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ISSN: 2365-9793

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ABSTRACT

Unemployment-Insurance Taxes and Labor Demand: Quasi-Experimental Evidence from Administrative Data¹

To finance unemployment insurance, states raise payroll tax rates on employers who engage in layoffs. Tax rates are, therefore, highest for firms after downturns, potentially hampering labor-market recovery. Using full-population, administrative records from Florida, I estimate the effect of these tax increases on firm behavior leveraging a regression kink design in the tax schedule. Tax hikes reduce hiring and employment substantially, with no effect on layoffs or wages. The results imply unanticipated costs of the financing regime which reduce the optimal benefit by a quarter and account for twelve percent of the unemployment in the wake of the Great Recession.

JEL Classification: D22, H22, H25, H71, J23, J32, J38, J65

Keywords: unemployment insurance, payroll taxes, recession

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¹ I am grateful to the editor, Matthew Notowidigdo, and three referees who improved the paper. Deep thanks are owed to Mark Duggan, Alex Mas, Laura Giuliano, and Alex Rees-Jones, and I am indebted to many for fruitful discussions including Patricia Anderson, Barbara Biasi, Leah Boustan, David Card, Eric Chyn, Raj Chetty, Julie Berry Cullen, Gordon Dahl, Pascaline Dupas, Amy Finkelstein, Brigham Frandsen, Alexander Gelber, Todd Gormley, Ann Harrison, Caroline Hoxby, Robert Jensen, Carla Johnston, Judd Kessler, Camille Landais, Corinne Low, Maxim Massenkoff, Bruce Meyer, Olivia S. Mitchell, James Poterba, Brendan Price, Kent Smetters, Jenna Stearns, Arthur van Benthem, Christopher Walters, Stephen Woodbury and seminar participants at the National Bureau of Economic Research Summer Institute, Notre Dame, and UC Davis. Data were provided by the Florida Department of Economic Opportunity. Financial support from the U.S. Department of Labor's Employment and Training Administration and the National Bureau of Economic Research is gratefully acknowledged. Views expressed are those of the author and should not be attributed to The University of California. © Johnston, 2019.

1. INTRODUCTION

Employers pay a dynamic payroll tax to finance unemployment insurance (UI) benefits, an instance of experience rating. Under this regime, each firm has its own tax rate that rises in response to layoffs and falls when the firm avoids them, which internalizes the fiscal externality of layoffs to firms (Blanchard and Tirole 2008). Because tax rates are linked to layoffs, however, firms face higher payroll taxes as they emerge from downturns, and troubled firms bear the largest tax increases. A potential unintended consequence of this regime is that it may discourage hiring in times when unemployment is already high, and firms are under strain.² The literature has focused on the role UI benefits play in prolonging joblessness through reduced labor supply (Farber, Rothstein, and Valletta 2015; Hagedorn et al. 2016; Johnston and Mas 2018), generally ignoring how UI taxes may affect employment by depressing labor demand (Anderson and Meyer 1997a). The objective of this paper is to fill that gap and measure the impact of UI tax increases on the demand side. I call this influence the “overhang effect,” since UI tax hikes are an overhang from layoffs.

Measuring this effect empirically is challenging. First, large micro data combining UI tax rates and firm behavior are not publicly available. Second, tax rates are endogenous by design, making it difficult to separate the causal effect of taxes from unobserved, confounding factors.³ In this paper, I employ new, full-population micro data on all workers and firms in Florida, linking firm behavior to tax records, and I exploit quasi-experimental variation to disentangle the effect of tax rates from underlying stress. Specifically, I use a regression kink design (RKD), which leverages the kink in the tax schedule as a function of a firm’s benefit ratio,⁴ providing variation in the tax rate that is

² To protect already-distressed firms from crushing tax rates, each state sets a limit on how high it allows a firm’s taxes to rise, limits that range by almost an order of magnitude across the country. The maximum per-employee tax varies from \$440 in Arizona, California, and Florida to \$3,100 (seven times larger) in North Dakota, Minnesota, and Virginia. These large differences reflect disagreement among policymakers regarding the impact of mechanical tax hikes on distressed firms

³ Even in panel data, simultaneity is a crucial concern. Higher taxes are likely to reduce firm employment, but increases in firm-specific unemployment translate to higher taxes as well. Consequently, OLS estimates of the effect of taxes likely misrepresent the true magnitude, the bias of which depends largely on the sign of serial correlation in employment changes.

⁴ The benefit ratio is the cost of UI benefits charged to the firm over the past three years divided by the taxable wage base over that same period.

independent of other factors (Card et al. 2015). Firms near the kink point have recently had layoffs, so the local average treatment effect (LATE) generated by this variation precisely captures the influence described as the “overhang effect.”

The results reveal that UI tax increases reduce hiring and employment, with no discernible effect on layoffs, worker earnings, or exit. A 1-percentage-point increase in a firm’s UI tax rate reduces firm hiring by 2.8 percent and employment by 1.5 percent. Assuming no spillovers and the standard caveats regarding external validity, these estimates suggest that the overhang effect during the recent recovery accounted for 12 percent of unemployment in 2010 and 2011 and that changes in experience rating and UI costs explain about a quarter of the joblessness of the recent recovery.⁵ There is no evidence firms manipulate their position on the tax schedule and, in practice, fine manipulation is extremely difficult since firms cannot control the costs of former employees with any precision. Importantly, the results are unaffected when using a within-firm RKD, implying unobserved firm heterogeneity does not drive the results. The validity of the research design is further supported by the smooth evolution of predetermined covariates, uniform pre-trends across the kink, a variety of specification checks, non-parametric evaluations, and permutation exercises.

The firm response is substantial, the equivalent of a labor demand elasticity of approximately 4.⁶ While the response is large, analysts find responses with the same elasticity when studying a program that mirrors UI taxation in which labor costs were temporarily affected by hiring credits during the Great Recession (Cahuc, Carcillo, and Le Barbanchon 2018).⁷ Similar elasticities are also registered in the only other paper seeking to estimate the relationship between UI tax rates and labor demand

⁵ If hiring at one firm crowds out hiring at another, the implied unemployment effect found by scaling the estimates linearly may be overstated. If hiring at one firm promotes hiring elsewhere (employment raises incomes that increase labor demand at firms serving the newly employed), however, the implied unemployment effect may be understated.

⁶ Translating the effect size into an elasticity merely helps the reader evaluate the effect size relative to traditional labor demand responses and does not reflect an attempt to estimate a true elasticity generalizable to non-UI settings.

⁷ The authors study the influence of a hiring-credits program in France, *zéro charges*. The policy was implemented unexpectedly during the recession and reduced payroll taxes on new hires. Parallel to UI taxes, the policy temporarily altered labor costs at a time when firms were under strain. The main difference is that the tax credit provided by *zéro charges* applies to new hires only, whereas increases in UI tax rates affect the cost of all employees.

(Anderson and Meyer 1997a). My paper extends this work using design-based methods to measure the influence of UI taxes on firm behavior while exploring potential mechanisms behind the large effects, including that (i) the regime functions as a head tax and (ii) targeted firms appear to be cash-constrained.

Because cash-constrained firms have little alternative but to reduce labor costs, they can exhibit substantial labor-demand reductions in response to cost increases. This prediction is borne out in data where labor demand is two to four times more responsive when a firm is cash constrained. Firms that recently have had layoffs, moreover, behave as though they are cash constrained in other ways: they have higher exit rates, less hiring, more layoffs, and they are not deterred from additional layoffs by tax penalties, a hallmark of cash-constraints. The large firm response is partially explained by the head-tax feature of UI taxation. That is, UI imposes a tax on *employment* itself, rather than payroll (Acemoglu and Shimer 1999; Chetty 2006). In theory, the labor demand response is substantially larger when introducing a head tax than an equivalent payroll tax, and the effect should be larger among low-wage firms because the tax does not scale with earnings. Accordingly, low-wage firms are several times more responsive to the UI tax kink than their high-paying peers.

Though a large and active literature surrounds UI benefits,⁸ little has been done to understand the impacts of the unique tax structure that finances them. Most UI tax research has focused on the consequences of experience rating for temporary layoffs, a relatively small part of the modern labor market (Feldstein 1976; Topel 1983; Wolcowitz 1984; Card and Levine 1995). An exception to this is the work of Anderson and Meyer (1997a, 2000), who demonstrate that the influence of UI taxation is far broader. The authors relate endogenous tax rates to employment, using a sample covering firms in

⁸ See, for instance, Meyer (1989), Landais, Michaillat, and Saez (2010), Schmieder and von Wachter (2012), Kroft et al. (2012), Kroft, Lange, and Notowidigdo (2013), Hagerdorn et al. (2015), Farber, Rothstein, and Valletta (2015), Card et al. (2015), and Johnston and Mas (2019).

the early 1980s.⁹ The present study extends and complements the literature, making three contributions. First, I exploit newly available administrative UI records capturing the universe of firms, workers, and claims in recent data from a large state. Second, this paper is the first to break the simultaneity of tax rates and firm distress by exploiting a clean natural experiment in the form of a regression kink design. Third, the paper proposes and tests reasons for the large labor demand response found here and in prior work.

The results contribute to a few active discussions. First, UI taxes track the business cycle, which may diminish the macroeconomic stabilizing influence of UI. Second, the results contribute to the optimal UI literature, which assumes taxes reduce wages while imposing no impact on employment which would constitute an economic loss (Baily 1978; Chetty 2006). The evidence here suggests that taxes reduce employment—not wages—diminishing welfare and reducing the optimal benefit calculation by 26 percent (Gruber 1994). Third, the influence of the tax sheds light on the impact of other mandates that implicitly tax employment rather than payroll. Finally, the results explore an unintended consequence of UI experience rating for countries considering the practice, principally in Europe and South America (Fath and Fuest 2005; Simonetta 2017).

2. BACKGROUND ON UNEMPLOYMENT INSURANCE TAXATION

The U.S. federal government mandates that each state administer a UI program, under which laid-off workers receive weekly benefits. While unemployed, workers receive a weekly payment that replaces approximately half of their earnings for up to six months in normal times. To finance these benefits, firms pay a dynamic payroll tax. That is, a firm's tax rate increases when former employees collect more in benefits, and a firm's tax rate falls when fewer former employees draw benefits, with tax rates updating at the beginning of each year. The assigned tax rate applies to each establishment of

⁹ My study also relates to a literature on payroll-tax incidence (Hamermesh 1979; Kugler and Kugler 2008; Benmarker, Mallander, and Ockert 2009; Saez, Matsaganis, and Tsakloglou 2012; Egebark and Kaunitz 2014; Saez, Schoefer, and Seim 2019). The results here suggest that incidence changes markedly when tax rates fluctuate and are applied to firms in stress.

the firm, much like other business taxes, and there are no notable cutouts: states require UI participation for firms of all sizes, no matter how small, and for all industries.

To estimate the overhang effect, I rely on a kink in Florida's tax formula which assigns each firm a tax rate based on its *benefit ratio*—a statistic that reflects the cost of benefits drawn (B) by a firm's former employees over the past three calendar years divided by the firm's total taxable payroll (W) during the same period:

$$BR_t = \frac{\sum_{j=1}^3 B_{t-j}}{\sum_{j=1}^3 W_{t-j}}, \quad (1)$$

The Florida Department of Economic Opportunity uses each firm's benefit ratio to calculate individualized tax rates, $\tau_{it} = \min(\alpha_t + (1 + \lambda_t) \times BR_{it}, 5.4)$ for firm i in calendar year t .^{10,11} Parameters α and λ are chosen by the state and vary slightly from year to year based on a need to balance revenues with the expense of payments.¹² Tax rates rise with the benefit ratio until the rate reaches the maximum, 5.4 percent, generating a kink in the tax rate as a function of the benefit ratio as seen in figure 1.¹³ In the empirical analysis, I uncover the impact of the tax by measuring corresponding kinks in firm behavior. Relative to kinks in other states, more firms reside around Florida's kink due to the state's low maximum rate (one of the several states that uses the minimum allowable maximum rate under federal law) and large population (the third largest state by population), which, together, provide statistical power at the kink point. New firms, those without three years' experience, are not rated by this regime and instead pay a fixed rate of 2.7 percent until they have three years of employment history.

