# The Effects of Unemployment Insurance Taxation on Multi-Establishment Firms*

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**Abstract**

This paper investigates whether and to what extent state-level differences in business taxes influence the location decisions and labor demand of multi-establishment firms. In the United States each state administers its own unemployment insurance (UI) program, and cross-state variation leads to significant differences in the potential UI tax costs faced by employers in different states. Using US Census data on the locations of multi-state manufacturing firms for identification, I find that high tax plants were more likely to exit during economic downturns, and less likely to hire during the recovery. Moving a given plant's outside option from a high tax state to a low tax state would increase its likelihood of exit by 20% during the Great Recession. These findings suggest that decentralized administration of UI taxes may contribute to jobless recoveries and additional misallocation in the economy.

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# 1 Introduction

Unemployment Insurance (UI) provides laid off workers with weekly benefits while they search for a new job, and is a major form of social insurance in the United States. It is funded through payroll taxes on employers, and the U.S. is unique in that UI is administered at the state rather than national level. This produces a substantial amount of variation across states which has been growing over time: Maximum per-capita UI taxes range from less than $500 to more than $2000 per year across states. Since the Great Recession there has been a renewed interest in studying the effects of UI benefits on workers.[1] However, an equally important yet understudied question is whether firms respond to UI taxation, especially since UI tax schedules are regressive for low wage workers. Another large literature studies the determinants of firm location decisions, as many localities offer significant tax incentives to attract new employers.[2] But the loss of major employers, such as the closure of large manufacturing plants, can also be detrimental to local populations. In 2003 Boeing cited the high cost of unemployment insurance taxes in Washington state as one reason for seeking to move some of its manufacturing to another state.[3] Therefore, do differences in state business tax costs also affect firms' choices of where to close establishments during economic downturns?

This paper addresses both of these questions by studying how state level differences in maximum UI taxes affect manufacturing firms with locations in more than one state. It provides the first evidence of UI taxes influencing the plant closures of multi-state firms in response to negative shocks. I also find evidence of decreased hiring in response to higher UI taxes, and lower employment volatility in plants located in high tax states. Using microdata on the universe of employer establishments in the United States, I can accurately identify all the locations of multi-state firms, which make up more than half of all manufacturing

[1] Schmieder et al. (2012), Mueller et al. (2016), Kroft and Notowidigdo (2016), Landais et al. (2018*a*,*b*), Chodorow-Reich et al. (2018), Hagedorn et al. (2016), among others

[2] For example: Carlton (1983), Black and Hoyt (1989), Chirinko and Wilson (2008), and Mast (Forthcoming)

[3] `https://nyti.ms/2ZO30mB`

employment. While employer tax rates are an increasing function of previous UI benefit claims (called "experience rating"), a firm's experience rating in one state does not affect its experience rating in the other states it operates in. Thus, state-level administration creates an opportunity for multi-establishment firms to avoid UI tax increases when they exit completely from one state. Since state programs only count layoffs in their own state when assigning firm-specific tax rates, this creates an additional exit incentive that affects multi-state firms more than single-unit or single state firms.

Suppose two similar firms are operating in different sets of states, but both have their smallest manufacturing plants located in Ohio. The Great Recession hits and both firms need to cut employment by 30%. Absent UI tax savings, both firms would find it optimal to shut down their smallest plants in Ohio, and make the remaining cuts to employment through layoffs at their other locations (I assume plant size is correlated with productivity, as in practice employment share is strongly correlated with plant-level TFPR.). However, suppose Firm A has locations in other low tax states such as Indiana and Georgia, while Firm B has a location in the high tax state of Iowa. Since the cost of layoffs in Ohio are relatively cheaper than in Iowa, Firm B may find it more profitable to close their plant in Iowa instead of Ohio. In this way, Firm A is more likely to exit from Ohio than Firm B is due to differing "outside options".

My research design compares manufacturing establishments in the same state and year, but owned by firms located in different combinations of states. I calculate the difference in maximum per-capita UI taxes between a plant in state $s$ and the average of all the firm's locations, and test whether differences in this measure cause firms to strategically shut down high tax plants. This methodology controls for the potential endogeneity concern of other state policies or economic conditions influencing the choice of exit. I find that differences in state UI tax costs cause multi-state manufacturing firms to shut down plants with higher relative taxes, and that this response is driven by large negative shocks such as the Great Recession. During the sample period of 1997–2014, a one standard deviation increase in relative UI tax costs increases the likelihood of shutdown by 5% relative to the mean (or 0.2 percentage points). The estimated effect is even larger during economic downturns, when firms are more likely to be cutting a large share of employment. During the Great Recession, one standard deviation increase in relative UI tax costs increased the likelihood of shutdown by 10% relative to the mean. These findings are robust to controlling for additional plant-level characteristics such as revenue TFP, capital assets, and labor share. Additionally, plants with greater assets are less responsive to UI tax costs while plants with higher labor shares are more responsive.

A similar framework is used to study the effect of UI tax costs on hiring behavior. Because tax rates are typically a function of layoffs in the previous 3-5 years, a firm that laid off workers during the Great Recession would experience a substantial increase in UI tax rates in 2011 and 2012. And since UI taxes are a per-worker payroll tax cost, hiring new labor also becomes more costly in years following recessions. This UI tax increase coincides with periods when firms are especially cash-constrained, and could partially explain the "jobless recovery" after the Great Recession. I use a subsample of matched employer-employeee data to analyze the effect of UI tax costs on the hiring margin and find that in the years following the Great Recession (the years where firms experienced the largest UI tax increases), plants with higher relative UI tax costs were less likely to hire new employees. In 2011, a $400 increase in tax costs decreased the probability of any hire by 1 percentage point, and decreased total hiring by 7%.

Higher maximum UI taxes should also incentivize employers to smooth employment over time, because they are essentially an adjustment cost for laying off workers. If a firm operates in both a high tax state and a low tax state, they may respond to fluctuations in demand by adjusting employment more in the low tax state in order to keep employment stable in the high tax state. Looking at three separate periods of relative stability – before the 2001 recession, before the Great Recession, and after the Great Recession – I also find evidence that plants located in states with higher maximum UI taxes had lower measured employment volatility over each period.

The manufacturing sector exhibits a number of features that make it attractive to study. Most importantly, manufacturing industries have high utilization of UI benefits.[4] Secondly, manufacturing produces largely tradable goods, causing their plants to be less affected by local economic conditions that would also influence labor demand. Furthermore, it can be verified using the Census of Manufactures that many locations of multi-establishment manufacturing firms are in fact producing the same product codes, and therefore operations across states are likely to be substitutable. Lastly, in recent decades US manufacturing employment has experienced an unprecedented decline due to import competition and technological change (Fort et al. (2018)). Given that manufacturing firms are downsizing and shutting down plants, differences in potential UI tax costs will be more salient for these firms, and the impacts of plant closures potentially more detrimental to local populations.

There is a large literature studying optimal unemployment insurance and the effects of UI generosity on job search and labor supply.[5] However, the financing of UI benefits is a relatively understudied topic.[6] Early papers such as Feldstein (1976), Topel (1983), and Card and Levine (1994) provide theory and evidence that greater experience rating decreases the prevalence of temporary layoffs, and Anderson (1993) shows that higher UI taxes stabilize seasonal fluctuations in labor demand. On the tax incidence front, Anderson and Meyer (1997) and Anderson and Meyer (2000) find evidence that changes in tax rates at the state-industry level can be passed on to workers' wages but firm-level variation cannot. More recently, Johnston (2018) shows that UI tax increases greatly decreased hiring after the Great Recession.

[4]Appendix Figure A.1 shows that in the March CPS, Construction and Manufacturing are the two most overrepresented industries for UI claimants. This paper does not study the behavior of multi-state Construction firms since they make up a dramatically smaller share of total employment in the Construction sector.

[5]Optimal design of benefits: Baily (1978), Chetty (2006), Kolsrud et al. (2018), Ganong and Noel (2017) Labor supply effects: Card et al. (2007*b*), Card et al. (2007*a*), Lalive (2008), Chetty (2008), Card et al. (2015), Farber et al. (2015), Gerard and Gonzaga (2018), Johnston and Mas (2018)

[6]Saffer (1982), Wolcowitz (1984), Albrecht and Vroman (1999), Ratner (2013), Doornik et al. (2018) Also related is the literature on firing costs: Bentolila and Bertola (1990), Bertola (1992), Autor et al. (2006)

While the previous literature has treated employers as single-unit firms, my paper provides a contribution by analyzing the behavior of multi-establishment firms. Using US Census data allows me to identify all of the establishments within a firm, something that cannot be studied using administrative data from just a subset of states. Furthermore, I propose an additional margin of adjustment available to multi-state firms: Exiting from a state in order to avoid UI tax increases associated with layoffs. My results suggest that this margin is economically important and can cause plants to exit at higher rates than otherwise.

Another related branch of research is the study of state business taxation and firm location decisions.[7] Suárez Serrato and Zidar (2016) find that firm owners are not perfectly mobile across states, and Moretti and Wilson (2017) provide evidence of large migration responses of star scientists to changes in state personal and corporate income tax rates. The only other paper that explicitly studies the response of multi-establishment firms is Giroud and Rauh (2019), which shows that state personal and corporate income tax rates affect the amount of business activity and capital reallocation within multi-establishment firms. While much of the existing literature has focused on the effect of corporate or personal income tax rates, this is just one component of the potential tax burden firms face. Appendix Figure A.2 compares total state tax revenues from corporate income and unemployment insurance over time, showing that they are relatively close in magnitude. And as a payroll tax, firms are required to pay UI taxes regardless of whether they are profitable, producing additional financial constraints during economic downturns.[8] Unlike most payroll taxes studied in the previous literature[9], the fact that firm-specific UI tax costs vary from year-to-year makes them more difficult to fully pass onto workers due to wage rigidities.

Finally, this paper relates to the literature on within-firm reallocation and causes of misallocation in the economy.[10] Hopenhayn and Rogerson (1993) illustrate in a macro model

[7] Bartik (1985), Papke (1991), Holmes (1998), Goolsbee and Maydew (2000), Duranton et al. (2011), Rohlin et al. (2014)

[8] The other major payroll taxes, Social Security (6.2%) and Medicare (1.45%), are invariant across states.

[9] Gruber (1997), Saez et al. (2012), Ku et al. (2018), Saez et al. (2019)

[10] Cooper and Haltiwanger (2006), Hsieh and Klenow (2009), Bartelsman et al. (2013), Asker et al. (2014), Giroud and Mueller (2015), Kehrig and Vincent (2017), Restuccia and Rogerson (2017), Syverson (2017)

how labor market regulations in the form of firing costs can result in lower average productivity. Decker et al. (2016) finds evidence of declining reallocation rates across firms, and posit that rising adjustment costs could decrease firms responses to shocks. Foster et al. (2016) also show that during the Great Recession, plant closures were less productivity enhancing than in previous recessions. My findings show that state-level UI tax costs influence the employment and location decisions of multi-establishment firms. Therefore, growing differences in UI tax costs over time could be one of the adjustment costs that contribute to misallocation at the firm level if firms are making employment and location decisions based on tax costs rather than productivity.

In the next section, I provide additional background on US Unemployment Insurance and variation in state UI taxes. Section 3 describes the data and construction of my analysis sample, and Section 4 presents the research design and identification strategy. Section 5 describes my main results on plant closures. Section 6 analyzes additional outcomes, and Section 7 concludes.

## 2 Institutional Background

Over 90% of workers are covered by unemployment insurance, and every month there are more than a million new claimants[11]. Every year states collect $40-50 billion in UI tax revenues, and in 2009 during the Great Recession, over $80 billion in UI benefits were paid out to laid off workers. The first Unemployment Insurance program was enacted in Wisconsin in 1932, but UI was not widely adopted by states until the Social Security act of 1935 signed a federal mandate into law. Thus states have continued to administer their own UI programs under guidelines established by federal law, with benefit and tax schedules set at the state level. All firms establish state-specific UI accounts and there is no linkage of accounts across states for multi-state firms.

States set their taxable wage base $W$, and each employer in a state is assigned an

[11] Unemployment Insurance Data Summary: https://workforcesecurity.doleta.gov/unemploy/content/data.asp

employer-specific tax rate $\tau$ that is increasing in previous UI benefit claims; thus each worker a firm employs has a UI tax cost of $\tau * W$, for the first $W$ in annual earnings (ie: 4% of first $10,000 of wages equals a per-capita tax of $400 per worker). Since the experience rating of employer-specific tax rates is increasing in previous years' UI benefit claims, average UI taxes mechanically rise in the years following recessions. Figure 1 plots the time series of UI benefits and taxes as a percentage of total wages, and the shaded regions denote recessions. UI benefit claims spike during recessions, and there is a subsequent rise in UI taxes in the years afterwards, precisely during the recoveries.

At the state level, each employer's tax rate depends on their historic UI benefit claim experience. States use different formulas to calculate employer tax rates, but all are increasing functions of the dollar value of UI benefits paid out to previously laid off employees.[12] This incentivizes employers to keep employment stable, as otherwise firms could freely place workers on temporary layoff during periods of low demand. However, as a way to insure firms from particularly negative shocks, states also implement minimum and maximum tax rates. The tax rate schedule varies greatly between states, with the minimum rate usually ranging from 0–1% and the maximum rate ranging from 5.4 to more than 10%. New firms are charged a uniform "new employer rate" (which usually ranges from 2 to 4% depending on the state) for the first 2-3 years until an experience rating can be determined according to state formulas.

Besides differences in the maximum tax rate, the other major source of variation across states is the level of the taxable wage base. While some states have indexed their tax bases to average annual wages so that they automatically increase over time (referred to as "flexible" taxable wage bases), the federal government only mandates a minimum tax base of $7000.

[12] The reserve-ratio formula (used in 32 states) assigns each firm an experience rating based on its UI reserves to payroll ratio over previous years; the benefit-ratio formula (used in 16 states) calculates experience ratings as a function of each firm's UI benefit claims to payroll ratio in previous years; and the benefit-wage-ratio formula (used in Delaware and Oklahoma) simply adjusts the experience rating so that the amount raised is approximately equal to the amount in UI benefits paid out to workers laid off from the firm. The last state, Alaska, uses a Payroll Formula that determines the tax rate based on declines in the employer's quarterly payroll.

Therefore, employers in most states face imperfect experience rating in the sense that the marginal tax cost from an additional UI claimant does not equal the UI benefits claimed. This produces an implicit subsidy for employers that heavily utilize layoffs, especially in states with lower maximum UI taxes. Additionally, the low taxable wage base in many states means that UI tax costs are also extremely regressive for low-wage and/or part-time workers. The last time the Federal government increased the taxable wage base in 1982, the $7000 mandated tax base covered about 43% of total payroll. Today however, the same $7000 base covers less than 20%.

Figure 2 shows an example UI tax schedule from Texas: the employer-specific tax rate is an increasing function of previous UI benefit claims (the Benefit Ratio) and the taxable wage base in Texas is $9000. The tax is then levied as a per-worker payroll tax (ie: 5.4% on the first $9000 in wages). Importantly, UI taxes are capped at the maximum tax rate, so that even employers who frequently lay off workers are never liable for more than the maximum tax rate in the state. In this case, employers in Texas will pay a maximum of 6.25% * 9000 = $563.4 per worker per year. Therefore, employers in states with higher maximum rates and/or larger taxable wage bases will face on average larger UI tax costs per worker. Although there are multiple dimensions in which UI taxes can vary across states, the greatest differences arise from variation in the maximum tax rate and the taxable wage base. Therefore I define the maximum UI tax = max rate * taxable wage base as my summary measure of state UI tax costs. Although the maximum is not normally binding for employers that do not experience mass layoffs, it *is* the relevant cutoff for an employer considering the potential future tax increase from a major layoff. And as evidenced by trends in U.S. manufacturing employment (Appendix Figure A.3), manufacturing firms were downsizing significantly during this time.

At the outset UI coverage at the firm level was much more restrictive than it is today, but various reforms have liberalized the program over time so that at its height in 1985 it covered 96% of wage and salary workers (Price (1985)). Coverage is required for all employees who work at least 1 day a week for 20 weeks in a year, or have a quarterly payroll of $1500 or more; this definition covers even part-time work and brief job spells. Although certain types of workers (medical interns in hospitals, students working at school, agricultural workers on small farms) are exempt from unemployment insurance taxation, most business establishments will be subject to these taxes. The other major exemption from UI taxation are self-employed independent contractors, who are exempt from other payroll tax costs and employer benefits as well.

## 2.1 Variation in UI Taxes Across States

Figure 3 shows the degree of variation in maximum UI taxes across states in the US, with the maximum per-capita tax ranging from less than $400/year in low tax states such as Indiana and Florida, to over $2000/year in high tax states such as Minnesota and Utah. Although low tax states are primarily concentrated in the South, there is still a large degree of variation in the Industrial Belt where manufacturing has traditionally been concentrated. Figure 4 shows that maximum UI taxes are highly correlated with the actual levels of UI taxes paid by employers, and are therefore a good proxy for UI tax costs across states. On the other hand, the variation in maximum UI taxes is not very correlated with other state-level costs such as average wages, corporate income tax rates, and union membership.[13]

Furthermore, the variation in maximum UI taxes has been growing over time as some states index their taxable wage bases to income growth while low tax states keep their taxes at the $7000 federally mandated minimum, which hasn't been updated since 1982. While two-third of US states automatically index their maximum weekly UI benefits to rise in proportion to average annual wages, only 16 states indexed their taxable wage base the same way.[14] I will refer to these states with flexible taxable wage bases as "Flex" states. Appendix Figure A.5 shows the distribution of Flex states across the nation. While they are predominantly concentrated in the Northwest, they also include states such as Iowa, New

[13] See Appendix Figure A.4
[14] In 2012 Rhode Island became an additional state to implement a flexible taxable wage base.

