, they save on UI taxes. While switching to capital is likely infeasible for many of the labor-intensive industries studied in this paper, the structure of U.S. payroll taxes contains a nuance that may allow some firms to avoid taxes by substituting towards non-taxed labor. Namely, payroll taxes, including UI, are only assessed on payroll employees — i.e., workers receiving W-2 income; effectively, firms are only taxed on workers who could potentially claim UI benefits after losing their job at the firm. Notably, contract labor is not part of

this group, and so firms may be able to hire contract workers in lieu of regular employees in order to avoid UI taxes.[9]

Given these characteristics, we have several predictions for how UI taxes may affect firms, which we test in this paper. First, higher taxes should deter entry, reduce optimal labor demand, and encourage exit. Second, these patterns should be stronger if a firm's tax liability is amplified by its optimal labor structure. Namely, firms face higher realized UI taxes if their optimal labor demand is large (e.g., high labor shares), if they hire relatively more part-time or low-wage workers (who generate higher costs due to the per capita nature of the taxes), and if they have higher turnover of workers (e.g., due to seasonality of product demand). Firms with these higher expected costs should react more strongly to higher new employer taxes. Lastly, higher taxes give firms an incentive to substitute towards temporary or contract workers that are not W-2 employees, as these classifications of workers are not charged new employer taxes (they are not on payroll), and as a result are also not eligible for UI benefits.

3 Data

We combine state-level UI tax data with administrative data on firms and their workers. Appendix Section A.I provides additional details.

3.1 UI Tax Data and Identification

We collect industry-specific new employer tax rate information from all U.S. states and Washington DC, using a combination of annual reports from the Department of Labor, state UI websites, and correspondence with program administrators. Further details of the data's construction are described in Appendix Section A.I.1. Additional UI tax variables include taxable wage bases and maximum UI tax rates.

We leverage two broad sources of UI tax variation for identification: state taxable wage bases and new employer tax rates. Although state UI tax laws are not randomly

[9]The extent of this substitution towards contract labor is limited by federal regulation that dictates which workers can be classified as contract workers. For example, contract workers must have some independence from the firm.

determined, we believe UI tax regimes (characterized in Table A.1) are plausibly exogenous to concurrent economic conditions. This is because annual new employer rates and tax bases are automatically determined in accordance with tax policies that were established in the 1980's or earlier.[10] The first-order variation in state tax bases comes from whether states have adopted flexible tax bases indexed to wage growth. While the majority of states do not index their tax bases, a total of 17 states calculate their annual tax base as a percentage of average wages in their state; as a result these states have significantly higher tax bases on average, and the base automatically increases every year with no need for additional legislation.[11] Among states without automatic indexing, some periodically update their schedules to keep up with inflation, but the majority rarely legislate tax increases.[12] A decomposition of the variance in UI tax costs shows that over our sample period from 2003 to 2014, two-thirds of the variance occurs between states, primarily driven by state tax bases.[13]

However, there also exists variation in new employer rates within states, over time. The primary variation in new employer tax rates arises from whether states elect to assign rates based on the industry sector. The large majority of states charge a uniform new employer rate to all new businesses (the modal new employer rate is 2.7 percent), but 8 states assign sector-specific rates equal to the average tax rate within the state's industry sector (paid by mature firms); the exception is the construction sector, where roughly half of states assign

[10]Although legislated policy changes are rare, the largest number of state policy changes occurred right after the Great Recession in response to financing needs. In a robustness check below, we study years prior to the Great Recession.

[11]With the exception of Rhode Island, which abandoned indexing in 1999 and then re-adopted it in 2012, all states have been indexed since the 1980's, with Oklahoma being the last state to adopt indexing in 1987. Colorado also recently adopted indexing, but was not an indexed state during our period of analysis.

[12]For example, California pegs its tax base to the federal mandate of $7,000, which has not been updated since 1982, and has maintained a constant tax schedule with a top tax rate of only 6.2%. As a result, its regime does not reflect the real cost of financing UI benefits; in 2014, 51 percent of California's workers (30% of employers) were taxed at the maximum rate (`https://oui.doleta.gov/unemploy/pdf/sigmeasures/sigmeasuitaxsys14.pdf`)

[13]We decompose the variation in UI taxes (i.e., variance of log(average new tax rate*tax base)) into within-state variation (variance of log(average new tax rate*tax base) demeaned at the state level) and between-state variation (variance of state-level mean log(tax rate*tax base)). For 2003-2014, we find a variance of UI taxes of 0.355; 30% of this (i.e., 0.108) is within-state variation and 70% (i.e., 0.247) is between-state variation. (Note: this decomposition is commonly used in labor economics to study between- vs. within-firm pay inequality; see equation (2) of Sorkin and Wallskog (2023), for example.)

a higher sector-specific new employer rate. The secondary variation in new employer rates stems from whether rates are held constant over time, or are a function of the state's UI trust fund. In either scenario, no active legislation is needed – updated rates are simply calculated using existing formulas.

In the case of uniform rates, UI taxes can end up significantly lower or higher than the industry average, depending on the industry's layoff risk; for example, construction firms — which are likely to lay off many workers — may implicitly receive a tax discount under uniform new employer rates, compared to retail trade firms who are less likely to lay off many workers. It is precisely because of this disparity that many states designate higher construction-specific new employer rates to reflect the greater propensity for UI claims in the construction sector. To illustrate this, Figure 1 plots new employer rates over time for construction versus retail trade, for nine states with the largest annual variance. Construction rates are generally more cyclical than other industries, although there are some states where the two move in lockstep. Figure A.2 shows that there is significantly more variation in construction rates than other industries.

When new employer rates and state tax bases combine, new employer tax costs range from $77 to $2,726 per worker and may constitute a significant share of payroll for low-earning and/or part-time workers. Figure 2 plots the distribution of average per-capita new employer tax costs by state, where tax costs are defined as the new employer rate multiplied by the state's tax base. Hawaii, Oregon, Alaska, and New Jersey have the highest average new employer taxes, due to having large taxable wage bases. Meanwhile, South Dakota, Louisiana, Vermont, and Arizona charge the lowest new employer taxes. Figure 3 plots the distribution of state new employer taxes over time.

For additional controls and comparison, we also collect information about relevant taxes and policies that vary at the state level. These include corporate and personal income tax rates (provided by Suárez Serrato and Zidar (2016)), maximum weekly UI benefits, minimum wages, and state unemployment rates. All values are nominal. Table 1 reports summary

statistics for these state policy variables.[14] The median firm faces a new employer tax cost of $243 per worker.

3.2 Census Bureau Data

We combine state UI tax schedules with several administrative datasets from the U.S. Census Bureau on firms and their workers. We study firm entry, size, and survival using the Longitudinal Business Database (LBD) and its public-use version, the Business Dynamics Statistics (BDS). We additionally study use of temporary contract labor using the Census of Construction Industries (CCN). See Appendix subsection A.I.2 for details.

The LBD covers the universe of U.S. establishments that employ workers and includes annual measures of employment, payroll, and NAICS industry. Because the LBD contains longitudinal identifiers for firms and establishments, we are able to identify when new firms enter based on the entry year of their earliest entering establishment; we date a firm's age as the difference between the current year and the firm's entry year.[15] For firm entry and survival analyses, we use the BDS, which aggregates outcomes at the state, year, 2-digit NAICS sector, and firm age level. Since new employer UI tax rates only vary at the level of state and NAICS sector, this level of data in the BDS is sufficient for studying firm entry by using the number of firms of age zero in each state-year-sector cell. As shown in Table 1, the median state-year-sector cell sees 252 new entrants, reflecting an 8.3% entry rate.

We use the LBD's firm-level microdata for analyses involving more detailed firm-level information, namely employment as of the payroll period that includes March 12 each year. When studying LBD outcomes, we bundle all establishments of a firm in the same sector (2-digit NAICS) and state — we call this bundle a firm.[16] Bundling in this way mimics

[14]We present both unweighted and weighted-by-total firm count summary statistics, estimated at the NAICS sector-state-year level. The former describes the variables for the average sector-state-year cell, while the latter captures variables for the average firm in the economy.

[15]In our main LBD analysis, we focus on firms' behavior from age 1 to 5. Many age "0" firms are missing information on employment due to the measurement timing, and so we omit age 0 when studying employment. However, we use age 0 measures for studying entry.

[16]Note that in our LBD analyses, our sector measure is based on the first 2 digits of the 6-digit NAICS variable. Meanwhile, in our BDS analyses, our sector measure captures the 2-digit NAICS "sector" measure which bundles a handful of sectors as we define in the LBD: namely, in the BDS, the manufacturing sector

the firm unit at which UI taxes are collected, known as the State Employer Identification Number (SEIN), which generally consists of all establishments belonging to the same firm within a given sector in the given state.[17] For both the BDS and LBD, we use data from 2003 through 2014 for all 50 states plus Washington, DC.

The CCN is a partial census of construction establishments that is collected as part of the quinquennial Economic Census. The CCN consists of a survey with many questions on production and other firm behavior.[18] We use the 2007 and 2012 waves of the CCN, which collect information on expenditures on temporary staff and leased employees. In Section 5.3 we use this information to study how UI taxes predict the use of these types of workers, for whom a firm *does not* pay UI taxes.

4 Entry and Initial Hiring

We begin by assessing to what degree higher UI taxes deter firm entry, which is measured as when firms employ their first worker. We leverage cross-sectional variation in state new employer tax costs: states set taxes that are either uniform for all new employers within the state, or are industry-specific, creating significant variation in new employer taxes for otherwise similar firms, solely due to their location and year of entry. We first test whether fewer new firms enter when new employer taxes are higher, and then study the initial size of firms after entry to investigate how taxes affect initial hiring decisions.

4.1 New Firm Entry

To measure new entrants in the public-use BDS data, we use the count of age 0 firms in each state, 2-digit NAICS sector, and year cell. Our two outcome variables of interest are the log number of new entrants and the entry rate (dividing the count by the total number of

pools 2-digit NAICS 31, 32, and 33; the retail trade sector pools 44 and 45; and the transportation and warehousing sector pools 48 and 49 (this is the level at which the data is available). In our LBD analyses, we choose to separate these groups in order to control for sector (marginally) more flexibly. We do not expect this difference to generate meaningful bias in our results.

[17] The SEIN is an official tax ID and is not directly available in the LBD.

[18] See Calabria (2000) for details on the CCN and its sampling.

firms in the state-sector pair in the previous year).[19] To study whether current new employer taxes affect entry, we estimate the following regression for observations at the state s, 2-digit NAICS sector n, and year t level:

$$\begin{aligned}\text{Firm entry}_{snt} = \beta \text{Log}(\text{new employer tax rate} \times \text{tax base})_{snt} \\ + X'_{st}\delta + \alpha_{sn} + \gamma_{nt} + \epsilon_{snt}.\end{aligned} \tag{2}$$

We control for state-by-sector (α_{sn}) and sector-by-year fixed effects (γ_{nt}); the latter accounts for the fact that in states where new employer taxes are based on industry averages, UI tax rates will mechanically be higher in years following economic downturns. Consequently, we identify the role of deviations from expected UI tax rates in deterring firm entry.[20] We also control for a vector X'_{st} of time-varying state characteristics that likely also affect or correlate with firms' decisions to enter, including corporate and personal income tax rates, the log of maximum weekly UI benefits, the minimum wage, and the state unemployment rate. The identifying assumption is that UI taxes are uncorrelated with any unobservables that could affect entry, after controlling for these fixed effects and state characteristics; we address potential violations of this assumption below after presenting our main sample results. Because our aim is to measure how the average firm's entry decision may depend on taxes, we estimate model (2) with weights on observations corresponding to the total number of firms of all ages in the state-sector-year cell; doing this avoids implicitly overweighting very small state-sector pairs.

Since taxes represent a cost to firms (see Section 2), we expect higher tax burdens to deter firm entry and consequently a negative estimate for β in model (2). Indeed, this is what we find: new cohorts of firms that enter higher UI tax regimes are relatively smaller,

[19]Strictly speaking, the first measure is log of the number of new entrants plus 1; we do this to maintain the same sample between the different entry measures (i.e., there are 105 observations with zero entrants, out of 9,162). If we do not add 1, and consequently drop the 105 observations, the estimates negligibly change. Details are provided below when we report the main results.

[20]We perform a basic check of this linear specification by also estimating a binscattered version of model (2) where we discretize the tax measure. Figure A.3 shows that the relationship between firm entry and UI taxes is approximately linear.

as shown in Table 2. In both a baseline specification with only state-by-sector and sector-by-year fixed effects (column (1)) and one in which we add time-varying state characteristics (column (2)), we estimate a statistically significant β of -0.11.[21] This coefficient implies that a one standard deviation (0.57 log points) increase in the expected per-worker UI tax cost (i.e., the product of the new employer tax rate and the tax base) is associated with a 6.3% decline in the number of new firms.[22]

Importantly, the role of UI taxes is stark in comparison to the role of other taxes: neither corporate nor personal income taxes meaningfully predict fewer entrants, conditional on UI taxes. This contrasts with the existing literature (Moretti and Wilson (2017), Giroud and Rauh (2019)) that has found evidence of mature businesses (that are likely more profitable than new firms) responding to state-level differences in corporate and personal income tax costs. The distinct role of UI taxes likely arises due to the nature of the taxes: unlike income taxes, firms are charged UI taxes *regardless* of whether they are profitable. For young firms only starting to generate cash flows, income taxes may not bite, but payroll taxes will.

Furthermore, both the tax rate and the tax base matter for firm entry: in column (3), we consider the two components separately. Both of the UI tax terms have statistically significant negative estimated coefficients. In other words, regardless of whether higher UI tax costs comes from a higher rate or a higher tax base, both lead to fewer entrants. Thus for the remainder of the paper, we focus on the parsimonious tax measure of the product of rate and base, log(new rate*base).[23]

In columns (4)-(6) we turn to our second measure of firm entry: the entry rate, measured as the ratio of the number of new firms entering and the total number of firms in the state and sector in the previous year (multiplied by 100 for readability). We see very similar

[21]Note that we also estimate a coefficient of -0.11 if we exclude 105 observations with zero entrants and re-estimate columns (1) and (2).

[22]For example, this one standard deviation increase is akin to comparing taxes faced by retail trade firms in Colorado in 2004 ($250 per capita) to retail trade firms in New Mexico in 2004 ($454 per capita).

[23]Some states have large enough tax bases such that this approximation may be incorrect; at the extreme, Washington's tax base in 2014 was $41,300. In Table A.2 we show that our main entry results are robust to splitting the sample on the tax base; in fact, consistent with our product measure being a better approximate for the cost for firms facing lower tax bases, we find stronger results for states with below-median bases.

patterns: regardless of controls, higher UI taxes are associated with lower entry rates. In our preferred specification with full controls in column (5), we estimate that a one standard deviation increase in UI tax costs implies a 30 basis point decline in the entry rate, or 3.5% of the mean entry rate.

Robustness We present several robustness checks related to our measurement of firm entry and potential endogeneity concerns.