Firms pay their assigned tax rate only on the taxable wage base of each employee. In Florida and a dozen other states, this means an employer pays its marginal tax rate only on the first \$7,000 it pays

¹⁰ Florida's Department of Economic Opportunity is equivalent to the Department of Labor in other states.

¹¹ Notice that the cost of a given layoff affects a firm's benefit ratio and tax rate for three years; thus, tax rates for a given firm are serially correlated even if layoffs are not.

¹² For interested readers, the specific values of α and λ in Florida each year can be found in online Appendix table 1.

¹³ To provide context, a firm would need to lay off 4.4 percent of its workers in a single year to go from the minimum rate to the maximum rate. This calculation uses the average tax-formula parameter values and the average cost of a UI spell in 2012 (\$5,200).

each worker during the year, after which the firm pays a zero-marginal tax rate on all wages paid to that worker until the new year. Thus, for most employees, UI taxes function as a *head tax*—a tax on the quantity of workers a firm employs rather than a tax on total wages paid. This will explain part of the magnitude of the estimated effects.

Whereas marginal rates automatically fall during recessions under a progressive income tax, UI rates rise in response to downturns.¹⁴ Figure 2 demonstrates how unemployment and UI tax payments vary over time. The tax bill rises quickly while unemployment is high and tends to peak before employment fully recovers, with the tax closely following the pattern of the unemployment rate, lagged by eight quarters. After the 2001 recession, the average per-worker tax bill increased by 40 percent. After the 2008 recession, the per-worker tax bill increased by 70 percent.¹⁵ Figure 2 obscures enormous heterogeneity in which distressed firms confront much larger increases than stable firms who see essentially no change in their rate over the business cycle. In states with the highest experience rating, the most distressed firms face taxes up to seven times the peak shown in figure 2.

3. ADMINISTRATIVE DATA

To understand the employment costs of UI taxes, one needs longitudinal data on workers and firms that are linked to the tax rates firms face. I obtained new data, which have not been used previously. The data are full-population, administrative records for the universe of workers and firms in Florida running from 2003 to 2012, with each worker or firm identified by a unique ID.¹⁶ These data include three main files: a wage file covering 17,722,328 workers, a firm file covering 890,734 unique

¹⁴ A progressive income tax, by contrast, automatically reduces average marginal tax rates during recessions and increases rates during periods of growth and high income. Whereas progressive taxes attenuate the magnitude and persistence of shocks (Blundell, Graber, and Mogstad 2015), the UI tax may magnify them.

¹⁵ Marriner S. Eccles, the chairman of the Federal Reserve Board under Franklin D. Roosevelt and a forerunner to John Maynard Keynes, advocated for the inverse of this policy in which the federal government would *raise* payroll tax rates in good times and reduce them during recessions as countercyclic policy (Israelsen 1994).

¹⁶ Nationally, an employer is automatically enrolled in the UI program if it has a payroll of \$1,500 or more in a calendar year *or* has at least 1 employee working at least a portion of any day during any 20 weeks of a calendar. The coverage includes businesses, nonprofit organizations, state or local government employers, and Indian tribal units (Florida 2012). In practice, all lawful employers are included in the data.

firms, and a claims file covering 2,771,418 people who received benefits during the period.¹⁷ The wage file indicates the earnings each worker received from each of his employers in each quarter; the firm file includes each firm's tax rate, benefit ratio, benefit cost, wage base, NAICS industry code, and county; the claims file indicates which employees claimed benefits, the cost of benefits they received, and which employer was charged. Because the administrative earnings records are based on firms' tax filings, and are subject to audit, they avoid predictable measurement issues that arise in survey data (Bound and Krueger 1991).

I use these records to calculate the employment of each firm, as well as the quantity of new hires and layoffs. A firm's employment is the number of employees who received payroll at firm i during calendar year t , averaged over four quarters. The number of new hires is the count of employees at firm i in year t who did not work at the firm in the previous year; the hiring rate divides this number by employment. Separation tracks the number of employees with positive earnings at firm i in year t who do not work at the firm in $t + 1$. Layoffs measure the number of employees working at firm i in year t , who collect unemployment benefits within a year of departing the firm. Temporary layoffs reflect layoffs who return to the firm within a year of separating. Median earnings reflect typical quarterly earnings of workers at a firm. Firm exit is coded in the last year a firm is observed in the data.

In the main analysis, I exclude firms that are too new to be experience rated and those that are at the minimum rate, since they do not face tax variation relating to the kink.¹⁸ Table 1 presents summary statistics. In the cleaned sample, the average firm employs 58.8 workers with significant turnover (column 3). Each year, a representative firm hires 46.8 percent of its employees and separates from 45.9 percent. For reference, public-use LEHD data suggest essentially identical churn rates (see

¹⁷ For comparison, Florida has the population of a medium-large European country, having about double that of Austria, Belgium, Denmark, Greece, Portugal, Sweden, or Switzerland.

¹⁸ In Florida, firms do not receive a firm-specific tax rate for their first three years of operation; firms too new to be experience rated make up 29 percent of firms, but employ only 9 percent of workers. Instead of paying an experience-rated tax, they pay a fixed rate of 2.7 percent, and the state keeps record of the firm's benefit charges and wage base to calculate an individualized tax rate after three years of experience are accumulated. Firms with no charges tend to be smaller, stable firms like insurance offices and family restaurants.

online Appendix figure 1). 4.9 percent of an average firm's employees claim benefits (a proxy for the layoff rate), and 6 percent of those are recalled to their original employer within a year of receiving benefits. More generally, about 7.9 percent of firms exit annually, with smaller, newer firms exiting at a higher rate. The median worker receives yearly earnings of \$21,600. The average firm pays a UI payroll tax rate of 1.9 percent and has a benefit ratio of 0.069.

To compare firms near the kink with other firms, I present the summary statistics for all firms and for firms in relevant subgroups approaching the analytic sample around the kink. Though firms around the kink have a similar profile to other experience-rated firms (compare columns 3 and 4 in table 1), they differ somewhat from the average firm (compare columns 1 and 4). Overall, firms at the kink are older and larger, though they have similar rates of hiring, separation, and layoffs. The reader will notice enormous heterogeneity in firm size and behavior as evidenced by the SDs of each field; to limit the influence of outliers on the results, I winsorize hiring, employment, and earnings at the 0.1 percent tails, like Edmans (2012) and Lachowska, Mas, and Woodbury (2018).¹⁹

Though the data are well tailored to the question, they have important limitations. As with other administrative data, it is not possible to distinguish layoffs from separations if the employee does not claim UI benefits, a clear source of measurement error. Since layoffs are a dependent variable, however, such measurement error will not lead to bias in the estimates unless the measurement error is correlated with the independent variables.²⁰ The data, moreover, cover only legal employment relationships, leaving unobserved any informal employment.

4. THE OVERHANG EFFECT

Experience rating increases tax rates for firms in distress. Whereas progressive tax instruments reduce rates when the market is weak, the UI program increases rates, possibly reducing hiring in times,

¹⁹ That is, if a value is above the 99.9th percentile, its value is set the value of the 99.9th percentile of the distribution.

²⁰ For reference, about half of eligible unemployed workers claim benefits (Anderson and Meyer 1997b).

industries, or locations where unemployment is already common. In part to protect firms under strain, Florida caps tax rates so that they cannot rise above 5.4 percent, generating a kink in firm tax rates as a function of the benefit ratio. Since the maximum tax rate in Florida is low compared to other states, it is well populated and firms there do not appear substantially different from other firms (see table 1). The kink is situated at the 89th percentile of layoff histories (i.e., benefit ratio).²¹ Importantly, the kink identifies the effect of the tax among firms who have recently had layoffs, meaning the local average treatment effect (LATE) recovered by the kink precisely reflects the impact described as the “overhang effect.”

The tax schedule generates a kink in tax rates, allowing the analyst to compare the behavior of similar firms whose tax rates vary independent of underlying firm factors, conditional on a few controls (Card et al. 2015). The panel nature of the data provides a unique opportunity to estimate the impact of tax rates using within-firm comparisons over time. I model a firm’s behavior y (principally in terms of hiring, employment, exit, layoffs, and log average worker earnings) as a continuously differentiable function of the running variable (the firm’s benefit ratio, v_{it} , minus the kink’s location, k_t) to estimate the effect of the tax rate. The tax formula changes slightly from year to year and a small number of firms have rates that do not comply with the formula (fewer than 0.01 percent), so I implement a fuzzy RKD, instrumenting rates with the prevailing kink in the tax formula:

$$R_{it} = \alpha_t + \delta_i + \sum_{p=1}^{\bar{p}} \{ \gamma_p (v_{it} - k_t) + \pi_p (v_{it} - k_t) \cdot D_{it} \} + u_{it}, \quad (2)$$

$$y_{it} = \mu_t + \eta_i + \beta R_{it} + \sum_{p=1}^{\bar{p}} \{ \omega_p (v_{it} - k_t) \} + \varepsilon_{it}, \text{ all where } |v_{it} - k_t| \leq h \quad (3)$$

Here, R_{it} is the (endogenous) UI tax rate of firm i in year t ; v_{it} is the running variable (the benefit ratio), and k_t is the value of the running variable at the kink point in year t ; $D_{it} = \mathbb{1}(v_{it} > k_t)$ indicates a firm being above the kink threshold in a given year; ω_p accounts for the relationship

²¹ About 41 percent of observations have a benefit ratio of 0, having had no benefit charges in the past three years.

between the outcome and the running variable; and h is the bandwidth. Yearly fixed effects nonparametrically model secular time trends. The linear coefficient on $(v_{it} - k_t) \cdot D_{it}$ captures the average slope change in tax rates at the kink point, which provides the identifying variation for β , the effect of a one-point tax increase. The preferred specification relies on a local-linear approach, but the design yields similar results using a quadratic specification. The first stage is quite strong (see figure 3 and online App. table 2); the instrument has a t -statistic of 1,416 and the model explains more than 98 percent of the variation in tax rates around the kink, suggesting significant power.²² To preserve hiring and layoff observations of zero, the specification estimates the effect in levels rather than logs. Aiding interpretation, I divide the estimated level effects in hiring, layoffs, and employment by the average employment around the kink ($P = \hat{\beta}/E[S \mid \text{abs}(v - k) < 0.02]$), so the estimates reflect the impact of the tax on hiring, layoffs, and employment changes as percentages of employment; by the same logic, I log-transform earnings to present coefficients interpretable as percent changes. Throughout the analysis, standard errors are clustered at the firm level to account for correlated outcomes within a firm over time.

To assess the influence of unobserved firm differences on the estimates, I leverage the panel structure of the data. The estimates are highly robust to firm fixed effects. This robustness demonstrates that the estimates are not the result of spurious firm differences around the kink.²³ I use Imbens-Kalyanaraman optimal bandwidths and show that the estimates are remarkably robust to a wide variety of bandwidth choices (Card et al. 2015; Imbens and Kalyanaraman 2012; Calonico, Cattaneo, and Titiunik 2014), where the optimal bandwidths are estimated on the full sample of rated firms. The typical IK bandwidth is about 0.02 (in terms of the benefit ratio). The bandwidth effectively restricts

²² The model explains less than 100 percent of the tax variation because the schedule changes slightly from year to year and there are a small number of firms whose tax rates do not follow the formula (see online App. table 1).

²³ This within-firm estimation strategy imposes an assumption that the firm dummies and RKD controls are additively separable. Within-firm variation identifies the effect of the tax kink. Firms that do not change their placement relative to the kink point aid in estimating the relationship between the outcome and running variable and the year coefficients, in effect assuming that the relationship is similar for different types of firms.

the analysis to firms within a narrow region around the kink point, implicitly comparing the behavior of firms with similar layoff histories that confront different tax rates owing to the tax schedule. Comparisons within this restricted window address concerns that observations at the maximum are radically different from other firms in the analytic sample. All the firms within the usual IK bandwidth of the kink differ by less than 0.05 standard deviations of the benefit-ratio, suggesting that even the highest-rated and lowest-rated firms in the analytic sample are quite similar in their layoff profile.

