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ABSTRACT

Benefit Generosity and Injury Duration: Quasi-Experimental Evidence from Regression Kinks*

In this paper, we investigate the effect of benefit generosity on claim duration and temporary benefits paid among temporary disability claims for workers' compensation. While previous studies have focused on natural experiments created by one-time large changes in minimum or maximum weekly benefits, we exploit variation around a kink in benefit generosity inherent in all workers' compensation systems in the United States. Using administrative data on the universe of injured workers in Oregon, we also find that more-generous benefits leads to longer injuries, but with implied elasticities that are smaller than the average elasticity from previous difference-in-difference studies. Our preferred estimates suggest that a 10-percent increase in benefit generosity leads to a 2- to 4-percent increase in injury duration. We derive similar duration-benefit elasticities when studying changes in benefits paid at the kink. We also introduce the first evidence that more-generous benefits encourage subsequent claim filing.

JEL Classification: I18, J33, J53

Keywords: worker compensation, moral hazard, regression kink

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1 Introduction

Since its introduction during the early 1910s, workers' compensation has grown to become one of the largest social-insurance programs in the United States. In 2012, it provided coverage to 128 million workers while paying out approximately $62 billion in total benefits (an increase of almost $10 billion from 2002), with about half going to injured workers and half to medical providers.[1] As benefits continue to climb, considering the trade-offs associated with more-generous benefits is increasingly beneficial. On one hand, higher benefits lessen the pressure to return back to work for injured workers and afford them more time to fully heal.[2] On the other, increasing generosity leads to an increase in moral hazard among workers; for example, it could entice workers to extend the duration of claims for workers' compensation, and even increase the probability of reinjury due to carelessness, or result in the extraneous provision of medical services.[3]

There is a well-established literature examining the effect of increases in benefit generosity on injury duration, with many studies exploiting large, one-time policy changes in workers' compensation benefits to estimate the elasticity of injury duration with respect to generosity. Difference-in-differences around such changes yield elasticity estimates that range from 0.4 to 0.9 (Meyer *et al.*, 1995; Neuhauser and Raphael, 2004). In this paper, we employ a new identification strategy—regression kinks—to estimate the impact of generosity on claim duration and temporary benefits paid. States' restrictions on minimum and maximum payments create a naturally occurring kink in the schedule of the replacement rates for workers just below and above certain wage thresholds. Using administrative data from Oregon, we exploit these changes in the intensity of treatment for workers close to the thresholds to estimate the responsiveness of injury duration and benefits paid with respect to benefit generosity.

[1] Source: National Academy of Social Insurance.

[2] For example, Bronchetti (2002) find that a 10-percent increase in benefit generosity offsets the drop in household consumption by 3-to-5 percent.

[3] See, for example, Butler (1985), Butler *et al.* (1996), or Dionne and St-Michel (1991).

Regression-kinks designs (RKD or RK) are a relatively new estimation strategy, and we employ them in a framework that allows us to compare the results with previous difference-in-differences estimates. While we confirm that an increase in benefit generosity leads to higher injury duration, the implied elasticity estimates are smaller that would be typical in the literature—our estimates range from 0.2 to 0.4. Given the structural change in benefits paid when replacement rates shift, we obtain larger cost-generosity elasticity estimates, which is expected.

Our results have significant policy implications as a number of states continue to implement workers' compensation reforms under the pressure of increasing costs.[4] Our estimates are particularly well-suited to identifying the likely costs associated with small increases to maximum and minimum thresholds (pegging them to inflation, for instance). Furthermore, our RK framework highlights a potential approach for individual states to assess the expected costs of changing benefit generosity at the margin, as it utilizes a feature common to most workers' compensation programs as the source of exogenous variation, in contrast to the use of a large one-time policy changes exploited in previous studies. In addition, given our ability to link individuals over time, we introduce to the literature new evidence that more-generous benefits increase the likelihood of subsequent claim filings.

The rest of the paper proceeds as follows. In Section 2, we review two different strands of relevant literature: moral hazard in workers' compensation and the RK framework, the latter of which has only recently been applied to considering policy. In Section 3, we describe key institutional features of the workers' compensation program in Oregon and, in Section 4, we present our empirical models and results. In Section 6, we discuss some implications of our analysis and conclude.

[4]See Hansen (2014) for a detailed look at California's attempt to reduce workers' compensation costs.

2 Background

2.1 Moral Hazard and workers' compensation

Asymmetric information in most social-insurance programs leads to both ex-ante and ex-post moral hazard. In general, ex-ante moral hazard refers to the activities one party might take that affect the probability of an incident, while ex-post moral hazard relates to a party's action once the incident has occurred. Regarding workers' compensation, ex-ante moral hazard would be present if generous benefits induced a worker to be more careless on the job and thus increases the probability of injury in response to additional generosity. Ex-post moral hazard occurs when higher benefits induce workers' into recovering more slowly from injury, or otherwise lengthen their receipt of workers' compensation. Dionne and St-Michel (1991) proposes a theoretical model to separate these two sources of moral hazard, and tests for the presence of moral hazard in the workers' compensation market in Quebec. Bolduc *et al.* (2002) develops a model in which both ex-ante and ex-post moral hazards interact to influence workers' behaviors. Also with Quebec data, they show that moral hazard is more prevalent when workers suffer from difficult-to-diagnose injuries. Similarly, Butler *et al.* (1996) notes that moral hazard explained most of the increase in the proportion of soft-tissue injury claims in the U.S during the 1980s.

Our study is more closely related to the large literature that examines the link between benefit generosity and the number and duration of claims. Butler and Worrall (1983) and Krueger (1990a) find that increasing benefit payments leads to an increase in the number of claims filed, while Biddle and Roberts (2003) observe that benefit generosity has a notable impact on the probability of claim filing for an injured worker. Using data from Illinois, Butler and Worrall (1995) finds that the expected injury duration is significantly affected by changes in benefits. Similarly, difference-in-differences studies using data from Minnesota (Krueger, 1990b), Michigan and Kentucky (Meyer *et al.*, 2005), and California (Neuhauser and Raphael, 2004) suggest that more-generous benefits, as measured by an increase in the maximum weekly payments, induce workers to stay on workers' compensation longer. Estimates of the implied elasticity of injury duration with respect to benefit range from 0.4 to 0.9.

A recent study by Bronchetti and McInerney (2012) reexamines the incentive effects in workers' compensation using 25 years of data from the March Current Population Survey. They find that the apparent responsive in workers' claim filing behavior around changes in benefits is quite sensitive to how one controls for the confounding influence of past earnings—the participation-benefit elasticity is less than 0.1 in their preferred specification. This suggests that the moral-hazard problem in workers' compensation may not be severe.

As we anticipate the potential for similar confoundedness, RKDs serve to net out the bias of these factors. We explain this framework in more detail below, but note here that we will retrieve an estimate of the causal impact of benefit generosity on injury duration as our identifying variation is through a comparison of otherwise similar workers, the difference among them being the relative replacement rates due to small differences in their wages. In the end, we do observe incidences of ex post moral hazard in workers' compensation—higher benefit generosity leads to an increase in injury duration and the probability of staying on workers' compensation—but our implied elasticity estimates are smaller in magnitude to those found in previous studies.

2.2 Empirical Applications of Regression Kinks

Nielsen *et al.* (2010) are among the first to employ the RKD, and do so to study the effect of student aid on college enrollment. The intuition of the design is very similar to that of regression discontinuity, but instead of a discrete jump in treatment status at some known value of the running variable there is a change in the intensity of treatment, creating "kinks" around which one can measure changes in the outcomes of interest based on the same limit-arguments that support more-traditional regression-discontinuity designs. Card *et al.* (2012, 2015) consider nonlinear identification of this framework and characterizes a class of models under which the RKD yields valid causal inference. The key condition to be satisfied is that the conditional density of the running variable has to be continuously differentiable through the kink points, which rules out instances of bunching or sorting. Similar to regression discontinuity, this assumption is empirically testable using some variation of the test proposed in McCrary (2008). Provided that this is satisfied, estimation could be done using both a sharp and fuzzy RKD design.[5]

There has been a marked increase in the use of RKD as a method of estimation, due to its appealing statistical properties. Simonsen *et al.* (2010) uses a kink in the schedule of reimbursement schemes in the Danish health care market to study the price sensitivity of demand for prescription drugs. In studies that are similar to ours in spirit, Landais (2013) exploits the kinks in the schedule of unemployment insurance benefits to study the effect of unemployment insurance on labor supply. Gelber *et al.* (2015) use the "bend points" inherent in disability insurance to examine the impact on subsequent earnings. In other recent work, RKDs have been used to identify the causal effect of government grant on local public employment (Lundqvist *et al.*, 2014) in the economic incidence of the Pell Grant (Turner, 2014).

Our study offers two main contributions to this growing literature. First, we apply the RKD in a novel setting that, to our knowledge, has not been looked at before. Specifically, we exploit the fact that states' maximum and minimum restrictions on workers' compensation benefits create kinks in a worker's compensation-replacement rate, such that otherwise-similar workers on either side of a wage threshold experience a change in how additional income translates into benefits. We use this quasi-experimental setting to estimate the effect of benefit generosity on injury duration and benefits paid. The rich literature on moral hazard in workers' compensation also affords us the opportunity to compare our results with previous difference-in-differences estimates to understand how different sources of variation lead to different estimates of the same parameters.

[5] Dong (2011) shows that it is possible to exploit both a jump and a kink to identify a treatment effect and applies such an estimator to investigating the retirement-consumption puzzle.