First, we measure firm entry based on when firms first hire employees. It is possible that would-be firms respond to higher UI taxes by still entering *without* employees, in which case we would not capture their entry in our data. We show in Table A.3 that business applications (which capture both firms with and firms without employees) at the state level respond similarly to UI taxes as our firm entry measure. While we had estimated an elasticity of the number of new employers to taxes of -0.11, in Table A.3 we estimate an elasticity of -0.07 for the number of new firm applications and an elasticity of -0.09 for the number of applicants that the Census Bureau predicts will eventually employ workers.[24]

Second, we argue that much of the variation in state tax policies derives from historical decisions and consequently can be thought of as exogenous to current economic conditions; indeed, as Table 2 shows, controlling (linearly) for economic conditions like the state unemployment rate does not result in attenuated entry results. Yet, there remains the possibility that some of the variation in taxes arises due to changes in state policies due to economic conditions. In particular, many states saw high UI claim rates during the Great Recession and subsequently raised rates in order to replenish their UI trust funds. Since firm entry remained sluggish after the recession, our results may reflect coincidental high taxes and low entry. To address this, in Table A.4 we show that our main entry results are robust to restricting to years prior to the Great Recession, during which we estimate an elasticity of new entrants to tax increases of -0.09.

[24]The Census Bureau classifies applicants as likely to eventually employ workers using criteria including legal formation, plans for employees, and sector.

Beyond concerns related to the Great Recession, there remains the possibility that states raise tax rates during local economic downturns, leading to endogeneity. We test this possibility by analyzing county-level entry data and comparing entry in neighboring counties located at state borders. We follow, for example, Dube et al. (2010) and argue that comparing neighboring counties allows us to control for local economic conditions: we assume that neighboring counties across state borders experience similar local conditions, such that any differences in entry may be attributed to differential taxation. To implement this analysis, we turn to a version of the BDS data that reports the number of firms by age within each county;[25] we identify counties at state borders and their cross-border county neighbors using the Census Bureau's County Adjacency File and estimate county-level entry regressions with the inclusion of county pair fixed effects. We consequently estimate an average treatment effect of taxes on entry, within county pairs.[26]

Table 3 presents results for both the number of new firms and the entry rate.[27] Within the sample of border counties, we estimate that higher taxes predict lower firm entry; for example, in column (1) we estimate an elasticity of new firms to the tax base of -0.1. This effect is robust to controlling for local economic conditions common within neighboring counties, as captured by year-county pair fixed effects in column (2): on average, a county facing double the taxes its neighbor faces can expect 8.8% fewer entrants, relative to its neighbor. In other words, higher UI taxes predict lower firm entry, even in markets facing

[25]This data does not contain sector information, and so we estimate entry responses to taxes that pool responses in different sectors. As new employer tax rates can vary substantially across sectors within a state, we focus on the tax base, which is uniform within a state, as our measure of UI taxes in this analysis.

[26]A single county may share a border with several other counties. In these cases, we follow Dube et al. (2010) and duplicate county observations. Because this generates unequal numbers of observations for different counties, we weight observations by approximately the number of firms "in" a particular county pair. Specifically, if county i and county j are neighbors and have (all ages) firm counts w_i and w_j in a given year, respectively, there are two observations for this pair (one for county i and one for county j). For both observations, we assign a weight equal to $(w_i \frac{w_j}{\sum_{j'} w_{j'}} + w_j \frac{w_i}{\sum_{i'} w_{i'}})$, where j' denotes *all* counties that i neighbors and i' all counties that j neighbors. Intuitively, if county i has many cross-state neighbors, we include a smaller fraction of their total firm count into the weight for any given observation. Placing an equal weight on both counties in a pair ensures that our estimates reflect the average difference in outcomes within county pairs.

[27]Table A.5 presents estimates for firm entry at the county level in general (i.e., without pairing neighboring counties), showing that higher tax bases also predict lower firm entry at the county level.

similar local conditions.[28]

Taken together, these results demonstrate that higher UI taxes robustly predict lower firm entry. Recall that these taxes are nominally small — many firms are only paying a few hundred dollars per worker. Yet, even small per-worker costs can be prohibitively costly to nascent firms. Below, we explore firms' initial hiring responses to taxes and then heterogeneity in responses by focusing on sectors in which the taxes may be particularly salient and costly.

4.2 Initial Hiring Decisions

Given that higher new employer taxes appear to deter firm entry, how does this affect initial hiring decisions amongst firms that choose to hire? On the one hand, firms that still choose to enter when taxes are high may be relatively more productive ones who plan to hire many workers, or may be ones for whom producing is still profitable in the face of taxes; i.e., there may be positive selection in terms of entrants' expected hiring. On the other hand, firms may respond to higher taxes by still choosing to enter, but doing so at a smaller scale. For instance, firms may hire only one or two employees instead of more; i.e., there may be a negative treatment effect on initial hiring.[29] Both of these forces could be stronger in sectors for which the taxes are particularly salient and costly.

We test the effect of higher taxes on initial employment by estimating regressions akin to model (2) in which the outcome is the log of employment in a firm's first full year (age 1).[30] We additionally study the likelihood of being particularly small (under 5 workers) in Table A.6. These analyses are performed at the firm level using the LBD microdata. We first consider the average effect of higher taxes, for all sectors, and then we explore heterogeneity

[28] In terms of entry rates, a county facing double the tax base its neighbor faces can expect a 0.8 percentage point lower entry rate than its neighbor (column (4)).

[29] Similarly, firms may also enter regardless of high taxes if they expect to have low costs, e.g., those with optimal low labor demand. This would generate negative selection in terms of entrants' expected hiring.

[30] Note that we measure firm entry according to the number of "age 0" firms, which captures firms that start employing workers anytime during a calendar year. Because our employment measures are based on March 12 employment, many firms that enter after the first quarter have zero recorded employment at age 0, so we focus on the following year (age 1), where firms may be more likely to employ workers in the first quarter. Note that we consequently also study the taxes as of age 1 in these regressions.

by sector.

Column (1) in Panel B of Table 4 presents the average effect. On average, higher taxes do not meaningfully predict either higher or lower initial hiring decisions: the coefficient on log taxes is 0.002 with a standard error of 0.003.[31] While this coefficient may reflect a combination of offsetting forces — for example, there could be positive selection offset by a negative treatment effect — it could also reflect a lack of salience. Many entrepreneurs may not fully understand the extent of their tax liabilities when they begin hiring workers, so they may only respond to the taxes once they start paying them (we explore this possibility below in Section 5). If this is true, we may observe effects in sectors where entrepreneurs could have a better understanding of their expected tax burden; we study this next.

4.3 Heterogeneity by Sector

So far we have shown that on average, higher UI taxes predict lower firm entry but not lower initial employment. However, these average effects may obscure sectoral variation in new firms' responses. We next turn to investigating whether taxes play a larger role when they are likely to be *particularly costly* for a firm. Importantly, we study both entry and initial hiring in tandem, as new firms may respond to costly taxes through some combination of either not entering at all or entering with different employment. We do this by leveraging our conclusions from Section 2: UI taxes should be more costly for firms if they expect to hire relatively more workers (e.g., have higher labor shares), to hire more part-time or low tenure workers (since the relatively low tax base makes low-earning workers relatively more costly), or to have higher turnover of workers. For example, firms in the construction sector are likely to face higher UI tax costs because they require many workers and experience high turnover due to seasonality.

We posit that firms in industries with these characteristics not only face higher new employer tax costs, but additionally will be more aware of these costs and consequently may

[31] Note that new firms tend to be quite small in their first year — the average new firm has about 3 employees, with 70% of firms having fewer than 5 employees.

respond to higher taxes by hiring few employees, if any. We test this by expanding model (2) to test for heterogeneity by industries' worker turnover rates, usage of part-time work, and labor shares. To stay parsimonious, we split industries into above- and below-median subgroups based on each of the three measures.[32] This allows us to measure whether UI taxes play a larger role in predicting firm entry and initial hiring decisions for industries with above-median turnover, part-time, and labor shares respectively. Table 4 presents the results of these estimates for the entry rate (Panel A) and initial firm size (Panel B); Table A.7 shows results for the number of new firms and Table A.6 presents results for being particularly small (under 5 workers).

As these tables show, higher UI taxes predict lower firm entry and/or lower initial firm size, *especially* in industries in which the taxes are particularly costly and salient. First, consider heterogeneity by worker turnover rates, shown in column (2) of Table 4. Panel A shows that the role of taxes in predicting lower entry rates doubles when we compare above-median turnover industries to below-median turnover industries, while Panel B shows negligible heterogeneity by turnover rates for initial hiring. In other words, entrepreneurs in high turnover industries (e.g., construction) respond to higher taxes by not entering, rather than entering with few employees. This may reflect the reality of employment patterns in these sectors: if worker turnover is mostly outside of the firm's control — for instance due to seasonal demand for their products and services — new entrants may be constrained in their ability to hire fewer workers.

A different story appears in sectors with high part-time rates, as shown in column (3). There, we see almost no heterogeneity by part-time prevalence in terms of firm entry, but substantially more variation in terms of initial employment. Firms in sectors with many

[32] Above-median turnover industries are: construction, retail trade, real estate, professional/scientific/technical services, admin/support services, arts/entertainment, accommodation/food, and other services. Above-median part-time industries are: retail trade, real estate, management, admin/support services, health, arts/entertainment, accommodation/food, and other services. Above-median labor share are: construction, retail trade, transportation/warehousing, professional/scientific/technical services, management, admin/support services, arts/entertainment, and accommodation/food. See Appendix section A.I.3 for details.

part-time workers respond to higher taxes by hiring relatively few workers upon entry, rather than not entering at all.[33]

Yet a different story appears when we split sectors by the labor share in column (4). Although we lack statistical significance, we see economically large heterogeneity in terms of entry, with above-median labor share sectors exhibiting an approximately 50% larger entry response to taxes, relative to other sectors. Similarly, we see a small gap in terms of initial employment, with new firms hiring marginally fewer employees when taxes are higher and labor shares are larger (although this too is statistically insignificant). Collectively, these patterns indicate that sectors in which labor is a large share of production may exhibit both entry and initial employment responses: entrepreneurs starting firms in transportation and warehousing, for example, may either choose to not enter or enter at a small scale when taxes are higher.

When we focus on the intersection of our "high salience/cost" divisions, we see striking results. For firms in sectors that are above-median in terms of turnover, part-time, *and* labor share (column (8)), we see negligible heterogeneity in terms of entry but the largest heterogeneity in terms of initial hiring.[34] For firms in sectors that are above the median in turnover, part-time rate, and labor shares, a one standard deviation (48%) increase in taxes predicts a 1% decrease in initial firm size.[35] In other words, for firms that enter in sectors in which the taxes are perhaps the most costly and salient, a natural response appears to be to hire fewer workers. The salience of these taxes likely only grows as firms get more experience,

[33]The fact that we do not see a negative entry coefficient for industries with more part-time workers may be because part-time work is predominantly more costly in terms of UI taxes in states with low tax bases. In states with high tax bases, the disparity in the tax burden of hiring part-time vs. full-time workers is diminished, especially if part-time workers earn less than the tax base. Duggan et al. (2022) find a consistent positive correlation over the past several decades between the size of a state's UI tax base and part-time employment among low-wage occupations. We find results consistent with this mechanism in Table A.8, where we estimate the part-time interaction separately for the subgroup of indexed states versus non-indexed states. We find that the positive coefficient for higher part-time industries is concentrated amongst indexed states, where due to larger tax bases the UI tax burden of hiring part-time labor is relatively low.

[34]These industry sectors are: retail trade; admin/support services/waste management; arts and entertainment; and accommodation and food.

[35]Since new firms tend to employ few workers, this 1% decrease reflects an average effect that pools many firms that do not respond in terms of employment with some firms that do. We discuss this idea more when studying employment in Section 5 below .

and so we expect larger responses to taxes as firms age; we explore this in Section 5.

We conclude this section by estimating a version of model (2) in which we estimate separate coefficients on the UI taxes by 2-digit NAICS sector. Figure 4 presents these results. The industries where firm entry decreases the most when UI taxes are higher exhibit characteristics we posit make UI taxes more costly, and thus salient; real estate, construction, transportation and warehousing, and accommodation/food are labor-intensive industries that hire many workers, many of whom only work part-time/seasonally or turn over quickly. Meanwhile, the information sector is made up of relatively footloose industries whose business is less dependent on local demand. On the other hand, the only industry where higher UI taxes (statistically insignificantly) predict a *higher* firm entry rate is healthcare, an industry with other barriers to entry that may dominate the effect of UI tax costs.[36]

5 Survival and Growth

After firms hire their first employees, are they still affected by the burden of payroll taxes? On the one hand, the relative costs of these taxes may decrease for firms as they grow their cash flows; on the other hand, each additional hire adds to their total tax costs, as the tax is effectively a surcharge on employment. Furthermore, inexperienced entrepreneurs may learn about these taxes as they gain experience paying them; in this way, the taxes may become more salient as a firm ages, such that the firm may respond more strongly to increases in taxes over time.

We investigate the impact of UI taxes on firms' post-entry outcomes, including firm survival, growth, and labor demand across the first few years of firms' lives. To do this, we consider the relevant taxes a firm faces as it ages: in the first few years, the firm faces the new employer tax rates that we studied for entry and initial hiring. After that, the firm transitions to a firm-specific tax rate that depends on their layoff history and is capped at a state-specific maximum tax rate; as we do not observe these firm-specific rates, we focus

[36]Manufacturing falls in the middle of the distribution of coefficients, suggesting that tradability is not a driving determinant of the entry effects.

on maximum rates as a proxy for tax costs. Below, we find that higher UI taxes predict higher exit rates, lower employment amongst survivors, and a shift in labor demand towards non-taxed contract labor.

5.1 Exit Rates

We first study firm survival by estimating how exit rates vary with taxes. To measure exit rates, we return to the BDS data and define the exit rate at each age from one to five as the number of firms deaths divided by the total number of firms, in a given age group, state, sector, and year cell. To study how UI taxes affect the survival of new firms from age one to five, we estimate the following regression for observations at the age a, state s, 2-digit NAICS sector n, and year t level:

$$\begin{aligned} \text{Exit Rate}_{asnt} = \alpha_a + \sum_{a=1}^{5} \beta_a \log(\text{new rate*base})_{snt} \\ + \sum_{a=1}^{5} \gamma_a \log(\text{max rate*base})_{st} + X'_{st}\delta + \mu_{sn} + \nu_{nt} + \epsilon_{snta}. \end{aligned} \tag{3}$$

β_a and γ_a are the coefficients of interest and distinguish between the impact of new employer rates (which only apply for ages 1 and 2) and maximum UI rates (which come into play starting at age 2 or 3, depending on the state and quarter in which a firm entered). The vector of controls X'_{st} includes additional time-varying state level policies such as corporate and personal income tax rates, log maximum weekly UI benefits, minimum wage, and state unemployment rate, as in model (2). We also include either entry year fixed effects or state-sector-entry year cohort fixed effects, depending on the specification. Given our significant findings on the entry margin, the cohort fixed effects serve as a way to control for the initial tax regime at entry, which could impact a firm's likelihood of survival irrespective of subsequent tax rates.