A. Diagnostics of the Natural Experiment

Unbiased estimation relies on two assumptions. First, the assignment variable must have a smooth effect on the outcome, meaning the benefit ratio must not have a kinked influence on firm behavior. Second, unobserved determinants of the outcome must evolve without kinking at the same point as the tax formula. Put simply, other factors of firm behavior must be smooth at the kink point.

To explore whether other factors evolve smoothly around the kink, I test for kinks in pre-determined covariates around the threshold by constructing covariate indices using all the predetermined covariates in the data, following Card, Chetty, and Weber (2007). To construct an index, I regress each outcome variable (hiring, employment, layoffs, firm exit, and log average worker earnings) on all the pre-determined firm characteristics including entity type (e.g., s-corporation, c-corporation, not-for-profit, trust, local government, etc.), two-digit NAICS industry code, proxies for firm age, county location, and observation year. Figure 4 plots each covariate index over the running variable, which shows covariates evolve smoothly across the kink point. To test for covariate balance more formally, I estimate RKD models using the covariate indices as the outcome variable, the results of which are presented in online Appendix table 4. The estimated kinks in the covariate indices are extremely small and usually wrong-signed, suggesting that any estimated kink in firm behavior is not an artifact of observed covariates around the kink.²⁴ A related concern is that firms differ across the

²⁴ I investigate whether quasi-experimental variation in tax rates predicts tax differences in other years which occurs mechanically to some degree because benefit charges affect a firm's benefit ratio for three years. A kink-induced 1-point higher tax rate in year t is associated with a 0.3-

kink in their pre-trends. I estimate local-linear regression discontinuity models with pre-trends as the outcome variable. Consistently, the pre-trends are identical across the kink point (see online App. table 5).

A key consideration for evaluation of the RKD design is whether firms can precisely manipulate their placement on the tax schedule, since this can generate a break in unobserved factors arising from selection (Lee and Lemieux 2013). Although firms can know the placement of the kink, it is essentially impossible for them to precisely manipulate their placement. First, tax rates depend on the value of benefits drawn by former workers, a variable that firms would find difficult to control: whether laid-off employees claim benefits (only half do (Anderson and Meyer 1997b)), and the duration of their spell are outside of the typical firm's influence. Second, benefit costs increase in discrete weekly increments, making precise manipulation still more challenging. Finally, the schedule changes from year to year with little warning, rendering fine-tuning essentially impossible. More to the point, there is no evidence of strategic manipulation as firm density does not bunch or break around the kink point (see online App. figure 2). Firm density thins as the benefit ratio rises, but there is no increased density on the favorable side of the kink. Following the intuition of McCrary (2008), I find no discontinuity or kink in firm density.

Other policies are not affected by the benefit ratio. I corresponded with Florida's program administrators who indicate that no other policies at the local, state, or federal level are based on the benefit ratio; in fact, such a policy would be impossible since no other agency has access to these statistics. In summary, there is no bunching, covariates and pre-trends evolve smoothly across the kink, the estimated placebo effects from the covariate indices are null, and other government policies do not change at the kink, suggesting that the setting represents a clean quasi-experiment for unbiased estimation of the influence of UI taxes on firm behavior.

point higher tax rate in year $t-1$ and a 0.6-point higher tax rate in year $t+1$. To generate the placebo in fig. 6, I use years further out when constructing placebo figures, specifically 3 years before time t .

B. Results and their Robustness

The central findings are presented in table 2. Each coefficient corresponds to a different regression estimating the effect of a one-point UI tax increase on firm hiring, employment, layoffs, exit, and log average earnings, each in percent terms. Results are presented for different specifications, all of which rely on variation arising from the kink. A one-point tax increase raises a firm's tax fee by \$70 per employee (1 percent times the taxable wage base, \$7,000), introducing a \$3,580 tax increase for the average firm at the kink. This increase corresponds to about 0.3 percent of median yearly wages and a 24 percent increase in average UI tax liability among firms around the kink.

The estimates suggest that a one-point tax increase reduces yearly firm hiring rate by 1.3 percentage points, a 2.8 percent reduction in hiring ($p < 0.001$, $t = 10.9$), and firm size falls by a corresponding 1.5 percent ($p < 0.001$, $t = 3.9$). Importantly, the results are robust to including firm-specific fixed effects, challenging objections that the kink in firm behaviors is an artifact of spurious firm heterogeneity along the benefit ratio. It is reassuring that the hiring and employment estimates closely align. These estimates are on course with a labor demand elasticity of 4, with CIs ruling out elasticity equivalents smaller than 3, similar to the labor-demand elasticity found for temporary hiring credits in Cahuc, Carcillo, and Le Barbanchon (2018).²⁵ Consistent with wage rigidity, tax changes do not affect worker earnings, another parallel with Cahuc, Carcillo, and Le Barbanchon. I find no evidence of cascading: tax increases do not induce layoffs, which would trigger additional tax increases for firms not already at the maximum. Nor do tax increases affect firm exit, a fact that helps confirm that there is not selective attrition arising from the kink. The estimates are robust to varied bandwidths and polynomial specifications. To harness all of the available variation in the tax formula I also provide estimates that allow the kink to differ each year in the first stage in table 3. These results are similar but register somewhat larger effects on hiring and employment.

²⁵ The tax reduces employment by about 1.2 percent and increases the wage bill by approximately 0.3 percent.

To evaluate the sensitivity of estimates to bandwidth, I vary the bandwidth while implementing the preferred specification (that from table 2, column 2: linear controls, optimal bandwidth, firm and year fixed effects), the results of which are shown in figure 5 and online App. figure 3. At bandwidths smaller than optimal, the estimates on hiring tend to be larger, but the estimates are remarkably stable, at around -0.013 , from 60 percent of the optimal bandwidth to 500 percent of the optimal bandwidth.²⁶ These tend to show that the estimates are quite stable and that the main estimates are on the conservative side of the range of estimates. I also implement a score of placebo tests in which I reproduce the main table using outcomes from a previous year in online Appendix table 6. Whereas the main effects are significant and robust, placebo estimates tend to be small, insignificant, or wrong-signed.

I present residualized plots that account for firm and year fixed effects in figures 6 and 7 to visualize the kink in the outcomes that identifies the main effects. The figure shows a distinct kink in hiring. A parallel figure using the firm's hiring from a placebo year shows no kink, suggesting the role of the tax. The benefit ratio proxies for firm distress, as evidenced by the fact that firm exit and layoffs increase as the benefit ratio rises (see online App. figures 4 and 5). Notice that the kink reflects the fact that hiring stops declining (as the benefit ratio increases) at the exact point where taxes stop increasing. If the kink in hiring were spurious, we would expect the opposite relationship, in which higher benefit ratios corresponded to lower hiring, again suggesting the role of the tax. Figure 7 shows the corresponding kink in total employment and no break in firm exit.

To evaluate the likelihood of recovering the main estimates by chance, I estimate placebos at regular intervals along the benefit ratio and compare the empirical distribution of these placebos to the

²⁶ An important question when implementing RKD is whether the analyst is misspecifying a curve with linear approximations (Ganong and Jager 2017). If the recovered behavioral kinks were the product of misspecifying a curve, narrower bandwidths would produce smaller (less negative) estimates and larger bandwidths would generate larger ones (more negative). Instead, the largest estimates exist at small bandwidths, suggesting the results are not the product of misspecification.

main estimate on hiring (see online App. fig. 6).²⁷ This process generates 450 placebo estimates, which cluster near zero, averaging -0.001 . Only one of the placebo estimates is smaller than the main effect, suggesting the probability of randomly estimating an effect of this size is remote.

Supporting the validity of the results is the peculiar timing of the firm response which closely follows the payment schedule. I examine the timing of the tax effect over the year, by estimating models in which the outcome of interest is a firm's hiring behavior in each quarter (online Appendix table 7). Firms pay the lion share of their UI tax bill in Q2 and Q3. Specifically, firms pay their UI tax bills by the last day of the first month *after* the quarter in question. So, firms pay their UI taxes for Q1 (which make up the two-thirds of their yearly bill) in April by the 30th, during Q2, and the largest remainder of the tax during the first month of Q3 (Employer's Quarterly Report Instructions, 2017). Accordingly, the firm response is concentrated in the second and third quarters in about equal share ($p < 0.001$), while the response in quarters one and four are smaller and statistically insignificant. In discussions with firm managers, the fact that firms are not forward looking is not entirely surprising. Their schedule is dictated by pressing daily needs: a neglected shipment, a burning legal matter, a truant employee, an insolvent customer. Most of their time is consumed by urgent, unpredictable issues. Consistent with the cash-constraint framework, paying the tax may induce a binding cash constraint, concentrating the employment effect in those quarters where the firm is required to pay the tax.

To examine the dynamic effects of the tax, I estimate the model using lagged firm hiring, conditioning on concurrent tax rates. The effect of the tax kink in the following years is small and statistically insignificant, suggesting that firm hiring recovers as soon as the tax changes. Moreover, these analyses suggest that the tax does not merely alter the timing of hires, which would present as an

²⁷ I estimate placebos from the minimum benefit ratio to 0.50 at intervals of 0.001. The bandwidth is held constant at the optimal at the kink, and I exclude the estimates from the area around the kink point.

approximately equal-and-opposite increase in hiring after time t . Instead, estimates of lagged effects reveal small, insignificant, same-sign impacts (see online Appendix figure 7).

C. Reasons for Response Size

The hiring and employment response in this study are quite large relative to that implied by typical labor demand elasticities. Two primary factors play a role in driving the substantial response. First, firms at the kink are cash constrained, which generates large labor demand responses as shown in the conceptual framework in the online Appendix (Schoefer 2015).²⁸ Second, UI taxes function as a head tax, which places considerable downward pressure on employment when taxes rise.

To evaluate the extent to which cash constraints magnify the overhang effect, I investigate whether the effect varies by measures of cash flows. First, I estimate the effect separately in “expansionary” years (2003–2007) and “recessionary” years (2008–2012), implementing the preferred model on the two subsamples (linear controls, optimal bandwidth, firm and year fixed effects). Consistent with financial duress exacerbating the overhang effect, taxes reduce hiring significantly more during the recessionary period than in the expansionary one ($p < 0.01$) and with larger reductions in employment during the recession than expansion (see table 4).²⁹ I incorporate a measure of (per worker) cash flow for each industry over the observation period from CompuStat and estimate the model separately for firms in industries that exhibit above- and below-median cash per employee. Again, the effect is significantly larger for firms in industries that are more cash constrained (significant differences with $p < 0.05$ in employment in table 4), a finding consistent with the hypothesis that cash constraints magnify the overhang effect of UI taxes. Industry-average cash is a noisy measure of firm cash constraints. Because of measurement error, the true differences are likely more pronounced than those represented in these tests (Farre-Mensa and Ljungqvist 2015). Finally, I estimate the effect by

²⁸ In short, a cash-constrained firm may be forced to reduce employment to cover its expenses and prevent closure.

²⁹ I estimate the tax effect in each year to demonstrate how the effects evolve over the business cycle (see online App. fig. 8). These coefficients are 58 percent larger in the wake of the great recession than before.

industry group. The hiring and employment effects are concentrated in manufacturing, retail, transportation, and communication. By contrast, the effects are smaller and statistically insignificant in industries that tend to have access to credit, such as finance, insurance, and real estate (see online App. table 8).

To evaluate whether the analytic sample behaves as if cash constrained in other ways, I test whether firms that have recently had layoffs fail to be deterred from additional layoffs by larger tax penalties, a hallmark of cash-constrained firms. In previous research, authors have found that firms reduce their reliance on layoffs in the presence of UI penalties (Topel 1983; Anderson 1993). I exploit the fact that the penalty a firm faces for a 1 percent layoff varies based on a firm's placement on the tax schedule. Firms sufficiently below the maximum face the full penalty, firms near the maximum are partially shielded, and firms just beyond the maximum rate face no penalty at all. Thus, within a narrow region around the onset of the maximum, the penalty for a 1 percent layoff ranges from a no penalty to 1.8-percentage-point tax increase. Though firms facing larger penalties have fewer layoffs in the cross section, this relationship reverses once firm-specific differences are accounted for using firm fixed effects (see online App. table 9). The confidence intervals on the main estimates in online App. table 9 rule out the magnitudes predicted by a typical labor demand model, suggesting that firms with recent layoffs are less responsive to penalties, consistent with the hypothesis firms that have recently had layoffs are cash constrained. The details of this test and analysis are described in depth in online Appendix B.