To clarify the source of identifying variation, consider a mapping of weekly wages into replacement rates and weekly benefits in Oregon during the 2014 fiscal year, which we plot in Figure 1. Here, replacements are a constant 66 2/3 percent of lost income, with weekly benefits constrained by minimum ($50 per week or 90% of weekly wage, whichever is lower) and maximum ($1,181.55 per week) amounts.[6] It is these restrictions that give rise to identifying variation, as the replacement rate kinks in two places: one at the minimum threshold and the other at the maximum threshold. In this scenario, the associated kinks are located at $75 and $1,772.325. Workers with weekly wages of less than $75 per week receive $50 since their benefits (66 2/3 percent × weekly wages) are lower than the minimum threshold. For these workers, their replacement rates are higher than 66 2/3 percent. In contrast, workers who earn more than $1,772.325 per week receive the maximum $1,181.55 in weekly benefits, with replacement rates lower than 66 2/3 percent. Our estimation strategy compares outcomes across workers on either side of these kinks, exploiting the marginal increase in intensity of treatment.[7]

3 Institutional Features and Data Sources

Workers' compensation in Oregon shares many programmatic features common to other states. As in the example above, the weekly benefit is 66 2/3 percent of a worker's weekly wage, as long as this benefit falls within a range defined by a minimum and maximum amount. The minimum weekly benefit is currently the lesser of $50 or 90 percent of a worker's weekly wage, while the maximum weekly benefit is a function of the state's average weekly wage (SAWW). As such, there is potential variation in these thresholds across years.[8] In addition, however, the maximum benefit was changed from 100 percent of the SAWW to

[6]These amounts are determined by the state's average weekly wage.

[7]Ideally, we would want to look at the kinks at both the minimum and maximum thresholds; however, with so few observations around the minimum thresholds, we will not have enough power to separately identify the effect at the these levels.

[8]The SAWW is determined by the Employment Department by May 15 of each year. See Oregon Revised Statuses 656.210, 656.211.

133 percent of the SAWW.[9]

One feature that complicates our estimation is the potential increase in benefit associated with increases in SAWW. In particular, if a worker at the maximum weekly benefit experiences an injury that overlaps with a new fiscal year, he thereafter receives a new inflation-adjusted maximum benefit.[10] This creates a source of missmeasurement, as we do not observe this change in maximum benefit in our data (as our unit of observation is a worker-claim). We overcome this challenge by supplementing our analysis with a discrete-time hazard model, where the unit of observation is a worker-week for a single claim. We discuss this model below, and note here that the model allows maximum benefits to vary through time according to known changes in policy parameters that would have been experienced over those worker-weeks.

We obtained comprehensive data on workers' wages, injury duration, and benefit generosity from Oregon's Workers' Compensation Division. Our main dependent variables are the days spent on workers' compensation and the benefits received during that time. In Oregon, injury duration is classified into two categories: temporary total disability (TTD) days, where workers are completely absent from work, and temporary partial disability (TPD) days, where workers return to work partially while recovering from injury. Our measure of injury duration is the sum of these two variables, and our measure of benefit is the amount paid to workers while they are on either TTD or TPD.[11] Our data encompass the universe of all injured workers in Oregon, from 1990 to 2010, though we exclude from our analyses workers with multiple claims for one accident, workers whose claims are not accepted, and workers who suffer from a permanent injury. With so few observations around the kink in benefits at the minimum benefit, we will also focus our attention on workers whose wages fall around the maximum threshold.

[9] This one-time increase in generosity occurred on 1 January 2002, and was not an overhaul of workers' compensation in any broad way. There was no other aspect of the program that was affected during this time.

[10] This inflation adjustment applies to all workers, no matter the date of injury.

[11] Stratifying by total or partial disability is problematic, as this distinction is unavailable in our data until the late 1990s, accounting for roughly half of our sample.

4 Empirics

Using administrative records from Oregon, we estimate the effect of benefit generosity on injury duration and benefits paid. Below, we discuss the econometric models and then the estimation results.

4.1 Econometric Models

RKDs can be estimated in manners similar to models from a standard regression-discontinuity design. The key difference is that in a traditional regression-discontinuity design, the estimated slope of the running variable is treated as a nuisance parameter, or a parameter that is estimated only to ensure the unbiased estimation of other parameters which are truly of interest. In the RKD, it is the slope parameter—or more precisely, the change in the slope of y in the running variable at the threshold—that is economically interesting. As such, our first primary econometric models will be based on the model,

$$\begin{aligned} y_{it} &= \alpha_1 WeeklyWage_{it} + \alpha_2 1(WeeklyWage_{it} > k_t) \\ &\quad + \alpha_3 WeeklyWage_{it} \times 1(WeeklyWage_{it} > k_t) + X_{it}'\gamma + \delta_t + u_{it}. \end{aligned} \tag{1}$$

where y_{it} is either injury duration of or benefits paid to an individual i in year t, $WeeklyWage_{it}$ is the weekly wage relative to k_t, the maximum weekly benefit in year t. X_{it} is a matrix of control variables.[12] Year fixed effects are absorbed in δ_t, and errors are absorbed in u_{it}. The parameter of interest in the RKD is α_3, the interaction between the threshold indicator and the weekly wage. Because benefits are less generous (in terms of replacement rate) on the right side of the threshold, we anticipate that marginal increases in $Weekly\_Wage_{it}$ will decrease injury durations and lower benefits paid to claims on the right side of the threshold (i.e., $\hat{\alpha}_3 < 0$).[13]

[12] We control for a worker's gender, age, industry type (based on the Standard Occupational Classification), and body part injured.

[13] We subsequently investigate models where we restrict the discontinuity at k to be zero (i.e., $\alpha_2 = 0$).

To adjust for the presence of non-linearities, we allow injury duration and paid benefits to be quadratic in weekly wage. Formally, then, we estimate,

$$\begin{aligned} y_{it} &= \alpha_1 WeeklyWage_{it} + \alpha_2 WeeklyWage_{it}^2 + \alpha_3 1(WeeklyWage_{it} > k_t) \\ &+\alpha_4 WeeklyWage_{it} \times 1(WeeklyWage_{it} > k_t) \\ &+\alpha_5 WeeklyWage_{it}^2 \times 1(WeeklyWage_{it} > k_t) \\ &+X_{it}'\gamma + \delta_t + u_{it}. \end{aligned} \tag{2}$$

In (2), the estimated change in the slope across the threshold is $\hat{\alpha}_4 + 2\hat{\alpha}_5 Weekly\ Wage_{it}$. However, as we are interested in the estimated change at the kink point and weekly wages have been rescaled around the kink, the term $2\alpha_5 Weekly\ Wage_i$ goes to zero in the limit. Hence, for all of the regressions we will be primarily interested in the sign and magnitude on $\hat{\alpha}_3$.

We adopt a bandwidth of $200 when presenting our main estimates, though we later demonstrate the sensitivity of our results to bandwidth selection. Precision can increase with larger bandwidths, of course, but potential non-linearities can also complicate the estimation of the kink at the threshold, where we are intent on exploiting exogenous policy variation for inference statements. Fortunately, our qualitative results are consistent across bandwidths and it is mostly the precision with which we estimate our parameters of interest that varies. As an additional robustness check, we implement a bandwidth-selecting procedure for regression discontinuity and regression-kink designs based on Calonico *et al.* (2014), which specifies bandwidths that are close to our preferred choice of $200.

4.2 Estimation Results

Here, we analyze the effect of more-generous benefits on two main outcomes: the number of temporary disability days (the sum of total and partial disability claims) and the total disability costs.[14]

We first consider the smoothness assumptions supporting the validity of our regression-kink design. In Figure 2, we plot the distribution of weekly wage and, in Figure 3, we plot worker characteristics. In short, there is no evidence of manipulation at the threshold. Similarly, in Figure 3 we see that neither workers' age, gender, the proportion of workers in the construction industry, nor claim-acceptance probabilities change systematically across the threshold.[15]

Given this smoothness, in Table 2 we report estimates of the effect of having a weekly wage to the right of the threshold. (We offer two set of models, with and without the restriction that the discontinuity at the threshold is zero. Estimated elasticities across this restriction are qualitatively similar.) The parameter of interest corresponds to the interaction of weekly wage and an indicator variable capturing that the weekly wage was above the maximum allowable, which range from -.019 to -.033. These appear as somewhat small effects, though the margin here is measured changes induced by an increase in benefit generosity of only 67 cents.[16] The implied benefit-duration elasticities—ranging from .25 to .41—are therefore much more informative, which we report at the bottom of the table.[17] The estimates are relatively robust across specifications as well as to the inclusion of controls though they lack some statistical precision. Panel A of Figure 4 illustrates this same change, where the negative-slope change is evident in going from the left to the right side of the maximum-

[14] Due to the large increase in benefit generosity in 2002—maximum-allowable benefits were increased 30 percent in 2002—we examine the impact of benefits using all observations in our sample, and in an appendix report separate estimates for observations in the periods before and after the large increase in generosity. Results are largely driven by observations in the years prior to 2002, at the lower level of generosity, which we show in appendix tables.

[15] The proportion of workers in the construction industry is a proxy of sorts for occupational type. We also find that the proportion of workers in other major industries such as farming or labor-intensive occupations is smooth across the thresholds.

[16] To the left of the threshold, an extra dollar in weekly wage results in an additional 67 cents in benefit. To the right, however, an extra dollar in weekly wage yields no change in benefits, as the maximum benefit was reached at the threshold.

[17] Elasticities are calculated around the threshold. For example, in Column (1) of Table 2, the elasticity of .41 is calculated as the change in injury duration from being above the threshold, scaled by the mean injury duration from Table 1 (-0.0325/61.63), divided by the change in weekly benefit, again scaled by its mean (-0.67/522.10).

benefit threshold.