Figure 5 plots the β_k and γ_k coefficients estimated from model (3). Panel A reports estimates without cohort fixed effects, and Panel B reports estimates including state-sector-

entry year fixed effects. For ease of comparison, all tax measures are normalized so that the estimated coefficients measure the impact of a one standard deviation increase of the respective tax measure.

We find three striking results. First, we see evidence that the initial tax regime at entry also affects survival rates, as controlling for cohort fixed effects significantly reduces the magnitudes of our estimates (Panel B vs. Panel A). This result can be further investigated by augmenting model (3) with an additional interaction of firm age and the entry-year log(new rate*base). These estimates are plotted in Figure 6, and the negative coefficients on entry-year UI taxes suggest that higher taxes at entry create positive selection for the firms that enter, as they face higher chances of survival at later ages.[37]

Second, greater concurrent UI taxes predict higher firm exit rates, regardless of age. After controlling for cohort fixed effects in Panel B of Figure 5, a one standard deviation increase in the log new employer tax at age 1 increases the likelihood of exit by 0.63 percentage points (an increase of 2.7% relative to the mean exit age 1 rate of 23.6%). Recall that this is also when all firms are still charged new employer rates.

Third, the tax measure (new versus maximum) that predicts higher exit at each age is precisely the tax measure that *should* matter at each age — young firms' survival is predicted by the new employer taxes they face, while relatively older firms' survival depends on the maximum taxes they may pay at their age. Starting in age 2, the new employer tax coefficient is close to zero and no longer statistically significant, because firms will have either graduated into experience rating already, or will be graduating in the next year. Instead, it is a measure of current tax costs — the maximum potential UI tax — that significantly predicts firm survival.

As firms age, a one standard deviation increase in the log maximum tax increases the likelihood of exit by 0.37, 0.47, 0.54, and 0.67 percentage points from ages 2 to 5, respectively.

[37]Because we only have new employer tax rates for 2003-2014, we estimate the regression on a subsample of our main analysis sample, dropping cells for which the firm's year of entry was before 2003. As a result, our subsample does not include all year-by-age combinations in the years prior to 2008. Our previous estimates of concurrent UI taxes are also robust to this subsample restriction.

Because mean exit rates also decline with age (16.2% of firms exit at age 2, but only 10.9% do so by age 5), the relative effect of UI taxes grows stronger with age. The age 5 effect accounts for a 6% increase in the likelihood of exit, relative to the mean likelihood at that age. The growing impact of the maximum tax as firms age also reflects the fact that struggling firms may take a few years to reach the maximum tax rate, since the maximum rate requires a sufficient number of workers to be laid off.[38] As a robustness check, Figure A.4 plots separate estimates for the subgroup of states in which firms graduate to experience rated taxes earlier (less than 2 years) versus later (after 2 years or more). Consistent with our proposed mechanism, new employer taxes affect exit more strongly than maximum UI taxes precisely for the subset of states whose new employer rates last longer.

In order to benchmark the impacts of UI taxes with the impact of other state-level policies that could affect firm survival, we include additional interaction terms of, for example, corporate income tax rate-by-age and personal income tax rate-by-age. Figure 7 plots estimates from regressions that add additional policy variable interactions. Panel A includes additional age interactions with the state corporate income tax rate and state personal income tax rate. Unlike the UI tax measures, these income tax measures do not have a statistically significant effect on exit rates, with the exception of the corporate income tax rate at age 5. This may be because most new firms are unprofitable in their early years and consequently do not pay income taxes, whereas payroll tax liabilities are always present. We take these results as evidence that payroll taxes for young firms can matter significantly more than income taxes — the taxes traditionally studied for older firms in the literature.

Panel B of Figure 7 includes additional age interactions with the state minimum wage and state unemployment rate. This analysis shows that exit rates are strongly correlated with unemployment rates, which is unsurprising given that unemployment is a key measure of economic conditions. Nevertheless, our UI tax coefficients remain consistent even with the inclusion of age interactions with this measure of the labor market. Minimum wages also

[38]The precise equation by which UI claimants translate into a firm's experience tax rate varies by state.

increase the likelihood of exit, with similar magnitudes as UI taxes in ages 1 through 3, and the effect waning by age 5. Collectively, we take these patterns as evidence that UI taxes have meaningful effects on firm survival.

5.2 Employment Growth

We have just seen that higher UI taxes predict higher exit rates — but what happens to the firms that survive? Now we turn to study how surviving firms grow in terms of employment as they age, in the face of changing UI taxes.

To do this, we estimate a similar regression to model (3) to study how firm-level employment in the LBD varies across ages 1 through 5 as a function of the new employer and maximum UI tax costs. Additionally, we include firm fixed effects in order to study relative employment patterns *within* a firm; this means that we study how firms react to *changes* in the UI taxes they face over time. We make two key sample restrictions within the LBD data. First, in order to abstract from the survival effects we previously documented, we restrict to a balanced sample of firms aged 1 through 5 (i.e., firms with positive employment at all five ages). Second, we restrict to firms in high turnover, part-time, and labor share sectors, for whom we posit that UI taxes are relatively more costly and salient.[39]

Figure 8 presents the results.[40] Within a firm, new employer taxes predict lower employment for the first four years. At age 1, a one standard deviation increase in UI taxes predicts 2% lower employment. The relatively small magnitude of the average treatment effect suggest there is still a substantial portion of young firms that do not respond to new employer taxes on this margin. In other words, given that the average new firm employs about 7 workers, the 2% average decrease in employment is consistent with 13% of firms reducing their employment by one, and the remaining firms not responding in terms of employment.[41] This effect attenuates as a firm ages, consistent with the new employer rate no

[39] As a reminder, these are firms in retail trade, admin/support/waste management, arts/entertainment, and accommodation/food.

[40] Figure A.5 presents robustness results, including versions without firm fixed effects and without normalizing taxes.

[41] The average firm size in the BDS at age 1 is 7. If all new firms would have 7 employees in the absence of

longer reflecting the actual cost for the firm; as the firm ages and experience rating becomes relevant, we see a larger effect for the maximum rate, with a negative coefficient on the maximum tax at age 5. Unlike in the survival results, here new employer taxes appear to matter beyond when they are strictly relevant. This may be because employment decisions are sticky and so these taxes having lingering effects on firm size.

These employment results, coupled with the survival results, are reflective of UI taxes proving costly for firms. Even amongst the firms that are able to survive, higher UI taxes may stunt employment growth for many years.

5.3 Substitution to Non-Taxed Workers

In the face of high payroll taxes, some firms may have options beyond exiting or staying small. For example, an alternative way employers can adjust employment in response to payroll tax costs is through the use of temporary or leased workers, who are non-W-2 employees for whom firms do not pay payroll taxes. For short-run or seasonal jumps in labor demand, firms can avoid paying additional UI taxes by hiring workers as independent contractors or through staffing agencies and temporary help firms. We hypothesize that firms' incentive to substitute regular employment with temporary or leased workers is greater when UI taxes are higher.

To test this hypothesis, we leverage Census Bureau data on contract labor usage by construction firms, as measured in the 2007 and 2012 snapshots of the CCN. To study new employers, we keep establishments that entered within two years of the census year. For example, firms in 2007 will be considered new if they entered in 2005 or 2006. Because each establishment is only identified as new once, this is a cross-sectional rather than panel regression. We estimate the following:

$$\text{Has Any Temporary or Contract Labor}_{ist} = \beta \log(\text{new rate*base})_{st} + X'_{ist}\gamma + \epsilon_{ist}, \quad (4)$$

tax responses, but 13% of employers respond to the one standard deviation higher taxes by only employing 6 employees, this would amount to an average treatment effect of $13\% \times (-\frac{1}{7}) + (1 - 13\%) \times 0 = -2\%$.

where we study whether establishment i in state s and year y has any temporary or contract labor; the outcome is an indicator variable equal to 1 if the establishment reports any expenses for temporary or leased workers, and 0 otherwise. β is the coefficient of interest, and the vector of controls X'_{ist} includes additional employer characteristics such as log payroll and log employment; state-level policy, including corporate and personal income tax rates, the log of maximum weekly UI benefits, the minimum wage, and the state unemployment rate; and fixed effects for 3-digit NAICS-by-state and 3-digit NAICS-by-year.[42] To account for differential sampling rates by establishment size, we also estimate regressions weighted by either employment or employment and match rates from the LBD.[43]

Table 5 presents the estimates under two different weighting schemes. Columns (1) and (3) present pooled effects of UI taxes on contract labor use for 2007 and 2012, while columns (2) and (4) estimate separate, but similar, coefficients for 2007 and 2012. All specifications reveal the same result: young construction firms operating in higher UI tax regimes are disproportionately likely to use temporary contract labor, which may allow them to operate at larger scales by avoiding some UI tax costs.[44] When we account for sampling by weighting by both employment and match rates in column (3), we see that a one standard deviation (0.66 log point) increase in UI taxes predicts a 3.6 percentage point higher likelihood of using contract labor, a 25% increase relative to the mean (14% contract labor usage). If we focus more on larger firms who are more likely to use contract labor (mean rate of 20%, column (1)), we see a larger effect, with a one standard deviation (0.65 log point) increase in UI taxes predicting a 7 percentage point higher likelihood of using contract labor (a 35%

[42] In previous analyses, we focused on sectoral differences and so included 2-digit NAICS. Here, we consider 3-digit NAICS in order to contrast different industries within the construction sector (2-digit NAICS 23).

[43] Despite its name, the Census of Construction only has universal coverage of large establishments. Smaller establishments are sampled at varying rates based on annual payroll thresholds. To account for this differential likelihood of being sampled, we can place greater weight on observations based on their empirical match rates to the LBD. We assign establishments to 10 bins of annual payroll, and calculate the match rate to the LBD to generate the weights. These bins range from 0-50k, 50-100k, 100-250k, 250-500k, 500-1m, 1-1.5m, 1.5-2m, 2-3m, 3-5m, and over 5m.

[44] Note that if the contract labor is employed at another firm, that other firm *does* pay UI taxes for them and thus could pass through some of these costs to the construction firm. However, if the contract firm is older or housed in another industry, it likely faces lower UI tax rates than the construction firm.

increase relative to the mean).

Regardless of specification, this analysis demonstrates that some firms may be able to partially circumvent UI taxes by hiring labor for whom they do not have to pay UI taxes directly. To the extent to which contract labor may turn over more quickly or be less productive, this could still prove costly for firms. Nonetheless, we conclude that at least some firms internalize these UI tax costs in ways that may distort their production processes.

6 Conclusion

New firm entry, particularly entrepreneurship, is frequently viewed as an important source of economic growth. While the existing literature on business taxation has primarily focused on the labor demand and location decisions of mature firms, we provide evidence that new employer tax costs can also significantly impact the entry and growth prospects of nationally new businesses. In the context of state UI taxes, we estimate that more expensive UI tax regimes deter both firm entry and impact short-run survival and growth after entry. These taxes are particularly costly to firms for whom labor plays a larger role in the production process, as well as for firms in sectors with higher labor turnover.

Taken together, our results highlight how state UI policies for new employers may have unintentional consequences for firm entry and outcomes. Thus policymakers face a tradeoff. On the one hand, new firms *should* potentially pay high taxes, since their high rates of exit and likelihood for layoffs can subsequently lead to large outlays from the UI system. From an actuarial perspective, new firms are costly to state UI programs, and so it is understandable that they may be charged more. Yet, on the other hand, we have shown in this paper that higher taxes for new firms can actually lead to substantial economic costs for states, too, in the form of lower entry, higher exit, and lower employment growth.

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Table 1: Summary statistics

	Unweighted			Weighted				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Mean	Std Dev	Median	Mean	Std Dev	Median	Min	Max
Number of new firms	581	952	252	1,869	1,958	1,126	0.00	11,052
Log(number of new firms)	5.44	1.52	5.53	6.97	1.16	7.03	0.00	9.31
Entry rate	8.52	2.88	8.26	7.98	3.45	7.62	0.00	100
New rate*base	372.61	264.27	259.20	347.04	236.14	243.00	76.51	2,726
Log(new rate*base)	5.74	0.57	5.56	5.71	0.49	5.49	4.34	7.91
Log(base)	9.45	0.52	9.26	9.27	0.47	9.10	8.85	10.63
New rate	2.66	1.09	2.70	3.02	1.14	2.70	1.00	9.88
Base ($)	14,637	8,517	10,500	12,098	7,388	9,000	7,000	41,300
Personal inc. tax rate	5.25	3.01	5.90	5.47	3.62	5.83	0.00	14.10
Corporate tax rate	6.52	2.88	7.00	6.47	2.91	7.10	0.00	12.00
Log(UI benefits) ($)	5.92	0.25	5.92	5.96	0.24	5.99	5.32	6.52
Minimum wage ($)	6.64	1.07	7.15	6.73	1.08	7.15	5.15	9.50
State unemp. rate	6.27	2.09	5.90	6.71	2.14	6.30	2.60	13.70

Notes: N = 9,162. This table presents summary statistics of the key variables in this paper, based on BDS data. These include the number of new firms, the firm entry rate, measures of nominal UI taxes (the level and log new rate times base, the log base, and the new rate), and other state characteristics (including the personal income and corporate tax rates, the level of UI benefits and minimum wage, and the state unemployment rate). All rates variables are scaled to lie between 0 and 100. The level of observation is a NAICS sector-state-year cell. For means, standard deviations, and medians, observations are either unweighted (columns (1)-(3)) or weighted (columns (4)-(6)) by a measure of the "size" of each cell: the total number of firms (all ages) in the sector-state-year.