Jersey, North Carolina, and Oklahoma. Figure 5 tracks average maximum UI taxes over time, and shows the growing divergence in UI taxes between these 16 Flex states versus the rest in the last two decades. The gap in average maximum taxes between these two groups of states has grown from a mere $45 (2014 dollars) in 1983, to $611 in 1997 and a whopping $1130 by 2014. The consequences of this divergence are also apparent in Figure 6, which shows that average industry UI taxes in Flex states increased by much more after the Great Recession. Since low tax states are capped by their relatively low maximum UI taxes, they experienced less of a spike in taxes in 2011 and 2012. Thus for firms facing the need to make large layoffs during the Great Recession, they would predict a much higher potential tax increase in Flex state plants versus non-Flex state plants.

Another potential concern is whether the degree of UI taxation in a state is closely tied to the generosity of UI benefits. While it is true that maximum benefit levels and maximum UI taxes are highly correlated, Appendix Figure A.6 shows that variation in UI taxes is not solely driven by variation in benefits. For example, although Iowa's maximum UI tax is over four times greater than Indiana's, the two states have similar maximum weekly UI benefits. Additionally, it is not the case that a state's total UI tax revenues are proportional to UI benefit outlays, as high maximum taxes generally also translate into larger than average trust funds. State UI trust fund balances ranged from 0% to more than 3% of total wages right before the Great Recession, and during the Great Recession thirty-six states depleted their trust funds and were forced to borrow from the federal government.

# 3 Data

## 3.1 U.S. Census Bureau Data

This paper combines multiple administrative datasets from the U.S. Census Bureau: the Longitudinal Business Database (LBD), the Census of Manufacturers (CMF), and the Longitudinal Employer-Household Dynamics (LEHD). The LBD covers the universe of private non-farm business establishments, and constitutes the main analysis sample. It includes annual information such as March employment, total payroll, NAICS industry, and first/last years of operation. It also includes firm identifiers that allow me to identify all of the establishments of a multi-establishment firm. The firm identifier in the LBD is broader than a tax EIN, and accounts for actual ownership rather than just EIN's used for tax purposes. Being able to observe all of a firm's locations across the U.S. will be crucial to my research design, which relies on comparing differences in maximum UI tax costs across each firm's locations in different states. Appendix Table A.1 shows that while 97% of manufacturing firms in the United States are single-state firms, multi-state firms make up more than half of overall manufacturing employment.

The CMF is a census of manufacturing plants that reports additional information about plant-level characteristics. Because it is collected at 5-year intervals (with an Annual Survey of Manufacturers collected in between), I will restrict to the 2007 CMF when merging with my main analysis sample to study other plant-level characteristics. The LEHD is a matched employer-employee dataset that provides quarterly earnings sourced directly from states' UI records. With unique person identifiers, workers are able to be matched to job spells both within and across states. However, this project only has access to data from 23 out of the 50 states.[15] Together they make up about 48% of total U.S. manufacturing employment, and the ability to observe job spells will allow me to construct additional measures of hires to complement the main analysis using the LBD.

Unfortunately, the Census Bureau data does not include information on employer tax rates or UI taxes paid. An ideal research design would allow me to use differences in statutory maximum UI taxes to instrument for observed differences in state UI tax costs. Due to data limitations (unobservable true UI tax costs), this paper instead reports reduced form estimates of the effect of differences in statutory maximums. However, given that I am focusing on responses to negative shocks and manufacturing decline, the maximum UI tax

[15]The 23 states I have access to are: AZ, AR, CA, CO, DC, DE, FL, IL, IN, IA, KS, ME, MD, MO, MT, NV, NM, OK, OR, PA, SC, TN, WA, and WV, of which 7 are flexible wage base states.

is a relevant dimension for firms because any mass layoff would likely push the firm up to the state's maximum tax rate.

## 3.2 Sample Construction and Summary Statistics

The focus of this paper is on the manufacturing sector. It is a sector whose workers rely heavily on Unemployment Insurance, and in contrast to Construction, Manufacturing has a large share of employment in firms operating in more than one state. In recent decades it has also experienced a significant decline in both employment and number of establishments, primarily driven by plant closures within firms (Fort et al. (2018)).

In state UI records, each UI account is identified by a state employer identification number (SEIN). In practice, large multi-establishment firms that own multiple locations within a state often have a different SEIN for each industry they operate in. This enables a diversified firm to potentially face different employer-specific tax rates for different establishments, even within the same state. Therefore when I restrict my analysis to manufacturing plants, any non-manufacturing plants dropped should not influence the firm's UI tax costs for their manufacturing employment.

To construct my main analysis sample, I define firms at the Firm ID and 3-digit NAICS industry level. So if a large corporation operates establishments in a variety of industries, I treat its manufacturing operations in each 3-digit NAICS as a unique firm.[16] I view this as a conservative step in ensuring that the plants I am comparing in my research design are similar and more substitutable for each other. I use the sample period 1997–2014 so that it is broad enough to encompass two economic downturns: the 2001 recession and the Great Recession of 2008-2009, yet also coincides with the recent divergence in UI tax costs across states. The additional restrictions I make require: (1) Firms to be located in more than one state at some point from 1997–2014; (2) Firms with multiple establishments in a state to be aggregated to the state level; (3) Establishments to have employed 10 or more employees at

[16] There are 21 unique 3-digit NAICS industries in the manufacturing sector. My results are also robust to combining all manufacturing industries within the same firm.

some point. In the end my sample still represents over half of manufacturing employment in the United States, as multi-state firms account for a large share of US manufacturing. The level of observation is a Firm ID, 3-digit NAICS industry, State, and Year, and is what I will refer to as a "plant" from here on out. By aggregating establishments to the state level, it allows Exit to be defined as complete exit from a state rather than shutting down one out of many establishments within the state. Appendix subsection A.3 provides additional details regarding the construction of my analysis sample.

Table 1 reports summary statistics for my main analysis sample of multi-state firms from 1997–2014, and the matched LEHD subsample (2000–2013). The left half reports summary statistics at the annual establishment level, while the right half reports summary statistics for observations aggregated to the firm level (for a total of approximately 14,500 firms throughout the sample period). The bottom panel of the table reports job-level variables after matching to the LEHD.[17] Comparing the two panels, one can see that the majority of firms only have locations in 2 states, although at the establishment level large firms receive more weight. Age is topcoded at 23 because 1975 is the first year observable in the LBD, although in my sample the majority of firms have already been in operation for multiple decades. This provides further rationale for my taking existing firm locations as given in my research design, as the majority of manufacturing plants were established during a period when when there was relatively little cross-state variation in UI taxes. Additionally, about 60% of firms operate in only one 6-digit NAICS industry.

Appendix Figure A.7 shows the distribution of the main sample of multi-state firms across the United States. For each state, it denotes the share of my main analysis sample located in that state. Multi-state manufacturing is concentrated in the Industrial Belt and the South. Relative to the overall number of manufacturing establishments, California, Michigan and New York are under-represented (they tend to have more single-unit or single-state firms than multi-state ones), while states like Arizona, Colorado, Maryland, Oklahoma,

[17] Details in Appendix subsection A.4

South Carolina, and Utah are over-represented. The most common pair of states to be found in the same firm is California and Texas due to their large populations. But also included in common state pairs are Illinois-Ohio, Ohio-Pennsylvania, and Indiana-Ohio, highlighting the concentration of manufacturing in the industrial Midwest.

# 4 Research Design

## 4.1 Conceptual Framework

Basing employer-specific UI tax rates on past UI claims is a key feature discouraging employers from abusing unemployment insurance, as otherwise firms could freely place workers on temporary layoff during periods of low demand. Employers foresee that laying off workers who are likely to claim UI benefits will cause their UI tax rates in future years to rise in response. This margin is especially relevant for employers facing a large (and possibly permanent) negative demand shock, as was the case for manufacturing during the last few decades due to import competition, technological change, and the Great Recession.

Since the tax rate depends on the employer's history of UI benefits charged, we can define the employment history vector $\vec{N} = (..., L_{-2}, L_{-1})$, where $L_t$ denotes the employment level in year t, and $L_0 = (1-\delta)L_{-1} + \Delta$, where $\delta$ is the voluntary quit rate and $\Delta$ denotes the employer's net hires/layoffs. This natural attrition through voluntary quits allows for the employer to choose inaction, which lowers employment levels without requiring layoffs (as only the claiming of UI benefits leads to UI tax increases). For simplicity assume the production function is defined by $F(L_0)$ (abstracting from Capital investment) and the employer takes prices $p$ and wages $w$ as given. While it is possible that employers could pass through UI tax costs to workers in the form of lower wages, the transient quality of firm-specific tax rates makes this difficult to do in practice. The employer then maximizes profits using the following value function:

$$V(p, \vec{N}, L_0) = \max_{L_0}\{pF(L_0) - wL_0 - \tau_s(\vec{N})L_0 + \beta \int V(p', \vec{N}')dG(p'|p)\}$$

UI taxation enters into the firm's problem in two ways. First, large per-capita UI taxes, $\tau_s(\vec{N})$, lowers the optimal level of employment in the current period. However, the future tax costs of any adjustments to employment today also reduces the firm's desire to layoff workers in the current period, as $\tau_s'$ is a function of past layoffs. Thus, the two counteracting forces cause the effect on overall employment to be theoretically ambiguous as ex ante the firm is reluctant to layoff workers due to future tax costs (+) but ex post the firm would like to layoff workers to reduce tax burden (-). This then leads to the result that greater experience rating of UI taxes promotes more stable employment, as large fluctuations in layoffs/hiring from year to year would translate to greater future UI tax costs for the firm. Additionally, this framework predicts decreased hiring of new workers in response to higher UI taxes since each new worker imposes an additional tax cost with no added benefit relative to a recalled worker.

If we extend to a multi-state firm problem with differences in the state tax function $\tau_s(.)$, large enough shocks to demand could push the firm to exit completely from relatively high cost states. By exiting from state $s$, (1) No UI tax cost is imposed for the workers laid off from the plant closure (since there is no more payroll to tax), and (2) Cutting employment from state $s$ instead of the firm's other locations prevents its UI taxes from increasing in other states. Thus, all else equal multi-state firms would prefer to make intensive margin adjustments in low tax states, while making adjustments on the extensive margin (shutdowns) in high tax states. Since U.S. manufacturing has been in steady decline for the last few decades, extensive margin responses should largely be on the exit and not the entry margin.

## 4.2 Identification

My identification strategy leverages the richness of establishment-level microdata by focusing on multi-establishment firms with locations in more than one state. Recall the opening example of two similar multi-state firms: Suppose two firms are producing motor vehicle parts, and have plants located in three states in the industrial Midwest. Firm A is located in Ohio (20%), Indiana (30%), and Illinois (50%), while Firm B is located in Ohio (20%), Iowa (30%), and Illinois (50%). The Great Recession hits, and both firms need to drastically downsize by cutting employment by 30%. However, UI tax costs are not equal across these states: Ohio and Illinois have maximum UI taxes of around $850/year, while Indiana has one of the lowest in the nation at only $392/year. Iowa, on the other hand, has a relatively high maximum of $1824/year due to both a higher maximum tax rate and a larger taxable wage base.

Due to the size of the shock, both firms find it optimal to close down one of their smaller (ie: less productive) manufacturing plants. Firm A closes down its smallest plant in Ohio, and makes the remaining cuts to employment in Indiana, incurring small UI tax increases in Indiana due to the layoffs. Firm B, however, decides to shut down its plant in Iowa instead, as UI taxes are relatively more expensive in Iowa than its other two locations. Even though all of the workers in Iowa have been laid off, Firm B faces no UI tax increases because it no longer has any employment in Iowa to tax. Although both Firm A and Firm B have similar manufacturing plants in Ohio, Firm A is much more likely to exit from Ohio than Firm B is because Firm A's 2nd largest plant is located in the low tax Indiana rather than high tax Iowa.

To parametrize the extent of this variation, I propose a measure of an establishment's UI tax costs relative to the rest of the firm. I proxy for UI tax costs using state maximum UI taxes to avoid the potential endogeneity of firm-specific UI tax rates. Defining the maximum UI tax as the maximum tax rate multiplied by the taxable wage base, I first compute each firm's employment weighted average UI tax out of all of its current locations. Then I calculate each establishment's deviation from the mean:

$$Dev_{fst} = Maxtax_{st} - \sum_{i \in f} \frac{Emp_{ift}}{TotEmp_{ift}} Maxtax_{it}$$

$i$ indexes states where firm $f$ has locations

Therefore, $Dev_{fst}$ is positive for establishments located in states with relatively high maximum UI taxes compared to the other locations of the firm, and is negative otherwise. From the previous example, Firm A's Ohio plant would have a Dev = \$113 in 2008, while Dev = -\$317 for the Ohio plant in Firm B. Conceptually, establishments with large positive deviations have cheaper "outside options" from a tax perspective if they were to exit completely from the state.

I weight by current employment when constructing this measure because plant employment shares within the firm are also highly correlated with exit. Firms will rarely shut down a plant that makes up over 50% of its employment, and moving operations to a low tax location is only feasible if the low tax plant actually has substantial existing operations. I also test sensitivity to defining $Dev_{fst}$ (1) using an unweighted mean, and (2) leaving out the own plant when calculating the mean. These two alternative measures produce qualitatively similar estimates, but are less precise because they do not account for plant employment shares. Additionally, fixing $Dev_{fst}$ to be the same value over time - such as the value from the plant's first year in sample - produces qualitatively similar estimates. I inflation adjust $Dev_{fst}$ to be in terms of 2014 dollars, and in order to account for the fact that high UI maximums are rarely binding, I cap $Maxtax_{st}$ at \$2000. This way no single state has the absolute highest maximum tax, and for firms that are located in only the highest tax states, they are assigned a $Dev_{fst}$ equal to zero.

### 4.3 Estimating Equation

In this paper the main outcome of interest is Establishment Exit, an indicator for whether the plant (aggregated to the state level if firms have multiple establishments within the same state) shuts down or reports zero employment in March of year t+1. This highlights the incentive for multi-state firms to exit from a state in order to avoid UI tax increases due to layoffs. The following linear probability model is estimated on the main analysis sample of plants from 1997–2014.

$$Exit_{fst} = \beta_1 Dev_{fst} + \beta_2 EmpShare_{fst} + \sum_n \alpha_n I(\#States = n)_{ft} + \delta_{st} + \gamma_j + \epsilon_{fst} \tag{1}$$

In the equation, $f$ denotes firm, $j$ denotes 3-digit NAICS industry, $s$ denotes state, and $t$ denotes year. $\beta_1$ is the coefficient of interest, and I control for plant employment share since it is correlated with both $Dev_{fjst}$ and Exit. I also include fixed effects that control for the number of states that the firm is currently located in since number of locations is correlated with both the tax deviation and exit rates. Importantly, I include state-by-year fixed effects to control for any other economic policies that may be varying at the state level, and industry fixed effects to control for differences in regional industry concentration. This ensures that the coefficient of interest $\beta_1$ is not driven by correlation between Exit and state policies/conditions or industry shocks.

An identifying assumption is that the location decisions of each firm's existing plants are uncorrelated with sensitivity to UI tax costs. For example, the firms that locate in high tax states do not do so because they are less sensitive to demand shocks. This is a reasonable assumption to make because the majority of manufacturing firms and plants have been in operation for decades; their plant locations would have been determined during a time when UI tax costs did not differ as much across states. In 1983, the last time the federally mandated taxable wage base was raised to \$7000, the average taxable wage base across all 51 states was only $7875, as all but 18 states were at the federal mandate of $7000. Furthermore, in Appendix Table A.6 I show that my results are robust to restricting to firms that have had no new establishment entry since 1992.

Another assumption is that state UI maximums are uncorrelated with state-level economic conditions that might separately affect firms' labor demand and shut down decisions. Throughout my sample period state maximum UI taxes were slightly negatively correlated with state unemployment rates. And Appendix Figure A.8 shows that in 2009 maximum UI taxes were also uncorrelated with UI benefit claims, so firm responses are not likely to be driven by labor supply. Additionally, if states with high UI tax costs were actually home to more productive or less sensitive manufacturing plants, this would bias against finding a firm response, leading me to underestimate the effect of UI tax differences. Another way firms could respond is by lowering the wages of their workers to counteract UI tax increases. Though unlikely due to the observed stickiness of wages, this would also tend to bias the estimates toward zero.

## 4.4 Interaction with Industry Job Losses

In order to provide additional evidence that what I identify are responses to negative shocks, I interact $Dev_{fst}$ with annual industry job losses at the national level. Because establishment exit is a major extensive margin adjustment, we would only expect firms to exit in response to large and semi-permanent negative shocks that require them to significantly cut employment. And while firm-level shocks are unobservable to the researcher, industry job losses can be used to proxy for years in which firms are more likely to be making large cuts to employment. U.S. Manufacturing has been on the decline since the early 2000's, but the industry was hit especially hard by the Great Recession of 2008-09. During the Great Recession, firms across the nation were forced to lay off workers, and these workers claimed unemployment benefits en masse. The manufacturing sector alone lost over 15% of employment over the course of 2008 and 2009, more than any other sector in the United

States.