In Table 3, we consider the estimated change in benefits paid. Because we expect benefits levels to increase even if injury duration is unchanged, it's not surprising that we find strong evidence that more-generous benefits lead to more-costly claims. The estimates range from -6.6 to -9.2, and imply cost-generosity elasticities that range from 1.10 to 1.55. This is also evident graphically, in Figure 5.

4.3 Robustness Checks and Sensitivity Analyses

4.3.1 Bandwidth sensitivity

We conduct bandwidth sensitivity checks to investigate the robustness of the main results to bandwidth choices. Figure 6 plots the point estimates of the impact of benefit generosity on injury duration as well as the 95% confidence intervals, using bandwidths varying from $100 to $300 in $10 increments. Figure 7 plots analogous graphs when the dependent variable is paid benefits. These figures are constructed with results from regressions that utilize the full set of control variables and a linear running variable. For the most part, our estimates are quite robust to bandwidth choices.

However, to further alleviate concerns about the sensitivity of our results to the choices of bandwidth and polynomial order, we also supplement the main analysis with results from a recent estimation procedure proposed by Calonico *et al.* (2014). This procedure constructs point estimates and confidence intervals based on a biased-corrected regression discontinuity and regression-kink estimators to account for the considerable sensitivity of RD results to bandwidth choices frequently observed in the empirical literature. Each column in Table 4 is a separate regression, and each regression uses the universe of all injured workers in Oregon, from 1990 to 2010. In the first column, we let the procedure calculate the optimal (bias-corrected) bandwidth and polynomial order. In Panel A, the point estimate for the coefficient of interest α_3 is -0.042. This is within the same order of magnitude of the estimates in Table 2, but we do lose some precision. The procedure specifies an optimal bandwidth of $267.26—

close to our preferred bandwidth of $200—and a first-order polynomial, again similar to what we use in our preferred specifications. In columns (2), (3), and (4), we adopt bandwidths of $300, $400, and $500, respectively, while letting the procedure choose the optimal polynomial order. In all cases, polynomials of degree one are chosen. In contrast, in columns (5) and (6) we impose second- and third-order polynomials while letting the procedure choose the optimal bandwidth. Overall, we observe that while the choice of bandwidth slightly alters the size and significance of the estimate, the choice of polynomial order seems to have the larger impact, perhaps because we are overfitting the data with higher-order polynomials.

In Panel B of Table 4, we present analogous results for predictions of benefits paid to workers on temporary disability. Consistent with our previous results, the estimated impact of increasing benefit generosity on benefits paid is quite robust to specification. We obtain estimated elasticities ranging from 1.16 to 1.64.

4.3.2 Hazard-model approach

We earlier suggested that there may be some concern about the unit of observation being worker-claim, as we do not observe the increase in benefits experienced for workers who are at the maximum weekly benefit when their injuries overlap with a new fiscal year. Here, we overcome this challenge by supplementing our analysis with a discrete-time hazard model, where the unit of analysis is worker-claim-week.

We expand the data set such that we observe each worker during each week that he remains on workers' compensation and can therefore accurately update his weekly benefit to account for year-to-year inflation adjustments. We then estimate the probability that a worker exits workers' compensation in any given week, anticipating that our main coefficient of interest (α_3) will be *positive*, as benefits to the right side of the threshold are not as generous and workers have less incentive to stay on workers' compensation. Following the convention in discrete-hazard model estimation, we also include indicators for each week a worker is injured to flexibly model the baseline hazard. (We present results using OLS for ease of interpretation, but Logit models produce similar average marginal effect estimates.)

We report estimated coefficients for these regressions in Table A1. As the probability of exiting workers' compensation in a particular week is quite small (about 5 percent, from Table 1), the estimates are also small, and they are estimated somewhat imprecisely. When scaled as elasticities, they range from -0.14 to -0.92. Again, these are smaller than the elasticities from prior difference-in-differences based approaches in the literature.

4.3.3 Pre/post-2002 regimes

We also report, in table A2 and A3, separate estimates for the pre- and post-2002 regimes, given the increase in allowable maximums beginning on 1 January 2002. Using only the pre-2002 period (when the maximum threshold is based on the 100 percent of the state average weekly wage) yields benefit-injury elasticities that range from -.08 to .34. In the post-2002 period, however, the estimated elasticities are significantly larger—they range from 1.58 to 7.08. We urge caution in interpreting these larger estimates as causal for two reasons. First, the sample size is dramatically smaller in the post-2002 years, as there are far fewer injury claims at the (33-percent) higher threshold.[18] Second, the largest elasticity estimates only arise when we use quadratic models, which can put undue weight on observations far from the thresholds. Indeed, a graphical inspection of Figure 4 suggests it is unclear if there is support for quadratic models.

5 Reinjury

Of critical public-health concern in workers' compensation is the incidence of reinjury. The factors that can drive reinjury are different than those that would drive other types of social insurance, such as unemployment insurance. While repeated unemployment would typically be seen as a signal of match quality, repeated injury could simply be related to

[18]This is anticipated, as moving the maximum benefit to 133 percent of the state's average weekly wage effectively pushes the threshold far to the right and thus we are only considering the higher earners.

incomplete healing. Alternatively, if workers' are not fully informed about workers' compensation benefits, benefit generosity for *current* claims could affect an individual's choice to file *future* claims, if individuals update their beliefs about generosity based on their own claiming experience.

Given the universe of workers compensation claims in Oregon, we can track individual claimants over time and, therefore, instances of reinjury. For the sample of first-time claim filers—those falling between 1990 and 2000—in Table 5 we consider the probability of subsequent injury given the benefit generosity of their first injury. Reinjury elasticities range from .86 to 1.75 in the unrestricted sample, and are somewhat larger—1.11 to 1.35—when the sample is restricted to only the reinjured. In Table 7, we again report the procedure of Calonico *et al.* (2014), which yields somewhat larger elasticities. The estimates, and corresponding Figure 6, provide compelling evidence that reducing benefit generosity is associated with sizable reductions in future claim filing.

This amounts to a new type of moral hazard previously undiscovered in workers' compensation. Previous research has identified ex-ante moral hazard (the effect of claim generosity on the likelihood of getting injured), or ex-post moral hazard (the effect of claim generosity on claim duration). We find no evidence of ex-ante moral hazard, and only moderate evidence of ex-post. That current claim benefits affect the likelihood of filing claims can be viewed as behavioral in some way. Though the available administrative records do not allow us to separate them from one another (Kahneman, 2003), we include among the operative mechanisms, that worker's have incomplete information on the benefit schedule, how the schedule maps into earnings, or how difficult it will be to live on a reduced income while recovering from their injury.

6 Conclusions

The effect of more-generous benefits on workers' compensation claims has been a long standing policy question. With administrative data from Oregon, we use a regression-kink design to estimate the effect of more-generous benefits on injury duration and total benefits paid to the universe of temporary disability claims. We find evidence, not surprisingly, that more-generous benefits result in more-costly claims. Indeed, increasing weekly benefit generosity by 10 percent results in total benefits paid increasing by roughly 10-to-15 percent. However, we find limited evidence that more-generous benefits result in longer claims of injury. Prior research using administrative data suggests that injury benefit elasticities may range from 0.4 to 0.9. Our preferred models yield injury benefit elasticities that range from 0.2 to 0.4. Based on a new approach to identifying the causal parameter of interest, this evidence echoes other more-recent studies that have suggested workers are becoming less responsive to changes in workers' compensation benefits.

Furthermore, we find compelling evidence that increases in current claim generosity are associated with substantial increases in the likelihood of filing a subsequent claim. Moreover, workers are quite elastic in this regard, as a 10-percent increase in benefits is estimated to lead to an 11-to-14 percent increase in subsequent claim filing. This goes against the common medically driven arguments that greater benefits would encourage a longer (and therefore fuller) recovery period, and drive down the likelihood of future injuries. (This is not substantively different from the argument that more-generous unemployment insurance benefits will create better job matches and limit future unemployment insurance.) Instead, our findings suggest a behavioral component to claim filing, wherein workers have limited information about the benefits they'll receive upon being injured, but acquire a forecast of the future benefits based on their current claim. While behavioral factors such as peer effects (Dahl, G., K. Loken, and M. Mogstad 2014), salience (Chetty, Looney, and Kroft 2009), or default options (Thaler, 1994) have been found elsewhere in economics, this is the first evidence of this type of moral hazard in workers' compensation. From a policy perspective, our findings also suggest previous estimates of the cost of increasing benefits will understate the long-run costs, as increases benefits will increase subsequent claim filing.