Table 2: Higher UI taxes predict lower firm entry

	Log(Number of New Firms)			Entry Rate		
	(1)	(2)	(3)	(4)	(5)	(6)
Log(new rate*base)	-0.105***	-0.110***		-0.432***	-0.528***	
	(0.008)	(0.008)		(0.074)	(0.070)	
Log(base)			-0.180***			-0.819***
			(0.017)			(0.137)
New rate			-0.030***			-0.114***
			(0.003)			(0.032)
Personal inc. tax rate		0.007***	0.006***		0.080***	0.072***
		(0.002)	(0.002)		(0.019)	(0.019)
Corporate tax rate		0.007***	0.007***		-0.020**	-0.018*
		(0.001)	(0.001)		(0.010)	(0.010)
Log(UI benefits) ($)		-0.029	-0.035		0.386	0.329
		(0.028)	(0.027)		(0.298)	(0.294)
Minimum wage ($)		-0.026***	-0.024***		-0.303***	-0.297***
		(0.004)	(0.004)		(0.051)	(0.052)
State unemp. rate		-0.018***	-0.019***		-0.277***	-0.281***
		(0.002)	(0.002)		(0.022)	(0.022)
R^2	0.994	0.995	0.995	0.914	0.919	0.919
Mean Outcome	6.972	6.972	6.972	8.521	8.521	8.521
Sector-Year FEs	X	X	X	X	X	X
Sector-State FEs	X	X	X	X	X	X
Firm Weights	X	X	X	X	X	X
N	9,162	9,162	9,162	9,162	9,162	9,162

Notes: This table presents regressions of how the level of firm entry in a sector-state pair varies with the UI tax regime. Columns (1)-(3) regress the log number of new (age 0) firms (plus 1) on UI taxes and controls; columns (4)-(6) present similar regressions for the firm entry rate, given by the number of new firms divided by the total number of firms (all ages) in the sector-state pair in the previous year (multiplied by 100). (See Appendix Table **??** for regressions of the log number of new firms (not plus 1); results are negligibly different.) The main independent variable is the log(new rate * base), which captures the log of the product of the new employer UI tax rate and the UI tax base. Starting in columns (2) and (5), we add additional controls (including the personal income and corporate tax rates, the level of UI benefits and minimum wage, and the state unemployment rate); columns (3) and (6) consider the roles of the UI tax rate and tax base separately. All columns additionally include sector-year and sector-state fixed effects. All rates variables are scaled to lie between 0 and 100. In all columns, the level of observation is a NAICS sector-state-year cell; in all columns, observations are weighted by a measure of the "size" of each cell: the total number of firms (all ages) in the sector-state-year. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Higher UI taxes predict lower firm entry, across state borders

	Log(Number of New Firms)		Entry Rate	
	(1)	(2)	(3)	(4)
Log(base)	-0.114***	-0.088***	-0.788***	-0.754***
	(0.019)	(0.025)	(0.132)	(0.181)
R^2	0.993	0.997	0.799	0.914
Mean Outcome	5.866	5.866	7.416	7.416
Year FEs	X		X	
County FEs	X	X	X	X
Year-County Pair FEs		X		X
N	31,250	31,250	31,250	31,250

Notes: This table presents regressions of how the level of firm entry in a county varies with the UI tax regime, as compared to neighboring counties across state borders. The sample consists of counties that sit at state borders, paired to one or more neighboring counties across the border. In the case a county pairs to more than one other county, they appear in the data multiple times; the observation level is a county-year-count neighbor pair. In this analysis we focus on the tax base, as the tax rate can vary across sectors, which are pooled in the county-level data.

Columns (1) and (2) regress the log number of new (age 0) firms (plus 1) on the UI tax base and controls; Columns (3) and (4) present similar regressions for the firm entry rate, given by the number of new firms divided by the total number of firms (all ages) in the sector-state pair in the previous year (multiplied by 100). All regressions include controls listed in the footer as well as economic controls, which include the personal income and corporate tax rates, the level of UI benefits and minimum wage, and the state unemployment rate. All rates variables are scaled to lie between 0 and 100.

Odd columns include year and county fixed effects, while even columns add year-by-county neighbor pair fixed effects. Because counties can appear multiple times, if they have multiple cross-border neighbors, we use weights that are adjusted to (a) be equivalent across counties within a pair and (b) approximate the number of firms within the county pair. If county i and county j are neighbors and have (all ages) firm counts w_i and w_j in a given year, respectively, there are two observations for this pair (one for county i and one for county j). For both observations, we assign a weight equal to $(w_i \frac{w_j}{\sum_{j'} w_{j'}} + w_j \frac{w_i}{\sum_{i'} w_{i'}})$, where j' denotes *all* counties that i neighbors and i' all counties that j neighbors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Higher UI taxes predict lower firm entry and employment when taxes matter more

	Baseline	Above Median						
		Turnover	Part-time	Labor share	Turnover, part-time	Turnover, labor share	Part-time, labor share	Turnover, part-time, labor share
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Dependent variable: Entry Rate								
Log(new rate*base)	-0.528***	-0.293***	-0.639***	-0.406***	-0.490***	-0.425***	-0.533***	-0.533***
	(0.070)	(0.106)	(0.122)	(0.085)	(0.109)	(0.084)	(0.089)	(0.089)
Above median ×		-0.344**	0.0208	-0.220	-0.089	-0.197	0.018	0.018
Log(new rate*base)		(0.143)	(0.152)	(0.142)	(0.141)	(0.145)	(0.142)	(0.142)
Panel B: Dependent variable: Age 1 Log(Employment)								
Log(new rate*base)	0.002	-0.002	0.011**	0.005	0.006	0.008	0.010**	0.010**
	(0.003)	(0.007)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
Above median ×		0.006	-0.015**	-0.005	-0.007	-0.009	-0.025***	-0.025***
Log(new rate*base)		(0.008)	(0.007)	(0.007)	(0.006)	(0.006)	(0.008)	(0.008)

Notes: This table presents regressions of how the firm entry rate (Panel A) and age 1 employment (Panel B) in a sector-state pair varies with the UI tax regime, based on whether the taxes should be relatively costly and/or salient to firms. All columns estimate regressions similar to column (5) of Table 2 but add in interactions between the UI taxes and indicators for whether the sector is above median in terms of worker turnover rates, part-time rates, and labor share, relative to other sectors; all columns include state-by-sector and sector-by-year fixed effects as well as economic controls (personal and corporate tax rates, UI benefits, minimum wage, and the state unemployment rate). Note that columns (7) and (8) are identical, because the sectors that are above-median in part-time and labor share (column (7)) also happen to be above-median in turnover (column (8)).

Above-median turnover: construction, retail trade, real estate, professional/science/technical services, admin/support services/waste management, arts and entertainment, accommodation and food, and other services.

Above-median part-time: retail trade, real estate, admin/support services/waste management, health, arts and entertainment, accommodation and food, and other services.

Above-median labor share: construction, retail trade, transportation and warehousing, professional/science/technical services, admin/support services/waste management, arts and entertainment, and accommodation and food.

In all columns of Panel A, the level of observation is a sector-state-year cell, and observations are weighted by a measure of the "size" of each cell: the total number of firms (all ages) in the sector-state-year. In Panel B, the level of observation is a firm-NAICS2-state-year cell and observations are weighted equally. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

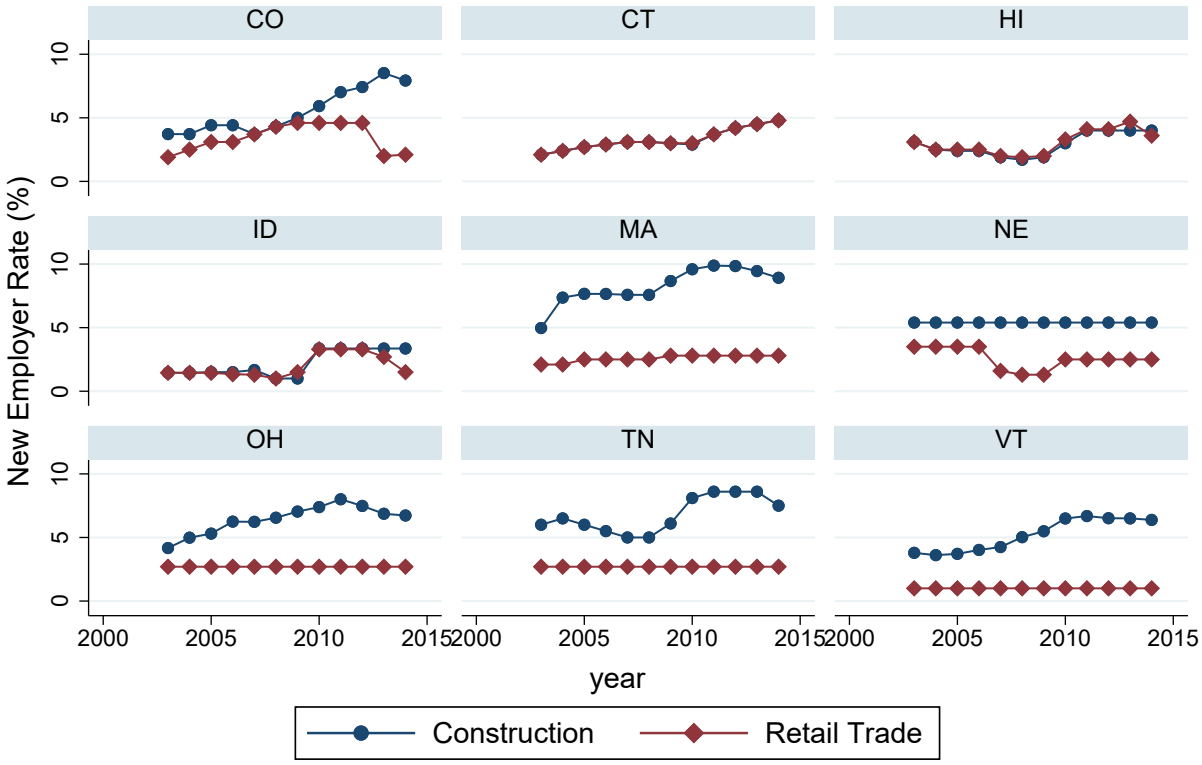
Panel A: N = 9,162. Mean outcome = 8.521. Panel B: N = 4,793,000. Mean outcome = 1.060.

Table 5: Higher UI taxes predict usage of contract labor in construction

	Has Any Temporary or Contract Labor			
	(1)	(2)	(3)	(4)
Log(new rate*base)	10.82**		5.515**	
	(4.585)		(2.401)	
Log(new rate*base) ×		10.94*		6.883**
2007		(5.934)		(3.111)
Log(new rate*base) ×		10.84**		5.770**
2012		(4.683)		(2.453)
Mean Outcome	19.96	19.96	14.17	14.17
NAICS3-Year FEs	X	X	X	X
NAICS3-State FEs	X	X	X	X
Economic controls	X	X	X	X
Log(payroll)	X	X	X	X
Weighting	Emp	Emp	Emp + Match	Emp + Match
N	24,000	24,000	24,000	24,000

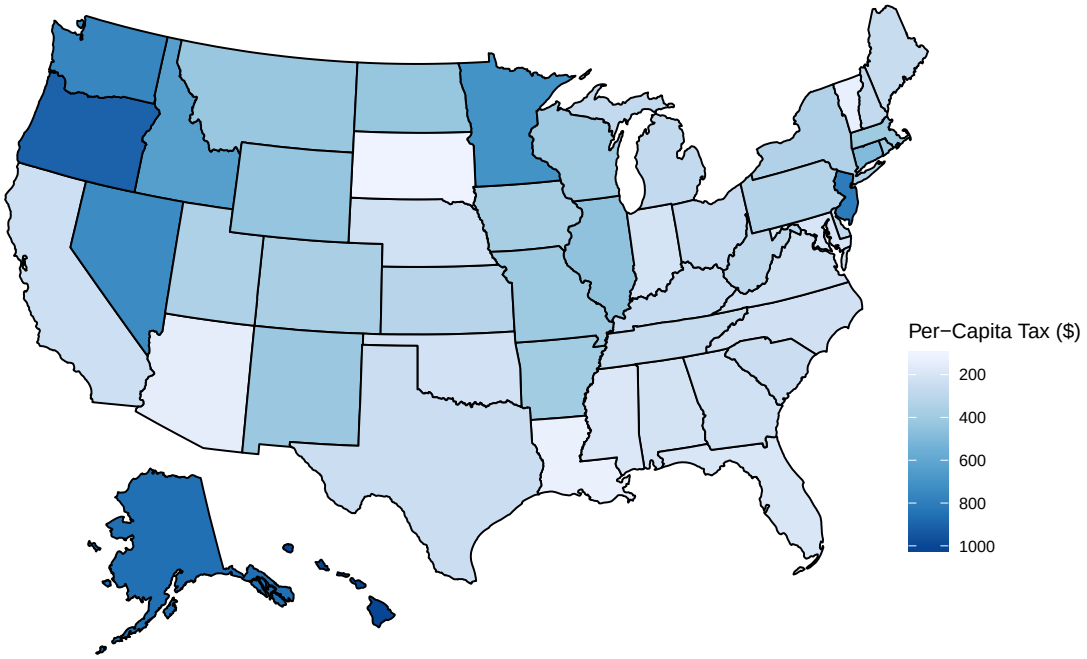
Notes: This table presents regressions of how firm contract labor usage at entry varies with the UI tax regime, for young Construction sector firms covered by the 2007 and 2012 Census of Construction Industries (CCN). The sample is constructed by matching young firms in the LBD to firms in the CCN; for the 2007 CCN we take firms that entered in 2005 or 2006, while for the 2012 CCN we take firms that entered in 2010 or 2011. The dependent variable is an indicator equal to 100 if the firm employs any temporary labor, and 0 otherwise. In all columns, the level of observation is a firm-sector-state-year cell. In columns (1) and (2), observations are weighted by employment in order to capture how taxes affect contract labor usage at larger employers (who are more likely to use contract labor). In columns (3) and (4), we additionally weight by the match rate for firms of different sizes, since the CCN has better coverage for larger firms; in practice, this weighting "down-weights" larger employers who are more likely to be matched to the CCN. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure 1: Sectoral variation in new employer rates over time (2003-2014)



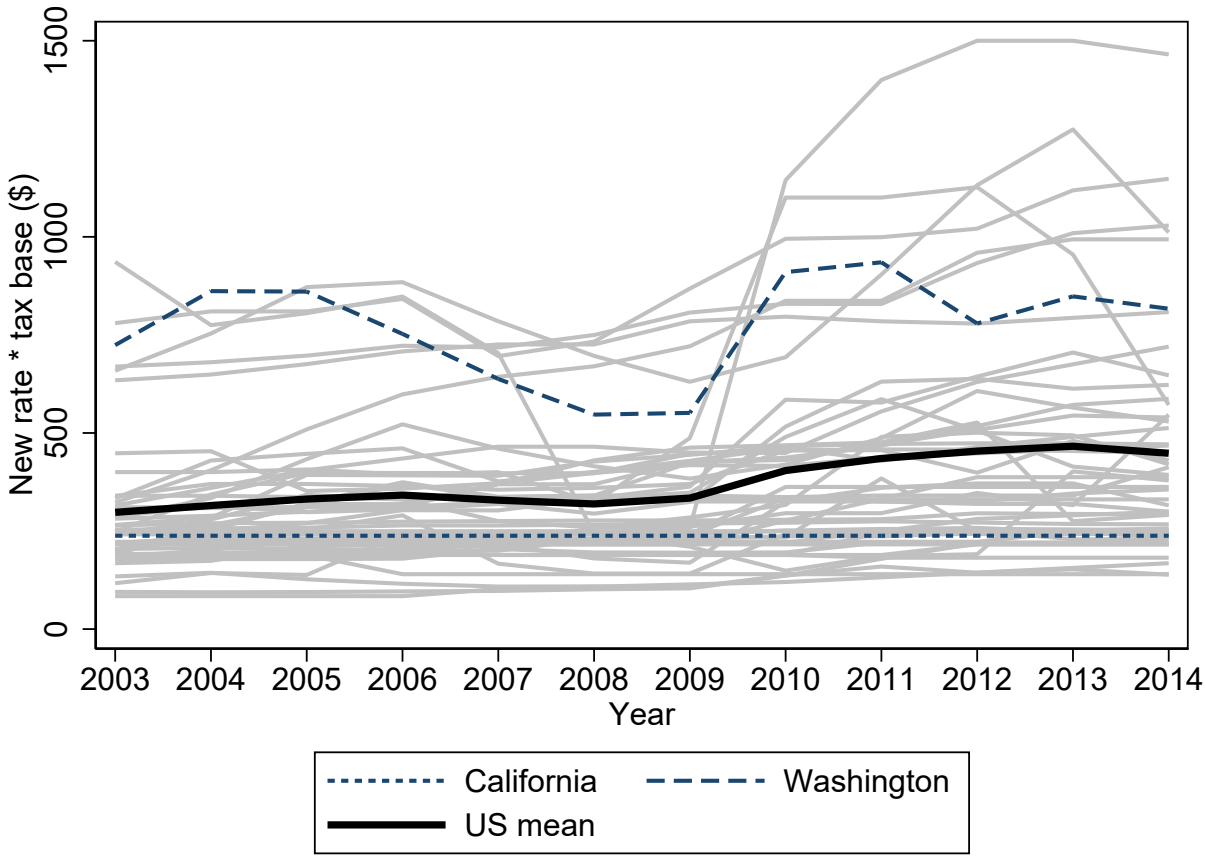
Notes: This figure demonstrates time, sectoral, and state variation in new employer rates by plotting how new employer rates evolve for Construction and Retail Trade firms in a selection of states.