Another factor that seems to play a role in driving the large firm response is the fact that UI taxes are effectively a head tax—a tax on the number of workers a firm employs (Chetty 2006). Based on a model derived and calibrated in online Appendix C, the head tax feature of the UI regime explains about half of the “excess” response recovered in the RKD estimates. To test this empirically, notice that if firms responded to UI fees as head taxes, we would expect that high-wage firms effectively pay a lower rate than firms with low average earnings. I split the sample into firms paying above-median

earnings to workers on average and firms paying below-median and re-estimate the preferred specification for each sample (see online App. table 10). In line with the head-tax explanation, the labor demand response is approximately 4 times larger among low-wage firms for whom the UI tax makes up a larger share of labor costs, differences that are statistically significant at the 0.001 level in most specifications.

5. DISCUSSION

A review of the literature suggests two additional factors associated with larger labor-demand elasticities that apply in the UI context (online App. table 11).

First, labor demand is more elastic when labor costs are heterogeneous (e.g., varying by firm rather than affecting firms uniformly). As an example, wage variation at the city-industry level generate an elasticity of -1 while wage variation at a broader city level generates a more modest elasticity of -0.3 (Beaudry, Green, and Sand 2018). Anderson and Meyer (1997a) explain this dynamic succinctly: in a competitive labor market, a firm with an anomalously high labor cost (e.g., tax rate) cannot fully shift that cost onto its employees in the form of lower wages, so the bulk of adjustment must be on the employment margin. The authors there report own-wage labor demand elasticities of 2.2–2.3, with confidence intervals spanning elasticities as large as 3.2. These estimates are based on industry-level variation, and estimates using firm-level variation are expected to be still larger.³⁰ Thus, part of the large elasticity recovered in the UI setting is likely the result of UI taxes finely varying across firms in the same market.

Second, labor demand is more elastic in settings where wages are difficult to adjust. For instance, wages are difficult to adjust in a short period because nominal wages are rigid. In papers that study

³⁰ Anderson and Meyer buttress this claim in AM (2000) where the authors exploit the introduction of experience rating in Washington state in 1985, focusing on the impact of UI taxes on earnings rather than on employment. Consistent with larger labor demand elasticities for firm-level variation, AM (2000) find smaller earnings responses for firm-level tax variation than industry-level. One interesting question is why AM (2000) find that UI taxes reduce wages, whereas I find precise zero effects. Because AM (2000) contemplates the effect of the introduction of experience rating in Washington state, they measure the influence of tax changes that are largely permanent. That is, construction firms will bear a permanent increase in their tax rate, and insurance firms will enjoy a permanent decrease in their tax rate. Whereas temporary changes can affect employment when wages are rigid, permanent changes primarily burden wages since labor supply is inelastic.

unexpected policy changes (like the tax subsidy in Cahuc, Carcillo, and LeBarbanchon (2018)) the authors argue that employers had little ability to adjust wages in the short period between the policy announcement and implementation. Similarly, studies in settings where wages are set by law (e.g., those bound by the minimum wage) also report larger demand elasticities (Kramarz and Philippon 2001). In UI, a firm's new tax rate is revealed a month or so before it is implemented, leaving little ability for firms to adjust wages. A final reason that labor demand responses may be larger, as suggested by the literature, is that labor demand elasticities have been increasing over time (Lichter, Peichl and Siegloch 2015).

Changes in UI Taxation over Time

Over the past four decades, UI taxes have become much better targeted at offending firms. Prior to the 1980s, states largely shielded distressed firms using low maximum rates which limited a firm's tax exposure when distressed. The 1982 Tax Equity and Fiscal Responsibility Act (TEFRA) required states to raise their maximum tax rates to 5.4 percent or higher by 1985. Figure 8 shows that in the mid-1980s the average maximum rate rose from 4.2 percent to 6.9 percent,³¹ a two-thirds rise that dramatically increased the potential tax hikes distressed firms could face.

Analysts in the 1970s and 1980s estimated that firms paid approximately 50 percent of the benefit costs they originated due to low maximum rates that shielded offending firms (U.S. Department of Labor 1985; Hamermesh 1996). Anderson (1993) reports the average firm paid only 40 percent of the cost of benefit charges in her sample (1978–1984). Since then, TEFRA increased experience rating substantially. Using administrative records, I find that firms in Florida pay a much larger share of benefits charged than firms had in the 1970s. On average, a firm in Florida pays 87 percent of the cost of benefits originated by the firm within two years of a charge. Florida employs the federal minimum

³¹ Hamermesh (1993) estimates that TEFRA boosted experience rating by 15 percentage points, or 30 percent.

for maximum rates and taxable wages, suggesting that Florida's pay-back rate represents a lower bound for other states.

Since rates reflect the cost of benefits paid, more generous benefits or longer unemployment spells also increase the tax hikes that firms face for a given layoff. From 1990 to 2015, weekly benefit payments and the average duration of UI receipt increased, resulting in the average claim costing 65 percent more today than it did in 1990, adjusted for inflation (see figure 9).³² The confluence of increased experience rating and increased costs means that a typical firm pays 187 percent more for an average layoff today than it did in 1980 in real terms.

Generalizability

Because there has been so little previous work, it is unclear how the results presented here correspond to the effects on firms distant from the kink point, as well as firms around the country. An estimator that is feasible for firms not at the kink is a changes-in-changes design, which accounts for firm differences and evolving layoff histories using a within transformation.³³ The estimator is useful to evaluate generalizability because it is feasible in different settings: in each state, the tax is a nonlinear function of the firm's benefit ratio (or similar statistic), allowing the analyst to account for underlying changes in the firm's health by controlling for changes in the benefit ratio, while adjusting for evolving time trends with year-specific fixed effects. I present comparable changes-in-changes (CIC) estimates using administrative data in Florida as well as Missouri.

The estimates reflect a broader array of firms, not just those at the kink, and allow me to assess whether estimates in one state correspond closely to those in another (online Appendix table 12, columns (2) and (3)). The (CIC) estimates in Florida are remarkably similar to the CIC estimates in

³² Additionally, the 1991 Emergency Unemployment Compensation Act raised firms' tax liability during recessions by increasing the duration of extended benefits from 13 to 20 weeks, a payment that was financed by state and federal UI programs in equal measure.

³³ The changes in changes technique implements the following specification:

$$Employment\Delta_{it} = Rate\Delta_{it} + BenefitRatio\Delta_{it} + \alpha_i + \delta_t + \varepsilon_{it}$$

Here, I regress employment changes on rate changes, while controlling for changes in the underlying benefit ratio. Including firm-specific fixed effects accounts for firm-specific trends in employment and time fixed effects nonparametrically account for broader trends in employment.

Missouri. In each state, a one-point increase in the tax rate (adjusting for the taxable wage base so that the rates in each state are comparable) is associated with a 1.2–1.3 percent reduction in firm employment, suggesting that firms in different states have similar responses to tax increases. Moreover, the results from this changes-in-changes design are extremely similar to the main estimates from RKD, suggesting that the RKD in this context provides a representative estimate.³⁴

I provide a comparison of Florida’s demographics to all other states using the 2010 Census in online App. table 13. Florida has a similar education profile, income distribution, and ethnic makeup as other states, suggesting Florida may be a relatively representative state.

Macroeconomic Implications

I calculate what the RKD estimates would suggest about how automatic UI tax hikes in 2010 and 2011 affected employment in the aftermath of the Great Recession, while ignoring the possibility of spillovers.³⁵ A conservative hiring reduction estimate is about 1.25 percent per tax-point increase, in the range of the RKD estimates and in the center of the more conservative CIC estimates.³⁶ Multiplying this number by the average annual tax increase at the time (the equivalent of a 1.4-point tax increase in 2010 and again in 2011) and then by the number of employees in the U.S. at that time (114.5 million), the total reduction in employment would be approximately 1,865,000 or 1.4 percent of employment in both 2010 and 2011. This would account for approximately 12 percent of the unemployment at the time.

If experience rating had stayed constant since the early 1980s, tax increases during the Great Recession would have reduced employment by 1 percent, a third less. The increase in taxes during

³⁴ I evaluate how similar Florida is to the rest of the country in online Appendix Table 13. Florida’s demographic and labor-market characteristics look fairly similar to the rest of the US in many, though not all dimensions. Using the characteristics in the table we investigate Florida’s “representativeness” by summing each state’s rank-distance from the national median for each variable. Using this criterion, Florida is eighth closest state to the national median.

³⁵ The \$300 billion received by the unemployed from state UI programs during the aftermath of the Great Recession automatically triggered \$300 billion in UI tax increases. At peak, UI benefits made up 1% of GDP, triggering a 1%-of-GDP tax increase in the years that followed.

³⁶ The calculation that follows would be somewhat larger and less precise if we were to use the estimate on employment instead. I use the hiring estimate to present the more conservative calculation.

labor market recovery may explain part of the emergence of jobless recoveries since the 1980s. The post-WWII average recovery experienced 7.5 percent employment growth over the 24 months after the recession ended. The recent three recessions (incidentally, the three recessions since TEFRA increased experience rating) have averaged 0.5 percent growth. My estimates suggest that 28 percent of the emergence of jobless recoveries can be explained by increases in experience rating and benefit costs, with about half (52 percent) of the effect accounted for by experience rating and the other half (48 percent) explained by cost increases.

Optimal Unemployment Insurance

The estimates speak to the social costs of financing UI benefits under the current tax regime. The workhorse model of optimal benefits maximizes social welfare by increasing generosity until marginal costs and benefits equate (Baily 1978; Chetty 2006; Schmieder, von Wachter, and Bender 2012). The model assumes that benefits are financed from workers' wages with no effect on employment, a premise that would be approximately accurate if rates were stable. Instead, UI taxes exhibit large fluctuations and reduce employment rather than wages. Whereas wage reductions can provide welfare-enhancing transfers, employment reductions represent deadweight loss, which is unaccounted in optimal UI formulae. This revelation alters the calculus of optimal benefits.³⁷ In online Appendix D, I incorporate the employment cost of UI taxes into the optimal UI formula and show that the demand-side distortion from benefit generosity via tax increases is slightly larger than the behavioral distortion exhibited by claimants in response to benefits; accounting for the distortions arising from UI taxes reduce optimal UI calculations by approximately 26 percent in the optimal benefit generosity formula.

³⁷ Chetty (2006) flags this issue, explaining "the model abstracts from the effects of UI on firm behavior by assuming that the supply of jobs and wage rates are not endogenous to the benefit level."

Policymakers might consider a few adjustments to mitigate the overhang effect while preserving insurance for the unemployed, balancing several tradeoffs. Naively decreasing the maximum rate while increasing the minimum would succeed in reducing the tax incidence on distressed firms but would also encourage layoffs (Topel 1983). Policymakers could, however, mitigate the head-tax aspect of UI taxation by expanding the taxable wage base to reflect insurable yearly earnings (raising the wage base to \$30,000 per employee in Florida), a natural reform. To reduce the concentration of the tax on firms in stress, states could experiment with unemployment insurance savings accounts, in which firms finance UI spells *before* separating, thus avoiding tax incidence when firms are already under strain (Altman and Feldstein 2007).

6. CONCLUSION

States raise tax rates on firms that lay off workers, a practice that serves the dual purpose of financing benefits and discouraging layoffs. Because tax rates are linked to layoffs, firms mechanically face higher payroll taxes when unemployment is high, and troubled firms bear the brunt of tax increases. An active policy debate centers on the role of unemployment insurance benefits in prolonging joblessness because of reduced labor supply (Farber, Rothstein, and Valletta 2015; Hagedorn et al. 2016), generally ignoring the role unemployment insurance taxes play in affecting labor demand.