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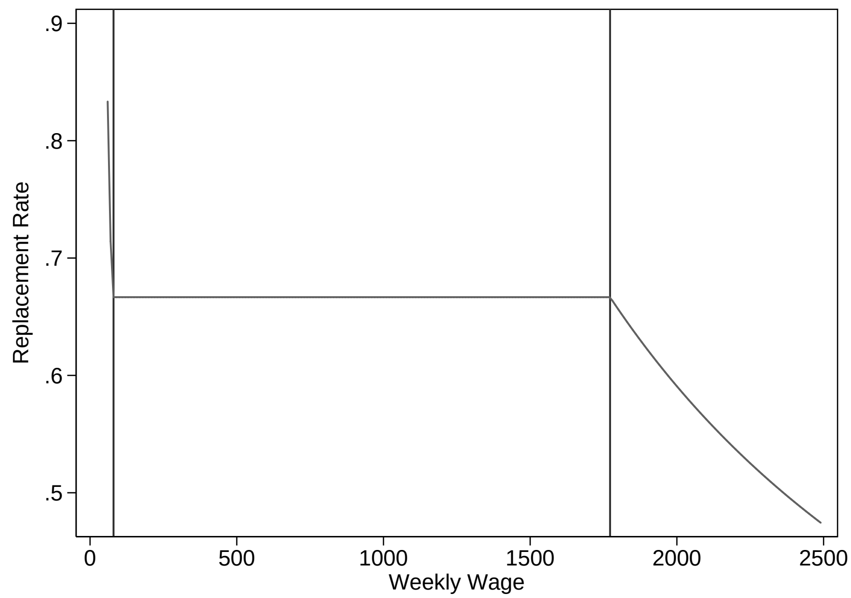
Figures and Tables

Figure 1
Weekly Benefits and Replacement Rates as Functions of Weekly Wages in 2014

(a) Replacement Rates



(b) Weekly Benefits

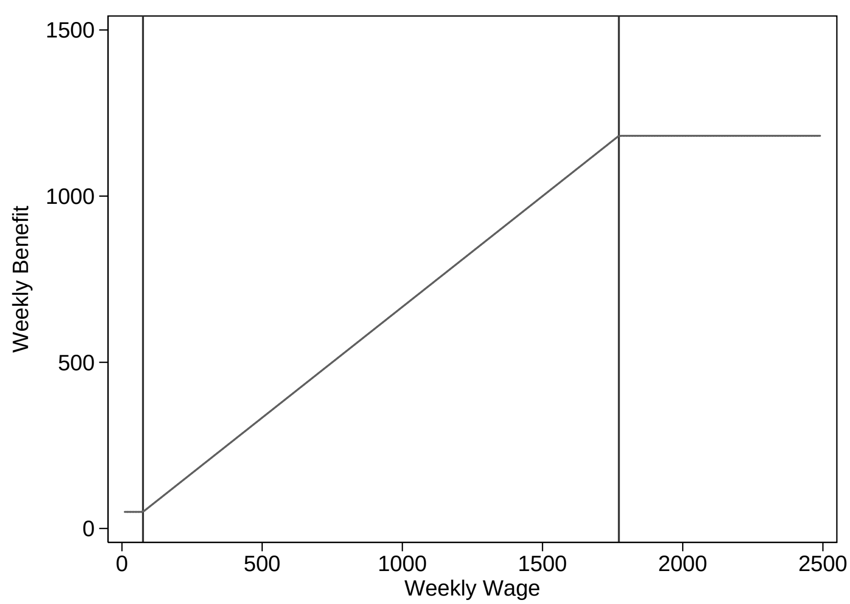
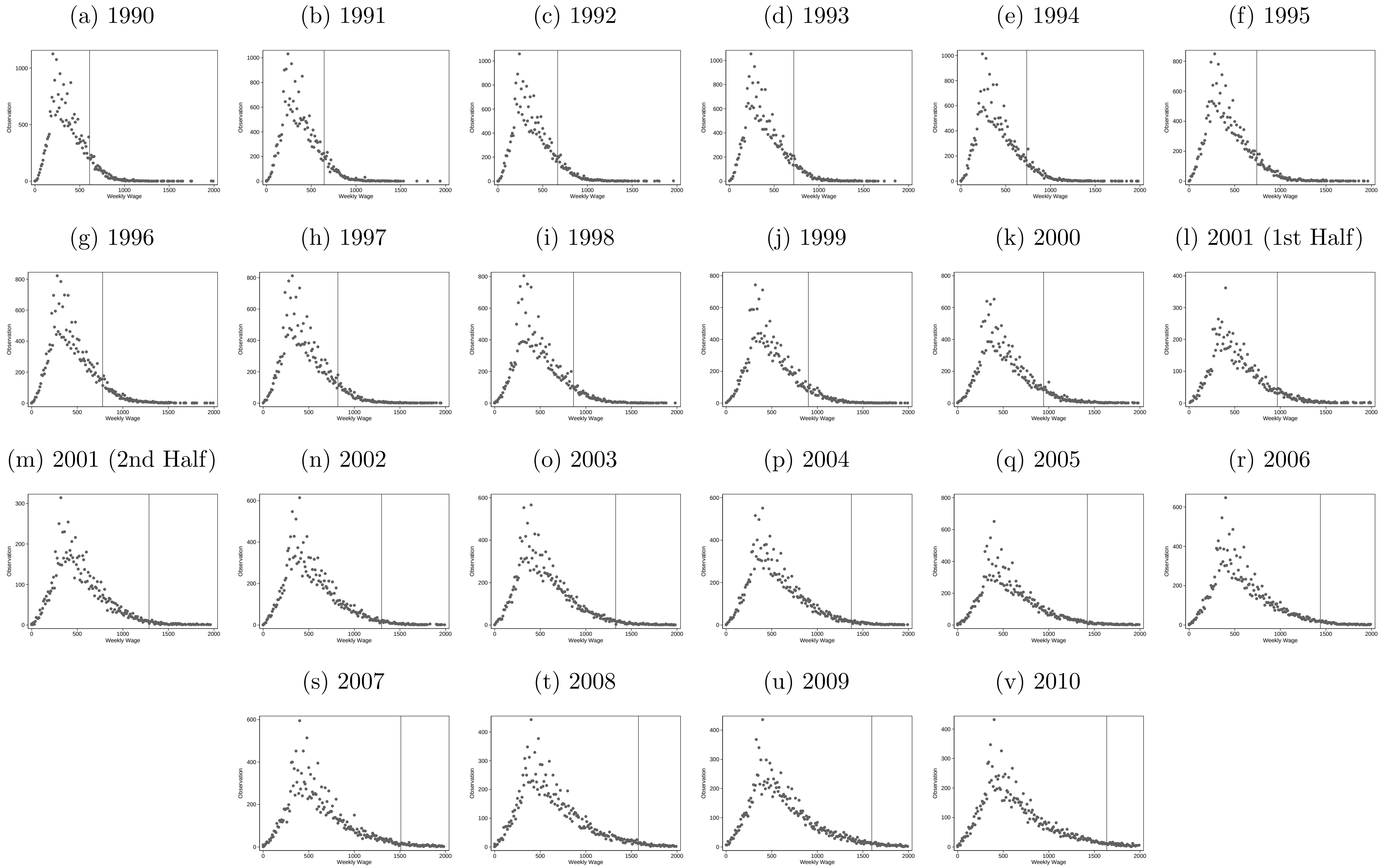
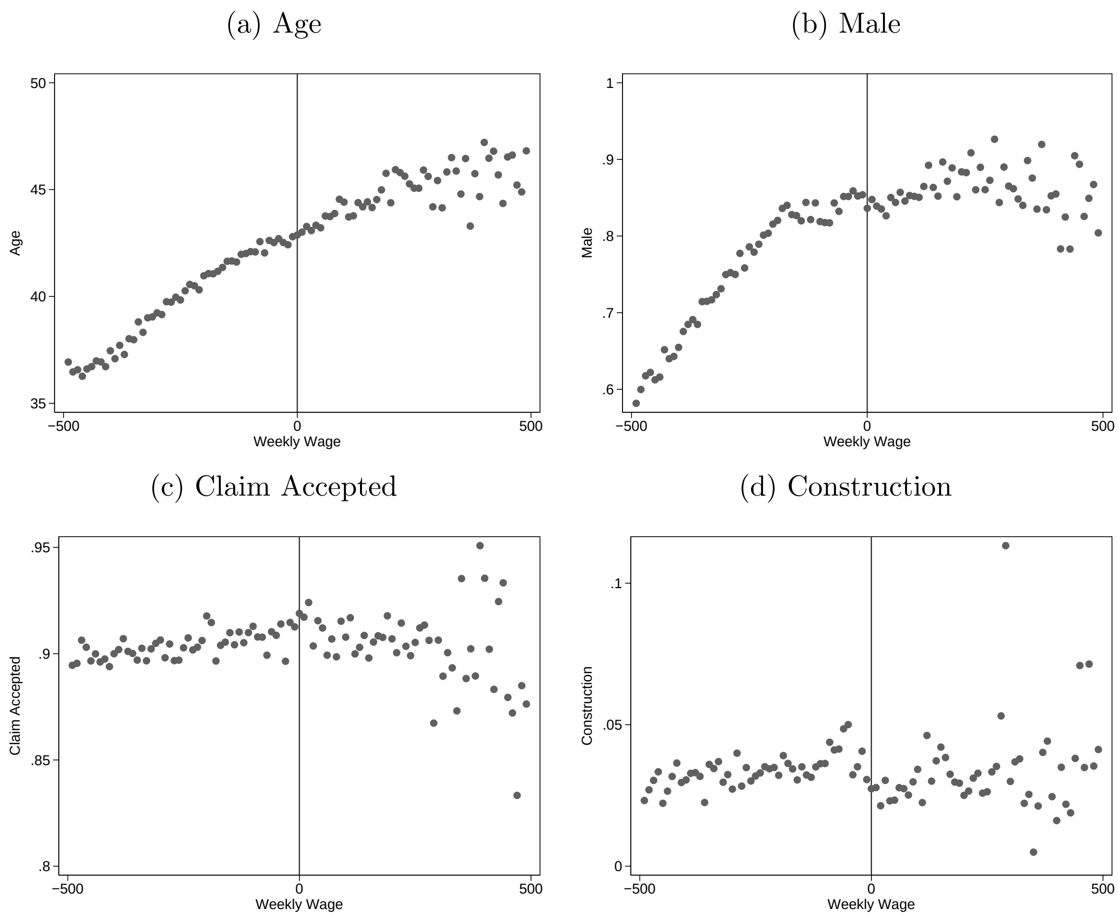


Figure 2
Density Tests



Notes: Based on administrative records from the workers' compensation Division in Oregon. Each cell is a fiscal year from 1990 to 2010. The vertical axis is based on the frequency of observations, with the running variable (weekly wage) on the horizontal axis. The vertical line represents the threshold. The bin width is $10.