Figure 2: Average new employer tax costs by state



Notes: This figure plots each state's average per-capita new employer tax cost from 2003 to 2014. The tax is calculated by multiplying each state's taxable wage base by the mean of new employer rates across all sectors and years. Values are top-coded at $1,000.

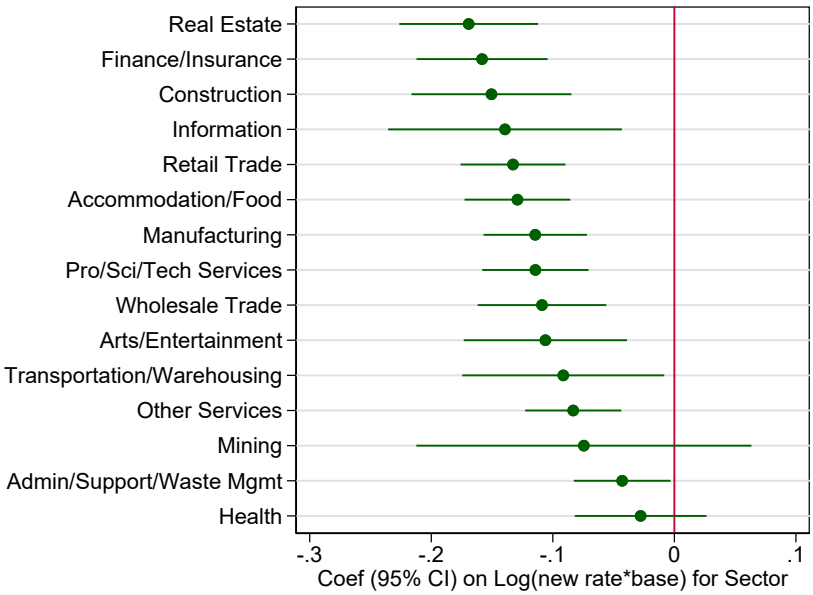
Figure 3: State per-capita new employer taxes over time (2003-2014)



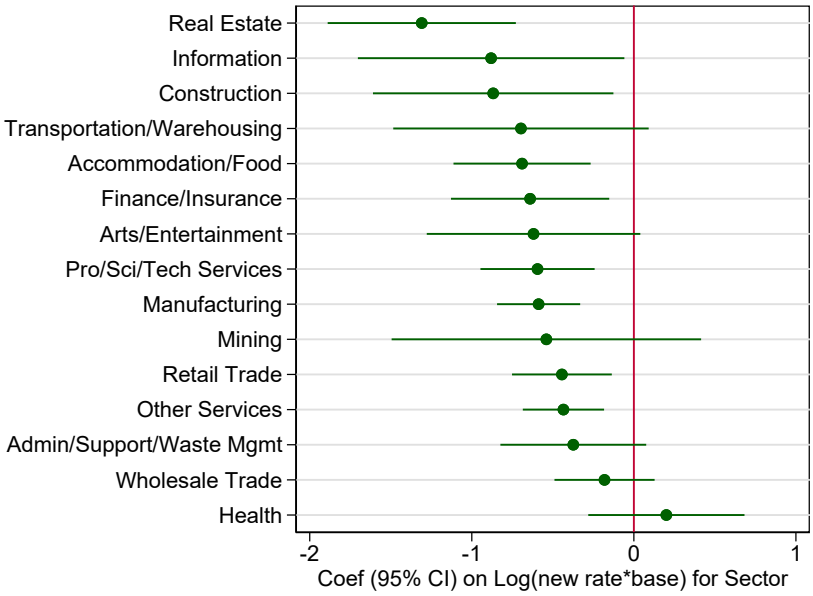
Notes: This figure plots the taxable wage base multiplied by the average new employer rate for each state in the US. Values are in nominal dollars, and top-coded at $1,500. Highlighted in bold is the unweighted national average.

Figure 4: Effect of UI taxes on firm entry varies by sector

(A) Effect of UI tax on log(number of new firms) by sector



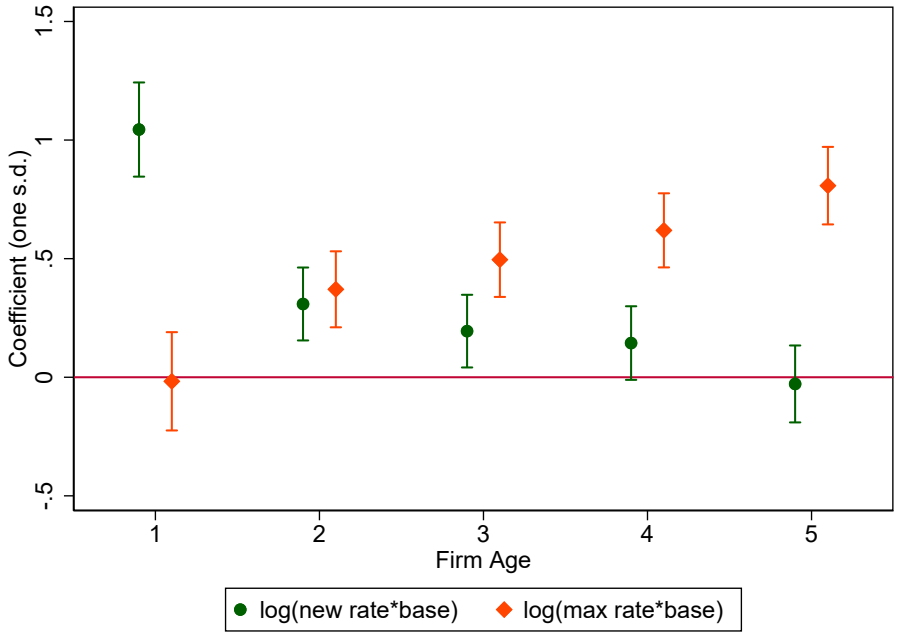
(B) Effect of UI tax on entry rate by sector



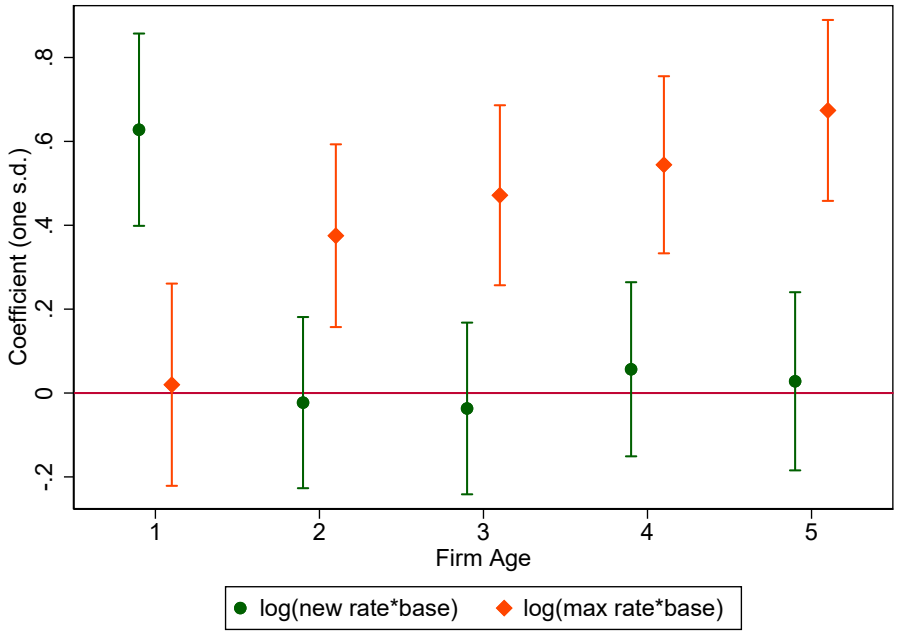
Notes: $N = 9,162$. This figure presents separate coefficient estimates on UI tax by sector, for the log number of new firms (Panel A) and the entry rate (Panel B). The specification is based on column (5) of Table 2.

Figure 5: Higher UI taxes increase likelihood of exit for young firms

(A) Includes entry year fixed effects

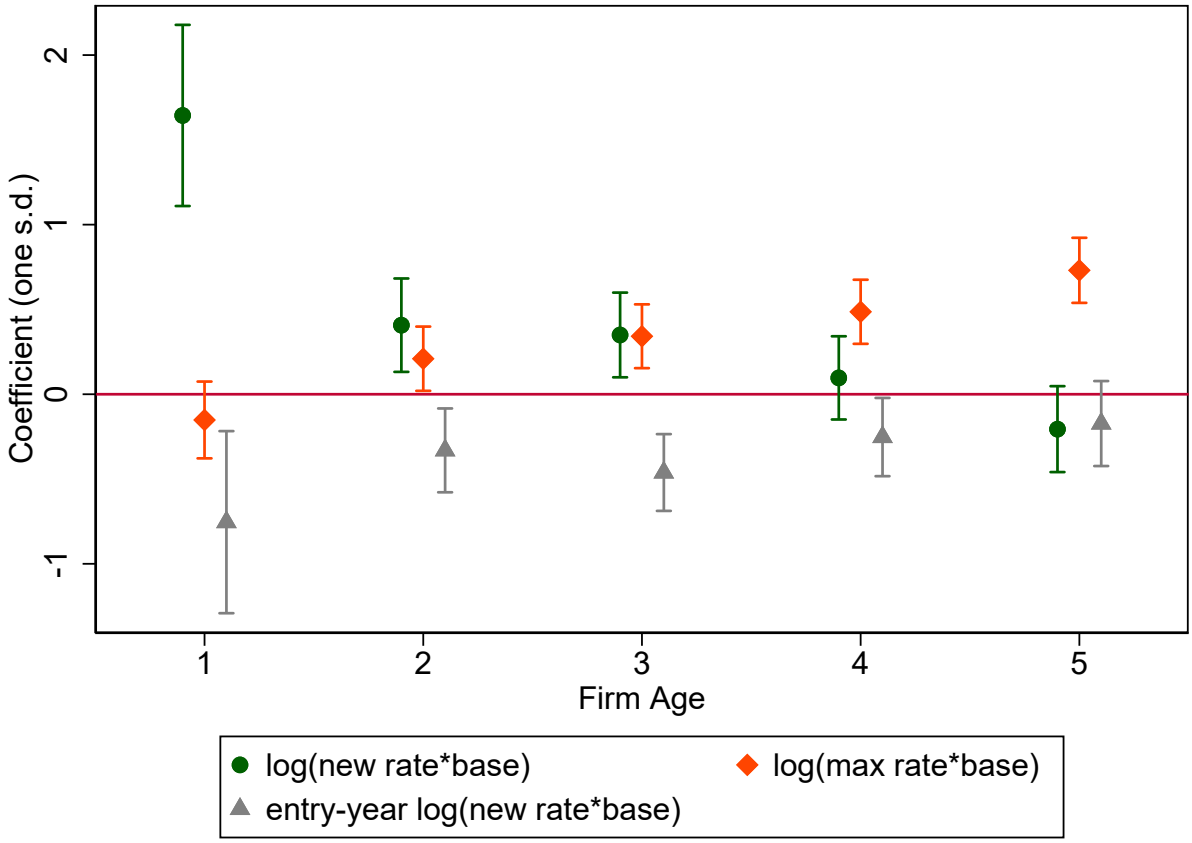


(B) Includes state-sector-entry year cohort fixed effects



Notes: $N = 40,309$. This figure presents regression estimates at the age-state-sector-year level of how exit rates vary by age with the UI tax regime. Each panel plots coefficients from a single regression of firms aged 1-5, of log(new rate*base) interacted with firm age and log(max rate*base) interacted with firm age. Both UI tax measures are normalized to have a standard deviation of one. Regressions are weighted by the total number of firms (all ages) in the sector-state-year, and additional controls include corporate and personal income tax, UI benefit, minimum wage, and state unemployment rate. Panel A includes age, sector-year, sector-state, and entry year fixed effects. Panel B additionally includes state-sector-entry year cohort fixed effects, to control for entry cohort. Error bars denote 95% confidence intervals for robust standard errors. Mean exit rates at each age are 23.6, 16.2, 13.6, 11.9, and 10.9 respectively.

