How Does the Income Effect Vary with Skill Level for Workers with Disabilities? Evidence from Workers' Compensation

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Abstract

Understanding how skilled vs. unskilled workers respond to disability benefits could help SSA determine how skill level should factor into disability determinations. Individuals with transferable skills could be better able to adapt to new occupations after the onset of a health condition that prevents them from returning to their previous occupations, which could make them more or less responsive to the amount of disability benefits. However, given that that benefits are determined by one's prior earnings using the same formula for all disabled workers, it is impossible to test whether return-to-work outcomes for workers with and without transferable skills differ in their sensitivity to the amount of disability benefits. This paper takes advantage of a policy change to permanent partial disability (PPD) benefits in Oregon workers' compensation to identify an income effect in response to disability benefits, and to examine how this income effect varies with a worker's skill level. In practice, the policy change resulted in nearly every individual receiving a different PPD benefit after 2005 compared to what she would have gotten prior to 2005. We find that unskilled workers are more responsive to benefit levels than skilled workers for a range of return-to-work outcomes including employment, earnings and weekly hours. For example, a $1,000 increase in PPD benefits results in a 0.35% decline in the probability of return-to-work for unskilled workers, compared to a 0.15% decline in the probability of return-to-work for skilled workers. While these estimates seem small it is important to keep in mind that a change in PPD benefits represents a one-time change in non-labor income. Indeed, if we rescale estimates from the prior literature to represent a one-time change in benefit levels then our estimates are in line with, if not larger than, other recent estimates of income effects for this population.

1. Introduction

Return to work after the onset of a health condition depends on several important factors. An individual must have sufficient residual functional capacity to do the activities required by a job. Sometimes, an individual may need to change employment if he or she cannot perform the same job as prior to the onset of the health condition. Individuals with transferable skills could be better able to adapt to new occupations after the onset of a health condition that prevents them from returning to their previous occupations. As a result, workers with transferrable skills could have more control over their return-to-work choices, making them more responsive to the amount of disability benefits. On the other hand, unskilled workers could face more liquidity constraints than skilled workers, in which case more cash benefits could enable them to delay return-to-work until they have found a better job match. However, given that that benefits are determined by one's prior earnings using the same formula for all disabled workers, it is impossible to test whether return-to-work outcomes for workers with and without transferable skills differ in their sensitivity to the amount of disability benefits.

SSA considers an individual to have transferable skills when "the skilled or semi-skilled job functions he or she has performed in his or her past relevant work can be used to meet the requirements of other work within his or her residual functional capacity (RFC)." Skill level—measured using the specific vocational preparation (SVP) rating, or the amount of preparation time required for a worker to develop the skills needed to perform the job, of one's past occupation—makes a material difference in the outcome of SSA's disability determination process for 33 medical-vocational rules that also depend on the applicant's age, education and RFC (SSA, 2021). Understanding how skilled vs. unskilled workers respond to disability benefits could help SSA determine how skill level should factor into disability determinations.

In this paper, we exploit a policy change to permanent disability benefits in Oregon workers' compensation to identify an income effect in response to disability benefits, and to examine how this income effect varies with a worker's skill level. Oregon instituted a major change to the formula for permanent partial disability (PPD) benefits in workers' compensation in 2005. In practice, the policy change resulted in nearly every individual receiving a different PPD benefit after 2005 compared to what she would have gotten prior to 2005. While nearly every worker experienced a change in benefits, certain types of workers experienced larger changes than others, as we describe below. PPD beneficiaries typically have the most severe injuries in the workers' compensation system. They are thus most likely to resemble SSDI beneficiaries and could potentially transition to SSDI if they are unable to return to work successfully (e.g., Murphy et al. 2020, Burton and Guo 2016, O'Leary et al. 2012). Furthermore, work disability in the Oregon setting is determined based on a very similar set of guidelines as used in SSA's medical-vocational decisions. Importantly, the 2005 reform presents a unique opportunity to examine how return-to-work outcomes vary with the generosity of disability benefits for workers with different skill levels, or SVP.