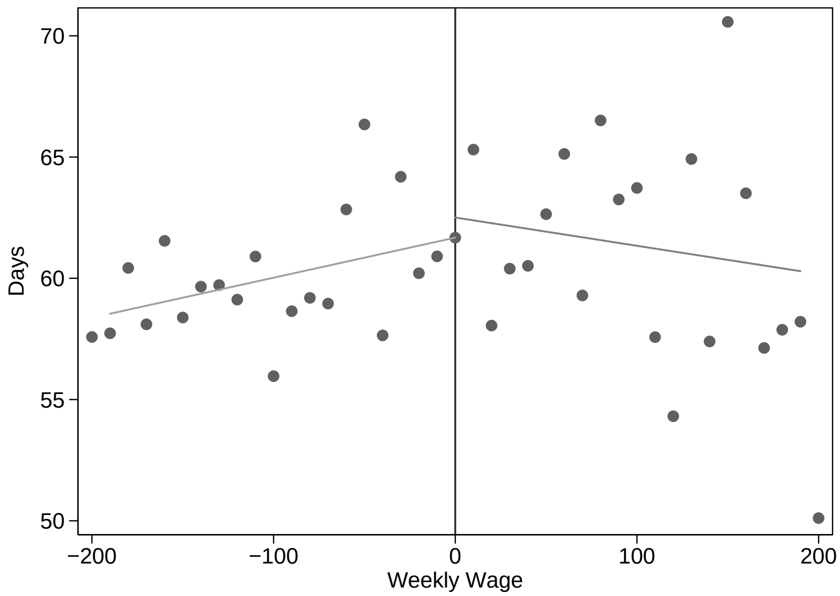
Figure 3
Workers and Claim Characteristic Across Threshold



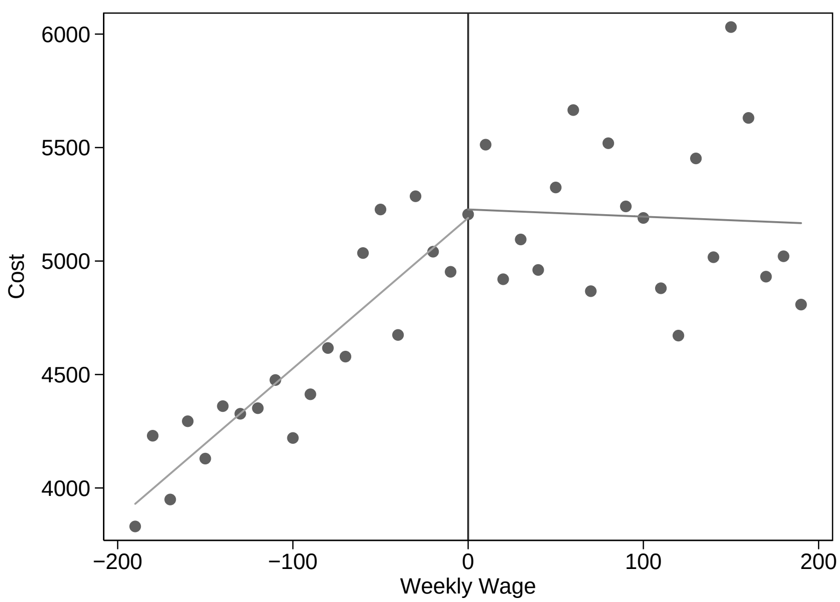
Notes: Based on administrative records from the workers' compensation Division in Oregon. The vertical axis is specified in each cell, with the running variable (deviation from the threshold) on the horizontal axis. The vertical line represents the threshold. The bin width is \$10.

Figure 4
Effects of Benefit Generosity
Bandwidth: 200

(a) On Injury Duration



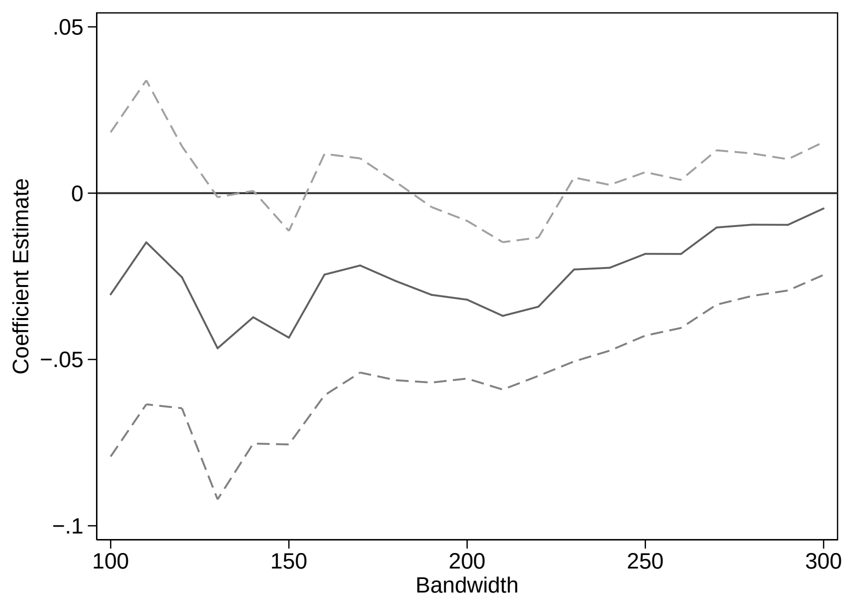
(b) On Claim Cost



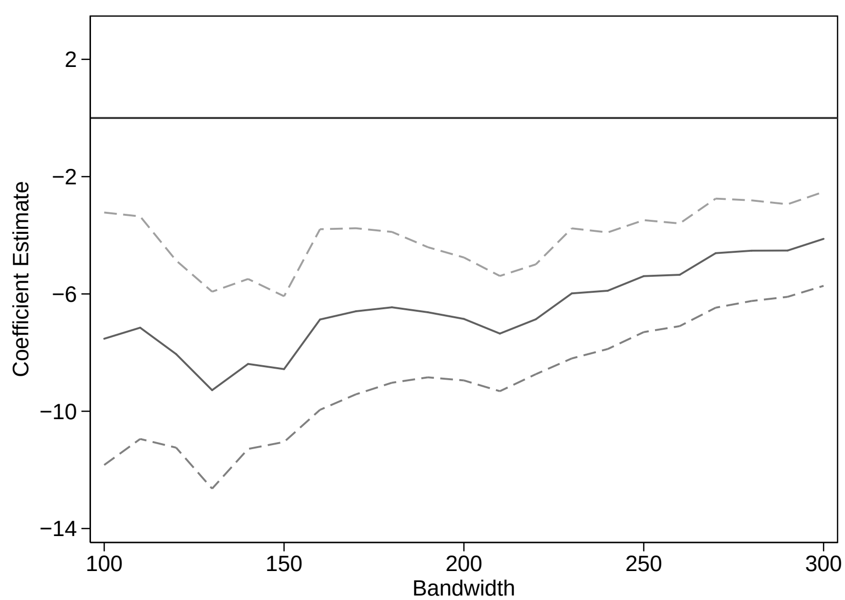
Notes: Based on administrative records from the workers' compensation Division in Oregon. Points represent the averages, with fitted values based on linear model in black lines. The vertical axis is duration on temporary benefits in Panel a and temporary benefits paid in Panel b. The horizon axis is the running variable (deviation of weekly wage from the threshold). The vertical line represents the threshold. The bin width is \$10.