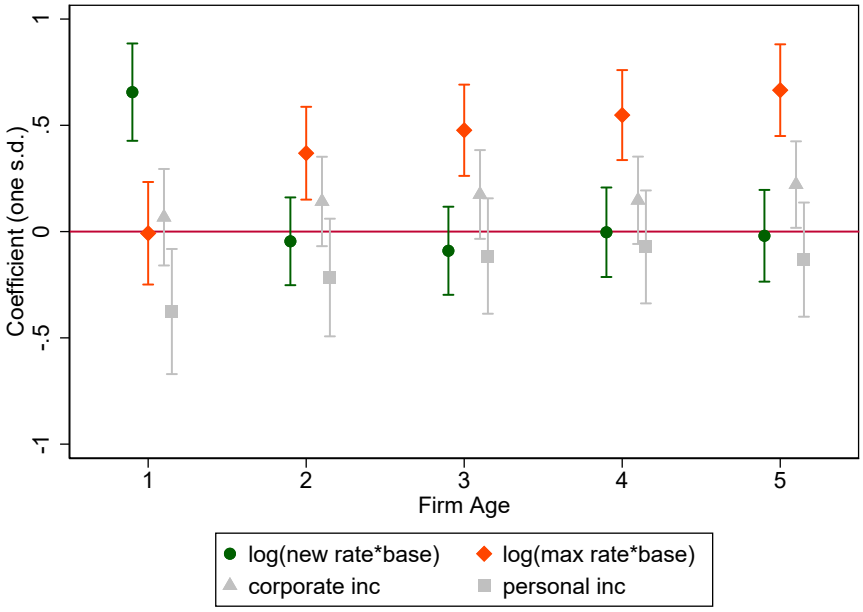
Figure 6: Initial UI taxes in the year of entry generate potential selection



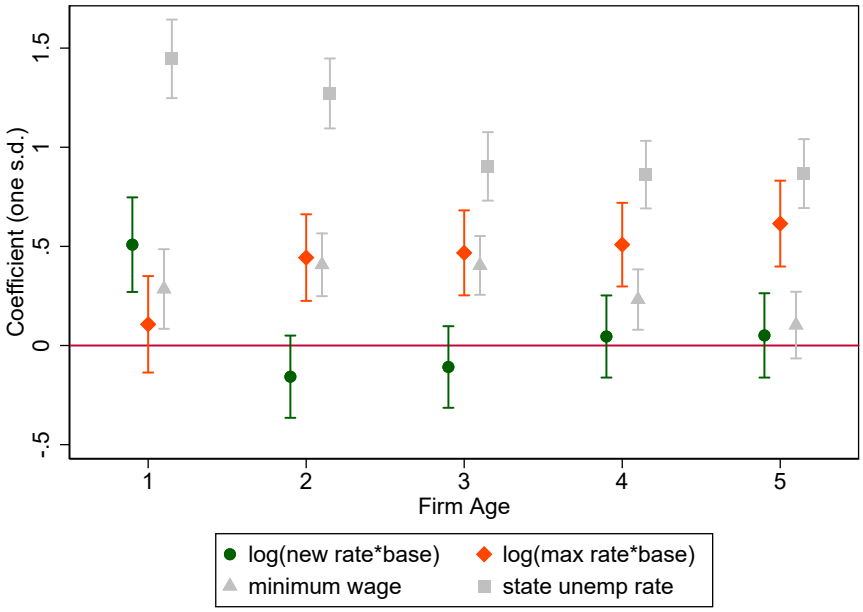
Notes: $N = 31,670$. This figure presents regression estimates at the age-state-sector-year level of how exit rates vary by age with the initial UI tax regime in the year of entry. Plots coefficients from a single regression of firms aged 1-5 of log(new rate*base) interacted with firm age; log(max rate*base) interacted with firm age; and log(new rate*base) in the year of entry interacted with firm age. All UI tax measures are normalized to have a standard deviation of one. Regressions are weighted by the total number of firms (all ages) in the sector-state-year, and additional controls include corporate and personal income tax, UI benefit, minimum wage, and state unemployment rate as well as age, sector-year, sector-state, and entry year fixed effects. Error bars denote 95% confidence intervals for robust standard errors. Mean exit rates at each age are 23.7, 16.4, 13.8, 12.1, and 11.0 respectively.

Figure 7: Benchmarking to other state variables

(A) State income taxes have no impact on exit rates

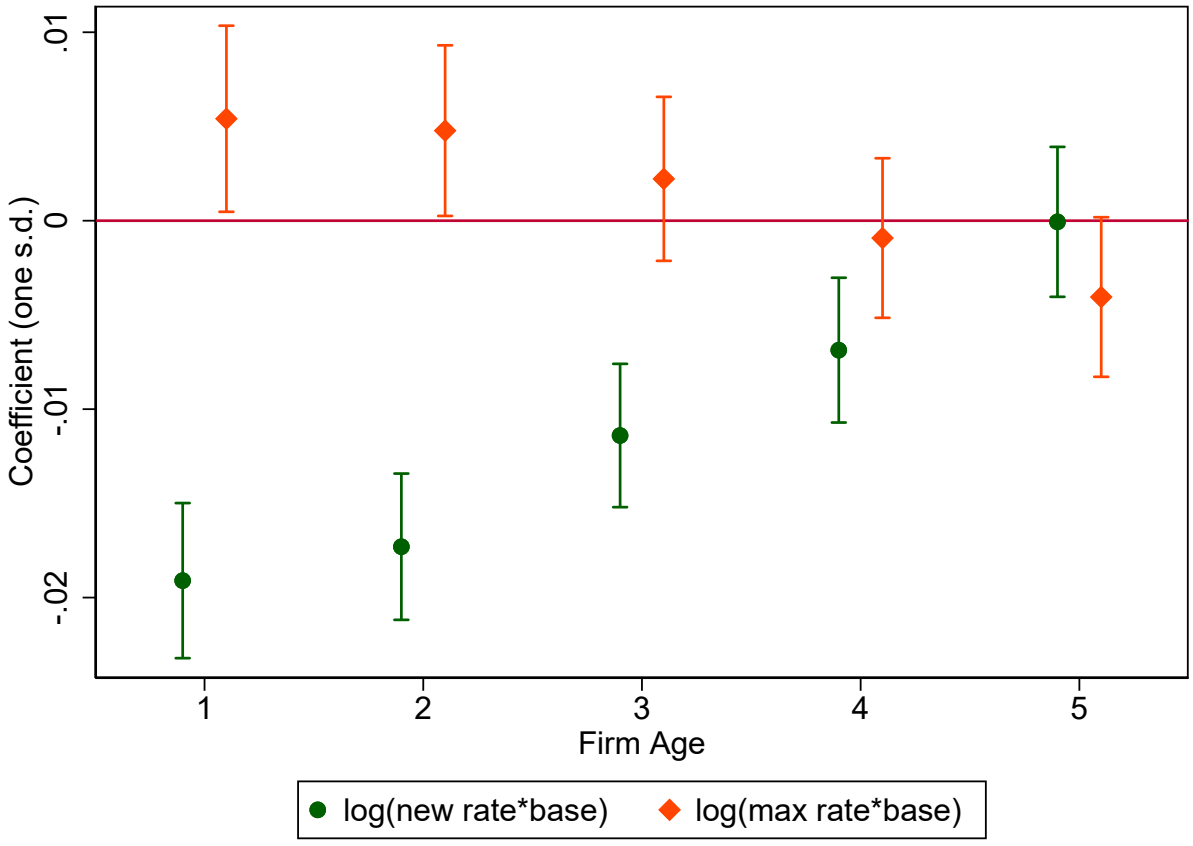


(B) UI taxes matter even with inclusion of minimum wage and unemployment rates



Notes: $N = 40,309$. This figure presents regression estimates at the age-state-sector-year level of how exit rates vary by age with various state variables. Panel (a) plots coefficients from a single regression of the following variables interacted with firm age: log(new rate*base); log(max rate*base); state corporate income tax rate; and state personal income tax rate. Panel (b) plots coefficients from a single regression of the following interacted with firm age: log(new rate*base); log(max rate*base); state minimum wage; and state unemployment rate. All state measures are normalized to have a standard deviation of one. Regressions are weighted by the total number of firms (all ages) in the sector-state-year, and additional controls include corporate and personal income tax, UI benefit, minimum wage, and state unemployment rate. Regressions also include sector-by-year, sector-by-state, age, and entry year fixed effects. Error bars denote 95% confidence intervals for robust standard errors. Mean exit rates at each age are 23.6, 16.2, 13.6, 11.9, and 10.9 respectively.

Figure 8: Higher UI taxes predict lower log(employment) at young ages



Notes: $N = 2,176,000$. This figure presents regression estimates at the firm-age level of how log employment varies by age with the UI tax regime. Plots coefficients of log(new rate*base) interacted with firm age and log(max rate*base) interacted with firm age, from a single regression on a balanced sample of firms aged 1-5 in high part-time, high labor share, and high turnover sectors (i.e., retail trade; admin/support services/waste management; arts and entertainment; and accommodation and food). Both UI tax measures are normalized to have a standard deviation of one. Regression also includes controls for corporate and personal income tax, UI benefit, minimum wage, state unemployment rate, and fixed effects for firm, NAICS2-year, NAICS2-state, age, and entry year. Error bars denote 95% confidence intervals for robust standard errors. Mean log employment is 1.65 (i.e., about 5 workers).

Supplemental Appendix

A.I Data Appendix

A.I.1 New Employer Tax Dataset

We construct a dataset of new employer tax rates at the state, year, and 2-digit NAICS level, summarized in Table A.1. Statutory new employer rates are summarized in the Department of Labor's annual reports of *Significant Measures of State UI Tax Systems*. While the majority of states assign all new employers a uniform rate, 8 states assign industry-specific new employer rates for higher experience industries, and an additional 18 states assign higher rates specifically for employers in the construction sector. Some states publish their industry-specific new employer rates, and we use these published rates whenever available. For states without industry rate information, we impute the industry average using empirical tax rates calculated from the Quarterly Census of Employment and Wages.

Some states have time-varying new employer rates, which are often calculated based on average employer costs, or the solvency of the UI trust fund. In these states, we supplement with ETA 204 Experience Rating Reports that states submit to the Department of Labor. Within these reports, states report the average rate charged to all employers who are ineligible for experience rating. There will sometimes be a discrepancy between new employer rates reported in the Significant Figures reports and the ETA 204 reports, and we resolve discrepancies in favor of ETA 204.

A.I.2 U.S. Census Bureau Data

A.I.2.1 Longitudinal Business Database (LBD) and Business Dynamics Statistics (BDS)

The LBD tracks all U.S. business establishments and firms with paid employees, starting in 1976. For each establishment, the LBD provides information on March 12th employment, annual payroll, and location (state) and industry (NAICS6). The BDS summarizes this data for public use, and we use the BDS to measure firm entry counts at the state, NAICS sector, and year level; in appendix results, we additionally use a version of the BDS that captures

firm entry at the county and year level. We assign zeroes for cells that are suppressed due to disclosure risk, as the smallest count that is publicly disclosed is a count of 3.

In addition to firm outcomes, we use the LBD to identify new firms entering the economy. To do this, we use Census-provided measures of the first year each establishment employs workers. To find the age of a given firm, we follow Haltiwanger et al. (2013) and take the earliest first year, amongst all establishments belonging to the firm nationally.

A.I.2.2 County Adjacency File

The Census Bureau provides public datasets that identify all pairs of neighboring counties. We use the 2010 version and focus on pairs located in different states.[45]

A.I.2.3 Census of Construction (CCN)

The CCN is compiled every 5 years as part of the Census Bureau's Economic Census, and we use data from the 2007 and 2012 censuses for our analysis. Importantly, the CCN requires firms to report the annual amount of money spent on hiring temporary staff and leased workers,[46] and this value is our outcome of interest. In 2002 and prior, the form asks about leased workers but not temporary workers, resulting in reported values that are not consistent with 2007 and 2012 amounts.

A.I.3 Industry characteristics

We identify sectors (NAICS2) where we expect the cost of UI taxes to be higher and/or more salient, as discussed in Section 2. We focus on three relevant measures at the industry level calculated in 2005: turnover rate, part-time share, and labor share. The turnover rate is defined as the share of workers hired or separated within the quarter, and is measured from the Quarterly Workforce Indicators (QWI). The part-time share is defined as the share of workers with usual weekly hours below 35, and is measured from the Current Population

[45] The dataset is accessible at `https://www.census.gov/geographies/reference-files/time-series/geo/county-adjacency.html`.

[46] See Section 16 of `https://www2.census.gov/programs-surveys/economic-census/2012/questionnaires/forms/cc23601.pdf`.

Survey (CPS). The labor share is defined as labor compensation divided by output, and is taken from the Bureau of Labor Statistics (BLS). Sectors with above median turnover are: construction (23), retail trade (44-45), real estate (53), professional, scientific, and technical services (54), admin/support services (56), arts and recreation (71), accommodation and food (72), and other services (81). Sectors with above median part-time work include all of the above except construction and professional, scientific, and technical services, with the addition of healthcare (62). Sectors with above median labor share include all of the high turnover sectors except real estate and other services, with the addition of transportation and warehousing (48-49).

A.II Appendix Tables and Figures

Table A.1: State new employer taxes (2003-2014)

State	Tax Formula	Mean Tax Base	New Rate	Construction
Alabama	Benefit Ratio	$8,000	2.7%	
Alaska	Payroll Variation	$31,900*	Industry Avg (IA)	IA
Arizona	Reserve Ratio	$7,000	2-2.7%	
Arkansas	Reserve Ratio	$10,800	3.3-4%†	
California	Reserve Ratio	$7,000	3.4%	
Colorado	Reserve Ratio	$10,300	2-4.6%†	IA
Connecticut	Benefit Ratio	$15,000	2.1-4.8%†	
Delaware	Benefit Wage	$10,300	2.1-2.6%†	IA
DC	Reserve Ratio	$9,000	2.7%	
Florida	Benefit Ratio	$7,250	2.7%	
Georgia	Reserve Ratio	$8,700	2.62%	
Hawaii	Reserve Ratio	$31,400*	1.9-4.7%†	
Idaho	Reserve Ratio	$31,600*	1-3.3%†	
Illinois	Benefit Ratio	$11,700	higher 3.1% or IA	IA
Indiana	Reserve Ratio	$7,800	2.5-2.7%	lesser 4% or IA
Iowa	Benefit Ratio	$23,000*	1-1.9%†	7.5-9%
Kansas	Reserve Ratio	$8,000	3-4%†	6%
Kentucky	Reserve Ratio	$8,300	2.7%	Max
Louisiana	Reserve Ratio	$7,300	IA	IA
Maine	Reserve Ratio	$12,000	1.4-3.1%†	
Maryland	Benefit Ratio	$8,500	2.1-2.6%†	
Massachusetts	Reserve Ratio	$13,700	2.1-2.8%†	IA
Michigan	Benefit Ratio	$9,000	2.7%	IA
Minnesota	Benefit Ratio	$25,500*	1-3%†	8%
Mississippi	Benefit Ratio	$9,300	1.2-2.7%	
Missouri	Reserve Ratio	$11,500	3.5%	IA
Montana	Reserve Ratio	$24,200*	IA	IA
Nebraska	Reserve Ratio	$8,400	1.3-3.5%†	Max
Nevada	Reserve Ratio	$25,000*	2.95%	
New Hampshire	Reserve Ratio	$10,000	2.7%	
New Jersey	Reserve Ratio	$27,800*	2.8-3.3%†	
New Mexico	Benefit Ratio	$19,900*	2-2.7%	
New York	Reserve Ratio	$8,650	4%	
North Carolina	Reserve Ratio	$18,700*	1.2%	
North Dakota	Reserve Ratio	$23,900*	1.2-2.1%†	IA
Ohio	Reserve Ratio	$9,000	2.7%	IA
Oklahoma	Benefit Wage	$15,500*	1-2%†	
Oregon	Benefit Ratio	$30,400*	2.4-3.3%†	
Pennsylvania	Both RR and BR	$8,100	3.5-3.8%†	9%
Rhode Island	Reserve Ratio	$16,900*	1.6-2.8%†	
South Carolina	Benefit Ratio	$8,500	2-3.9%†	
South Dakota	Reserve Ratio	$9,600	1.2%	
Tennessee	Reserve Ratio	$7,800	higher 2.7% or IA	IA
Texas	Benefit Ratio	$9,000	2.7%	IA
Utah	Benefit Ratio	$26,500*	IA	IA
Vermont	Benefit Ratio	$10,600	1%	IA
Virginia	Benefit Ratio	$8,000	2.5-3.2%†	
Washington	Benefit Ratio	$34,400*	IA	IA
West Virginia	Reserve Ratio	$9,700	2.7%	7.5%
Wisconsin	Reserve Ratio	$11,750	2.7-3.6%	6.6%
Wyoming	Benefit Ratio	$20,100*	IA	IA

Notes: Source: US Dept of Labor *Significant Provisions of State Unemployment Insurance Laws.*
*Indicates tax base that is indexed to state average wages. † Indicates new employer rates that are determined annually (based on state average, or trust fund solvency).