Using aggregate job loss data from the Business Employment Dynamics, I am able to observe quarterly job loss rates for each 3-digit NAICS industry at the national level. I then interact $Dev_{fst}$ with $\Delta_{jt}$, the z-score of industry job losses in the following year (October of year t to September of t+1). I include this interaction term as an additional RHS variable, to test whether firm responses were augmented during economic downturns.

$$Exit_{fst} = \beta_1 Dev_{fst} + \beta_2 \Delta_{jt} * Dev_{fst} + \beta_3 EmpShare_{fst} + \sum_n \alpha_n I(\#States = n)_{ft} + \delta_{st} + \gamma_{jt} + \epsilon_{fst} \tag{2}$$

Once again, $f$ denotes firm, $j$ denotes 3-digit NAICS industry, $s$ denotes state, and $t$ denotes year. Measuring industry job losses as z-scores allows for $\beta_2$ to be interpreted as an additive component to $\beta_1$; it tests whether firms respond differentially in boom/bust years. Appendix Figure A.9 plots the z-scores of industry job losses over time for a selection of 3-digit manufacturing industries. On average the largest spike occurs during the Great Recession and smaller spikes in 2001–2002, while years with the lowest z-scores were in 2011-2014. However there is also variation in the timing of job losses across industry. For example, Apparel Manufacturing had the largest job losses in the early 2000's, and a relatively smaller z-score during the Great Recession. Fabricated Metal Manufacturing, on the other hand, had an extremely large spike during the Great Recession. The $\Delta_{jt} * Dev_{fst}$ interaction term will account for differential responses across these two industries during the 2001 Recession versus the Great Recession.

# 5 Main Results on Plant Closures

## 5.1 Evidence from Raw Exit Rates

I first present nonparametric evidence using raw exit rates. The goal is to highlight the differential firm response for the 16 flexible wage base ("Flex") states that index their UI taxes to rise with wage growth. Firms operating plants in these states can expect their taxable wage bases to automatically increase every year, leading to greater UI tax costs over time.

Focusing on the subsample of firms that have locations in both a high tax Flex state and at least one non-Flex state (56% of my analysis sample) during the same year, Figure 7 plots annual establishment exit rates separately for Flex states versus the others. The exit rates track each other quite closely until a divergence in 2008 and 2009. Plants in a Flex state were 32% more likely to shut down than plants in any other state, a statistically significant difference in means. In contrast, Figure 8 shows that the remaining firms that are located in only Flex states or only non-Flex states show no discernable difference in exit rates during 2008–2009. This placebo test of sorts shows that the Great Recession didn't happen to impact Flex states differentially from non-Flex states. Rather, the firms located in Flex states that had cheaper outside options in other states were more likely to exit from their Flex state plants during the Great Recession.

## 5.2 Pooled Regression Results

My main analysis pools all states and years into one reduced form regression specification. Taking each firm's pre-determined combination of establishment locations as given, I estimate the causal effect of greater relative UI tax costs on Establishment Exit using Equation 1. Table 2 reports pooled regressions estimates, where Exit is a dummy for if the plant (aggregated to state-level) shut down or reported zero employment in the following year. Estimates of the preferred specification are shown in Column 2, where relative to a mean exit rate of about 4%, one standard deviation ($400) increase in $Dev_{fst}$ increases the likelihood of exit by 5%.[18] The estimates are stable to the inclusion of various controls, including a control for distance (coordinates for the centroid of state) to the state with the firm's largest employment share. Column 4 also shows robustness to reweighting by $1/(\#States)$, since unweighted regressions will overweight the effect of large firms. This shows that responses to UI tax costs were not just concentrated in large firms with multiple locations, but rather were a phenomenon affecting small firms as well.

Given the observed firm responses above, I next provide evidence for the mechanism through which this effect operates. Table 3 reports the regression estimates with the $Dev_{fst} * \Delta_{jt}$ interaction, showing that firms are more likely to respond to UI tax differences in years when their industry experiences large job losses. It is precisely during these years that many firms will have been hit with large negative and semi-permanent shocks. And for a plant located in a high tax state, the future UI tax savings from exit - up to $2000 per worker - are equivalent to 5% of annual wages for the average worker. This constitutes a substantial cost that cannot be avoided, and can prove especially burdensome for cash-constrained firms.

In 2008 industries had an average job loss $\Delta$ of 2, which translates to one standard deviation increase in $Dev_{fst}$ causing the likelihood of exit to increase by 10% during the Great Recession. This is not a purely mechanical relationship as overall exit rates did not vary as much as job losses did over this period.[19] It is also worth noting that these estimates likely suffer from attenuation bias given the unobservability of true UI tax costs faced by each firm.

Column 4 also reports results using Employment Growth as the outcome, where Employment Growth is defined as $100 * \frac{Emp_{t+1} - Empt}{\frac{1}{2}(Emp_t + Emp_{t+1})}$, and is equal to -200 if a plant exits completely. This measure combines both the intensive and extensive margins of employment adjustment, and shows that the negative employment effects of shutdowns outweighs and

[18]Going from Column 1 to Column 2 shows an increase in the estimated coefficient after controlling for state-by-year fixed effects, likely due to differences in economic conditions in high tax versus low tax states.

[19]Appendix Figure A.10 plots annual establishment exit rates, which hover around the sample mean of 4%.

potential disincentivizing effects on layoffs.

Appendix subsection A.2 describes a complementary difference-in-differences analyses during the Great Recession that takes more of an event study approach. They exploit the differences in state UI taxes driven by flexible wage base states, with two sets of comparisons: one within-state and one within-firm. They provide additional evidence that firms are reallocating plant closures in response to differences in maximum UI taxes.

## 5.3 Robustness

To investigate whether my results are sensitive to the way I define the UI tax deviation $Dev_{fst}$, I also report estimates from using two alternate specifications. In Table 4, I replace $Dev_{fst}$ with a dummy variable $Firm\_Min_{fst}$, equal to one for the plants in the firm with the lowest maximum UI tax in year $t$. In line with my previous estimates, the negative coefficients indicate that Exit is less likely to occur when the plant is the lowest cost plant in the firm. In Table 5, I replace $Dev_{fst}$ with $Dev2_{fst} = Maxtax_{st} - min_{i \in f}(Maxtax_{it})$, the difference between the own state's maxtax and the firm's overall minimum maxtax. These estimates are likely to be attenuated because the state with the minimum maxtax may not actually account for a sizeable share of the firm's employment, reducing the firm's ability to reallocate towards that location. My results are also robust to calculating tax deviations in terms of the state average UI taxes rather than the maximum UI taxes.

As another robustness test, I construct a placebo $Dev_{fst}$ measure replacing each state's maximum UI tax with the max tax of the alphabetically preceding state. Appendix Table A.2 shows that estimates using these placebo measures are statistically insignificant and close to zero. Appendix Table A.3 reports estimates controlling for lagged log employment (in year t-2), and in doing so limits the sample to establishments that have been in operation for at least 2 years. This is desirable because new firms may face many temporary tax incentives that drive their location decision, and new employers face a "new employer" tax rate for the first few years until sufficient layoff history can be established. As an additional comparison to the oft-studied state corporate income tax, Appendix Table A.4 reports estimates using $CorpDev_{fst}$, the deviation from the firm's mean state corporate tax rate. When coefficients on both the corporate tax deviation and the UI tax deviation are estimated in the same regression, only the coefficients on the UI $Dev_{fst}$ are statistically significant, showing that firms are indeed responding to UI tax costs and not other state taxes.

My results are also robust to additional sample restrictions. For example, Appendix Table A.5 reports estimates restricting the sample to firms that only operate in a single 6-digit NAICS industry, thereby ensuring that plants within the firm are producing the same goods and are more substitutable. The estimates are less precise due to the reduction in sample size, but are of similar signs and magnitudes. Additionally, restricting to firm-years where all plants in the firm have no non-manufacturing operations in the same state produces similar estimates. This addresses the concern that manufacturing plant closures may be the result of consolidations with non-manufacturing plants. Results are also robust to restricting to firm-years where the firm's existing plants were all opened before the start of the sample period, in case firms with high UI tax burdens are more likely to open new plants in low tax states (Appendix Table A.6). Furthermore, my results are not only driven by the Great Recession. Appendix Table A.7 shows that breaking the sample period into two subperiods, 1997–2005 and 2006–2014, produces similar estimates of the response to the 2001 Recession and China trade shock in the first period, and the Great Recession in the second.

## 5.4 Other Plant Characteristics

In order to benchmark the estimated effects of UI taxes to the effects of other plant-level characteristics, I also match my main analysis sample to the 2007 Census of Manufacturers. I merge 2007 values of plant-level TFPR, Total Assets, and Labor Share to corresponding plants in 2008 to study their effects on shutdown during the Great Recession (when the largest firm responses occurred).[20] I include them as additional controls in the following

[20]Because the Census of Manufacturers is only collected every 5 years, these plant-level characteristics are unavailable for the whole sample period.

regression specification:

$$\begin{aligned} Exit_{fs} = \beta_1 Dev_{fs} + \beta_2 ln(TFP)_{fs} + \beta_3 ln(Assets)_{fs} + \beta_4 LaborShare_{fs} + \\ \beta_6 EmpShare_{fs} + \sum_n \alpha_n I(\#States = n)_f + \delta_s + \gamma_j + \epsilon_{fs} \end{aligned} \tag{3}$$

The sample is restricted to year 2008, and $f$ denotes firm, $j$ denotes 3-digit NAICS industry, and $s$ denotes state. Measures of $TFP$ are obtained from Foster et al. (2016), $Assets$ is calculated as total assets per worker, and $LaborShare$ is calculated as (wage and salaries + benefits) divided by value-added. Table 6 reports the results of this analysis. Column 2 shows that even after controlling for these additional plant characteristics, the coefficient on $Dev_{fst}$ is large and statistically significant, which is suggestive of misallocation. These results are also robust to controlling for firm fixed effects. Additional pairwise interactions in Columns 5-7 shows that while the interaction with log TFP is insignificant, the negative interaction with assets per worker suggests that plants with large capital investments are less responsive to UI tax differences - consistent with larger capital adjustment/shutdown costs. Meanwhile, the positive interaction with labor share confirms that plants more reliant on labor for production are also more responsive to UI tax differences.

# 6 Additional Outcomes

## 6.1 Using LEHD Data to Study Hiring

The conceptual framework from section 4.1 predicts lower employment volatility but ambiguous responses for overall employment and layoffs. On the hiring margin, however, higher UI taxes should lead employers to be more reluctant to hire new workers since higher per-capita labor costs decrease the optimal level of employment. Since the LBD only provides annual employment levels, it is difficult to discern whether changes in employment are coming from greater separations, fewer hires, or both. Therefore, I turn to employer-employee data from the LEHD to identify new hires at the establishment level. As mentioned previously, the LEHD data includes a subset of 23 states yet still accounts for almost 50% of US manufacturing. Manufacturing shares are also very similar in LEHD compared to non-LEHD states (11.5% vs 12%), and maximum UI taxes average \$863 and \$983 respectively.

Since experience rating causes employer-specific UI tax rates to increase in the years following large layoffs, a firm that laid off workers during the Great Recession would experience a substantial increase in their UI tax rates in 2011 and 2012 (see Figure 6). This timing also coincides with years the firm may be particularly cash-constrained, and because UI tax bases are lower than average wages employers would face the majority of their tax burden in the first and second quarters of the year. I test whether firms are more sensitive to hiring precisely in years when UI taxes are high. I define new hires as employees with no earnings at the firm in year t-1, and positive earnings in year t. The outcomes of interest include $AnyHire_{fst}$, an indicator for whether the SEIN[21] has any new hires during the year, as well as $Log(1 + Hires)_{fst}$, where Hires denotes the cumulative number of new hires during the year. My estimating equation takes the following form:

$$\begin{aligned} AnyHire_{fst} = \sum_{k=2000}^{2013} \beta_k Dev_{fst} * I(t = k) + \beta_2 EmpShare_{fst} + \\ \sum_n \alpha_n I(\#States = n)_{ft} + \delta_{st} + \gamma_j + \epsilon_{ist} \end{aligned} \tag{4}$$

In the equation f denotes firm, j denotes 3-digit NAICS industry, s denotes state, and t denotes year. Yearly coefficients $\beta_k$ are estimated for $Dev_{fst}$, in order to compare hiring responses over the business cycle. I also include the same previous controls for plant employment share, state-by-year fixed effects, 3-digit NAICS industry fixed effects, and fixed

[21] For the most part, SEIN's in my matched sample are synonymous with my prior establishment definition since I aggregate LBD establishments to the state level. However, it is possible that some SEIN's in the LEHD will also include employment in non-manufacturing locations that were dropped when constructing my main LBD analysis sample.

effects for the number of states the firm is located in.

It is also worth noting that after the Great Recession, a number of states also temporarily increased their maximum UI taxes in 2010 and/or 2011 to replenish their UI trust funds. This caused tax costs in some states to rise by even more than expected during this period; For example, Indiana's maximum UI tax more than doubled from \$400 to \$900 in 2011, and Oklahoma's maximum rose from \$820 to \$1395. Thus in some states firms were simultaneously hit with both legislated tax increases and the mechanical increases due to previous layoffs. This creates an additional burden on cash-constrained firms due to the front-loading of UI tax payments described earlier.

Figure 9 shows that precisely in the years following recessions, plants with higher relative UI tax costs were less likely to hire new workers. In 2011, plants with \$400 greater relative UI tax costs had a 1 percentage point lower probability of having any hire, and had 7% lower total hiring. Given that the vast majority of plants engage in hiring - on average only 4% of plants do not hire over the course of a year - a 1 percentage point drop in the likelihood of any hire is a relatively large effect. This provides evidence that the increase in UI taxes after the Great Recession contributed to the slow pace of hiring after 2009, and could partially explain the recent phenomena of "jobless recoveries" where employment fails to recover at the same pace as output.

## 6.2 Employment Volatility

Theory predicts that establishments in high-tax states should also experience lower employment volatility due to the incentives for smoothing employment. I test this prediction in the cross-section on a balanced panel of plants within my sample. In order to ensure that measures of employment volatility only pick up changes in employment and not plant entry/exit, I further restrict to firms that do not open or close any plants over the length of the panel. Thus, I consider short panels of only a 4-5 years in order maximize the number of firms included. I study three separate time periods of relatively stable employment (leaving out recession years): 1997–2000, 2003–2007, and 2010–2014. The outcome of interest, $SD_{fs}$ is constructed by taking the standard deviation of logged annual employment over each period, in order to measure the magnitude of employment fluctuations over the panel.

Unlike my previous research designs which exploit within-state variation in relative UI tax costs, I now conduct a within-firm comparison to test whether firms are more likely to smooth employment for their higher tax plants. If a firm operates in both a high tax state and a low tax state, they may respond to fluctuations in demand by adjusting employment more in the low tax plant in order to reduce layoffs in the high tax plant. Since the outcome measures volatility over time, each plant only has one observation in the following regression, and the $Maxtax_s$ is the state average over 2003–2007.

$$SD_{fs} = \beta Maxtax_s + \delta_f + \epsilon_{fs} \tag{5}$$

In the equation f denotes firm and s denotes state. I control for firm fixed effects, and $\beta$ is the coefficient of interest. These results are also robust to controlling for average log employment, as well as using the state's average tax rather than the maximum tax over each period. Table 7 reports the estimates of my model over the three sample periods. On average a $500 increase in maximum UI taxes is associated with 4-5% lower volatility relative to the mean. While the estimated magnitudes are small, probably due to measurement error in using maximum UI taxes instead of true UI tax costs, they are nonetheless statistically significant and consistent over all three panels. These estimates suggest that firms also respond to differences in state UI taxes when adjusting employment from year-to-year.

# 7 Conclusion

Cross-state disparaties in UI taxes have been increasing over time, as only a subset of states index their taxable wage bases to income growth and federally mandated minimums have not changed since the 1980's. Yet there have been no federal reforms aimed at ensuring state UI trust funds are properly funded. Thus many states have unsustainably low UI tax schedules and were forced to borrow from the federal government in order to pay out benefits during the Great Recession. Given that now the state of UI trust fund solvency across the US is extremely unbalanced and many state tax systems are in need of reform, studying how businesses respond to differences in UI taxation across states is of incredible policy relevance.

This paper studies how multi-establishment manufacturing firms respond to these differences in state-level UI taxation. Because employer tax rates are an increasing function of previous UI claims, firms can expect mass layoffs to result in large increases to their UI tax costs. But for firms located in more than one state, exiting completely from a state allows them to avoid UI tax increases associated with those layoffs, providing an additional incentive to reallocate employment.

By comparing plants located in the same state and year, I find that firms do respond to UI tax differences by reallocating plant closures towards states with higher relative tax costs. These effects are concentrated during economic downturns, when firms are cash constrained and more likely to be cutting employment. My estimates imply that during the Great Recession, moving a high tax plant's outside option from a high tax state ($2000 maximum) to a low tax state ($500 maximum) would have increased its likelihood of exit by 20%. These results are robust to controlling for other plant-level characteristics such as productivity, capital assets, and labor share, although plants with greater assets are less responsive while plants with greater labor share are more responsive. I also find evidence of decreased hiring after the Great-Recession, and lower employment volatility in high tax states during non-recession periods. These findings show that state-level administration of UI taxation introduces a wedge that contributed to the slow pace of hiring after the Great Recession, and to misallocation in the economy.

In Appendix subsection A.1, I simulate a stylized two-period model of a multi-state firm to illustrate effects of counterfactual UI tax systems. Changing to a counterfactual tax system with standardized UI tax costs but state-level experience rating and administration, establishment exit would equalize across states but result in greater exit overall. However, if the system instead assigned UI experience rating at the national level so that firms who exit from one state are still liable for UI tax increases, counterfactual exit rates could fall while also raising more UI tax revenue. This highlights an unintended consequence of decentralized administration, as the current UI tax system has become a factor influencing the plant closures of multi-state manufacturing firms. A first step towards reform could involve the creation of a more national experience rating system for multi-state firms, akin to apportionment formulas used in corporate income taxation.