Figure 5
Bandwidth Sensitivity Checks
Effects of Benefit Generosity

(a) On Injury Duration

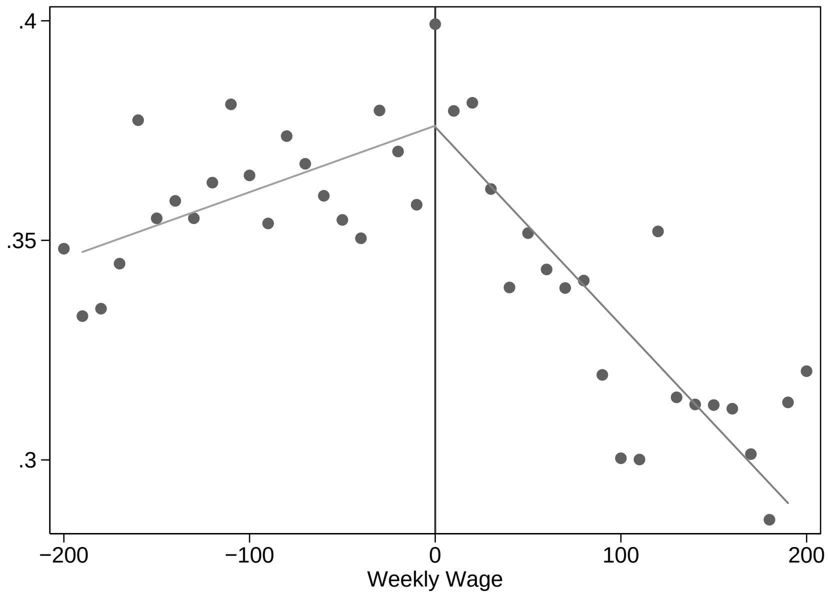


(b) On Claim Cost



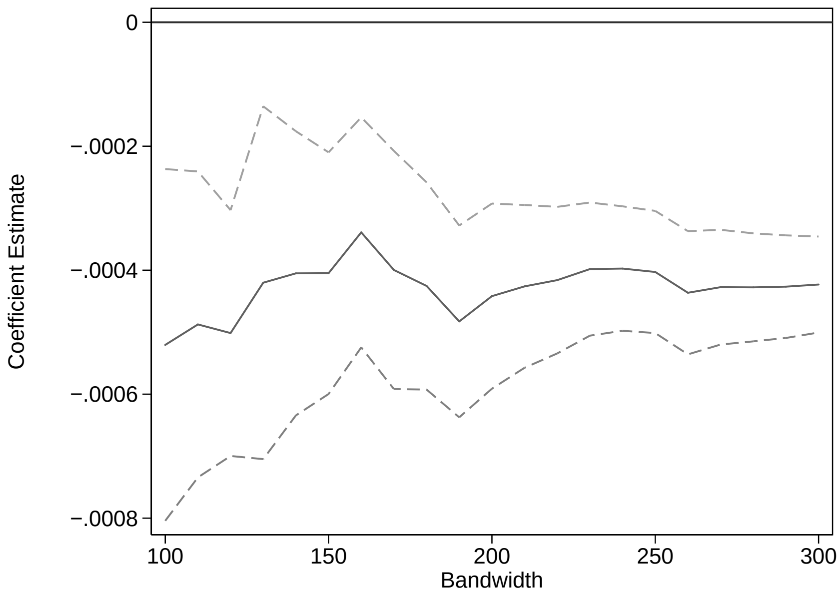
Notes: Based on administrative records from the workers' compensation Division in Oregon. The solid line represents the coefficient estimates while the dash lines are 95-percent confidence interval. All regressions include control variables and a first degree polynomial order in the running variable (corresponding to a linear specification). Standard errors are clustered at the bin width level.

Figure 6
Effects of Benefit Generosity on Reinjury Probability
Bandwidth: 200



Notes: Based on administrative records from the workers' compensation Division in Oregon. Points represent the averages, with fitted values based on linear model in black lines. The vertical axis is reinjury probability among all workers in Panel a and first injury probability among all workers who have reinjured in Panel b. The horizon axis is the running variable (deviation of weekly wage from the threshold). The vertical line represents the threshold. The bin width is $10.

Figure 7
Bandwidth Sensitivity Checks
Effects of Benefit Generosity on Reinjury Probability



Notes: Based on administrative records from the workers' compensation Division in Oregon. The solid line represents the coefficient estimates while the dash lines are 95-percent confidence interval. All regressions include control variables and a first degree polynomial order in the running variable (corresponding to a linear specification). Standard errors are clustered at the bin width level.

Table 1
Summary Statistics (at Threshold)

Variable	Mean	Median	99 pct
Weekly Wage	793.91	734.40	1,600.00
Weekly Benefit	522.10	483.20	1,059.03
Injury Duration	61.63	20.00	554.00
Benefits Paid	5,087.78	1,711.83	40,736.00
Reinjury Probability	0.37	0	1

Notes: Sample restricted to those within $50 of the threshold, with non-missing running variables and non-rejected claims. Injury duration and benefits paid are top-coded at the 99 percentile.

Table 2
Effect of Benefit Generosity on Injury Duration
Bandwidth: 200

	Discontinuity at Threshold Estimated				Discontinuity at Threshold = 0			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Weekly Wage	0.0193***	0.0156**	0.0305	0.0282	0.0222***	0.0182***	0.0302*	0.0262
	(0.007)	(0.006)	(0.022)	(0.022)	(0.005)	(0.005)	(0.017)	(0.017)
Weekly Wage^2			0.0001	0.0001			0.0001	0.0001
			(0.000)	(0.000)			(0.000)	(0.000)
1(Weekly Wage above maximum)	1.0576	0.9273	-0.0385	-0.2447				
	(1.281)	(1.241)	(1.608)	(1.574)				
Weekly Wage × 1(... above maximum)	-0.0325***	-0.0320**	-0.0194	-0.0193	-0.0300**	-0.0298**	-0.0195	-0.0204
	(0.012)	(0.012)	(0.037)	(0.038)	(0.012)	(0.012)	(0.038)	(0.038)
Weekly Wage^2× 1(... above maximum)			-0.0002	-0.0002			-0.0002	-0.0002
			(0.000)	(0.000)			(0.000)	(0.000)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	72,667	72,630	72,667	72,630	72,667	72,630	72,667	72,630
Elasticity	0.41	0.40	0.25	0.24	0.38	0.38	0.25	0.26

Notes: Dependent variable: Days on temporary disability. Standard errors in parentheses, allowing for clustering in bins (bin width = $10). Sample restricted to those injured during fiscal years 1990-2010, with weekly earnings within the bandwidth, whose claims were not rejected. Controls include fiscal year indicators, age, gender, nature of injury and industry indicators. Elasticity is calculated at the mean around the threshold. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table 3
Effect of Benefit Generosity on Claim Cost
Bandwidth: 200

	Discontinuity at Threshold Estimated				Discontinuity at Threshold = 0			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Weekly Wage	6.1973***	5.7968***	7.6521***	7.4493***	6.4764***	6.0602***	8.0166***	7.7907***
	(0.559)	(0.490)	(1.873)	(1.689)	(0.434)	(0.384)	(1.433)	(1.312)
Weekly Wage^2			0.0069	0.0079			0.0084	0.0093
			(0.008)	(0.007)			(0.007)	(0.006)
1(Weekly Wage above maximum)	99.9375	94.4866	45.0255	42.2129				
	(107.399)	(101.859)	(137.824)	(128.090)				
Weekly Wage × 1(... above maximum)	-6.8521***	-7.2624***	-8.2587**	-9.2212***	-6.6181***	-7.0401***	-8.0448**	-9.0202***
	(1.069)	(1.045)	(3.405)	(3.213)	(1.091)	(1.042)	(3.541)	(3.307)
Weekly Wage^2× 1(... above maximum)			-0.0072	-0.0062			-0.0113	-0.0100
			(0.018)	(0.017)			(0.015)	(0.014)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	72,667	72,630	72,667	72,630	72,667	72,630	72,667	72,630
Elasticity	1.05	1.11	1.26	1.41	1.01	1.08	1.23	1.38

Notes: Dependent variable: Payments to workers on temporary disability. Standard errors in parentheses, allowing for clustering in bins (bin width = $10). Sample restricted to those injured during fiscal years 1990-2010, with weekly earnings within the bandwidth, whose claims were not rejected. Controls include fiscal year indicators, age, gender, nature of injury and industry indicators. Elasticity is calculated at the mean around the threshold. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table 4
Sensitivity Checks based on Calonico *et al.* (2014)
Effects of Benefit Generosity

	(1)	(2)	(3)	(4)	(5)
			Panel A: On Injury Duration		
Weekly Wage × 1(... above maximum)	-0.042	-0.056	-0.053**	-0.033*	-0.076
	(0.042)	(0.036)	(0.025)	(0.019)	(0.048)
Bandwidth	267.26	300	400	500	464.55
Polynomial order	1	1	1	1	2
Elasticity	0.53	0.71	0.67	0.42	0.96
			Panel B: On Temporary Benefits Paid		
Weekly Wage × 1(... above maximum)	-9.247**	-10.731***	-9.197***	-7.587***	-10.084*
	(3.633)	(2.997)	(2.087)	(1.613)	(5.734)
Bandwidth	246.51	300	400	500	350.99
Polynomial order	1	1	1	1	2
Elasticity	1.42	1.64	1.41	1.16	1.54

Notes: Dependent variable: Days on temporary disability in Panel A and temporary disability paid in Panel B. Standard errors in parentheses. Sample restricted to those injured during fiscal years 1990-2010, with weekly earnings within the bandwidth, whose claims were not rejected. Controls include fiscal year indicators, age, gender, nature of injury and industry indicators. Elasticity is calculated at the mean around the threshold. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table 5
Effect of Benefit Generosity on Reinjury Probability
Bandwidth: 200

	Discontinuity at Threshold Estimated				Discontinuity at Threshold = 0			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Weekly Wage	0.00014***	0.00016***	-0.00013	-0.00015	0.00016***	0.00016***	0.00011	0.00005
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Weekly Wage^2			-0.00000	-0.00000*			-0.00000	-0.00000
			(0.000)	(0.000)			(0.000)	(0.000)
1(Weekly Wage above maximum)	0.00651	0.00190	0.02984***	0.02364**				
	(0.008)	(0.008)	(0.010)	(0.009)				
Weekly Wage × 1(... above maximum)	-0.00061***	-0.00044***	-0.00083***	-0.00052**	-0.00060***	-0.00044***	-0.00068**	-0.00041
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Weekly Wage^2 × 1(... above maximum)			0.00000***	0.00000***			0.00000	0.00000
			(0.000)	(0.000)			(0.000)	(0.000)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	72,667	72,630	72,667	72,630	72,667	72,630	72,667	72,630
Elasticity	1.28	0.93	1.75	1.10	1.26	0.93	1.43	0.86

Notes: Dependent variable: Probability of reinjury. Standard errors in parentheses, allowing for clustering in bins (bin width = $10). Sample restricted to those injured during fiscal years 1990-2010, with weekly earnings within the bandwidth, whose claims were not rejected. Controls include fiscal year indicators, age, gender, nature of injury and industry indicators. Elasticity is calculated at the mean around the threshold. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table 6
Sensitivity Checks based on Calonico *et al.* (2014)
Effects of Benefit Generosity

	(1)	(2)	(3)	(4)	(5)
Weekly Wage $\times$ 1(... above maximum)	-0.00088***	-0.00080***	-0.00071***	-0.00066***	-0.00118***
	(0.00021)	(0.00018)	(0.00013)	(0.00010)	(0.0037)
Bandwidth	271.55	300	400	500	338.47
Polynomial order	1	1	1	1	2
Elasticity	1.85	1.68	1.50	1.39	2.49

Notes: Dependent variable: Probability of reinjury. Standard errors in parentheses. Sample restricted to those injured during fiscal years 1990-2010, with weekly earnings within the bandwidth, whose claims were not rejected. Controls include fiscal year indicators, age, gender, nature of injury and industry indicators. Elasticity is calculated at the mean around the threshold. *** significant at 1%; ** significant at 5%; * significant at 10%.