Table A.2: Higher UI taxes predict lower firm entry, for both low- and high-base states

	Log(Number of New Firms)		Entry Rate	
Sample	Low Base ($\leq \$10,500$)	High Base ($> \$10,500$)	Low Base ($\leq \$10,500$)	High Base ($> \$10,500$)
	(1)	(2)	(3)	(4)
Log(new rate*base)	-0.104***	-0.072***	-0.694***	-0.394***
	(0.010)	(0.018)	(0.099)	(0.147)
Personal inc. tax rate	-0.003	0.008***	0.106***	0.045*
	(0.003)	(0.003)	(0.023)	(0.024)
Corporate tax rate	0.005	0.007***	-0.054	-0.020*
	(0.005)	(0.001)	(0.038)	(0.011)
Log(UI benefits) ($)	0.111**	-0.060	0.744*	0.114
	(0.047)	(0.039)	(0.411)	(0.405)
Minimum wage ($)	-0.008	-0.038***	-0.313***	-0.385***
	(0.006)	(0.006)	(0.060)	(0.074)
State unemp. rate	-0.010***	-0.025***	-0.119***	-0.367***
	(0.002)	(0.002)	(0.024)	(0.031)
R^2	0.991	0.996	0.896	0.935
Mean Outcome	6.323	7.270	7.946	8.784
Sector-Year FEs	X	X	X	X
Sector-State FEs	X	X	X	X
Firm Weights	X	X	X	X
N	4,450	4,697	4,450	4,697

Notes: This table presents regressions of how the level of firm entry in a sector-state pair varies with the UI tax regime, with the sample split into two bins based on the median nominal tax base ($10,500). Columns (1)-(2) regress the log number of new (age 0) firms on UI taxes and controls; columns (3)-(4) present similar regressions for the firm entry rate, given by the number of new firms divided by the total number of firms (all ages) in the sector-state pair in the previous year (multiplied by 100). The main independent variable is the log(new rate*base), which captures the log of the product of the new employer UI tax rate and the UI tax base. All columns include controls for the personal income and corporate tax rates, the level of UI benefits and minimum wage, and the state unemployment rate, as well as sector-year and sector-state fixed effects. All rates variables are scaled to lie between 0 and 100. In all columns, the level of observation is a NAICS sector-state-year cell; in all columns, observations are weighted by a measure of the "size" of each cell: the total number of firms (all ages) in the sector-state-year. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3: Higher UI taxes also predict fewer business registrations

	Log(Number of New Firms)	Log(Number of Applications)	Log(Number of Applications Likely to Become Firms)
	(1)	(2)	(3)
Log(new rate*base)	-0.127***	-0.071***	-0.088***
	(0.022)	(0.016)	(0.019)
Personal inc. tax rate	0.003	-0.001	0.012**
	(0.005)	(0.003)	(0.006)
Corporate tax rate	0.008***	-0.005**	-0.001
	(0.002)	(0.002)	(0.003)
Log(UI benefits) ($)	0.018	0.025	-0.018
	(0.072)	(0.050)	(0.063)
Minimum wage ($)	-0.030**	-0.005	-0.030***
	(0.012)	(0.007)	(0.011)
State unemp. rate	-0.017***	-0.015***	-0.015***
	(0.004)	(0.003)	(0.004)
R^2	0.998	0.998	0.998
Mean Outcome	9.236	11.219	10.486
Year FEs	X	X	X
State FEs	X	X	X
N	510	510	510

Notes: This table presents regressions of how the level of firm entry and business applications in a state varies with the UI tax regime. Column (1) regresses our main measure of firm entry (from BDS which captures firms with employees, pooling across all sectors with a state in a given year) on UI taxes (i.e., the product of the unweighted average new employer rate in the state and the base) and controls. Columns (2) and (3) consider alternative measures of firm entry in the form of business applications (from the Business Formation Statistics (BFS) data from the Census Bureau; see `https://www.census.gov/econ/bfs/index.html` for details); these measures capture annual business application counts, including firms with and without employees. Column (2) considers all new business applications. Meanwhile, column (3) restricts to business applications that the Census Bureau classifies as likely to become firms with employees (i.e., firms we would see in BDS); these include business applications (a) from corporations, (b) that indicate having or planning to have employees, or (c) operating in high-employment rate sectors (i.e., accommodation and food services and parts of construction, manufacturing, retail, professional/science/technical services, education, and health care. In all columns, we include state controls (including the personal income and corporate tax rates, the level of UI benefits and minimum wage, and the state unemployment rate) as well as state and year fixed effects. All columns restrict to 2005-2014 (because the BFS data begins in 2005). In all columns, the level of observation is a state-year cell; observations are weighted by a measure of the "size" of each cell in the BDS: the total number of firms (all ages) in the state-year. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.4: Higher UI taxes predict lower firm entry, even before the Great Recession

	Log(Number of New Firms)		Entry Rate	
Sample:	Pre GR	Post GR	Pre GR	Post GR
	(1)	(2)	(3)	(4)
Log(new rate*base)	-0.089***	-0.085***	-0.786***	-0.518***
	(0.018)	(0.009)	(0.197)	(0.075)
Personal inc. tax rate	0.009*	0.007***	0.066	0.050***
	(0.005)	(0.002)	(0.063)	(0.018)
Corporate tax rate	-0.022***	0.003	-0.158***	0.018
	(0.007)	(0.002)	(0.055)	(0.017)
Log(UI benefits) ($)	0.028	0.079**	0.911	0.323
	(0.071)	(0.032)	(0.860)	(0.254)
Minimum wage ($)	-0.005	-0.028***	-0.197*	-0.339***
	(0.007)	(0.006)	(0.114)	(0.044)
State unemp. rate	-0.024***	-0.012***	-0.200***	-0.182***
	(0.005)	(0.002)	(0.064)	(0.020)
R^2	0.998	0.996	0.960	0.932
Mean Outcome	7.089	6.913	9.712	7.922
Sector-Year FEs	X	X	X	X
Sector-State FEs	X	X	X	X
Firm Weights	X	X	X	X
N	3,057	6,105	3,057	6,105

Notes: This table presents regressions of how the level of firm entry in a sector-state pair varies with the UI tax regime, with the sample split into two windows: before the Great Recession (i.e., 2003-2006) and during and after the Great Recession (i.e., 2007-2014). Columns (1)-(2) regress the log number of new (age 0) firms on UI taxes and controls; columns (3)-(4) present similar regressions for the firm entry rate, given by the number of new firms divided by the total number of firms (all ages) in the sector-state pair in the previous year (multiplied by 100). The main independent variable is the log(new rate * base), which captures the log of the product of the new employer UI tax rate and the UI tax base. All columns include controls for the personal income and corporate tax rates, the level of UI benefits and minimum wage, and the state unemployment rate, as well as sector-year and sector-state fixed effects. All rates variables are scaled to lie between 0 and 100. In all columns, the level of observation is a NAICS sector-state-year cell; in all columns, observations are weighted by a measure of the "size" of each cell: the total number of firms (all ages) in the sector-state-year. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.5: Higher UI taxes predict lower firm entry: County-level

	Log(Number of New Firms)		Entry Rate	
Sample:	All Counties	Border Counties	All Counties	Border Counties
	(1)	(2)	(3)	(4)
Log(base)	-0.164***	-0.127***	-0.737***	-0.670***
	(0.017)	(0.026)	(0.114)	(0.187)
R^2	0.995	0.994	0.857	0.825
Mean Outcome	6.287	6.182	7.911	7.617
Year FEs	X	X	X	X
County FEs	X	X	X	X
N	37,645	14,178	37,645	14,178

Notes: This table presents regressions of how the level of firm entry in a county varies with the UI tax regime. The sample consists of either all counties (columns (1) and (3)) or counties that sit at state borders (columns (2) and (4)). The observation level is a county-year pair. In this analysis we focus on the tax base, as the tax rate can vary across sectors, which are pooled in the county-level data.

Columns (1) and (2) regress the log number of new (age 0) firms (plus 1) on the UI tax base and controls; Columns (3) and (4) present similar regressions for the firm entry rate, given by the number of new firms divided by the total number of firms (all ages) in the sector-state pair in the previous year (multiplied by 100). All regressions include controls listed in the footer as well as economic controls, which include the personal income and corporate tax rates, the level of UI benefits and minimum wage, and the state unemployment rate. All rates variables are scaled to lie between 0 and 100. Observations are weighted by a measure of the "size" of each cell: the total number of firms (all ages) in the county-year. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.6: Higher UI taxes predict especially low employment when taxes likely matter more

	Age 1 Employment < 5							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(new rate*base)	0.023	-0.128	-0.348*	-0.252	-0.199	-0.347	-0.321*	-0.321*
	(0.148)	(0.284)	(0.210)	(0.230)	(0.196)	(0.219)	(0.171)	(0.171)
High turnover ×		0.209						
Log(new rate*base)		(0.328)						
High part-time ×			0.657**					
Log(new rate*base)			(0.287)					
High labor share ×				0.449				
Log(new rate*base)				(0.294)				
High turnover and part-time					0.471			
× Log(new rate*base)					(0.289)			
High turnover and labor share						0.646**		
× Log(new rate*base)						(0.290)		
High part-time and labor share							1.081***	
× Log(new rate*base)							(0.323)	
High turnover, part-time, and								1.081***
labor share × Log(new rate*base)								(0.323)
Mean Outcome	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4
NAICS2-Year FEs	X	X	X	X	X	X	X	X
NAICS2-State FEs	X	X	X	X	X	X	X	X
Economic controls	X	X	X	X	X	X	X	X
N	4,793,000							

Notes: This table presents regressions of how firm size at entry varies with the UI tax regime, based on whether the taxes should be relatively costly and/or salient to firms. The dependent variable is an indicator equal to 100 if the firm employs fewer than 5 workers in its first year, and 0 otherwise. All columns replicate column (10) of Table 2 but add in interactions between the UI taxes and indicators for whether the sector is above median in terms of worker turnover rates, part-time rates, and labor share, relative to other sectors. Above-median turnover industries: construction, retail trade, real estate, professional/science/technical services, admin/support services, arts and entertainment, accommodations and food, and other services. Above-median part-time industries: retail trade, real estate, admin/support services, health, arts and entertainment, accommodations and food, and other services. Above-median labor share: construction, retail trade, transportation and warehousing, professional/science/technical services, admin/support services, arts and entertainment, and accommodations and food. In all columns, the level of observation is a firm-NAICS2-state-year cell. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.7: Higher UI taxes predict lower firm entry counts when taxes likely matter more

	Log(Number of New Firms)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(new rate*base)	-0.110***	-0.090***	-0.127***	-0.096***	-0.109***	-0.096***	-0.109***	-0.109***
	(0.008)	(0.013)	(0.013)	(0.011)	(0.012)	(0.010)	(0.010)	(0.010)
High turnover × Log(new rate*base)		-0.029*						
		(0.016)						
High part-time × Log(new rate*base)			0.031**					
			(0.016)					
High labor share × Log(new rate*base)				-0.024				
				(0.016)				
High turnover and part-time × Log(new rate*base)					-0.002			
					(0.015)			
High turnover and labor share × Log(new rate*base)						-0.026*		
						(0.016)		
High part-time and labor share × Log(new rate*base)							-0.004	
							(0.016)	
High turnover, part-time, and labor share × Log(new rate*base)								-0.004
								(0.016)
R^2	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995
Mean Outcome	6.972	6.972	6.972	6.972	6.972	6.972	6.972	6.972
Sector-Year FEs	X	X	X	X	X	X	X	X
Sector-State FEs	X	X	X	X	X	X	X	X
Firm Weights	X	X	X	X	X	X	X	X
N	9,162	9,162	9,162	9,162	9,162	9,162	9,162	9,162

Notes: This table presents regressions of how the level of firm entry in a sector-state pair varies with the UI tax regime, based on whether the taxes should be relatively costly and/or salient to firms. All columns replicate column (5) of Table 2 but add in interactions between the UI taxes and indicators for whether the sector is above median in terms of worker turnover rates, part-time rates, and labor share, relative to other sectors. Above-median turnover industries: construction, retail trade, real estate, management, health, arts and entertainment, accommodations and food, and other services. Above-median part-time industries: retail trade, real estate, management, health, arts and entertainment, accommodations and food, and other services. Above-median labor share: construction, retail trade, transportation and warehousing, professional/science/technical services, management, arts and entertainment, and accommodations and food. In all columns, the level of observation is a NAICS sector-state-year cell, and observations are weighted by a measure of the "size" of each cell: the total number of firms (all ages) in the sector-state-year. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.8: Entry rate patterns vary by indexing policies