In this paper, I measure the influence of UI tax increases, which target distressed firms by design. The regression kink analysis reveals that UI taxes have substantial effects on firm labor demand, a finding consistent with prior work in this area, which is unduly sparse (Anderson and Meyer 1997a). The large response appears to be driven by two primary factors. First, firms facing tax increases have recently had layoffs and thus are likely to be in distress, generating large employment responses. Second, UI taxes are effectively a head tax, increasing the labor demand elasticity substantially. Several other factors discussed may also play a role.

Unemployment insurance is traditionally considered an automatic stabilizer because benefits are paid in proportion to the prevalence of unemployment; however, taxes for UI also track the business cycle proportionally, potentially burdening labor market recovery with higher labor costs when unemployment is already high, eroding the stabilizing influence of the program. My results, moreover, assess the optimal UI literature, which assumes UI taxes impose no employment distortion. The findings here suggest a need for models that account for employment costs when assessing the optimal generosity and potential duration of UI.

REFERENCES

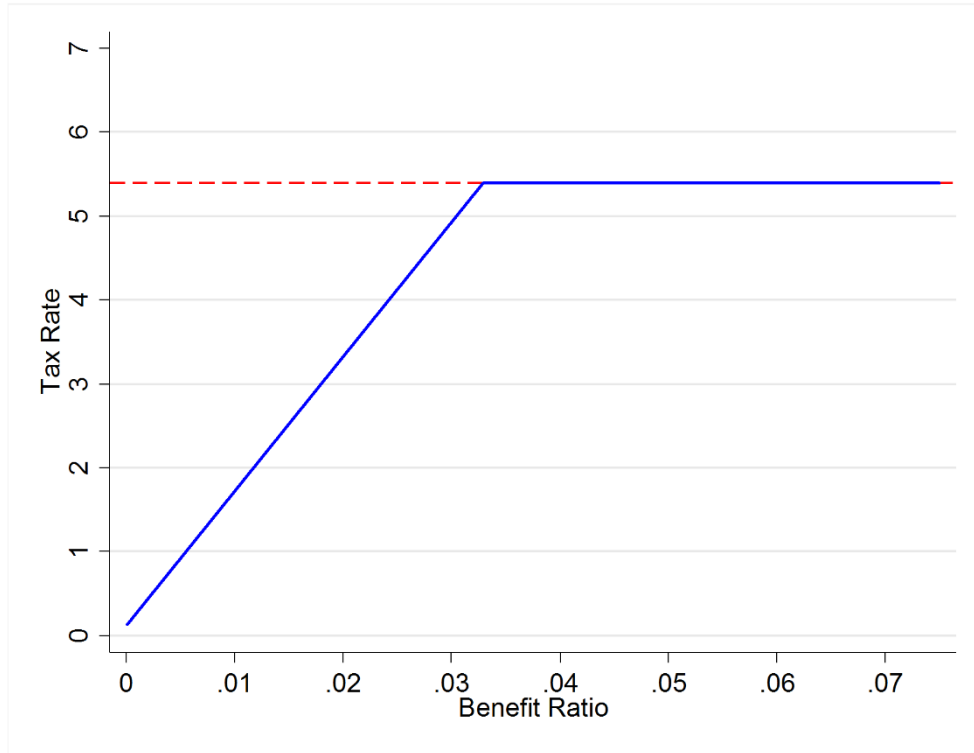
- Acemoglu, Daron, and Robert Shimer. "Efficient Unemployment Insurance." *Journal of Political Economy*, 107.5 (1999): 893–928.
- Feldstein, Martin, and Daniel Altman. "Unemployment insurance savings accounts." *Tax Policy and the Economy* 21 (2007): 35–63.
- Anderson, Patricia M. "Linear Adjustment Costs and Seasonal Labor Demand: Evidence from Retail Trade Firms." *The Quarterly Journal of Economics*, 108.4 (1993): 1015–1042.
- Anderson, Patricia M., and Bruce D. Meyer. "The Effects of Firm Specific Taxes and Government Mandates with an Application to the US Unemployment Insurance Program." *Journal of Public Economics*, 65.2 (1997): 119–145.
- Anderson, Patricia M., and Bruce D. Meyer. "Unemployment Insurance Take-up Rates and the After-Tax Value of Benefits." *The Quarterly Journal of Economics* 112, no. 3 (1997): 913–937.
- Anderson, Patricia M., and Bruce D. Meyer. "The Effects of the Unemployment Insurance Payroll Tax on Wages, Employment, Claims and Denials." *Journal of Public Economics*, 78.1 (2000): 81–106.
- Anderson, Patricia M., and Bruce D. Meyer. "Unemployment Insurance Takeup Rates and The After-Tax Value of Benefits." *The Quarterly Journal of Economics*, 112.3 (1997): 913–937.
- Baicker, Katherine, Claudia Goldin, and Lawrence F. Katz. "A Distinctive System: Origins and Impact of US Unemployment Compensation." *The Defining Moment: The Great Depression and the American Economy in the Twentieth Century*, (Chicago: University of Chicago Press, 1998).
- Baily, Martin Neil. "Some Aspects of Optimal Unemployment Insurance." *Journal of Public Economics*, 10.3 (1978): 379–402.
- Benmarker, Helge, Erik Mellander, and Björn Öckert. "Do Regional Payroll Tax Reductions Boost Employment?" *Labour Economics*, 16.5 (2009): 480–489.
- Bewley, Truman F. *Why Wages Don't Fall during A Recession*. Harvard University Press, 2002.
- Blanchard, Olivier J., and Jean Tirole. "The Joint Design of Unemployment Insurance and Employment Protection: A First Pass." *Journal of the European Economic Association* 6, no. 1 (2008): 45–77.
- Blundell, Richard, Michael Graber, and Magne Mogstad. "Labor Income Dynamics and the Insurance from Taxes, Transfers, and the Family." *Journal of Public Economics*, 127 (2015): 58–73.
- Bound, John, and Alan B. Krueger. "The Extent of Measurement Error in Longitudinal Earnings Data: Do Two Wrongs Make a Right?" *Journal of Labor Economics*, 9.1 (1991): 1–24.
- Brittain, John A. "The Incidence of Social Security Payroll Taxes." *The American Economic Review*, 61.1 (1971): 110–125.
- Cahuc, Pierre, Stéphane Carcillo, and Thomas Le Barbanchon. "The Effectiveness of Hiring Credits." *Review of Economic Studies*, (2018).
- Calonico, Sebastian, Matias D. Cattaneo, and Rocio Titiunik. "Robust Nonparametric Confidence Intervals for Regression-Discontinuity Designs." *Econometrica* 82, no. 6 (2014): 2295–2326.
- Card, David, Andrew C. Johnston, Pauline Leung, Alexandre Mas, and Zhuan Pei. "The Effect of Unemployment Benefits on the Duration of Unemployment Insurance Receipt: New Evidence

- from a Regression Kink Design in Missouri, 2003–2013.” *American Economic Review: Papers and Proceedings*, 105.5 (2015): 126–30.
- Card, David, David S. Lee, Zhuan Pei, and Andrea Weber. “Inference on Causal Effects in a Generalized Regression Kink Design.” *Econometrica*, 83.6 (2015): 2453–2483.
- Card, David, and Phillip B. Levine. “Unemployment Insurance Taxes and the Cyclical and Seasonal Properties of Unemployment.” *Journal of Public Economics*, 53.1 (1994): 1–29.
- Card, David, Raj Chetty, and Andrea Weber. “Cash-on-Hand and Competing Models of Intertemporal Behavior: New Evidence from the Labor Market.” *Quarterly Journal of Economics*, 112.4 (2007): 1511–1560.
- Chetty, Raj. “A General Formula for the Optimal Level of Social Insurance.” *Journal of Public Economics*, 90 (2006): 1879–1901.
- Chetty, Raj. “Moral Hazard versus Liquidity and Optimal Unemployment Insurance.” *Journal of Political Economy*, 116.2 (2008): 173–234.
- Clower, Robert. “A Reconsideration of the Microfoundations of Monetary Theory.” *Economic Inquiry*, 6.1 (1967): 1–8.
- Edmans, Alex. “The Link between Job Satisfaction and Firm Value, with Implications for Corporate Social Responsibility.” *The Academy of Management Perspectives*, 26.4 (2012): 1–19.
- Egebark, Johan and Niklas Kaunitz. “Do Payroll Tax Cuts Raise Youth Employment?” SSRN Working paper No. 1001, 2014.
- “Employer’s Quarterly Report Instructions.” Florida Department of Revenue.
http://floridarevenue.com/forms_library/current/rt6n.pdf (accessed December 14, 2017)
- Farber, Henry S., Jesse Rothstein, and Robert G. Valletta. “The Effect of Extended Unemployment Insurance Benefits: Evidence from the 2012-2013 Phase-out.” *American Economic Review: Papers & Proceedings*, 105.5 (2015): 171–176.
- Farre-Mensa, Joan, and Alexander Ljungqvist. “Do Measures of Financial Constraints Measure Financial Constraints?” *Review of Financial Studies*, 29.2 (2016): 271–308.
- Fath, Julia, and Clemens Fuest. “Experience Rating of Unemployment Insurance in the US: A Model for Europe?” *CESifo DICE Report* 3, no. 2 (2005): 45–50.
- Feldstein, Martin. “Temporary Layoffs in the Theory of Unemployment.” *The Journal of Political Economy*, 84.5 (1976): 937–957.
- Florida Department of Economic Opportunity. 2003-2012. “Administrative Unemployment Insurance Data from Florida.” (accessed September 16, 2013).
- Florida State Government. “What Employers Need to Know about Florida Reemployment Tax (formerly Unemployment Tax).” (<http://dor.myflorida.com/dor/taxes/reemployment.html> retrieved February 1, 2016) (2014).
- Fullerton, Don, and Gilbert E. Metcalf. “Tax Incidence.” *Handbook of Public Economics*, vol. 4, A. J. Auerbach and M. Feldstein, eds. (Amsterdam: Elsevier, 2002), pp. 1787–1872
- Goltz, Jay. “Why the Payroll Tax Break Won’t Create Jobs.” *The New York Times* (https://boss.blogs.nytimes.com/2010/01/27/why-the-payroll-tax-break-wont-create-jobs/?_r=0 retrieved on October 12, 2016) (2010).
- Goos, Maarten, and Jozef Konings. “The Impact of Payroll Tax Reductions on Employment and Wages: A Natural Experiment using Firm Level Data.” (2007).