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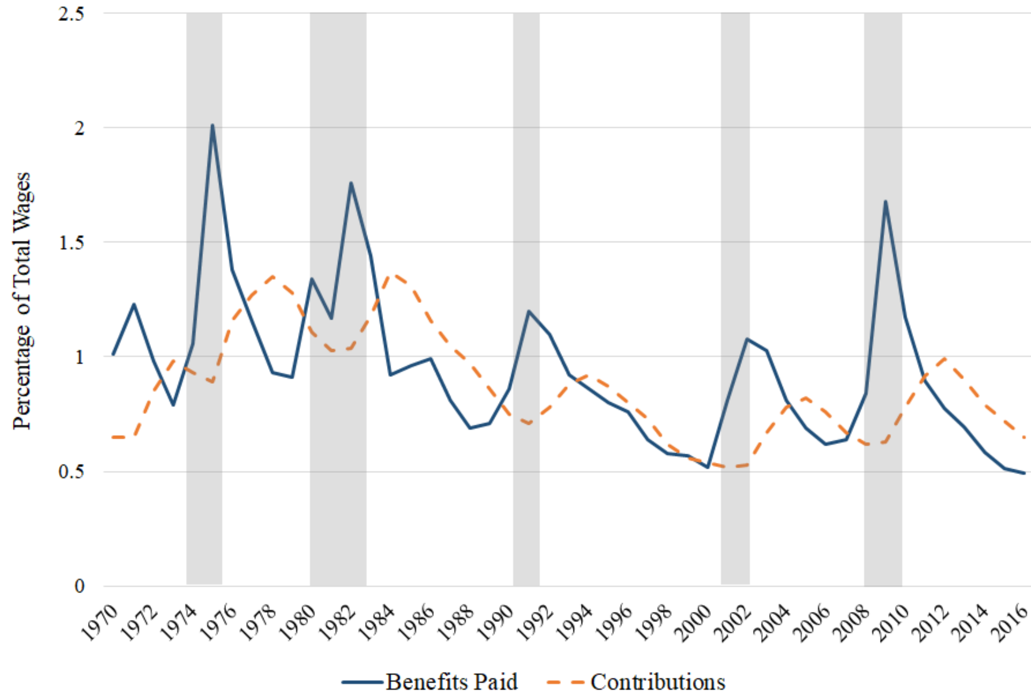
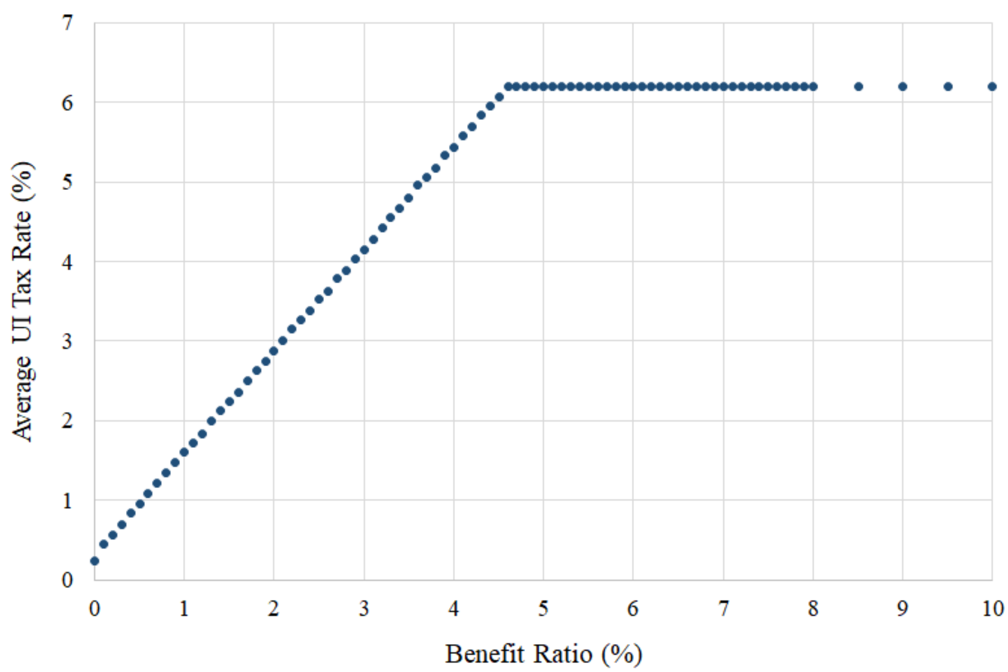
# FIGURES

Figure 1: U.S. UI Benefits and UI Taxes Over Time (1970–2016)



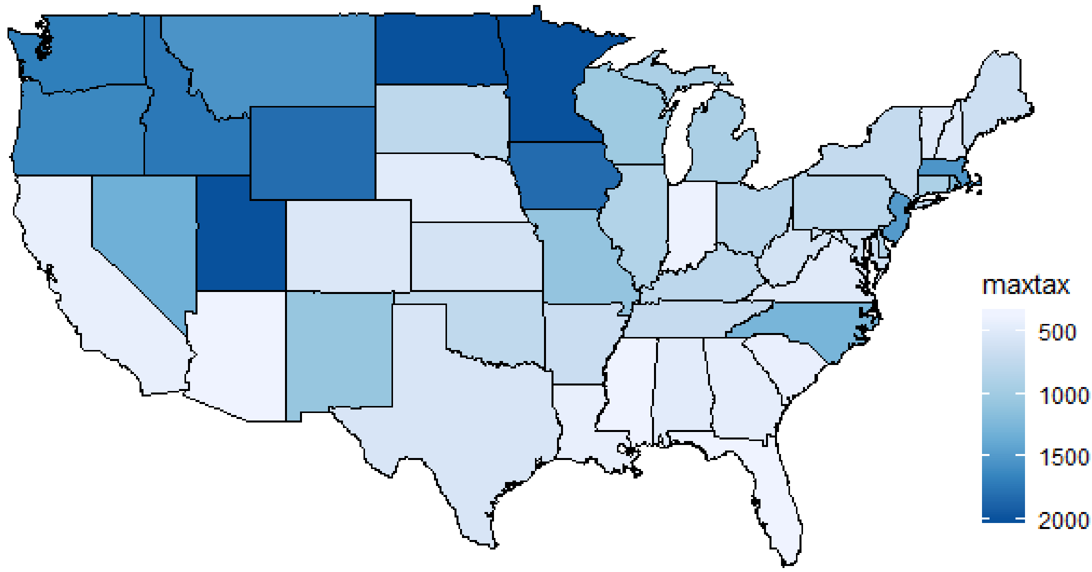

Source: US Dept of Labor Unemployment Insurance Chartbook

Figure 2: Empirical UI Tax Schedule for Texas (2009)



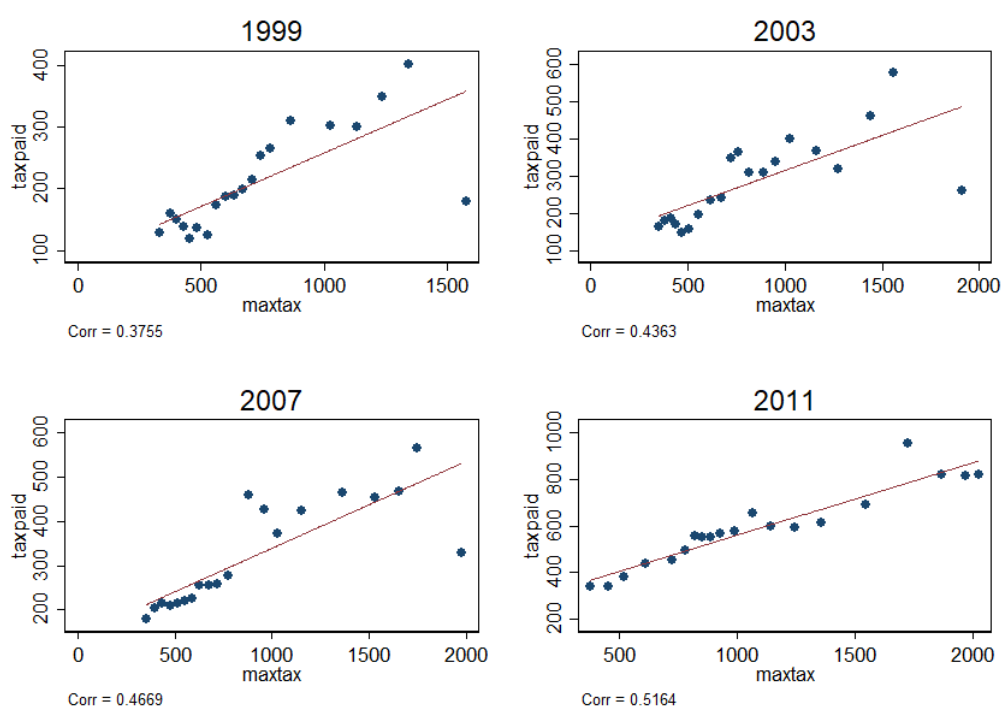

Source: US Dept of Labor ETA 204 Experience Rating Report

Figure 3: Maximum Per-Capita UI Tax (2008)



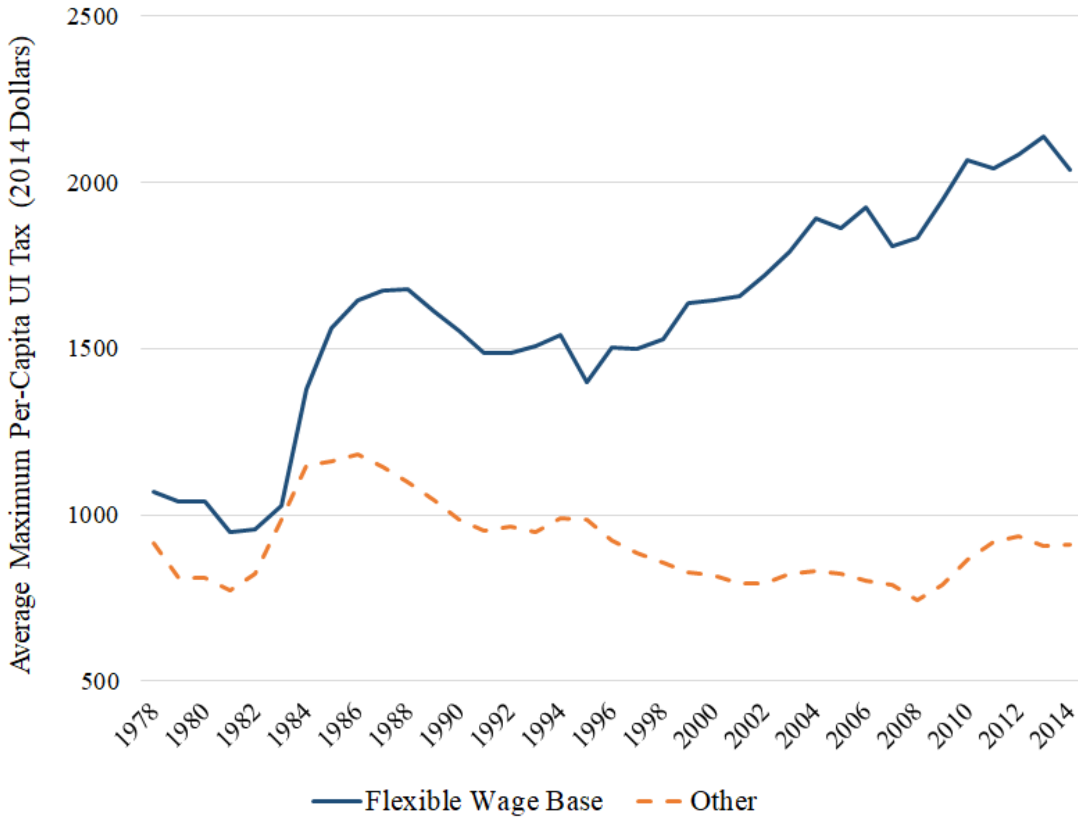

Source: US Dept of Labor *Significant Measures of State UI Tax Systems, 2008*

Figure 4: Correlation between Maximum UI Taxes and Industry Taxes Paid



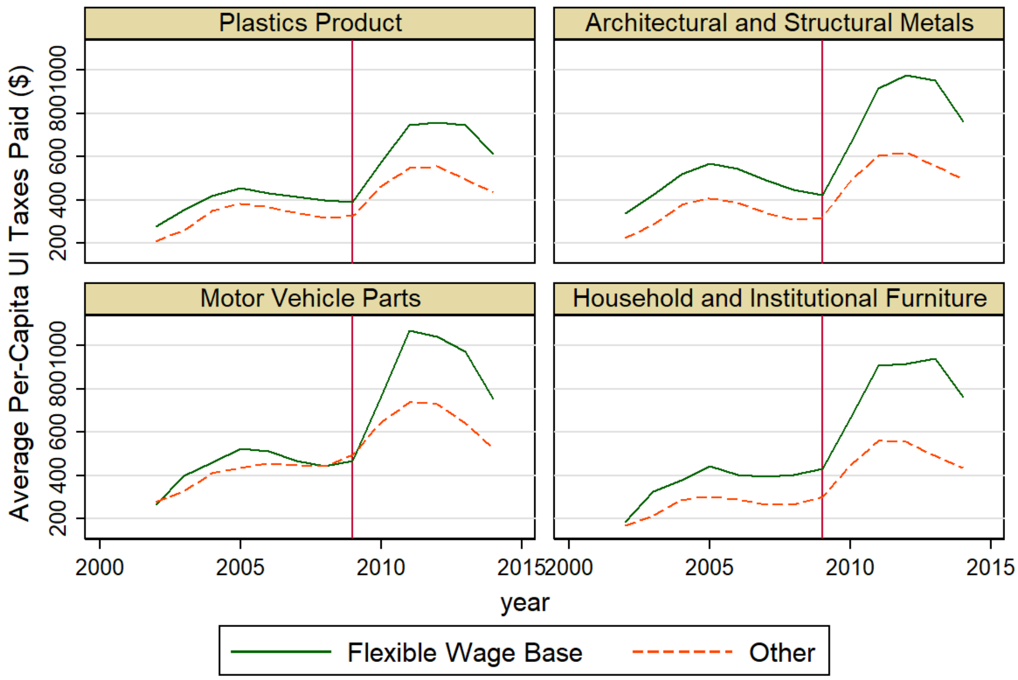

Binned scatterplots, controlling for 4-digit NAICS industry. Taxpaid equals annual UI contributions divided by average employment, at state by 4-digit NAICS level.

Figure 5: Growing Differences in Maximum UI Taxes Across States



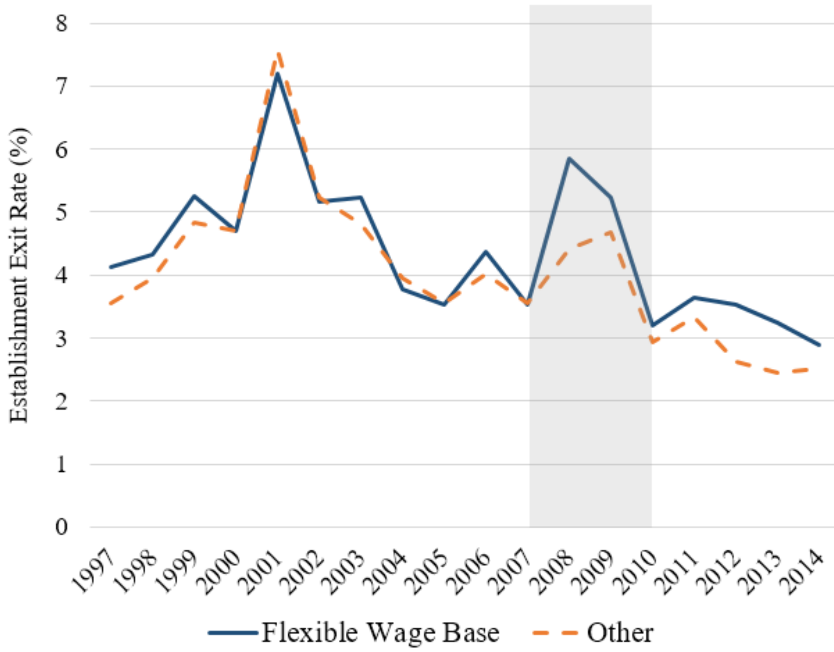

Plots unweighted average maximum UI taxes across the two groups of states, inflation adjusted to 2014 dollars. Excluded from the figure are flexible wage base states Alaska and Hawaii.

Figure 6: Average Industry Per-Capita UI Taxes



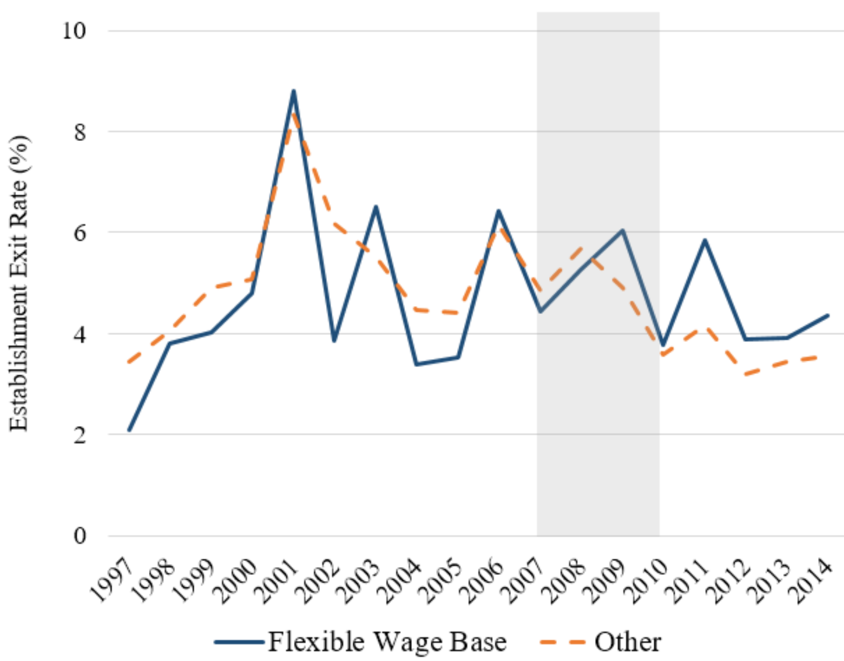

Tax paid equals annual UI contributions divided by average employment, at state by 4-digit NAICS level. Annual employment weighted averages are plotted for Flex states and non-Flex states.