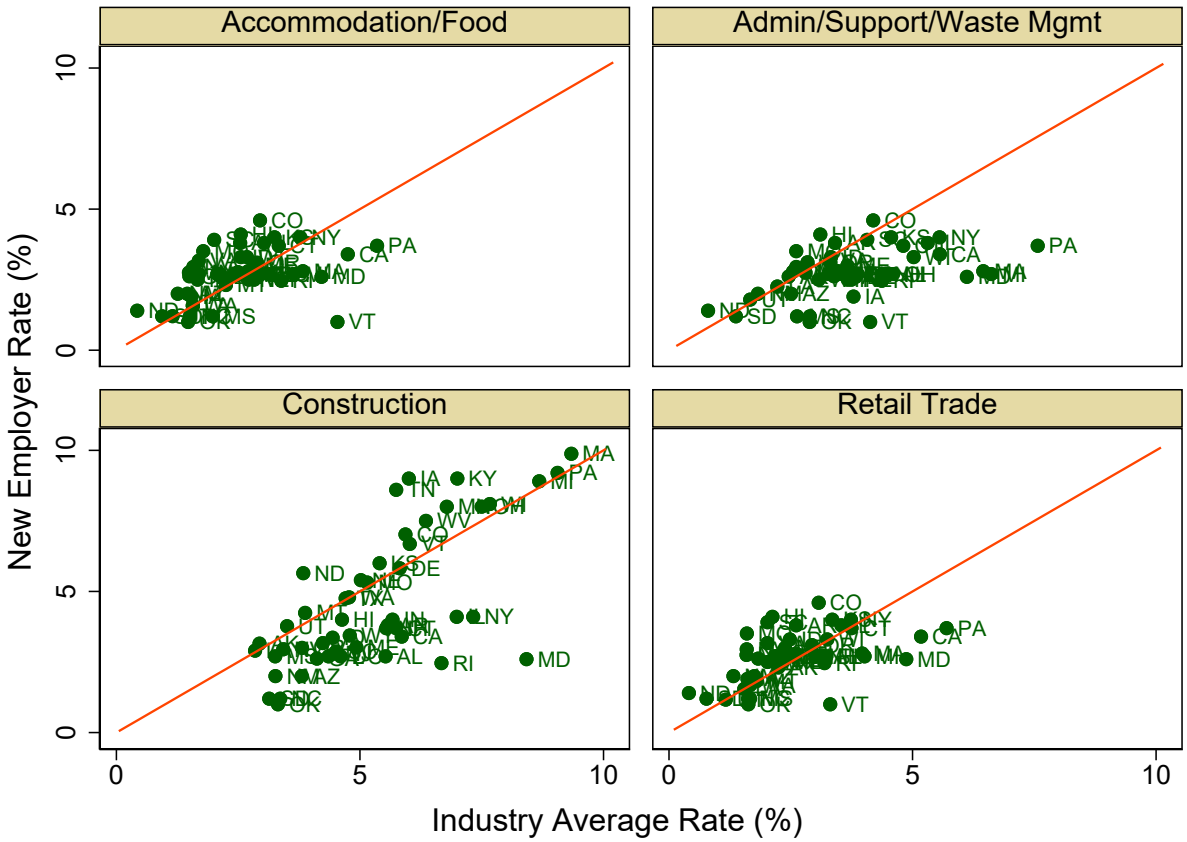
Sample:	Non-Indexed States				Indexed States			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Dependent variable: Log(Number of New Firms)								
Log(new rate*base)	-0.116***	-0.079***	-0.125***	-0.089***	-0.089***	-0.083***	-0.128***	-0.083***
	(0.013)	(0.023)	(0.018)	(0.019)	(0.010)	(0.016)	(0.018)	(0.013)
High turnover × Log(new rate*base)		-0.054*				-0.010		
		(0.028)				(0.020)		
High part-time × Log(new rate*base)			0.019				0.070***	
			(0.025)				(0.021)	
High labor share × Log(new rate*base)				-0.047*				-0.011
				(0.025)				(0.020)
Panel B: Dependent variable: Entry Rate								
Log(new rate*base)	-0.333***	0.093	-0.404**	-0.081	-0.528***	-0.393***	-0.879***	-0.365***
	(0.109)	(0.195)	(0.165)	(0.153)	(0.095)	(0.109)	(0.177)	(0.086)
High turnover × Log(new rate*base)		-0.616***				-0.201		
		(0.237)				(0.167)		
High part-time × Log(new rate*base)			0.143				0.621***	
			(0.226)				(0.197)	
High labor share × Log(new rate*base)				-0.440**				-0.299*
				(0.220)				(0.177)
Sector-Year FEs	X	X	X	X	X	X	X	X
Sector-State FEs	X	X	X	X	X	X	X	X
Firm Weights	X	X	X	X	X	X	X	X

Notes: This table presents regressions of how the level of firm entry in a sector-state pair varies with the UI tax regime and industry characteristics, split by whether the state uses an indexing policy. Columns (1)-(4) study non-indexed states, while (5)-(8) study indexed states (Alaska, Hawaii, Idaho, Iowa, Minnesota, Montana, Nevada, New Jersey, New Mexico, North Carolina, North Dakota, Oklahoma, Oregon, Rhode Island, Utah, Washington, and Wyoming). All columns replicate column (5) of Table 2, within the given sample, augmented with the interactions shown. All rates variables are scaled to lie between 0 and 100. In all columns, the level of observation is a NAICS sector-state-year cell and the observations are weighted by a measure of the "size" of each cell: the total number of firms (all ages) in the sector-state-year. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Non-indexed states: N=6,107; mean log number of new firms=7.138; mean entry rate=8.547. Indexed-states: N=3,055; mean log number of new firms=6.285; mean entry rate=8.412.

Figure A.1: Entry rate of age 0 Firms (1978-2020)

Notes: This figure plots the ratio of age 0 firms divided by the total number of firms, source from the Business Dynamics Statistics.

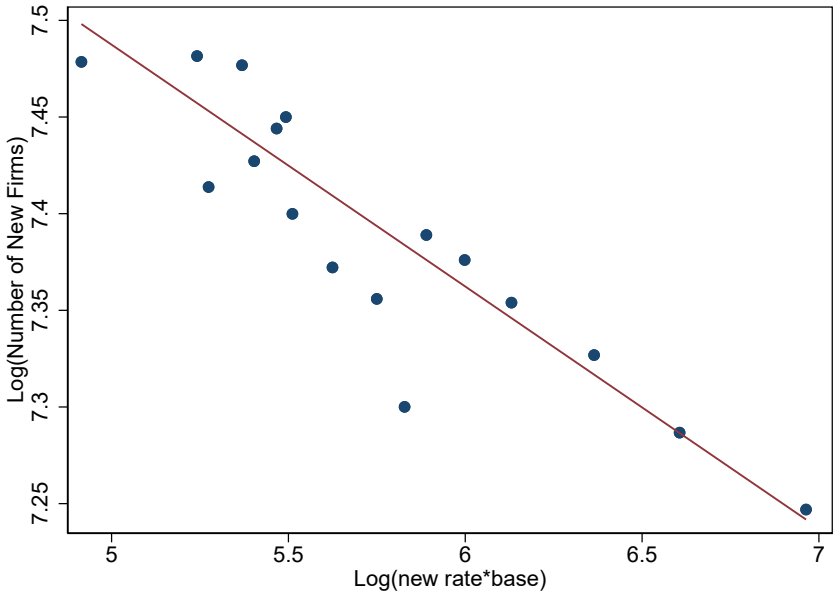
Figure A.2: Comparison of new employer rates and industry averages (2011)



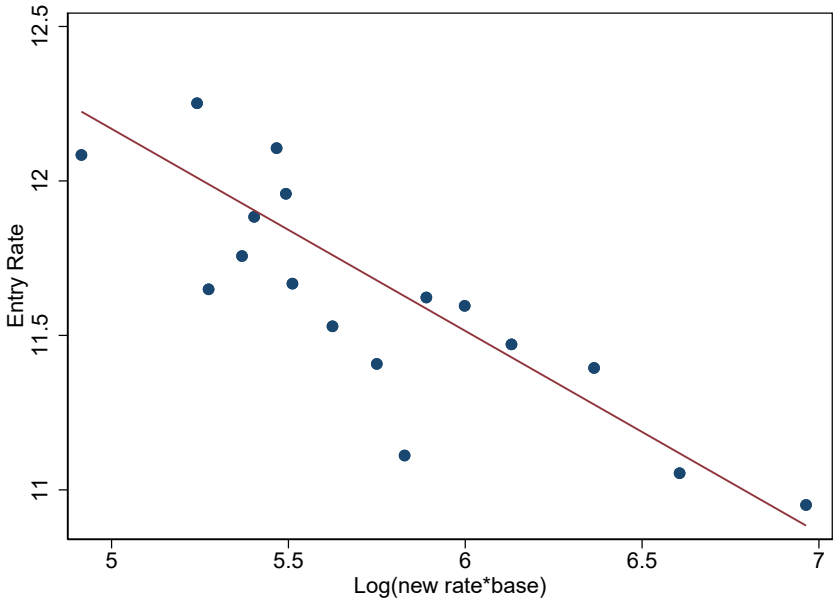
Notes: This figure plots the four sectors with the highest share of taxable wages. Average industry rates calculated from the Quarterly Census of Employment and Wages, and equal to UI contributions divided by total taxable wages.

Figure A.3: Effect of UI taxes on firm entry across tax level

(A) Effect of UI tax on log(number of new firms) by tax level



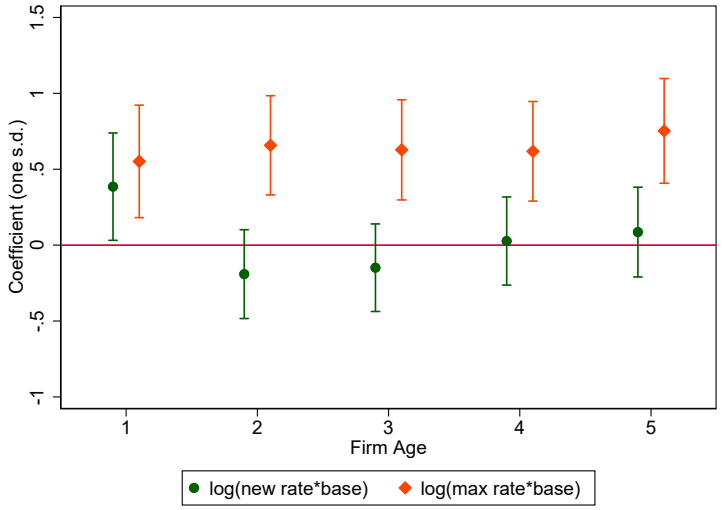
(B) Effect of UI tax on entry rate by tax level



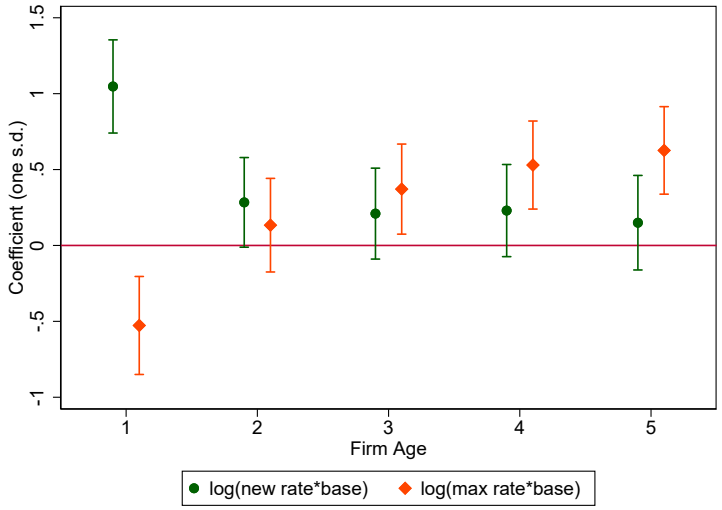
Notes: This figure presents binscattered regressions of firm entry on UI taxes, for the log number of new firms (Panel A) and the entry rate (Panel B). Specifications are based on columns (2) and (5) of Table 2.

Figure A.4: Effect of UI taxes on firm exit, by age and time to graduation

(A) Graduate to experience-rated tax rates within 2 years



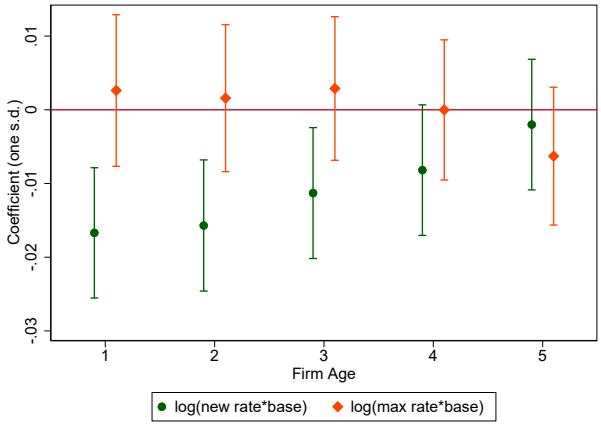
(B) Graduate to experience-rated tax rates after 2+ years



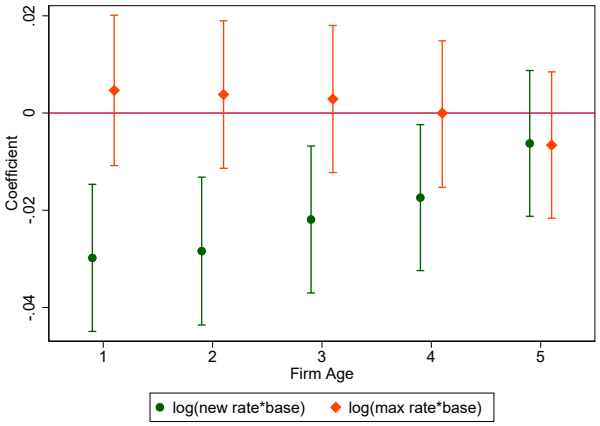
Notes: $N = 18,992$ (Panel A) and $N = 21,317$ (Panel B). This figure present regression evidence that taxes calculated using new employer rates disproportionately predict lower survival *when* they are the relevant tax rates, while taxes calculated using maximum rates disproportionately predict lower survival when the new rates are no longer relevant. Each panel plots coefficients of tax measures interacted with firm age, for either the sample of states that graduate firms to experience-rated tax rates before age 2 (Panel A) or the sample that graduate after age 2 (Panel B). Regressions are weighted by firm count, and additional controls include corporate and personal income tax, UI benefit, minimum wage, state unemployment rate, and sector-by-year, sector-by-state, entry-year, and age fixed effects.

Figure A.5: Effect of UI taxes on log(employment), by age

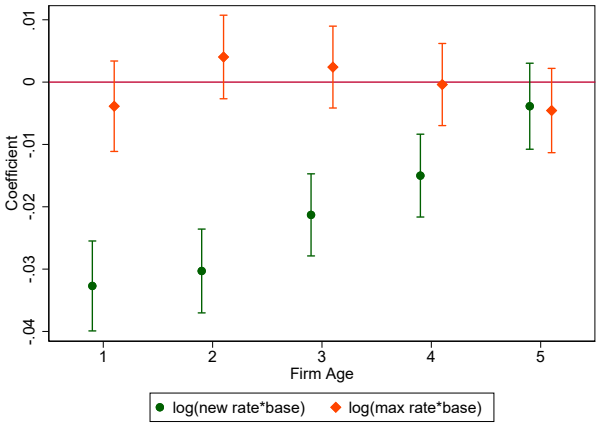
(A) No firm fixed effects, taxes normalized



(B) No firm fixed effects, taxes not normalized



(C) Firm fixed effects, taxes not normalized



Notes: $N = 2,176,000$. These figures present robustness specifications of Figure 8. Each panel plots coefficients from a single regression of log employment on tax measures interacted with firm age for a balanced sample of firms aged 1-5 in high part-time, labor share, and turnover rate sectors (i.e., retail; administrative and support and waste management and remediation services; arts, entertainment, and recreation; and accommodation and food services). Additional controls include corporate and personal income tax, UI benefit, minimum wage, state unemployment rate, and NAICS2-by-year, NAICS2-by-state, age, and entry-year fixed effects. Panels a and b do not include firm fixed, and panels b and c do not normalize taxes.