- Gruber, Jonathan. “The Incidence of Mandated Maternity Benefits.” *The American Economic Review*, 84.3 (1994): 622–641.
- Gruber, Jonathan. “The Incidence of Payroll Taxation: Evidence from Chile.” *Journal of Labor Economics*, 15.3 (1997): 72–101.
- Guo, Audrey. “The Effects of Unemployment Insurance Taxation on Multi-Establishment Firms.” (2019).
- Hagedorn, Marcus, Iourii Manovskii, and Kurt Mitman. “The Impact of Unemployment Benefit Extensions on Employment: The 2014 Employment Miracle?” NBER Working Paper No. 20884, 2015.
- Hagedorn, Marcus, Fatih Karahan, Iourii Manovskii, and Kurt Mitman. “Unemployment Benefits and Unemployment in the Great Recession: The Role of Macro Effects.” NBER Working Paper No. 19499, 2013.
- Hamermesh, Daniel S. “New Estimates of the Incidence of the Payroll Tax.” *Southern Economic Journal*, 45.4 (1979): 1208–1219.
- Hamermesh, Daniel S., *Labor Demand* (Princeton: Princeton University Press, 1996).
- Imbens, Guido W., and Thomas Lemieux. “Regression Discontinuity Designs: A Guide to Practice.” *Journal of Econometrics*, 142.2 (2008): 615–635.
- IPUMS USA. 2010. “United States Census.” <https://usa.ipums.org/usa/> (accessed March 10, 2017).
- Israelsen, L. Dwight. “The Economic Thought of Marriner S. Eccles.” *Economics Research Institute Study Paper* 94, No. 11 (1994): 1–37.
- Johnston, Andrew C., and Alexandre Mas. “Potential Unemployment Insurance Duration and Labor Supply: The Individual and Market-Level Response to a Benefit Cut.” *Journal of Political Economy* 126, no. 6 (2018): 2480-2522.
- Katz, Lawrence F. “Wage Subsidies for the Disadvantaged.” NBER Working Paper No. 05679, 1996.
- Kaur, Supreet. “Nominal Wage Rigidity in Village Labor Markets.” NBER Working Paper No. 20770, 2014.
- Kramarz, Francis, and Thomas Philippon. “The Impact of Differential Payroll Tax Subsidies on Minimum Wage Employment.” *Journal of Public Economics*, 82.1 (2001): 115–146.
- Kroft, Kory, and Matthew J. Notowidigdo. “Should Unemployment Insurance Vary with the Unemployment Rate? Theory and Evidence.” *The Review of Economic Studies* 83.3 (2016): 1092–1124.
- Kugler, Adriana D., and Maurice Kugler. “Labor Market Effects of Payroll Taxes in Developing Countries: Evidence from Colombia.” NBER Working Paper No. 13855, 2008.
- Lachowska, Marta, Alexandre Mas, and Stephen A. Woodbury. “Sources of Displaced Workers’ Long-Term Earnings Losses.” NBER Working Paper No. 24217, 2018.
- Lee, David S., and Thomas Lemieux. “Regression Discontinuity Designs in Economics.” *Journal of Economic Literature*, 48.2 (2010): 281–355.
- Lee, David S. “Randomized Experiments from Non-Random Selection in US House Elections.” *Journal of Econometrics*, 142.2 (2008): 675–697.
- Lester, Richard A. and Charles V. Kidd, *The Case against Experience Rating in Unemployment Compensation* (New York: Industrial Relations Counselors, Inc., 1939).

- Lichter, Andreas, Andreas Peichl, and Sebastian Sieglösch. “The Own-Wage Elasticity of Labor Demand: A Meta-Regression Analysis.” ZEW Discussion Paper No. 14-016, 2015.
- Lucas Jr., Robert E., and Nancy L. Stokey. “Money and Interest in a Cash-in-Advance Economy.” *Econometrica*, 55.3 (1987): 491–513.
- McCrary, Justin. “Manipulation of the Running Variable in the Regression Discontinuity Design: A Density Test.” *Journal of Econometrics*, 142.2 (2008): 698–714.
- Missouri Department of Employment Security. 2003-2012. “Administrative Unemployment Insurance Data from Missouri.” (accessed February 17, 2014).
- Myers, Charles A. “Experience Rating in Wisconsin in 1940.” *The American Economic Review*, 30.4 (1940): 835–837.
- Myers, Charles A. “The Case against Experience Rating in Unemployment Compensation.” *The Journal of Political Economy*, 48.4 (1940): 617.
- Nordhaus, William D. “Forecasting Efficiency: Concepts and Applications.” *The Review of Economics and Statistics* (1987): 667-674.
- Saez, Emmanuel, Benjamin Schoefer, and David Seim. “Payroll Taxes, Firm Behavior, and Rent Sharing: Evidence from a Young Workers’ Tax Cut in Sweden.” *American Economic Review*, (forthcoming).
- Saez, Emmanuel, Manos Matsaganis, and Panos Tsakloglou. “Earnings Determination and Taxes: Evidence from a Cohort-Based Payroll Tax Reform in Greece.” *The Quarterly Journal of Economics*, 127.1 (2012): 493–533.
- Schmieder, Johannes F. and Till Von Wachter. “The Effects of Unemployment Insurance Benefits: New Evidence and Interpretation.” *Annual Review of Economics*, 8 (2016): 547–581.
- Schoefer, Benjamin. “The Financial Channel of Wage Rigidity.” *Working paper series*, Harvard University, 2015.
- Simonetta, Suzanne. “What the EU Can Learn from the American Experience with Unemployment Insurance.” *Intereconomics* 52, no. 3 (2017): 142–148.
- Topel, Robert H. “On Layoffs and Unemployment Insurance.” *The American Economic Review*, 73.4 (1983): 541–559.
- U.S. Census Bureau. 2010. “Longitudinal Employer-Household Dynamics.” <https://lehd.ces.census.gov/data/> (accessed June 10, 2019).
- U.S. Department of Labor. 1986-2017. “Unemployment Insurance Data Summary.” https://oui.doleta.gov/unemploy/data_summary/DataSum.asp (accessed January 15, 2018).
- U.S. Department of Labor. 1978-2017. “Significant Provisions of State Unemployment Insurance Laws.” <https://oui.doleta.gov/unemploy/statelaws.asp> (accessed September 15, 2015).
- U.S. Department of Labor, Office of the Inspector General. “Financing the Unemployment Insurance Program Has Shifted from a System Based on Individual Employer’s Responsibility toward a Socialized System.” Audit Report No. 03-3-203-03-315.
- Wolcowitz, Jeffrey. “Dynamic Effects of the Unemployment Insurance Tax on Temporary Layoffs.” *Journal of Public Economics*, 25.1 (1984): 35–51.

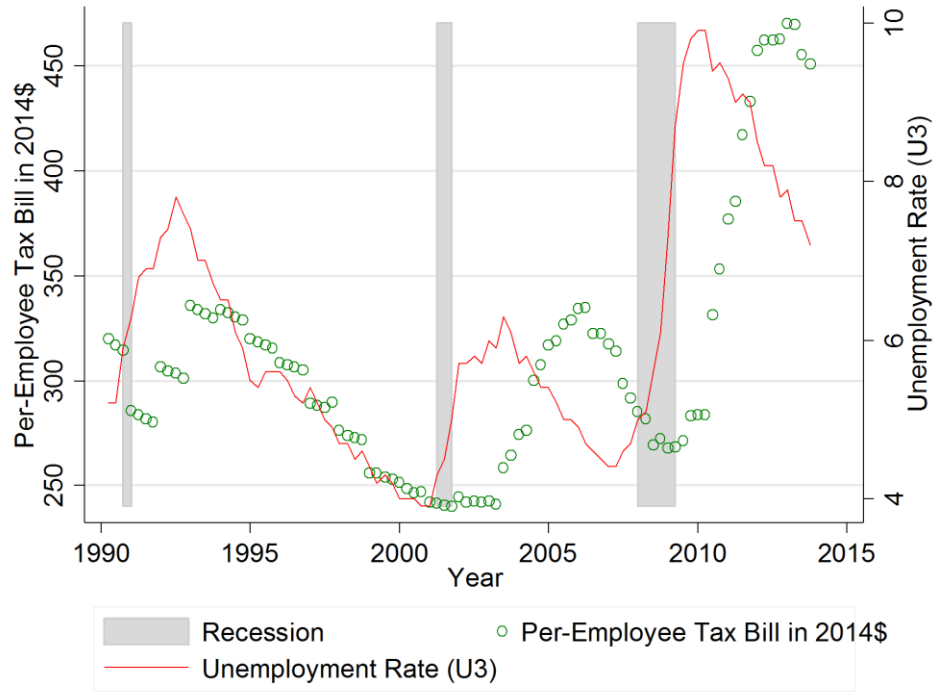
FIGURE 1. THE KINK IN THE TAX FORMULA



TAX SCHEDULE IN FLORIDA TAX FORMULA

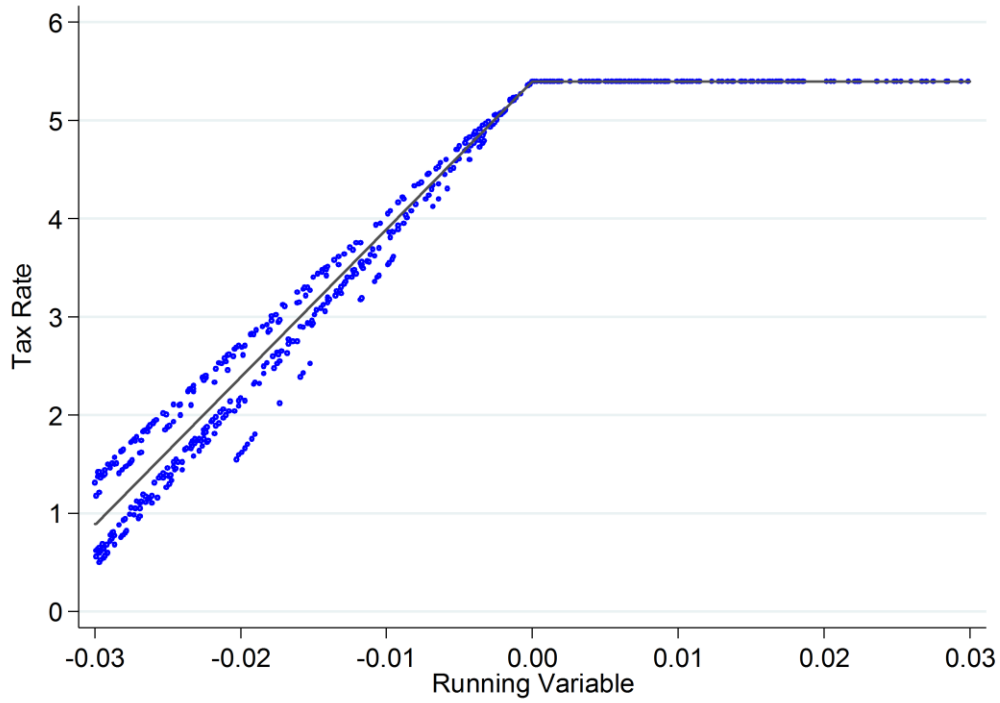
NOTE.—This figure shows the UI tax formula in Florida in 2010 to demonstrate schedule-induced tax variation. The tax is a linear function of the benefit ratio, subject to a maximum. Intuitively, the benefit ratio reflects the per-employee cost of a firm's layoffs (benefits paid to former employees as a percentage of taxable wages over the past three years). The tax rate is capped at 5.4 percent, which generates a kink in the tax as a function of the benefit ratio.

FIGURE 2. UNEMPLOYMENT INSURANCE TAXATION OVER THE BUSINESS CYCLE



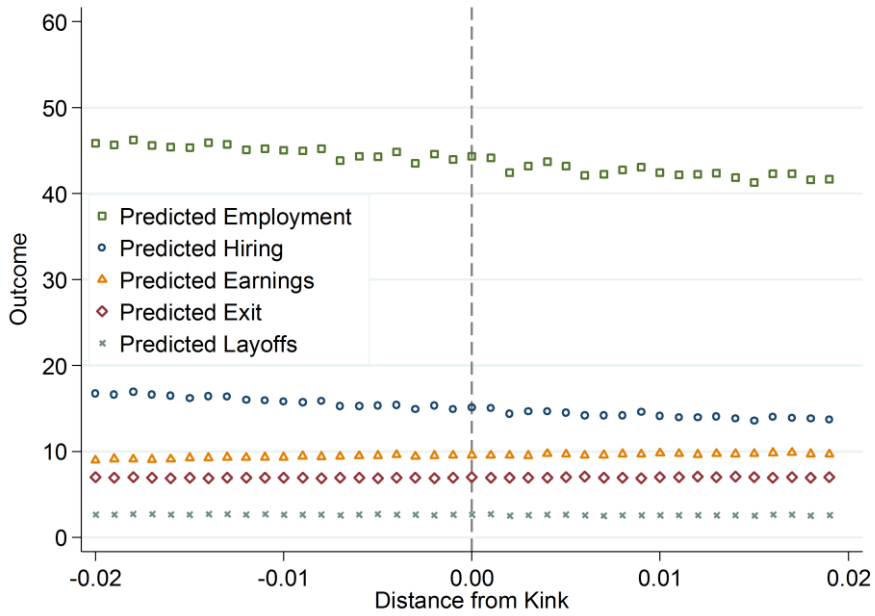
NOTE.— The open dots represent the average per-employee tax paid across states by employers in 2014\$ using the Bureau of Labor Statistics' Unemployment Insurance Data Summary (UIDS). The continuous line represents the average unemployment rate using U3. The shaded periods are NBER-designated recessions.