Figure 7: Exit Rates for Flex State Plants versus Other Plants



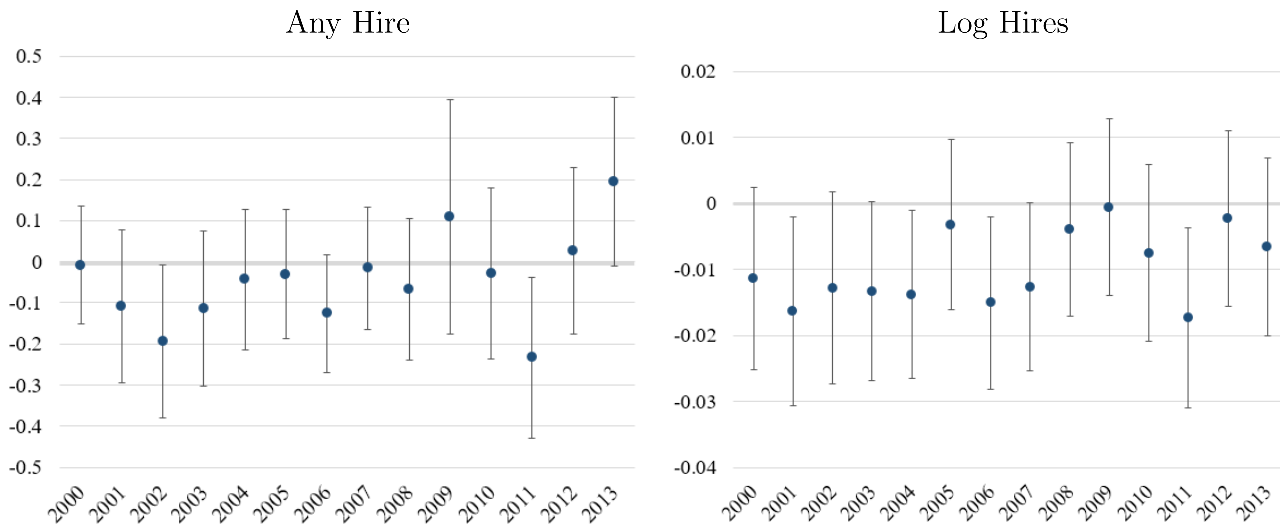

Restricted to firms with locations in both a Flex state and non-Flex state in that year.

Figure 8: No Difference in Exit Rates for Firms in Only Flex or Non-Flex




Restricted to firms with locations in only Flex states or only non-Flex states in that year.

Figure 9: Yearly Coefficients on $Dev_{fst}$




Estimated yearly coefficients on $Dev_{fst}$ for regression controlling for Employment Share, Multi FE, and State-by-Year FE. Error bars denote 95% confidence intervals. Mean of Any Hire equals 96.2, and mean of Log Hires equals 3.19. SD of $Dev$ equals 3.96. Full regression table in Table A.8.

# TABLES

Table 1: Summary Statistics of Main Analysis Sample (1997–2014)

| | Establishment-Year Level (N=475000) | | | Firm Level (N=14500) | | |
|---|---|---|---|---|---|---|
| | Mean | Pseudo-Median | SD | Mean | Pseudo-Median | SD |
| March Employment | 275.1 | 105.5 | 815.5 | 204.3 | 114.3 | 342.5 |
| Average Payroll ($) | 44,360 | 40,230 | 25,970 | 42,840 | 40,090 | 17,400 |
| # of States | 6.5 | 4 | 6.6 | 3.7 | 2 | 3.5 |
| Age (topcoded at 23) | 15.75 | 19 | 7.826 | 20.55 | 23 | 5.106 |
| # Years in Sample | 12.5 | 13.5 | 5.4 | 10.3 | 9.4 | 6 |
| Maximum UI Tax ($) | 961.2 | 874.1 | 439.2 | 960 | 916.4 | 275.6 |
| Tax Deviation ($) | 4.748 | 0 | 385.9 | -2.75 | -0.365 | 118.4 |
| I (Estab Exit) | 0.039 | | | 0.586 | | |
| I (Same Industry) | 0.485 | | | 0.605 | | |
| 2000–2013 Matched LEHD Sample (N= 115000) | | | | | | |
| Annual Employment | 310.7 | 119.9 | 902.8 | | | |
| Avg Annual Earnings ($) | 37,380 | 34,310 | 20,850 | | | |
| Median Q1 Earnings ($) | 9.057 | 8.304 | 6.457 | | | |
| Median Job Tenure (Qtrs) | 18.65 | 19.63 | 4.282 | | | |

Left panel reports summary statistics at level of firm-state-year. Right panel reports statistics at level of firm. Exit equals one if establishment disappears or reports zero employment in t+1. Same Industry equals one if firm operates in only one 6-digit NAICS industry throughout whole period. Bottom panel reports LEHD variables at firm-state-year level.

Table 2: Establishment Exit (1997–2014)

| Exit multiplied by 100 | (1) Exit | (2) Exit | (3) Exit | (4) Exit |
|---|---|---|---|---|
| $\text{Dev}_{fst}$ ($\$100's$) | 0.0368*** | 0.0512*** | 0.0503*** | 0.0583*** |
| | (0.0135) | (0.0150) | (0.0149) | (0.0174) |
| Employment $\text{Share}_{fst}$ | -10.04*** | -10.03*** | -10.06*** | -9.028*** |
| | (0.165) | (0.165) | (0.194) | (0.210) |
| $\text{Distance}_{fst}$ | | | -0.00246 | -0.00543 |
| | | | (0.00376) | (0.00461) |
| $R^2$ | 0.016 | 0.018 | 0.021 | 0.022 |
| Mean of Exit | 3.935 | 3.935 | 3.935 | 4.461 |
| SD of Dev | 3.859 | 3.859 | 3.859 | 3.280 |
| State-by-Year FE | | Yes | Yes | Yes |
| Industry-by-Year FE | | | Yes | Yes |
| Multi-by-Year FE | | | Yes | Yes |
| Age Bins | | | Yes | Yes |
| Weighting | | | | Yes |
| # of Unique Firms | 14500 | 14500 | 14500 | 14500 |
| $N$ | 475000 | 475000 | 475000 | 475000 |

Regressions include State, Year, Multi, and 3-digit industry FE's. Multi is a categorical variable for # of states firm is located in. Exit=100 if establishment disappears or reports zero employment in t+1. Distance defined as straight line distance from the state with firm's largest employment share, and is equal to zero if no plant has employment share greater than 20%. All columns are unweighted except for Column 4, which weights by 1/(# of plants in the firm). Standard errors clustered at firm level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Interaction with Industry Job Losses (1997–2014)

| Dep Vars multiplied by 100 | (1) Exit | (2) Exit | (3) Exit | (4) Empl Growth |
|---|---|---|---|---|
| $\text{Dev}_{fst}$ (\$100′$s$) | 0.0513*** | 0.0513*** | 0.0595*** | -0.132*** |
| | (0.0150) | (0.0149) | (0.0174) | (0.0390) |
| $\text{Dev}_{fst} * \Delta_{jt}$ (\$100′$s$) | 0.0276** | 0.0283** | 0.0326** | -0.0576** |
| | (0.0111) | (0.0111) | (0.0147) | (0.0280) |
| Employment $\text{Share}_{fst}$ | -10.03*** | -10.06*** | -9.026*** | 8.745*** |
| | (0.165) | (0.194) | (0.210) | (0.474) |
| $\text{Distance}_{fst}$ | | -0.00245 | -0.00540 | -0.00106 |
| | | (0.00376) | (0.00461) | (0.00978) |
| $R^2$ | 0.021 | 0.021 | 0.022 | 0.025 |
| Mean of Dep Var | 3.935 | 3.935 | 4.461 | -10.58 |
| SD of Dev | 3.859 | 3.859 | 3.280 | 3.859 |
| Multi FE | Yes | Yes | Yes | Yes |
| State-by-Year FE | Yes | Yes | Yes | Yes |
| Industry-by-Year FE | Yes | Yes | Yes | Yes |
| Multi-by-Year FE | | Yes | Yes | Yes |
| Age Bins | | Yes | Yes | Yes |
| Weighting | | | Yes | |
| # of Unique Firms | 14500 | 14500 | 14500 | 14500 |
| $N$ | 475000 | 475000 | 475000 | 475000 |

Dependent variables are multiplied by 100. Multi is a categorical variable for # of states firm is located in. Exit=100 if establishment disappears or reports zero employment in t+1. Main effect of $\Delta$ is absorbed by industry-by-year FE's. Distance defined as straight line distance from the state with firm's largest employment share, and is equal to zero if no plant has employment share greater than 20%. All columns are unweighted except for Column 3, which weights by 1/(# of plants in the firm). Standard errors clustered at firm level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Indicator for Firm Minimum (1997–2014)

| Dep Vars multiplied by 100 | (1) Exit | (2) Exit | (3) Exit | (4) Exit | (5) Empl Growth |
|---|---|---|---|---|---|
| $\text{Firm\_Min}_{fst}$ ($100's) | -0.323*** | -0.317*** | -0.311*** | -0.370*** | 0.550** |
| | (0.0965) | (0.0963) | (0.0962) | (0.104) | (0.237) |
| $\text{Firm\_Min}_{fst} * \Delta_{jt}$ ($100's) | | -0.106 | -0.160** | -0.192** | 0.308 |
| | | (0.0743) | (0.0794) | (0.0870) | (0.197) |
| Employment $\text{Share}_{fst}$ | -10.04*** | -10.04*** | -10.07*** | -9.199*** | 8.746*** |
| | (0.165) | (0.165) | (0.194) | (0.221) | (0.474) |
| $\text{Distance}_{fst}$ | | | -0.00236 | -0.00375 | -0.00135 |
| | | | (0.00376) | (0.00441) | (0.00978) |
| $R^2$ | 0.018 | 0.021 | 0.021 | 0.022 | 0.025 |
| Mean of Dep Var | 3.935 | 3.935 | 3.935 | 4.308 | -10.58 |
| Mean of Firm_Min | 0.363 | 0.363 | 0.363 | 0.701 | 0.363 |
| Multi FE | Yes | Yes | Yes | Yes | Yes |
| State-by-Year FE | Yes | Yes | Yes | Yes | Yes |
| Industry-by-Year FE | | Yes | Yes | Yes | Yes |
| Multi-by-Year FE | | | Yes | Yes | Yes |
| Age Bins | | | Yes | Yes | Yes |
| Weighting | | | | Yes | |
| # of Unique Firms | 14500 | 14500 | 14500 | 14500 | 14500 |
| $N$ | 475000 | 475000 | 475000 | 475000 | 475000 |

Dependent variables are multiplied by 100. Multi is a categorical variable for # of states firm is located in. Exit=100 if establishment disappears or reports zero employment in t+1. Main effect of $\Delta$ is absorbed by industry-by-year FE's. Distance defined as straight line distance from the state with firm's largest employment share, and is equal to zero if no plant has employment share greater than 20%. All columns are unweighted except for Column 4, which weights by 1/(# of plants in the firm) if $Firm\_Min$ equals zero and assigns weight of one otherwise. Standard errors clustered at firm level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Tax Deviation from Firm Minimum (1997–2014)

| Dep Vars multiplied by 100 | (1) Exit | (2) Exit | (3) Exit | (4) Exit | (5) Empl Growth |
|---|---|---|---|---|---|
| $\text{Dev2}_{fst}$ ($\$100's$) | 0.0389*** | 0.0372*** | 0.0369*** | 0.0363*** | -0.0583** |
| | (0.0113) | (0.0114) | (0.0113) | (0.0119) | (0.0281) |
| $\text{Dev2}_{fst} * \Delta_{jt}$ ($\$100's$) | | 0.00380 | 0.0132* | 0.0133 | -0.0362* |
| | | (0.00734) | (0.00787) | (0.00917) | (0.0199) |
| Employment $\text{Share}_{fst}$ | -10.04*** | -10.04*** | -10.08*** | -9.039*** | 8.753*** |
| | (0.165) | (0.165) | (0.194) | (0.210) | (0.474) |
| $\text{Distance}_{fst}$ | | | -0.00264 | -0.00569 | -0.000933 |
| | | | (0.00376) | (0.00461) | (0.00977) |
| $R^2$ | 0.018 | 0.021 | 0.021 | 0.021 | 0.025 |
| Mean of Dep Var | 3.935 | 3.935 | 3.935 | 4.461 | -10.58 |
| SD of Dev2 | 5.334 | 5.334 | 5.334 | 5.139 | 5.334 |
| Multi FE | Yes | Yes | Yes | Yes | Yes |
| State-by-Year FE | Yes | Yes | Yes | Yes | Yes |
| Industry-by-Year FE | | Yes | Yes | Yes | Yes |
| Multi-by-Year FE | | | Yes | Yes | Yes |
| Age Bins | | | Yes | Yes | Yes |
| Weighting | | | | Yes | |
| # of Unique Firms | 14500 | 14500 | 14500 | 14500 | 14500 |
| $N$ | 475000 | 475000 | 475000 | 475000 | 475000 |

Dependent variables are multiplied by 100. Multi is a categorical variable for # of states firm is located in. Exit=100 if establishment disappears or reports zero employment in t+1. Main effect of $\Delta$ is absorbed by industry-by-year FE's. Distance defined as straight line distance from the state with firm's largest employment share, and is equal to zero if no plant has employment share greater than 20%. All columns are unweighted except for Column 4, which weights by 1/(# of plants in the firm). Standard errors clustered at firm level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Comparing to Other Plant Characteristics (2007 CMF)

| Exit multiplied by 100 | (1) Exit | (2) Exit | (3) Exit | (4) Exit | (5) Exit | (6) Exit | (7) Exit |
|---|---|---|---|---|---|---|---|
| $\text{Dev}_{fs}$ ($\$100's$) | 0.146** | 0.144** | 0.0636** | 0.0607* | 0.145** | 0.142** | 0.148** |
| | (0.0681) | (0.0681) | (0.0323) | (0.0323) | (0.0681) | (0.0678) | (0.0683) |
| $\ln(\text{TFP})_{fs}$ | | -0.225 | | 0.577 | -0.729** | | |
| | | (0.317) | | (0.481) | (0.291) | | |
| $\ln(\text{Assets})_{fs}$ | | -0.300* | | -0.290 | | -0.481*** | |
| | | (0.167) | | (0.256) | | (0.158) | |
| $\text{LaborShare}_{fs}$ | | 1.032*** | | 1.485*** | | | 1.209*** |
| | | (0.274) | | (0.346) | | | (0.242) |
| $\text{Dev}_{fs} * ln(TFP)_{fs}$ | | | | | -0.00513 | | |
| | | | | | (0.0631) | | |
| $\text{Dev}_{fs} * Assets_{fs}$ | | | | | | -0.0677* | |
| | | | | | | (0.0347) | |
| $\text{Dev}_{fs} * LaborShare_{fs}$ | | | | | | | 0.122** |
| | | | | | | | (0.0585) |
| $\text{Employment Share}_{fs}$ | -12.24*** | -12.40*** | -12.57*** | -12.74*** | -12.30*** | -12.20*** | -12.47*** |
| | (0.725) | (0.731) | (0.728) | (0.735) | (0.726) | (0.726) | (0.729) |
| $R^2$ | 0.022 | 0.023 | 0.436 | 0.437 | 0.022 | 0.022 | 0.024 |
| Mean of Exit | 4.257 | 4.257 | 4.257 | 4.257 | 4.257 | 4.257 | 4.257 |
| SD of Dev | 4.202 | 4.202 | 4.202 | 4.202 | 4.202 | 4.202 | 4.202 |
| Multi FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| State FE | Yes | Yes | | | Yes | Yes | Yes |
| Industry FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm FE | | | Yes | Yes | | | |
| # of Unique Firms | 5800 | 5800 | 5800 | 5800 | 5800 | 5800 | 5800 |
| $N$ | 21500 | 21500 | 21500 | 21500 | 21500 | 21500 | 21500 |

Sample consists of LBD plants in 2008 that could be matched to the 2007 CMF. SD of ln(TFP), ln(Assets), and LaborShare are 0.592, 1.079, and 0.725, respectively. Multi is a categorical variable for # of states firm is located in. Exit=100 if establishment disappears or reports zero employment in t+1. When controlling for Firm FEs, single-state firms are grouped into one "firm". Standard errors clustered at firm level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Employment Volatility

| | | 1997–2000 | | | 2003–2007 | | | 2010–2014 | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) SD | (2) SD | (3) SD | (4) SD | (5) SD | (6) SD | (7) SD | (8) SD | (9) SD |
| Maximum UI Tax | -0.00188** | -0.00149* | | -0.00155*** | -0.00160*** | | -0.00103*** | -0.000853** | |
| ($100's) | (0.000902) | (0.000882) | | (0.000574) | (0.000573) | | (0.000394) | (0.000384) | |
| State Average UI Tax | | | -0.00373** | | | -0.00239 | | | -0.00313** |
| ($100's) | | | (0.00176) | | | (0.00166) | | | (0.00130) |
| Log(Emp) | | -0.0268*** | | | -0.0291*** | | | -0.0267*** | |
| | | (0.00363) | | | (0.00335) | | | (0.00310) | |
| $R^2$ | 0.554 | 0.563 | 0.554 | 0.541 | 0.553 | 0.541 | 0.528 | 0.538 | 0.528 |
| Mean of SD | 0.171 | 0.171 | 0.171 | 0.179 | 0.179 | 0.179 | 0.175 | 0.175 | 0.175 |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| # of Unique Firms | 2500 | 2500 | 2500 | 2000 | 2000 | 2000 | 2500 | 2500 | 2500 |
| $N$ | 6700 | 6700 | 6700 | 6300 | 6300 | 6300 | 7400 | 7400 | 7400 |

SD is defined as the standard deviation of Log(Emp) over the 4-5 year panel. RHS variables are the mean values over the 4-5 year panel. Standard errors clustered at firm level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

# A APPENDIX

## A.1 Model of Multi-State Firm

I propose a simple two-period model of a multi-state firm to rationalize the establishment exit behavior I have documented. This will also allow me to illustrate the effect of two counterfactual UI tax systems. The first counterfactual, mandating uniform tax schedules across states, shuts down the ability for firms to reallocate employment from high tax to lower tax states. The second counterfactual, establishing a system with national experience rating, would cause any plant closures to count against the firms' remaining locations, thereby shutting down the firm's ability to exit from a state in order to avoid paying UI taxes.