Appendix Tables

Table A1
Summary Statistics (at Threshold) - First Injury

Variable	Mean	Median	99 pct
Weekly Wage	768.62	714.00	1,585.16
Weekly Benefit	505.18	475.11	1,051.21
Injury Duration	60.73	20.00	554.00
Benefits Paid	4,873.01	1,625.56	40,736.00
Reinjury Probability	0.33	0	1

Notes: Sample restricted to those within $50 of the threshold, with non-missing running variables and non-rejected claims. Injury duration and benefits paid are top-coded at the 99 percentile.

Table A2
Effect of Benefit Generosity on Injury Duration - First Injury
Bandwidth: 200

	Discontinuity at Threshold Estimated				Discontinuity at Threshold = 0			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Weekly Wage	0.02125***	0.01737***	0.05053*	0.04525	0.02280***	0.01879***	0.03598	0.02991
	(0.006)	(0.006)	(0.026)	(0.027)	(0.005)	(0.005)	(0.023)	(0.024)
Weekly Wage^2			0.00014	0.00013			0.00008	0.00007
			(0.000)	(0.000)			(0.000)	(0.000)
1(Weekly Wage above maximum)	0.55812	0.51062	-1.79665	-1.89806				
	(1.341)	(1.333)	(1.637)	(1.666)				
Weekly Wage*1(... above maximum)	-0.02816**	-0.02659*	-0.01261	-0.00591	-0.02687**	-0.02541*	-0.02092	-0.01471
	(0.013)	(0.014)	(0.045)	(0.047)	(0.013)	(0.013)	(0.044)	(0.045)
Weekly Wage^2*1(... above maximum)			-0.00038	-0.00040			-0.00022	-0.00023
			(0.000)	(0.000)			(0.000)	(0.000)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	54,779	54,742	54,779	54,742	54,779	54,742	54,779	54,742
Elasticity	0.35	0.33	0.16	0.07	0.33	0.32	0.26	0.18

Notes: Dependent variable: Days on temporary disability. Standard errors in parentheses, allowing for clustering in bins (bin width = $10). Sample restricted to those injured during fiscal years 1990-2010, with weekly earnings within the bandwidth, whose claims were not rejected. Controls include fiscal year indicators, age, gender, nature of injury and industry indicators. Elasticity is calculated at the mean around the threshold. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table A3
Effect of Benefit Generosity on Temporary Benefits Paid - First Injury
Bandwidth: 200

	Discontinuity at Threshold Estimated				Discontinuity at Threshold = 0			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Weekly Wage	5.93012***	5.57826***	8.76783***	8.55232***	6.21867***	5.82841***	8.38884***	8.06730***
	(0.441)	(0.410)	(1.977)	(1.858)	(0.372)	(0.365)	(1.770)	(1.734)
Weekly Wage^2			0.01349	0.01414			0.01197	0.01219
			(0.010)	(0.009)			(0.009)	(0.009)
1(Weekly Wage above maximum)	103.37333	89.75988	-46.81917	-59.98948				
	(109.401)	(108.228)	(147.735)	(143.838)				
Weekly Wage*1(... above maximum)	-6.25603***	-6.59667***	-7.49914**	-8.16943**	-6.01822***	-6.38927***	-7.71568**	-8.44754**
	(1.152)	(1.129)	(3.690)	(3.644)	(1.094)	(1.054)	(3.445)	(3.350)
Weekly Wage^2*1(... above maximum)			-0.02220	-0.02180			-0.01802	-0.01644
			(0.020)	(0.019)			(0.014)	(0.014)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	54,779	54,742	54,779	54,742	54,779	54,742	54,779	54,742
Elasticity	0.97	1.02	1.16	1.26	0.93	0.99	1.19	1.31

Notes: Dependent variable: Payments to workers on temporary disability. Standard errors in parentheses, allowing for clustering in bins (bin width = \$10). Sample restricted to those injured during fiscal years 1990-2010, with weekly earnings within the bandwidth, whose claims were not rejected. Controls include fiscal year indicators, age, gender, nature of injury and industry indicators. Elasticity is calculated at the mean around the threshold. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table A4
Effect of Benefit Generosity on Injury Duration, Pre & Post 2002
Bandwidth: 200

Panel A: Pre 2002

	Discontinuity at Threshold Estimated				Discontinuity at Threshold = 0			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Weekly Wage	0.0165**	0.0125*	0.0219	0.0206	0.0207***	0.0158***	0.0230	0.0185
	(0.007)	(0.007)	(0.026)	(0.026)	(0.005)	(0.005)	(0.020)	(0.020)
Weekly Wage^2			0.0000	0.0000			0.0000	0.0000
			(0.000)	(0.000)			(0.000)	(0.000)
1(Weekly Wage above maximum)	1.4964	1.2045	0.1426	-0.2514				
	(1.376)	(1.315)	(1.716)	(1.649)				
Weekly Wage × 1(... above maximum)	-0.0290**	-0.0269**	0.0073	0.0067	-0.0255*	-0.0241*	0.0080	0.0055
	(0.012)	(0.012)	(0.039)	(0.040)	(0.013)	(0.013)	(0.041)	(0.041)
Weekly Wage^2× 1(... above maximum)			-0.0003	-0.0003			-0.0003*	-0.0002
			(0.000)	(0.000)			(0.000)	(0.000)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	66,532	66,506	66,532	66,506	66,532	66,506	66,532	66,506
Elasticity	0.34	0.32	-0.09	-0.08	0.31	0.29	-0.09	-0.07

Panel B: Post 2002

	Discontinuity at Threshold Estimated				Discontinuity at Threshold = 0			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Weekly Wage	0.0507***	0.0520***	0.1293	0.1077	0.0409**	0.0450**	0.1202*	0.1141*
	(0.018)	(0.017)	(0.078)	(0.069)	(0.017)	(0.017)	(0.066)	(0.060)
Weekly Wage^2			0.0004	0.0003			0.0003	0.0003
			(0.000)	(0.000)			(0.000)	(0.000)
1(Weekly Wage above maximum)	-3.5839	-2.5809	-1.1986	0.8452				
	(4.696)	(4.714)	(5.267)	(5.183)				
Weekly Wage × 1(... above maximum)	-0.0759*	-0.0899**	-0.3330**	-0.3300**	-0.0844**	-0.0960**	-0.3397**	-0.3253**
	(0.041)	(0.043)	(0.137)	(0.130)	(0.037)	(0.038)	(0.135)	(0.128)
Weekly Wage^2× 1(... above maximum)			0.0006	0.0007			0.0007	0.0006
			(0.001)	(0.001)			(0.001)	(0.001)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	6,135	6,124	6,135	6,124	6,135	6,124	6,135	6,124
Elasticity	1.58	1.85	6.94	6.88	1.76	2.00	7.08	6.78

Notes: Dependent variable: Days on temporary disability. Standard errors in parentheses, allowing for clustering in bins (bin width = $10). Panel A includes workers that were injured between fiscal year 1990 and December 31, 2001. Panel B includes workers that were injured between January 1, 2002 and fiscal year 2010. Sample restricted to those injured during fiscal years 1990-2010, with weekly earnings within the bandwidth, whose claims were not rejected. Controls include fiscal year indicators, age, gender, nature of injury and industry indicators. Elasticity is calculated at the mean around the threshold. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table A5
Effect of Benefit Generosity on Temporary Benefits Paid, Pre & Post 2002
Bandwidth: 200

Panel A: Pre 2002

	Discontinuity at Threshold Estimated				Discontinuity at Threshold = 0			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Weekly Wage	5.9442***	5.5169***	6.8903***	6.8626***	6.4509***	5.9187***	7.7286***	7.3320***
	(0.540)	(0.500)	(2.217)	(2.022)	(0.419)	(0.380)	(1.701)	(1.544)
Weekly Wage^2			0.0045	0.0064			0.0079	0.0083
			(0.009)	(0.008)			(0.008)	(0.007)
1(Weekly Wage above maximum)	181.0061	143.8560	103.0429	57.7609				
	(107.839)	(101.307)	(144.872)	(131.851)				
Weekly Wage × 1(... above maximum)	-6.7927***	-6.7397***	-6.1848*	-6.7673**	-6.3687***	-6.4008***	-5.7022	-6.4961*
	(0.993)	(0.983)	(3.381)	(3.266)	(1.057)	(1.009)	(3.801)	(3.489)
Weekly Wage^2× 1(... above maximum)			-0.0131	-0.0137			-0.0224	-0.0189
			(0.017)	(0.017)			(0.013)	(0.013)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	66,532	66,506	66,532	66,506	66,532	66,506	66,532	66,506
Elasticity	1.01	1.01	0.93	1.01	0.95	0.96	0.85	0.97