FIGURE 3. FIRST STAGE IN FLORIDA TAX FORMULA



NOTE.— The figure plots a random sample of firms around the tax kink to demonstrate the first stage. The dispersion in this figure reflects the fact that the tax formula changes slightly from year to year. To see how the parameters of the tax function evolved over time, consult online Appendix table 1. Administrative data are from the Florida Department of Economic Opportunity (DEO).

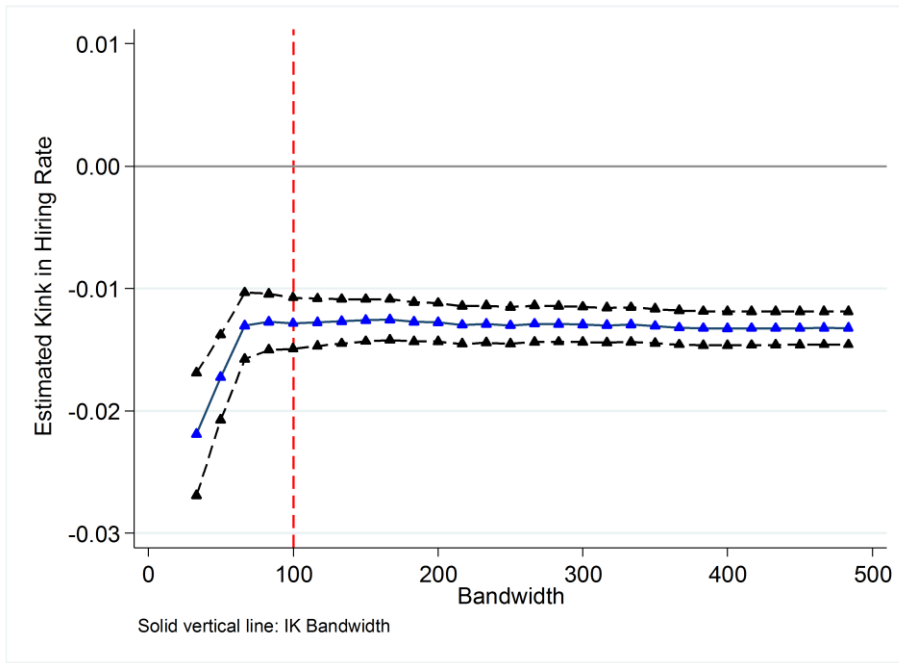
FIGURE 4. SMOOTHNESS OF PREDICTED VALUES AROUND THE KINK



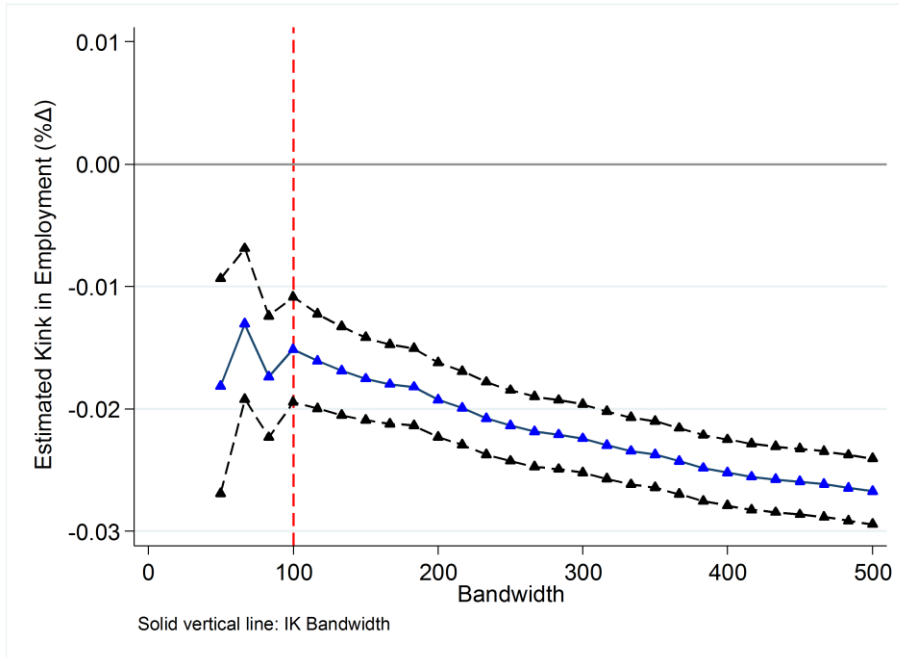
NOTE.— This figure shows the predicted values of major outcome variables in bins around the kink point. In each, the outcome is predicted with NAICS codes, county, entity type (legal structure), a proxy for firm age, and firm age squared. The indices show that, based on predetermined covariates, the predicted distribution of outcomes is smooth across the kink, suggesting that observable factors of the outcome variable do not confound RKD estimation in this setting. Administrative data are from Florida DEO.

FIGURE 5. RKD ESTIMATES WITH VARYING BANDWIDTHS

Panel A: Effect on Hiring



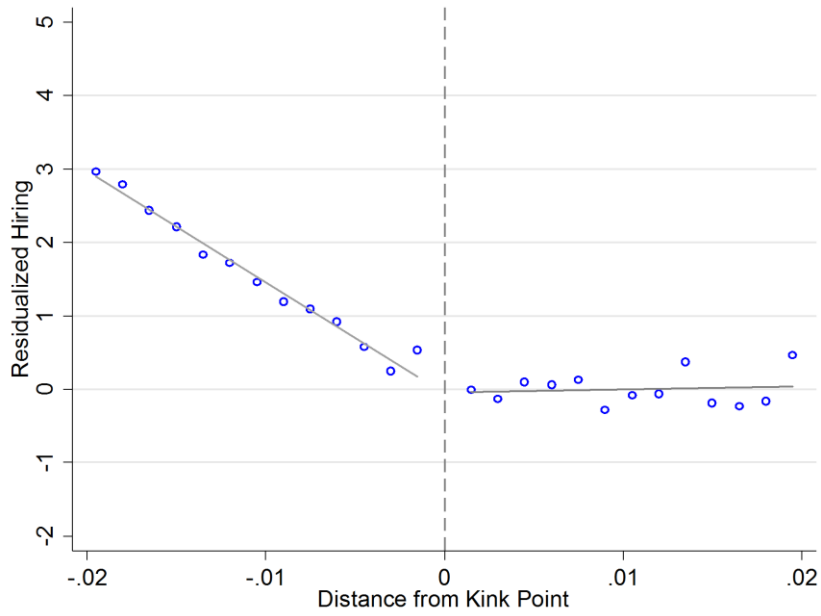
Panel B: Effect on Employment



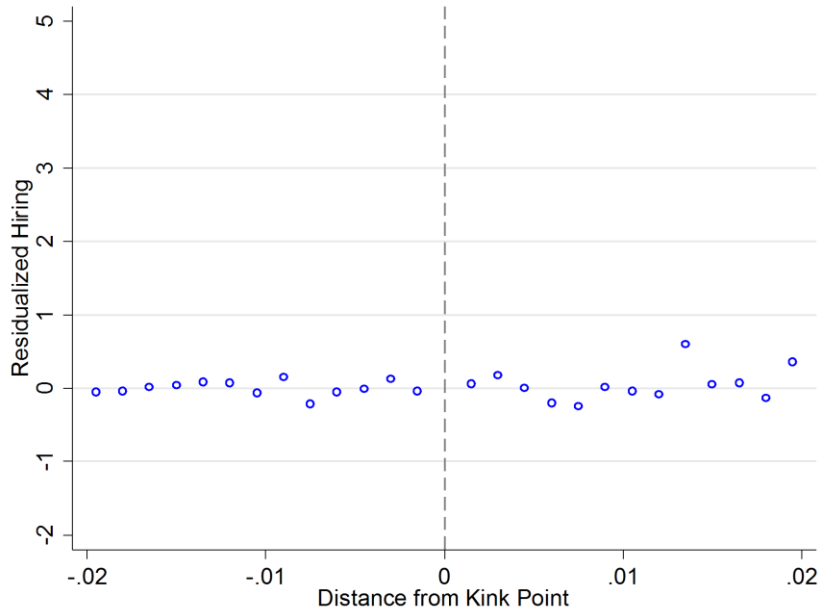
NOTE.— Each center triangle represents the estimated effect of UI taxes for a given bandwidth with the accompanying standard errors. The red dashed line represents the optimal IK bandwidth. Administrative data are from Florida DEO.

FIGURE 6. HIRING KINK AND PLACEBO

Panel A: Effect on hires



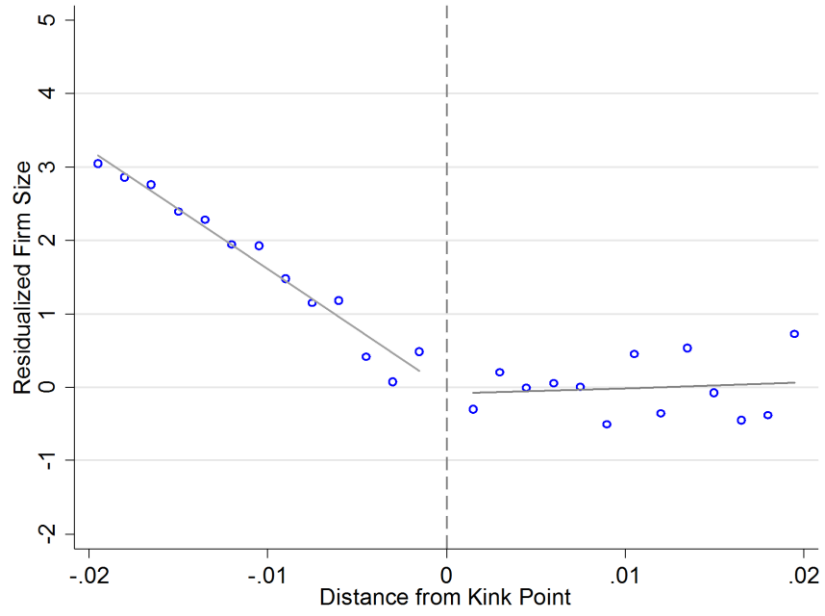
Panel B: Placebo hires



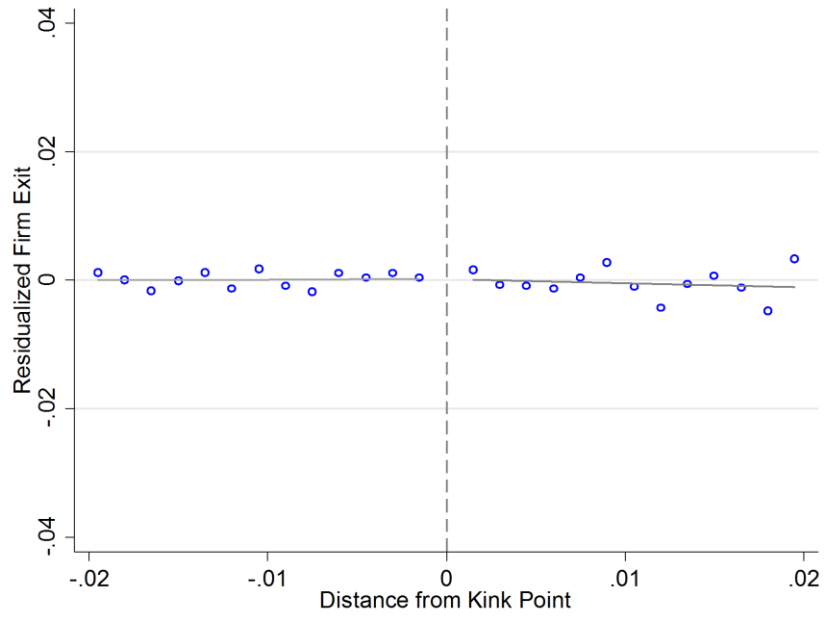
NOTE.— The top figure shows the kink in the residuals accounting for firm and year fixed effects. The bottom figure shows placebo residuals using outcome data from a placebo year, $t-3$.