Each firm operates in two locations, state a and state b, producing a single homogeneous good. They face a downward sloping demand function, governed by parameters $\sigma$ and $\rho$. The $\rho$ is an industry specific demand shifter through which negative shocks are propogated to firms. Each manufacturing plant faces decreasing returns to scale ($\alpha < 1$), which drives productive firms to operate more than one manufacturing plant. These decreasing returns can be thought of as capacity constraints, transportation costs, etc. For simplicity I will abstract from capital stock, and assume it feeds into the plant-specific productivity $A_s$.

$$P = \rho Q_{tot}^{-\frac{1}{\sigma}} \qquad \text{where } Q_{tot} = \sum_s Q_s \text{ and } \rho = \rho_j + \epsilon$$

$$Q_{fs} = A_{fs} L_{fs}^{\alpha} \quad \text{where } A_{fs} = \mu_f + \upsilon_{fs}$$

Plant-level costs are then composed of a fixed cost of operation, $C$, and per-capita labor costs, composed of a fixed wage $w$ and unemployment insurance taxes $\tau_s$. I assume at baseline that $\tau_s$ is equal across states, as maximum UI taxes are not binding during good times. The firm then chooses the optimal level of employment to maximize profit:

$$\pi = \rho(Q_a + Q_b)^{(1-\frac{1}{\sigma})} - (w + \tau_a)L_a - (w + \tau_b)L_b - 2 * C$$

At the optimum, relative employment at each plant is a function of the relative labor costs:

$$\frac{L_a^*}{L_b^*} = (\frac{w + \tau_a}{w + \tau_b} \frac{A_b}{A_a})^{\frac{1}{\alpha - 1}}$$

Thus, baseline employment shares in each state pin down the relative productivities. I assume a multivariate normal distribution of plant productivies with equal means for high and low tax states, since the empirical mean of employment shares are close to 50% in Flex versus non-Flex states.

For simplicity, I consider a two-period model with perfect foresight and no labor mobility across states. After facing a negative demand shock to $\rho$ in period 1, firms decide whether to exit from each state in order to maximize total profit $\pi_1 + \beta * \pi_2$. In the absence of UI taxes $\tau$, negative demand shocks should cause the firm to adjust employment proportionally in both plants, maintaining the same relative employment share across plants.

UI taxation enters the problem through tax increases in period 2. If a firm lays off workers but does not exit from any state in period 1, their UI taxes will increase in period 2 to $\tau_s^{hi} > \tau_0$, with $\tau_a^{hi} > \tau_b^{hi}$. If a firm instead shuts down a plant in period 1, that plant remains closed in period 2 and the firm's UI taxes in the surviving plant will increase by less in period 2, to $\tau_s^{low} > \tau_0$ since the surviving plant will have suffered fewer layoffs (likewise, $\tau_a^{low} > \tau_b^{low}$). Therefore, expected UI tax increases in period 2 could drive a firm to close down a plant in period 1 when it would not have otherwise, and to favor closing plants in state a over state b due to the higher UI taxes.

For a reasonable range of parameter values, simulating a population of two-state firms facing negative demand shocks shows that implementing a UI tax system with standardized UI taxes but state-level experience rating could cause exit rates to equalize across locations but result in higher overall exit than before (due to greater UI tax savings from plant closures). However, a counterfactual tax system that implemented experience rating at the national level instead (thereby shutting down firms' ability to avoid UI taxes through exit) could result in lower exit rates while simultaneously raising more UI tax revenue.

## A.2 Difference-in-Differences Approach

To provide additional evidence that firms are responding to differences in state UI tax costs, I estimate a simple within-state difference-in-differences model to isolate the effect of UI tax costs from other state-level policies or economic conditions. For the within-state analysis, I focus on the 16 Flex states, because establishments in those states should have the largest potential responses to UI tax costs. I then define plants as "Treatment" if in 2005 they are the location with the highest maximum UI tax out of all the states the firm is located in. Consider another pair of firms Firm B and Firm C, who each have plants located in Iowa. Like before, Firm B's other locations are in Indiana and Illinois (making Iowa the highest maxtax plant), while Firm C has another location in Minnesota (with maxtax $> \$2000$). Firm B would be labeled a Treatment plant while Firm C would be Control. And if negative demand shocks drive the strategic plant closures of high tax locations, we would expect a differential change in exit rates during the Great Recession of 2008-2009.

Because Exit is mechanically equal to zero in the years up until closure, a pre-trend cannot be estimated for plants observed in 2007. To estimate a pseudo "pre-trend" I restrict my sample to establishments observed in 2005, and follow them for 7 years until 2011, defining 2006-2007 as a pre-period and 2008-2011 as the post-period. I define treatment using the firm's baseline composition in 2005, to limit potentially endogenous changes in firm locations due to establishment entry/exit. I then estimate a linear regression specification including yearly indicators interacted with the Treatment dummy:

$$Exit_{ist} = \sum_{k=2005}^{2011} \beta_k Treat_i * I(t = k) + \gamma_{st} + \delta_i + \epsilon_{ist} \tag{6}$$

In the specification above, i indexes establishment, s indexes state, and t indexes year. The outcome of interest is an indicator for whether the plant shuts down or reports zero employment in March of year t+1. Included are state-by-year fixed effects to control for economic conditions or other state policies, as well as establishment fixed effects. Figure A.11 plots the yearly coefficients on Treatment, relative to the baseline difference in 2005. There is a statistically significant increase in 2008 and 2009, showing that the gap in exit rates between Treatment and Control plants increased by 2-3 percentage points during the Great Recession. This is quite a large effect given that the overall exit rate during this period was only around 4%.

Given that we observe a difference in exit rates between treatment and control plants within Flex states, we would expect to observe a parallel pattern of exit from these Flex states when comparing within firm rather than within state. Figure A.12 plots the estimates from an analogous difference-in-differences model studying firms that have locations in both Flex and non-flex states, providing evidence of increased exit precisely from Flex states during the Great Recession.

## A.3 Additional Details of LBD Sample

My main analysis sample is constructed from the LBD and spans the years 1997–2014. To ensure that each establishment's NAICS industry remains constant over the sample period, I define industry using the modal NAICS code. Though rare, some establishments change 3-digit NAICS over the course of the sample (3-digit is finest level of industry I use in my analysis), and I have checked that my main results are robust to dropping these establishments from my sample. For establishments that shut down prior to 2002, only SIC codes were collected (NAICS information was only available in 2002 and later), so in order to assign them a NAICS code I create a crosswalk between 4-digit SIC and 4-digit NAICS codes based on the most frequent SIC to NAICS pairs in the 1997 CMF (which reported both SIC and NAICS codes).

After dropping single-unit firms and government-owned businesses, I also drop any establishments not in NAICS sectors 31-33, which are the manufacturing industries. Collectively manufacturing made up about 17% of U.S. employment in 1997, but was down to 11% in 2014. And as stated previously, I redefine firms as Firm ID-by-3-digit NAICS industry. In the final analysis sample of approx 159,000 firm-by-year observations, 31.4% operate solely in manufacturing industries, and 45.4% operate in more than one 3-digit NAICS industry. Next I aggregate all establishments to the Firm ID-by-3-digit NAICS-by-State level so that each firm only has one location in each state. This ensures that I define Establishment Exit as complete exit from a state, rather than the closure of one establishment out of multiple. In the final sample, only 23.5% of these "plant"-level observations were aggregates of more than one establishment. I then drop any plants that never employ more than 10 workers at a time, to ensure that the plants studied have actual manufacturing capacity.

Finally, to restrict my sample to multi-state firms I require all firms to have locations in more than one state in at least one year from 1997 to 2014. I still keep any years in which these firms only operated in a single state (provided they were multi-state in an earlier/later year), in order to help identify fixed effects in my regression models. It should be noted that in my sample, firms with only one location are not synonymous with single-unit firms, as the former may be affiliated with a firm ID with establishments in other non-manufacturing industries. Additionally, if an establishment starts off as a single-unit firm before becoming acquired by a multi-unit firm (or starts off in a multi-unit and is then converted into a single-unit due to closure), I will only include the years in which the they are designated a multi-unit firm.

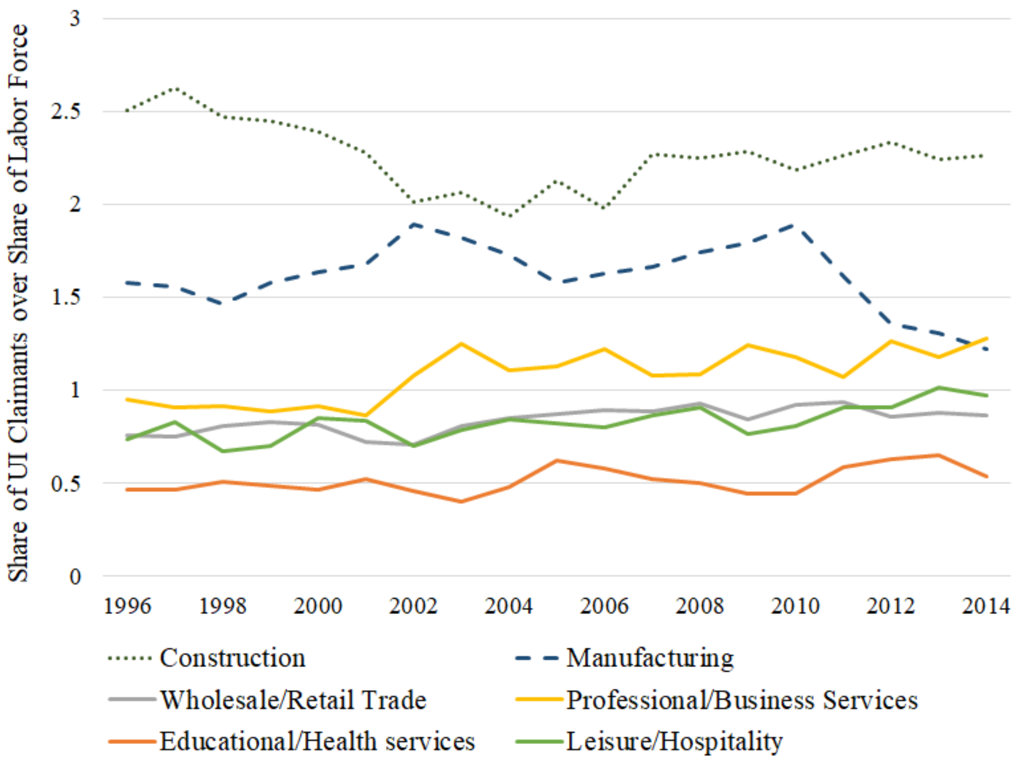
## A.4 Additional Details of LEHD Sample

Unfortunately, matching LBD establishments to the subset of states for which I have LEHD data for reduces my sample, as the LEHD states represent approximately 48% of total manufacturing employment. While LEHD coverage begins in some states as early as 1990, other states do not begin reporting to the LEHD until much later. Therefore, I restrict my LEHD sample to the period 2000–2013 in order to maximize coverage while still incorporating the last two recessions. Nevertheless, because my research design compares firms with differing outside options, I can still use previously calculated tax deviation measures (from the entire sample) for identification.

For multi-establishment firms, matching LEHD data to the LBD is not very straightforward due to the fact that LEHD employers are defined at the SEIN rather than establishment level. A portion of LEHD employers cannot be matched to the LBD at all (especially in years the employer exits), and some SEIN's will match to multiple LBD establishments, and vice versa. To keep matches conservative, I restrict to SEIN's with current manufacturing NAICS codes and require a match on both Firm ID and EIN. If an LBD "plant" (aggregated at the state level) matches to multiple SEINs, I aggregate the matched SEINs to the state level as well to ensure that only one observation is created. However, if the LBD observation was only made up of a single establishment yet matched to multiple SEINs, I drop that observation instead. I also drop any matched observations employing fewer than 5 workers during the year. The resulting matched sample includes almost 60% of the firms in the main LBD sample.

# APPENDIX TABLES AND FIGURES

Figure A.1: UI Claimants in March CPS, by Sector

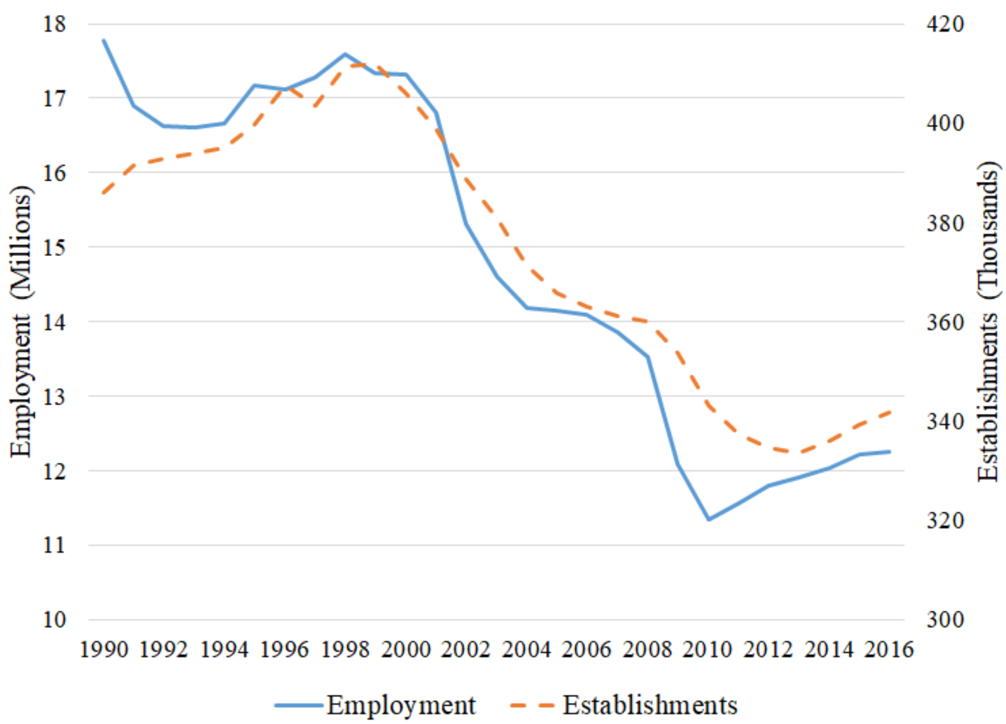



Source: March Current Population Survey. Limited to workers in the labor force aged 18-64.