We find that unskilled workers are more responsive to benefit levels than skilled workers for a range of return-to-work outcomes including employment, earnings and weekly hours. For example, a $1,000 increase in PPD benefits results in a decline in the probability of work by 0.26 percentage points for unskilled workers, compared to 0.12 percentage points for skilled workers. This represents a 0.35% decline in the probability of return-to-work for unskilled workers, compared to a 0.15% decline in the probability of return-to-work for skilled workers. Note that unskilled and skilled workers receive similar average PPD benefits ($8,991 for unskilled workers and $8,832 for skilled workers), so a $1,000 increase in benefits is equivalent to an 11% increase in benefits for both groups. This implies the elasticity of labor supply with respect to non-labor income is approximately 0.03 for unskilled workers and 0.01 for skilled workers.

While these estimates seem small it is important to keep in mind that a change in PPD benefits typically are provided in a lump sum rather than an annuity, representing a one-time change in non-labor income. Indeed, if we rescale estimates from the prior literature from annuity payments to represent a one-time change in benefit levels then our estimates are in line with, if not larger than, those in the literature. For example, Autor et al. (2016) examine the effect of the 2001 Agent Orange decision that expanded eligibility of U.S. veterans with type 2 diabetes who served in the theater for Disability Compensation (DC) benefits on labor supply and they estimate that receiving an annual DC benefit—on average, approximately $10,000—reduced veterans' labor force participation by 18 percentage points. Assuming a 2.4% discount rate, a $10,000 annual DC benefit is equivalent to a present-discounted value (PDV) of $113,439.[1] This implies a one-time change of $1,000 in non-labor income reduced the labor force participation of American veterans with type 2 diabetes by 0.16 percentage points. Similarly, rescaling estimates from Marie and Vall Castello (2012) yields an employment effect of -0.02 percentage points per $1,000 increase in the PDV of disability benefits for Spanish PPD beneficiaries aged 55 and older, and rescaling estimates from Gelber, Moore and Strand (2017) yields an employment effect of -0.10 percentage points per $1,000 increase in the PDV of SSDI benefits.

[1] The average age of the veterans in the sample is 52.6 years and we assume benefits are received until the full retirement age of 66 years.

2. Institutional Background

In Oregon, when a worker files a workers' compensation claim, she is immediately eligible for health insurance, which covers any medical expenses associated with the workplace injury. If the worker misses work due to the injury, she is eligible to receive temporary total disability (TTD) benefits equal to two-thirds of wages (subject to a minimum and maximum) after a three-day waiting period from the date of injury.[2] The worker may receive temporary benefits as long as a doctor verifies that she is currently unable to work and her condition has not yet stabilized. Eventually, the worker is deemed to have reached "maximum medical improvement" (MMI), the point where no further recovery is expected. At this stage, if there is any residual incapacity due to the injury or illness, the worker is assessed for permanent disability benefits and the claim is closed.

The most common type of permanent disability benefit, and the focus in this paper, is the permanent partial disability (PPD) benefit.[3] If awarded, PPD benefits are provided to the worker at the time of claim closure, regardless of the workers' subsequent work activity. Awards totaling less than $6,000 are provided in a lump sum at claim closure. By default, larger awards are provided in monthly installments at a rate similar to the temporary benefit rate, although workers with larger awards may opt to receive their PPD benefit as a lump sum.[4] Conditional on receiving PPD benefits, the average time from injury date to claim closure date is just over one year, and 95 percent of workers reach MMI within three years.

[2] See https://www.oregonlaws.org/ors/656.210 for the exact details of how TTD payments are calculated.

[3] In 2018, approximately 17 percent of all indemnity claims in Oregon were for permanent partial disability awards. The main other type of permanent benefit is permanent total disability benefits, which accounted for 2 percent of all indemnity claims in 2018. See https://www.oregon.gov/dcbs/reports/compensation/indemnity/Pages/index.aspx

[4] Over the analysis period for our paper, between 50 and 60 percent of PPD awards were less than $6,000. Based on estimates from a large state insurer, between 15 and 20 percent of awards above $6,000 request to receive a lump sum.