FIGURE 7. EMPLOYMENT AND EXIT KINK

Panel A: Effect on employment

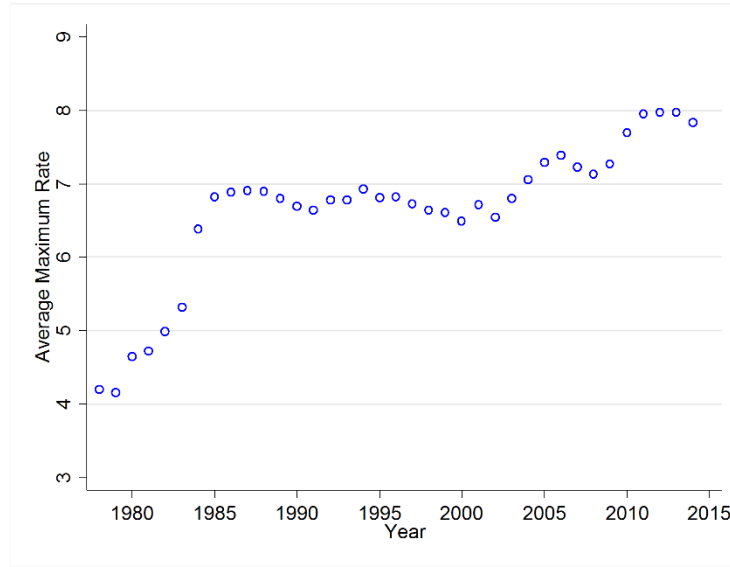


Panel B: Effect on exit

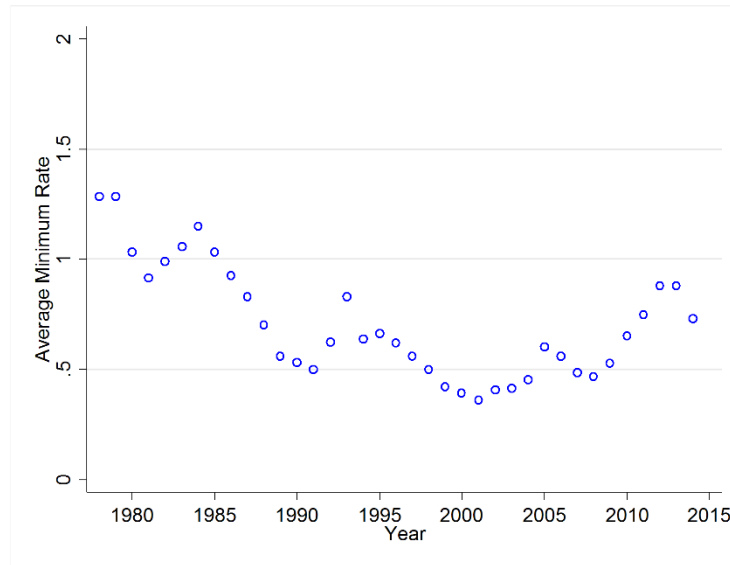


NOTE.— These panels show the kink in the residuals accounting for firm and year fixed effects for employment and firm exit.

FIGURE 8: EVOLUTION OF UI TAX SYSTEMS OVER TIME IN THE UNITED STATES



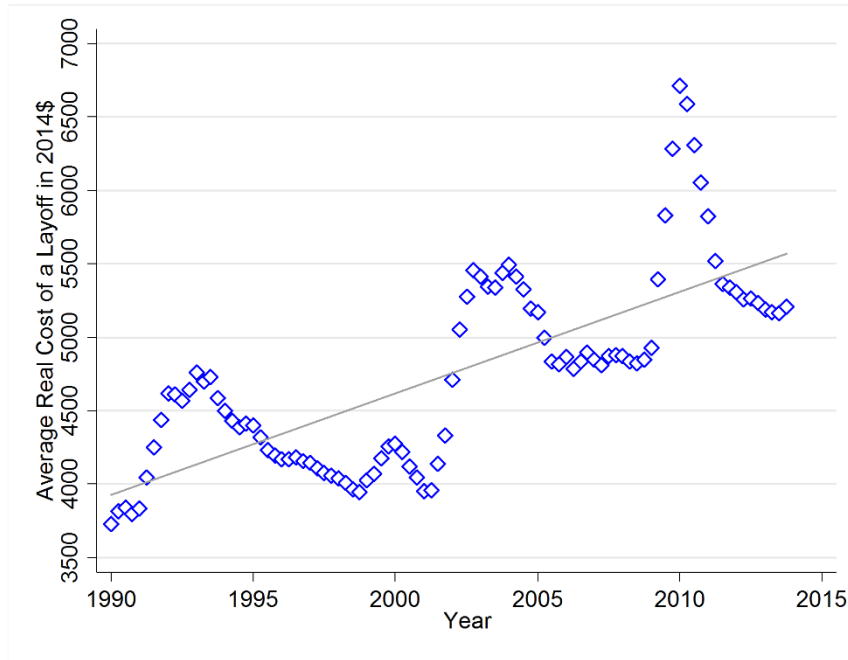
A. THE AVERAGE MAXIMUM TAX RATE OVER TIME



B. AVERAGE MINIMUM TAX RATE OVER TIME

NOTE.—The dots represent the average maximum/minimum UI tax rate across states in the U.S. from 1978 to 2015. There was a significant increase in maximum rates around 1985, when federal law (the Tax Equity and Fiscal Responsibility Act) induced states to raise their maximum rates substantially. In recent years, the rising maximum rate was instigated by states to help cover shortfalls in UI trust funds. I calculated these averages from Commerce Clearinghouse UI Data (CCUID), which include the minimum and maximum rate each state had in place each year. The information in this figure was provided by the Employment and Training Administration (ETA) of the Department of Labor (DOL).

FIGURE 9: AVERAGE COST OF UNEMPLOYMENT SPELLS OVER TIME



NOTE.—The diamonds represent the average real benefit cost of a layoff across states over time from 1990 to 2015. Some growth comes from increases in real value of weekly benefits implemented around 2001, and most cost growth is driven by lengthening unemployment durations. Data from UIDS.

TABLE 1—SUMMARY STATISTICS

	All firms	Rated firms	Rated firms with non-zero benefit ratios	Rated firms, non-zero BR, near kink point
Firm size	26.0 (411)	33.4 (487)	58.8 (659)	51.9 (476)
Hiring rate	0.447 (7.69)	0.429 (7.09)	0.468 (5.53)	0.444 (4.07)
Separation rate	0.431 (7.17)	0.413 (6.61)	0.459 (5.30)	0.402 (3.22)
Layoff rate	0.041 (0.04)	0.040 (0.04)	0.049 (0.05)	0.052 (0.05)
Temp layoff rate	0.002 (0.06)	0.002 (0.06)	0.003 (0.05)	0.003 (0.05)
Median earnings	5,427 (57,504)	5,863 (60,727)	6,581 (19,236)	7,018 (13,030)
Exit rate	0.079 (0.27)	0.067 (0.25)	0.074 (0.26)	0.074 (0.26)
Tax rate	1.86 (0.02)	1.51 (0.02)	3.08 (1.95)	4.17 (1.14)
Benefit ratio	0.069 (2.42)	0.030 (1.24)	0.066 (1.74)	0.026 (1.14)
New firm	0.291 (0.45)	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)
N	2,596,948	1,841,585	706,779	269,758

NOTE.—Cleaned data from Florida DEO comparing firms in subsamples approaching the analytic sample in column 4. A firm's employment is the number of employees who received payroll at firm *i* during calendar year *t*, averaged over four quarters. The number of new hires is the count of employees at firm *i* in year *t* who did not work at firm *i* in the year previous; the hiring rate divides this number by employment. The separation rate tracks the number of employees at firm *i* in year *t* who do not work at firm *i* in *t* + 1 over employment. The layoff rate is based on the number of employees working at firm *i*, who collect unemployment benefits within a year of departing. The temporary layoff rate reflects the share of employees who are laid off and return to the firm within a year of separating. Median earnings are the typical quarterly earnings of workers at firm *i* in year *t*. Firm exit is coded in the last year a firm is observed.

TABLE 2—REGRESSION KINK ESTIMATES OF OVERHANG EFFECT

Outcome	RKD (1)	RKDFE (2)	RKDFE (3)	RKDFE (4)	RKD (5)
Hiring Rate	-0.014 (.001)	-0.013 (.001)	-0.013 (.001)	-0.020 (.002)	-0.024 (.002)
Employment (%Δ)	-0.015 (.002)	-0.015 (.002)	-0.019 (.002)	-0.013 (.004)	-0.020 (.004)
Firm Exit	0.002 (.001)	0.001 (.001)	0.003 (.001)	-0.003 (.002)	0.003 (.003)
Ave. Earnings (%)	0.008 (.002)	0.001 (.002)	-0.001 (.001)	0.002 (.002)	0.002 (.005)
Layoff Rate	0.001 (.001)	0.000 (.001)	0.000 (.000)	-0.006 (.001)	0.000 (.001)
Controls					
Year Fixed Effects	X	X	X	X	X
Firm Fixed Effects		X	X	X	
Linear Control	X	X	X		X
Quadratic Control				X	
Bandwidth (times optimal)	1	1	2	2	½

NOTE.— Each coefficient represents a separate regression reflecting the RKD estimate of a 1-point increase in the tax rate on the outcome indicated on the left column. In the first stage, taxes are instrumented with the prevailing kink. The standard errors are presented under each estimate. Administrative data are from Florida DEO.

TABLE 3—REGRESSION KINK ESTIMATES OF OVERHANG EFFECT USING YEARLY KINKS

Outcome	RKD (1)	RKDFE (2)	RKDFE (3)	RKDFE (4)	RKD (5)
Hiring rate	-0.016 (.001)	-0.017 (.001)	-0.016 (.001)	-0.017 (.002)	-0.027 (.002)
Employment (%Δ)	-0.022 (.002)	-0.024 (.002)	-0.029 (.002)	-0.053 (.006)	-0.022 (.004)
Firm exit	0.002 (.001)	0.001 (.001)	0.002 (.001)	-0.005 (.002)	0.003 (.003)
Log ave. earnings	0.015 (.002)	0.002 (.002)	0.000 (.001)	0.003 (.003)	0.006 (.005)
Layoff rate	0.003 (.000)	0.001 (.001)	-0.001 (.000)	-0.006 (.001)	0.000 (.001)
Controls					
Year fixed effects	X	X	X	X	X
Firm fixed effects		X	X	X	
Linear control	X	X	X		X
Quadratic control				X	
Bandwidth (times optimal)	1	1	2	2	½

NOTE.— Each coefficient represents a separate regression reflecting the RKD estimate of a 1-point increase in the tax rate on the outcome indicated on the left column. In the first stage, there is a separate kink variable for each year, allowing the estimate to incorporate all the kink-related variation which changes slightly over time. The standard errors are presented under each estimate. Administrative data are from Florida DEO.

TABLE 4—KINK HETEROGENEITY BY CASH CONSTRAINT

	RKDFE 2003– 2007 (1)	RKDFE 2008– 2012 (2)	<i>Difference</i> (2) – (1) (3)	RKDFE High Cash (4)	RKDFE Low Cash (5)	<i>Difference</i> (5) – (4) (6)
Outcome						
Hiring rate	0.000 (.004)	-0.014 (.003)	-0.014 (.005)	-0.015 (.003)	-0.026 (.005)	-0.011 (.006)
Employment (%Δ)	-0.009 (.018)	-0.022 (.015)	-0.013 (.023)	-0.010 (.006)	-0.037 (.009)	-0.027 (.011)
Exit	0.003 (.002)	-0.001 (.002)	-0.004 (.003)	0.002 (.002)	0.000 (.002)	-0.001 (.003)
Firm/year FE	X	X	X	X	X	X
Linear control	X	X	X	X	X	X

NOTE.—This table presents results from the preferred specification on subsamples that focus on firms in more- and less-cash-constrained subsamples. Columns 3 and 6 calculate the difference in the estimates from high- and low-cash subsamples.