Figure A.2: State Business Tax Revenues (FY2004–FY2016)


Source: *Total state and local business taxes*, Ernst & Young LLP estimates based on data from the U.S. Census Bureau, state and local government finances

Figure A.3: Decline in U.S. Manufacturing Employment




Source: Quarterly Census of Employment and Wages

Figure A.4: No Correlation b/w Max UI Taxes and Other State Costs (2008)

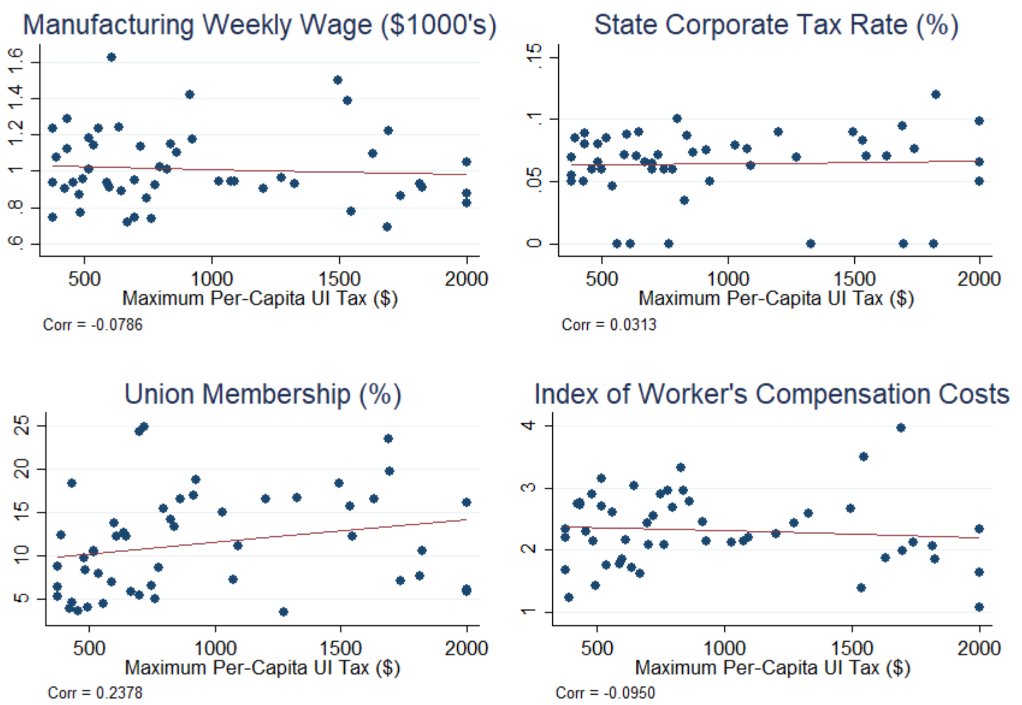
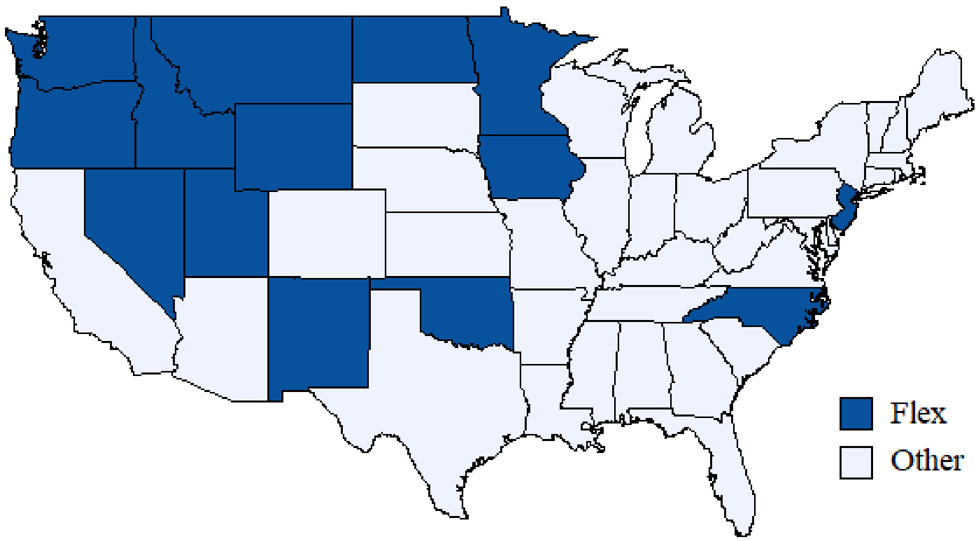
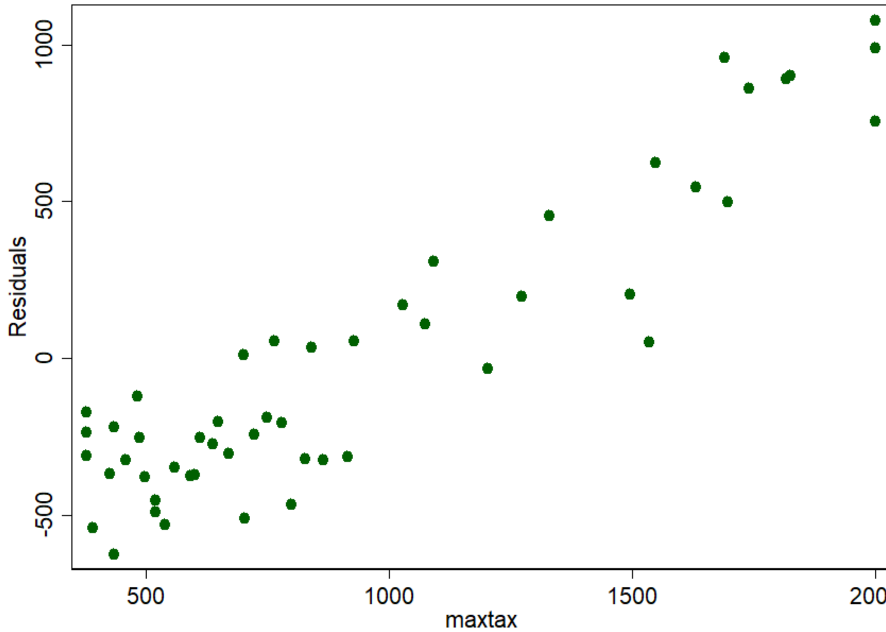



Figure A.5: Flexible Taxable Wage Base States



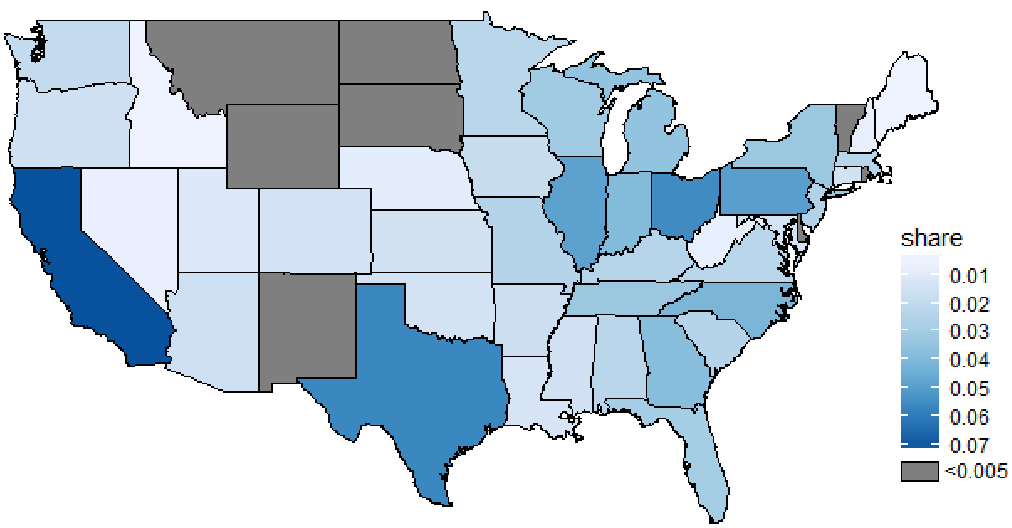

14 Flex states: ID, IA, MN, MT, NV, NJ, NM, NC, ND, OK, OR, UT, WA, and WY. Not pictured are flexible wage base states Alaska and Hawaii.

Figure A.6: Residual Variation in Maximum UI Taxes (2008)




Scatterplot of residuals from a regression of state maximum UI taxes on weekly maximum UI benefits using data from 2008. The positive correlation between residuals and maximum taxes shows that not all of the variation in maxtax can be accounted for by the maximum benefit level.

Figure A.7: Distribution of Multi-State Firms (1997–2014)




Plots the share of plants in main analysis sample located in each state. Smallest 10 states plus DC are omitted.

Figure A.8: No Correlation b/w Max UI Taxes and UI Benefit Claims (2009)

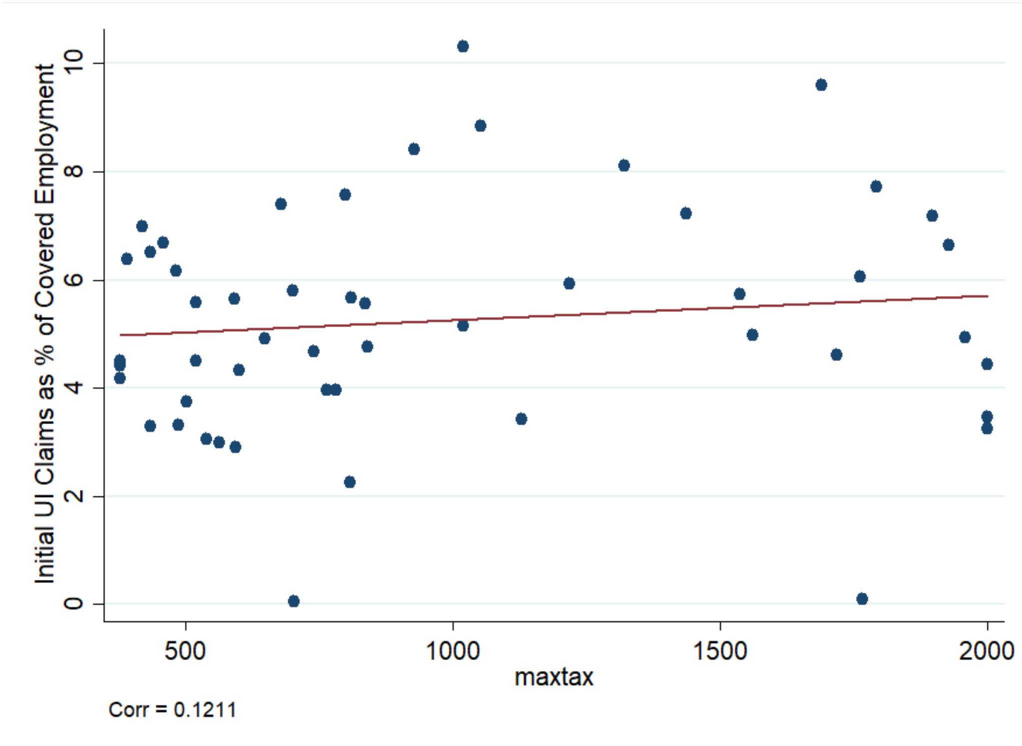
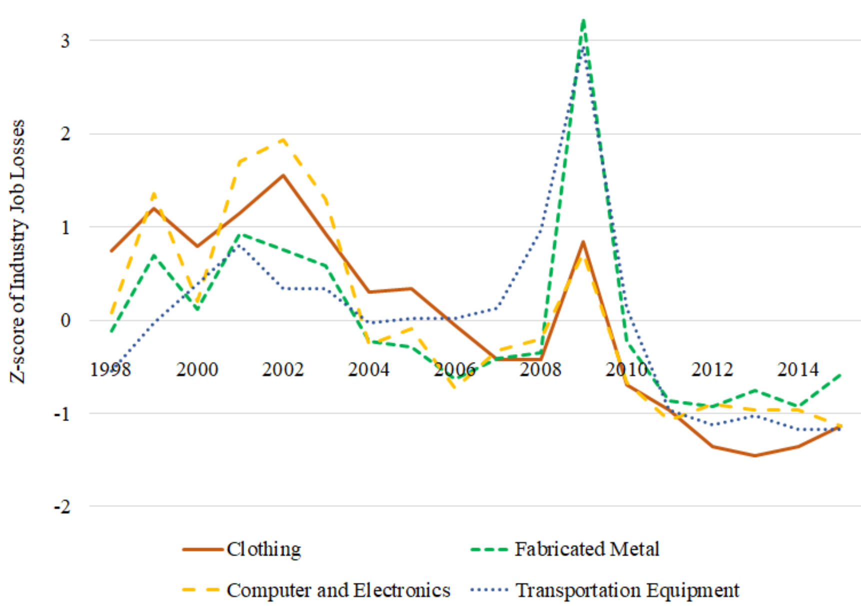
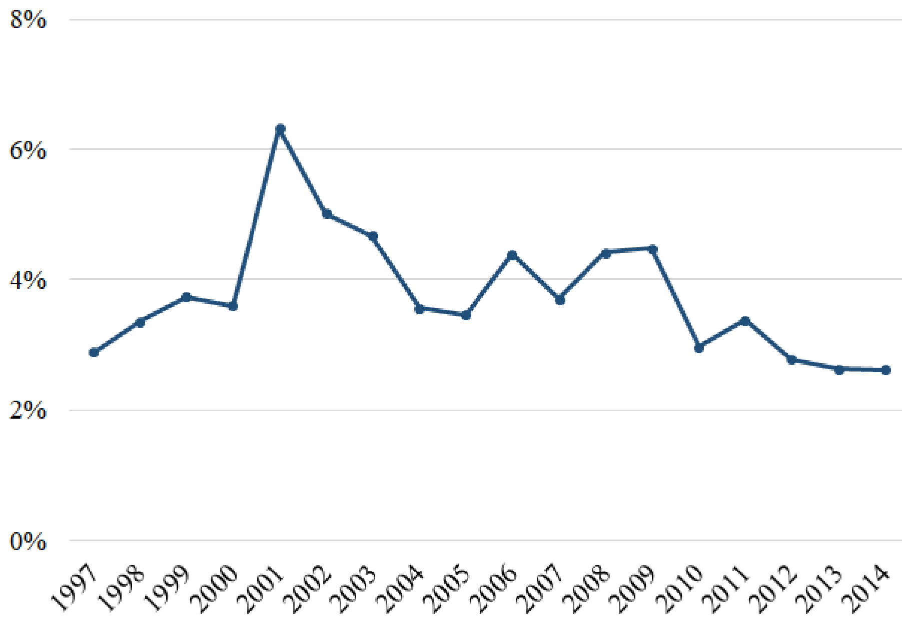



Figure A.9: Z-scores of 3-digit NAICS Industry Job Losses



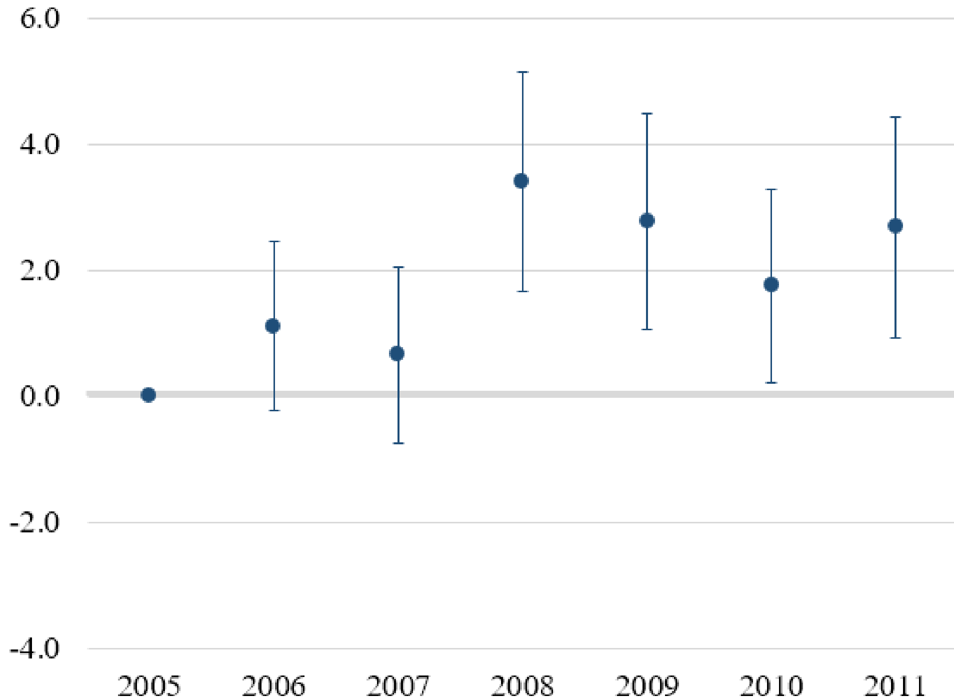

Source: Business Employment Dynamics. Z-scores calculated for the distribution of maximum quarterly job loss rates each year from 1998–2015.

Figure A.10: Annual Establishment Exit Rates (1997–2014)



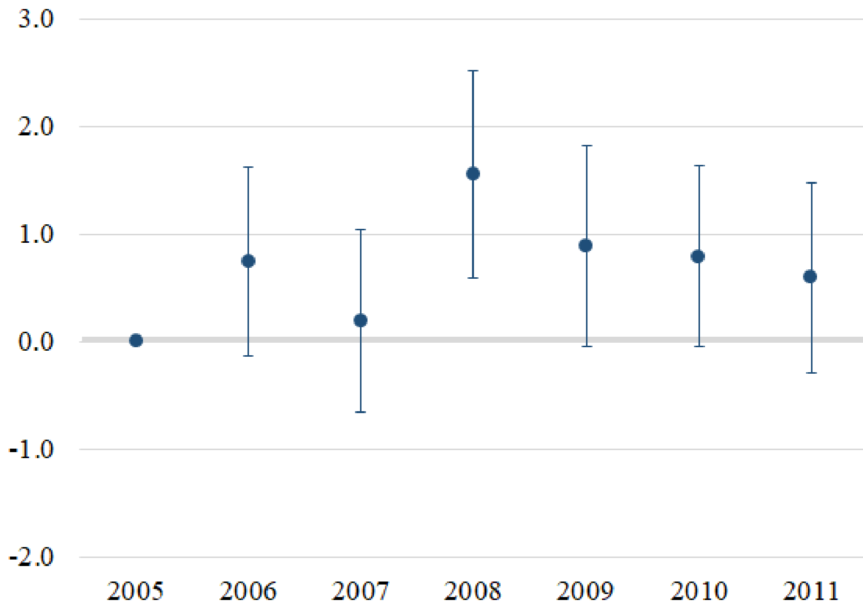

Exit defined as establishment disappearing or reporting zero employment in t+1. The unusually large spike in 2001 is driven by administrative changes in Firm ID due to 2000 Census updating.

Figure A.11: Within-State Comparison: Coefficients on Treatment Plants




Sample consists of approx 26000 plants from 16 Flex states. Treatment defined as plants that have highest maxtax in firm. Yearly coefficients are relative to the baseline difference in 2005. Error bars denote 95% confidence intervals.