Panel B: Post 2002

	Discontinuity at Threshold Estimated				Discontinuity at Threshold = 0			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Weekly Wage	9.6812***	9.2756***	16.6623**	14.4127**	8.0232***	8.0711***	14.5927**	14.4265**
	(1.917)	(1.671)	(7.568)	(6.464)	(1.680)	(1.602)	(6.788)	(6.243)
Weekly Wage^2			0.0331	0.0244			0.0248	0.0244
			(0.037)	(0.032)			(0.035)	(0.031)
1(Weekly Wage above maximum)	-609.1230	-442.4886	-271.7370	1.8097				
	(495.782)	(494.335)	(526.772)	(514.493)				
Weekly Wage × 1(... above maximum)	-12.0160***	-13.0711***	-39.0573***	-39.5237***	-13.4507***	-14.1137***	-40.5671***	-39.5136***
	(3.951)	(4.170)	(12.865)	(12.674)	(3.691)	(3.678)	(12.702)	(12.003)
Weekly Wage^2× 1(... above maximum)			0.0741	0.0895			0.0983*	0.0893
			(0.066)	(0.066)			(0.057)	(0.057)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	6,135	6,124	6,135	6,124	6,135	6,124	6,135	6,124
Elasticity	2.14	2.32	6.94	7.03	2.39	2.51	7.21	7.02

Notes: Dependent variable: Payments to workers on temporary disability. Standard errors in parentheses, allowing for clustering in bins (bin width = $10). Panel A includes workers that were injured between fiscal year 1990 and December 31, 2001. Panel B includes workers that were injured between January 1, 2002 and fiscal year 2010. Sample restricted to those injured during fiscal years 1990-2010, with weekly earnings within the bandwidth, whose claims were not rejected. Controls include fiscal year indicators, age, gender, nature of injury and industry indicators. Elasticity is calculated at the mean around the threshold. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table A6
Effect of Benefit Generosity on Exiting Probability
Bandwidth: 200

	Discontinuity at Threshold Estimated				Discontinuity at Threshold = 0			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Weekly Wage	-8.75e-06**	-6.50e-06	-3.10e-05*	-3.62e-05**	-1.01e-05***	-7.37e-06*	-3.19e-05**	-3.44e-05**
	(4.29e-06)	(4.48e-06)	(1.78e-05)	(1.83e-05)	(3.62e-06)	(3.79e-06)	(1.48e-05)	(1.52e-05)
Weekly Wage^2			-1.06e-07	-1.42e-07*			-1.10e-07	-1.35e-07*
			(8.29e-08)	(8.52e-08)			(7.24e-08)	(7.46e-08)
1(Weekly Wage above maximum)	-0.000493	-0.000322	-0.000113	0.000219				
	(0.000865)	(0.000885)	(0.00128)	(0.00130)				
Weekly Wage × 1(... above maximum)	9.20e-06	1.04e-05	4.70e-05	5.96e-05*	7.91e-06	9.55e-06	4.64e-05	6.08e-05*
	(8.41e-06)	(8.73e-06)	(3.19e-05)	(3.26e-05)	(8.06e-06)	(8.41e-06)	(3.10e-05)	(3.18e-05)
Weekly Wage^2× 1(... above maximum)			2.00e-08	3.34e-08			3.02e-08	1.35e-08
			(1.63e-07)	(1.67e-07)			(1.12e-07)	(1.15e-07)
Observations	1,110,202	1,109,547	1,110,202	1,109,547	1,110,202	1,109,547	1,110,202	1,109,547
Elasticity	-0.14	-0.16	-0.71	-0.91	-0.12	-0.15	-0.70	-0.92

Notes: Dependent variable: Probability worker exists workers' compensation in a given week. Standard errors in parentheses, allowing for clustering in bins (bin width = $10). Sample restricted to those injured during fiscal years 1990-2010, with weekly earnings within the bandwidth, whose claims were not rejected. Controls include fiscal year indicators, age, gender, nature of injury and industry indicators. Elasticity is calculated at the mean around the threshold. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table A7
Effect of Benefit Generosity among Workers with Difficult-to-Diagnose Injuries
Bandwidth: 200

Panel A: Injury Duration

	Discontinuity at Threshold Estimated				Discontinuity at Threshold = 0			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Weekly Wage	0.0136	0.0118	0.0355	0.0327	0.0147**	0.0127*	0.0311	0.0287
	(0.009)	(0.009)	(0.035)	(0.035)	(0.007)	(0.007)	(0.022)	(0.022)
Weekly Wage^2			0.0001	0.0001			0.0001	0.0001
			(0.000)	(0.000)			(0.000)	(0.000)
1(Weekly Wage above maximum)	0.3665	0.3187	-0.5385	-0.4926				
	(1.412)	(1.405)	(2.235)	(2.250)				
Weekly Wage × 1(... above maximum)	-0.0207	-0.0196	-0.0388	-0.0388	-0.0198	-0.0188	-0.0414	-0.0411
	(0.013)	(0.013)	(0.049)	(0.052)	(0.015)	(0.014)	(0.053)	(0.055)
Weekly Wage^2 × 1(... above maximum)			-0.0001	-0.0001			-0.0001	-0.0001
			(0.000)	(0.000)			(0.000)	(0.000)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	43,983	43,970	43,983	43,970	43,983	43,970	43,983	43,970
Elasticity	0.26	0.25	0.37	0.37	0.25	0.24	0.53	0.53

Panel B: Temporary Benefits Paid

	Discontinuity at Threshold Estimated				Discontinuity at Threshold = 0			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Weekly Wage	5.7545***	5.5168***	7.7348***	7.6068***	5.8339***	5.6366***	7.5855***	7.6542***
	(0.676)	(0.641)	(2.772)	(2.657)	(0.518)	(0.497)	(1.880)	(1.843)
Weekly Wage^2			0.0095	0.0100			0.0089	0.0102
			(0.011)	(0.010)			(0.008)	(0.008)
1(Weekly Wage above maximum)	28.3097	42.8164	-18.3623	5.8445				
	(115.243)	(112.874)	(186.740)	(183.103)				
Weekly Wage × 1(... above maximum)	-6.0275***	-6.5186***	-8.9559*	-10.0546**	-5.9601***	-6.4159***	-9.0441*	-10.0264**
	(1.185)	(1.170)	(4.535)	(4.633)	(1.216)	(1.188)	(4.659)	(4.732)
Weekly Wage^2 × 1(... above maximum)			-0.0042	-0.0020			-0.0025	-0.0025
			(0.023)	(0.023)			(0.016)	(0.016)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	43,983	43,970	43,983	43,970	43,983	43,970	43,983	43,970
Elasticity	1.01	1.10	1.51	1.69	1.00	1.08	1.52	1.69

Notes: Dependent variable: Days on temporary disability (A); Payments to workers on temporary disability (B). Standard errors in parentheses, allowing for clustering in bins (bin width = $10). Sample restricted to those injured during fiscal years 1990-2010, with weekly earnings within the bandwidth, whose claims were not rejected. Controls include fiscal year indicators, age, gender, nature of injury and industry indicators. Elasticity is calculated at the mean around the threshold. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table A8

Effect of Benefit Generosity on Reinjury Probability among Workers with Difficult-to-Diagnose Injuries

Bandwidth: 200

	Discontinuity at Threshold Estimated				Discontinuity at Threshold = 0			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Weekly Wage	0.00016***	0.00017***	-0.00010	-0.00013	0.00018***	0.00017***	0.00016	0.00006
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Weekly Wage^2			-0.00000	-0.00000			-0.00000	-0.00000
			(0.000)	(0.000)			(0.000)	(0.000)
1(Weekly Wage above maximum)	0.00801	-0.00057	0.03205**	0.02303				
	(0.011)	(0.011)	(0.015)	(0.016)				
Weekly Wage × 1(... above maximum)	-0.00065***	-0.00046***	-0.00093**	-0.00062	-0.00063***	-0.00046***	-0.00078*	-0.00051
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Weekly Wage^2 × 1(... above maximum)			0.00000**	0.00000**			0.00000	0.00000
			(0.000)	(0.000)			(0.000)	(0.000)
Observations	43,983	43,970	43,983	43,970	43,983	43,970	43,983	43,970
Elasticity	1.37	0.97	1.96	1.31	1.33	0.97	1.64	1.07

Notes: Dependent variable: Reinjury probability. Standard errors in parentheses, allowing for clustering in bins (bin width = \$10). Sample restricted to those injured during fiscal years 1990-2010, with weekly earnings within the bandwidth, whose claims were not rejected. Controls include fiscal year indicators, age, gender, nature of injury and industry indicators. Elasticity is calculated at the mean around the threshold. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table A9
Effect of Benefit Generosity on Reinjury Probability among Workers with Same-Type Reinjuries
Bandwidth: 200

	Discontinuity at Threshold Estimated				Discontinuity at Threshold = 0			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Weekly Wage	0.00007***	0.00007***	-0.00008	-0.00008	0.00011***	0.00010***	0.00012	0.00007
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Weekly Wage^2			-0.00000	-0.00000*			0.00000	-0.00000
			(0.000)	(0.000)			(0.000)	(0.000)
1(Weekly Wage above maximum)	0.01317**	0.00840	0.02526***	0.01852**				
	(0.006)	(0.005)	(0.009)	(0.008)				
Weekly Wage × 1(... above maximum)	-0.00036***	-0.00021***	-0.00044**	-0.00022	-0.00033***	-0.00019***	-0.00032	-0.00014
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Weekly Wage^2× 1(... above maximum)			0.00000**	0.00000*			-0.00000	-0.00000
			(0.000)	(0.000)			(0.000)	(0.000)
Observations	72,667	72,630	72,667	72,630	72,667	72,630	72,667	72,630
Elasticity	2.16	1.26	2.64	1.32	1.98	1.14	1.92	0.84

Notes: Dependent variable: Reinjury probability of the same type. Standard errors in parentheses, allowing for clustering in bins (bin width = $10). Sample restricted to those injured during fiscal years 1990-2010, with weekly earnings within the bandwidth, whose claims were not rejected. Controls include fiscal year indicators, age, gender, nature of injury and industry indicators. Elasticity is calculated at the mean around the threshold. *** significant at 1%; ** significant at 5%; * significant at 10%.