Figure A.12: Within-Firm Comparison: Coefficients on Flex States




Sample consists of approx 84000 plants (2800 firms) operating in both Flex and non-Flex states in 2005. Yearly coefficients from regression with state, year, and firm FE's (relative to baseline difference in 2005). Error bars denote 95% confidence intervals.

Table A.1: Breakdown of US Manufacturing by Locations Across States (2002)

| Number of States Firm is Located In | Share of Firms (%) | Share of Employment (%) |
|---|---|---|
| One | 96.7 | 43.3 |
| Two | 1.7 | 6.8 |
| 3–4 | 0.8 | 7.0 |
| 5–9 | 0.5 | 10.9 |
| 10 or More | 0.3 | 32.1 |

Includes all 2002 LBD establishments operating in NAICS 31–33, aggregated by Firm ID.

Table A.2: Placebo Tax Deviation from Firm Mean (1997–2014)

| | (1) Exit | (2) Exit | (3) Exit | (4) Empl Growth |
|---|---|---|---|---|
| Placebo Dev$_{fst}$ ($\$100's$) | 0.00379 | 0.00342 | 0.0125 | 0.0193 |
| | (0.0140) | (0.0140) | (0.0156) | (0.0366) |
| Placebo Dev$_{fst} * \Delta_{jt}$ ($\$100's$) | -0.00338 | -0.00282 | 0.00272 | 0.0234 |
| | (0.0102) | (0.0102) | (0.0131) | (0.0255) |
| Distance$_{fst}$ | | -0.00233 | -0.00540 | -0.00157 |
| | | (0.00377) | (0.00461) | (0.00978) |
| Employment Share$_{fst}$ | -10.03*** | -10.05*** | -9.016*** | 8.706*** |
| | (0.165) | (0.194) | (0.211) | (0.475) |
| $R^2$ | 0.020 | 0.021 | 0.021 | 0.025 |
| Mean of Dep Var | 3.935 | 3.935 | 4.461 | -10.58 |
| SD of Placebo Dev | 4.444 | 4.444 | 3.817 | 4.444 |
| Multi FE | Yes | Yes | Yes | Yes |
| State-by-Year FE | Yes | Yes | Yes | Yes |
| Industry-by-Year FE | Yes | Yes | Yes | Yes |
| Multi-by-Year FE | | Yes | Yes | Yes |
| Age Bins | | Yes | Yes | Yes |
| Weighting | | | Yes | |
| # of Unique Firms | 14500 | 14500 | 14500 | 14500 |
| $N$ | 475000 | 475000 | 475000 | 475000 |

Dependent variables are multiplied by 100. Multi is a categorical variable for # of states firm is located in. Exit=100 if establishment disappears or reports zero employment in t+1. Placebo Dev is calculated replacing each state's maxtax with the maxtax of the alphabetically preceding state. Distance defined as straight line distance from the state with firm's largest employment share, and is equal to zero if no plant has employment share greater than 20%. All columns are unweighted except for Column 3, which weights by 1/(# of plants in the firm). Standard errors clustered at firm level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.3: Controlling for Lagged Employment (1997–2014)

| | (1) Exit | (2) Exit | (3) Exit | (4) Empl Growth |
|---|---|---|---|---|
| $\text{Dev}_{fst}$ ($\$100's$) | 0.0433*** | 0.0444*** | 0.0546*** | -0.112*** |
| | (0.0150) | (0.0150) | (0.0175) | (0.0378) |
| $\text{Dev}_{fst} * \Delta_{jt}$ ($\$100's$) | | 0.0290*** | 0.0346** | -0.0539* |
| | | (0.0112) | (0.0147) | (0.0281) |
| $\text{LogEmp}_{fs,t-2}$ | -0.816*** | -0.815*** | -0.995*** | 1.004*** |
| | (0.0379) | (0.0378) | (0.0448) | (0.0963) |
| Employment $\text{Share}_{fst}$ | -7.047*** | -7.047*** | -5.919*** | 7.796*** |
| | (0.204) | (0.204) | (0.222) | (0.501) |
| $R^2$ | 0.025 | 0.025 | 0.026 | 0.027 |
| Mean of Dep Var | 3.804 | 3.804 | 4.341 | -10.76 |
| State-by-Year FE | Yes | Yes | Yes | Yes |
| Industry-by-Year FE | Yes | Yes | Yes | Yes |
| Multi-by-Year FE | Yes | Yes | Yes | Yes |
| Age Bins | Yes | Yes | Yes | Yes |
| Weighting | | | Yes | |
| # of Unique Firms | 13500 | 13500 | 13500 | 13500 |
| $N$ | 460000 | 460000 | 460000 | 460000 |

Dependent variables are multiplied by 100. Multi is a categorical variable for # of states firm is located in. Exit=100 if establishment disappears or reports zero employment in t+1. Distance defined as straight line distance from the state with firm's largest employment share, and is equal to zero if no plant has employment share greater than 20%. All columns are unweighted except for Column 3, which weights by 1/(# of plants in the firm). Standard errors clustered at firm level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.4: Corporate Tax Rate Deviation (1997–2014)

| | (1) Exit | (2) Exit | (3) Exit | (4) Exit |
|---|---|---|---|---|
| $\text{CorpDev}_{fst}$ ($\$100's$) | 0.0356** | 0.0200 | 0.0113 | 0.0386** |
| | (0.0170) | (0.0187) | (0.0190) | (0.0174) |
| $\text{CorpDev}_{fst} * \Delta_{jt}$ ($\$100's$) | -0.00287 | -0.0178 | -0.0198 | -0.00242 |
| | (0.0131) | (0.0144) | (0.0146) | (0.0134) |
| $\text{Dev}_{fst}$ ($\$100's$) | | 0.0435** | 0.0398** | |
| | | (0.0163) | (0.0164) | |
| $\text{Dev}_{fst} * \Delta_{jt}$ ($\$100's$) | | 0.0351*** | 0.0364*** | |
| | | (0.0122) | (0.0123) | |
| Placebo $\text{Dev}_{fst}$ ($\$100's$) | | | | -0.00238 |
| | | | | (0.0143) |
| Placebo $\text{Dev}_{fst} * \Delta_{jt}$ ($\$100's$) | | | | -0.00275 |
| | | | | (0.0104) |
| $\text{LogEmp}_{fs,t-2}$ | | | -0.816*** | |
| | | | (0.0379) | |
| Employment $\text{Share}_{fst}$ | -10.09*** | -10.08*** | -7.051*** | -10.08*** |
| | (0.163) | (0.194) | (0.204) | (0.194) |
| $R^2$ | 0.020 | 0.021 | 0.025 | 0.021 |
| Mean of Dep Var | 3.937 | 3.935 | 3.804 | 3.935 |
| Multi FE | Yes | Yes | Yes | Yes |
| State-by-Year FE | Yes | Yes | Yes | Yes |
| Industry-by-Year FE | Yes | Yes | Yes | Yes |
| Multi-by-Year FE | | | Yes | Yes |
| Age Bins | | | Yes | Yes |
| # of Unique Firms | 15500 | 14500 | 13500 | 14500 |
| $N$ | 482000 | 475000 | 460000 | 475000 |

Dependent variables are multiplied by 100. Multi is a categorical variable for # of states firm is located in. Exit=100 if establishment disappears or reports zero employment in t+1. Column 1 estimates were disclosed using a previous analysis sample. Corporate tax data from Suárez Serrato and Zidar (2016). Standard errors clustered at firm level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.5: Restricting to Firms Operating in Only One NAICS Industry (1997–2014)

| | (1) Exit | (2) Exit | (3) Exit | (4) Exit |
|---|---|---|---|---|
| $\text{Dev}_{fst}$ ($100'$s$) | 0.0534** | 0.0544** | | |
| | (0.0229) | (0.0230) | | |
| $\text{Dev}_{fst} * \Delta_{jt}$ ($100'$s$) | | 0.0268 | | |
| | | (0.0181) | | |
| $\text{Dev2}_{fst}$ ($100'$s$) | | | 0.0275* | 0.0280* |
| | | | (0.0149) | (0.0150) |
| $\text{Dev2}_{fst} * \Delta_{ft}$ ($100'$s$) | | | | 0.0132 |
| | | | | (0.0111) |
| $\text{Log(Emp)}_{fs,t-2}$ | -0.538*** | -0.538*** | -0.538*** | -0.538*** |
| | (0.0591) | (0.0591) | (0.0591) | (0.0591) |
| Employment $\text{Share}_{fst}$ | -7.886*** | -7.885*** | -7.891*** | -7.889*** |
| | (0.277) | (0.277) | (0.277) | (0.277) |
| $R^2$ | 0.033 | 0.033 | 0.033 | 0.033 |
| Mean of Exit | 4.099 | 4.099 | 4.099 | 4.099 |
| State-by-Year FE | Yes | Yes | Yes | Yes |
| Industry-by-Year FE | Yes | Yes | Yes | Yes |
| Multi-by-Year FE | Yes | Yes | Yes | Yes |
| Age Bins | Yes | Yes | Yes | Yes |
| # of Unique Firms | 7000 | 7000 | 7000 | 7000 |
| $N$ | 200000 | 200000 | 200000 | 200000 |

Exit=100 if establishment disappears or reports zero employment in t+1. Multi is a categorical variable for # of states firm is located in. Sample restricted to firm-years with more than one plant and operating in single 6-digit NAICS industry. Standard errors clustered at firm level in parentheses. $^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

Table A.6: Firms with No New Entry Since 1992 (1997–2014)

| | (1) Exit | (2) Exit | (3) Exit | (4) Empl Growth |
|---|---|---|---|---|
| $\text{Dev}_{fst}$ ($\$100's$) | 0.0555** | 0.0561** | 0.0632** | -0.109* |
| | (0.0243) | (0.0242) | (0.0264) | (0.0592) |
| $\text{Dev}_{fst} * \Delta_{jt}$ | 0.0532*** | 0.0540*** | 0.0317 | -0.117** |
| | (0.0204) | (0.0204) | (0.0235) | (0.0494) |
| $\text{Distance}_{fst}$ | | -0.00300 | -0.00589 | 0.00531 |
| | | (0.00647) | (0.00744) | (0.0159) |
| $\text{Employment Share}_{fst}$ | -9.699*** | -9.730*** | -9.139*** | 12.53*** |
| | (0.256) | (0.310) | (0.331) | (0.725) |
| $R^2$ | 0.027 | 0.028 | 0.029 | 0.035 |
| Mean of Dep Var | 4.282 | 4.282 | 4.579 | -11.42 |
| Multi FE | Yes | Yes | Yes | Yes |
| State-by-Year FE | Yes | Yes | Yes | Yes |
| Industry-by-Year FE | Yes | Yes | Yes | Yes |
| Multi-by-Year FE | | Yes | Yes | Yes |
| Age Bins | | Yes | Yes | Yes |
| Weighting | | | Yes | |
| # of Unique Firms | 9500 | 9500 | 9500 | 9500 |
| $N$ | 177000 | 177000 | 177000 | 177000 |

Dependent variables are multiplied by 100. Multi is a categorical variable for # of states firm is located in. Exit=100 if establishment disappears or reports zero employment in t+1. Distance defined as straight line distance from the state with firm's largest employment share, and is equal to zero if no plant has employment share greater than 20%. All columns are unweighted except for Column 3, which weights by 1/(# of plants in the firm). Standard errors clustered at firm level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.7: Separate Sub-Periods: (1997–2005) and (2006-2014)

| | 1997–2005 | | | | 2006–2014 | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) Exit | (2) Exit | (3) Exit | (4) Empl Growth | (5) Exit | (6) Exit | (7) Exit | (8) Empl Growth |
| $\text{Dev}_{fst}$ ($\$100's$) | 0.0477** | 0.0477** | 0.0443* | -0.133** | 0.0531*** | 0.0538*** | 0.0704*** | -0.0131*** |
| | (0.0223) | (0.0223) | (0.0257) | (0.0582) | (0.0193) | (0.0193) | (0.0227) | (0.0490) |
| $\text{Dev}_{fst} * \Delta_{jt}$ | 0.0459*** | 0.0456*** | 0.0226 | -0.119*** | 0.0285* | 0.0307* | 0.0525** | -0.0169 |
| | (0.0166) | (0.0166) | (0.0215) | (0.0409) | (0.0164) | (0.0165) | (0.0215) | (0.0416) |
| $\text{Distance}_{fst}$ | | 0.00750 | 0.00148 | -0.0274* | | -0.0123*** | -0.0127** | 0.0255** |
| | | (0.00553) | (0.00647) | (0.0141) | | (0.00476) | (0.00608) | (0.0125) |
| $\text{Employment Share}_{fst}$ | -10.81*** | -10.60*** | -9.591*** | 9.000*** | -9.205*** | -9.469*** | -8.418*** | 8.441*** |
| | (0.230) | (0.271) | (0.295) | (0.666) | (0.220) | (0.257) | (0.283) | (0.646) |
| $R^2$ | 0.022 | 0.023 | 0.023 | 0.024 | 0.018 | 0.019 | 0.020 | 0.027 |
| Mean of Dep Var | 4.247 | 4.247 | 4.721 | -11.28 | 3.594 | 3.594 | 4.170 | -9.823 |
| SD of Dev | 3.580 | 3.580 | 3.580 | 3.035 | 3.580 | 4.144 | 4.144 | 3.535 |
| 4.144 | | | | | | | | |
| Multi FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| State-by-Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry-by-Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Multi-by-Year FE | | Yes | Yes | Yes | | Yes | Yes | Yes |
| Age Bins | | Yes | Yes | Yes | | Yes | Yes | Yes |
| Weighting | | | Yes | | | | Yes | |
| # of Unique Firms | 12000 | 12000 | 12000 | 12000 | 10500 | 10500 | 10500 | 10500 |
| $N$ | 248000 | 248000 | 248000 | 248000 | 227000 | 227000 | 227000 | 227000 |

Dependent variables are multiplied by 100. Multi is a categorical variable for # of states firm is located in. Exit=100 if establishment disappears or reports zero employment in t+1. Distance defined as straight line distance from the state with firm's largest employment share, and is equal to zero if no plant has employment share greater than 20%. All columns are unweighted except for Column 4, which weights by 1/(# of plants in the firm). Corporate tax data from Suárez Serrato and Zidar (2016). Standard errors clustered at firm level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.8: Hiring Using Matched LEHD Data (2000–2013)

| | (1) Any Hire | (2) Any Hire | (3) Log Hires | (4) Log Hires |
|---|---|---|---|---|
| Dev_2000 | -0.00871 | -0.00741 | -0.0114 | -0.0138** |
| | (0.0733) | (0.0730) | (0.00705) | (0.00692) |
| Dev_2001 | -0.108 | -0.101 | -0.0163** | -0.0151** |
| | (0.0952) | (0.0947) | (0.00731) | (0.00726) |
| Dev_2002 | -0.195** | -0.203** | -0.0128* | -0.0126* |
| | (0.0947) | (0.0953) | (0.00741) | (0.00737) |
| Dev_2003 | -0.114 | -0.113 | -0.0133* | -0.0127* |
| | (0.0962) | (0.0969) | (0.00694) | (0.00694) |
| Dev_2004 | -0.0436 | -0.0630 | -0.0138** | -0.0147** |
| | (0.0873) | (0.0881) | (0.00653) | (0.00647) |
| Dev_2005 | -0.0305 | -0.0354 | -0.00321 | -0.00266 |
| | (0.0806) | (0.0804) | (0.00658) | (0.00650) |
| Dev_2006 | -0.126* | -0.128* | -0.0151** | -0.0147** |
| | (0.0735) | (0.0738) | (0.00664) | (0.00658) |
| Dev_2007 | -0.0161 | -0.0163 | -0.0127* | -0.0110* |
| | (0.0758) | (0.0761) | (0.00650) | (0.00647) |
| Dev_2008 | -0.0663 | -0.0457 | -0.00394 | -0.000412 |
| | (0.0880) | (0.0889) | (0.00668) | (0.00666) |
| Dev_2009 | 0.109 | 0.136 | -0.000570 | 0.00427 |
| | (0.145) | (0.145) | (0.00686) | (0.00670) |
| Dev_2010 | -0.0285 | -0.0370 | -0.00752 | -0.00621 |
| | (0.106) | (0.107) | (0.00683) | (0.00687) |
| Dev_2011 | -0.233** | -0.228** | -0.0174** | -0.0194*** |
| | (0.100) | (0.102) | (0.00696) | (0.00694) |
| Dev_2012 | 0.0271 | 0.0118 | -0.00233 | -0.00504 |
| | (0.103) | (0.103) | (0.00678) | (0.00678) |
| Dev_2013 | 0.195* | 0.189* | -0.00660 | -0.00722 |
| | (0.105) | (0.107) | (0.00691) | (0.00694) |
| Employment Share$_{fst}$ | 14.13*** | 14.15*** | 2.827*** | 2.842*** |
| | (0.516) | (0.516) | (0.0484) | (0.0480) |
| $R^2$ | 0.039 | 0.044 | 0.235 | 0.251 |
| Mean of Dep Var | 96.16 | 96.16 | 3.185 | 3.185 |
| Multi FE | Yes | Yes | Yes | Yes |
| State-by-Year FE | Yes | Yes | Yes | Yes |
| Additional Controls | | Yes | | Yes |
| $N$ | 115000 | 115000 | 115000 | 115000 |

Any Hire is indicator equal to 100 if establishment has any new hire in year t. Log Hires=Ln(1+Hires), where Hires is the total number of new hires in year t. Multi is a categorical variable for # of states firm is located in. Standard errors clustered at firm level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$