In 2003, Oregon passed Senate Bill 757 (SB 757), which introduced a significant change to the PPD benefit formula effective for injuries occurring on or after January 1, 2005. Prior to 2005, the PPD award to depended on two main factors: 1) whether the injury involved particular body parts that were listed on a pre-existing schedule ("scheduled injuries") or not ("unscheduled injuries");[5] and 2) the severity of the resulting impairment in functioning, rated as a percent of the person or whole body.[6] The benefit for unscheduled injuries depended on two additional factors: 1) whether the worker was deemed unable to return to the job held at the time of injury; and 2) conditional on being deemed unable to return to one's pre-injury job, one's rating of *work disability*, defined as the extent to which the injury might prevent future work, taking into account the worker's age, education, the specific vocational preparation (SVP) required to perform the pre-injury job, and the relationship between the claimant's base functional capacity (before the injury) and residual functional capacity (after the injury). Workers with scheduled injuries were ineligible for work disability awards prior to 2005. (DCBS 2015)

Specifically, the benefit formula prior to the 2005 reform was as follows:

$$PPD_{iT}^{Pre} = \begin{cases} p_i^p * BEN_T^S\,, & S_i = 1, \\ f_U(p_i^P + W_i * p_i^W), & S_i = 0, \end{cases} \qquad (1)$$

where PPD_{it}^{Pre} denotes the pre-reform PPD benefit awarded to worker *i* for an injury occurring in year *T*, which is a function of whether the injury is scheduled ($S_i = 1$). For scheduled impairments, the benefit increases linearly in the impairment rating p_i^P with slope

[5] For example, injuries to the hand or foot, or hearing loss, were scheduled injuries. Unscheduled injuries included conditions such as back pain, shoulder pain, and mental conditions.

[6] Scheduled and unscheduled injuries had different rating procedures. For scheduled injuries, the extent of impairment was determined relative to the injured body part, whereas for unscheduled injuries, the extent of impairment was determined relative to the whole body. We convert impairment ratings for scheduled injuries to the percent of the person by dividing the specified degrees for the body part(s) by 320 (the maximum number of degrees for the whole body).

BEN_T^S. For unscheduled impairments, the benefit is a convex kinked function f_U increasing in the sum of the impairment rating p_i^P and (if eligible for work disability, $W_i = 1$) the work disability rating p_i^W.

In 2005, SB 757 introduced a new rating procedure and benefit calculation to be applied to all PPD cases, eliminating the distinction between scheduled and unscheduled injuries. Now all claimants, regardless of injury type, would be eligible for work disability if deemed unable to return to the pre-injury job. Additionally, if deemed unable to return to one's pre-injury job, the benefit now depended on an additional factor: the individual's pre-injury weekly wage. Specifically, the benefit formula after the 2005 reform is as follows:

$$PPD_{iT}^{Post} = p_i^P * 100 * SAWW_T + W_i * (p_i^P + p_i^W) * 150 * w_{iT}. \qquad (2)$$

where PPD_{iT}^{Post} indicates the benefit post reform, $SAWW_T$ is the state average weekly wage in the year of injury, and w_{iT} is the individual's pre-injury weekly wage.

Figure 1 illustrates the Oregon PPD benefit as a function of impairment rating before and after the 2005 reform, separately for scheduled and unscheduled injuries. The dashed lines represent the pre-reform benefit functions for scheduled injuries (Figure 1a) and unscheduled injuries (Figure 1b). The right panel also illustrates two cases for unscheduled injuries before the reform: without work disability and with a work disability rating of 10% (the blue and orange dashed lines, respectively). Prior to the reform, individuals with scheduled injuries tended to receive higher PPD benefits than those with unscheduled injuries, especially if the unscheduled injury was not rated for work disability. For example, in 2004 an individual with an impairment severity rating of 5% (of the whole person) would receive $8,944 if their injury was scheduled, $2,944 if their injury was unscheduled and they were not also rated for work disability, and $8,832 if their injury was unscheduled and they had a 10% work disability rating.

The solid lines in Figures 1a and 1b represent the post-reform benefit functions for three cases: 1) no work disability rating (blue solid line); 2) a 10% work disability rating and pre-injury wage of $400 (the 25th percentile in our sample) (orange solid line); and 3) a 10% work disability rating and pre-injury wage of $800 (the 75th percentile in our sample) (grey solid line). Recall that the post-reform benefit functions are the same for scheduled and unscheduled injuries. In 2005, an individual with an impairment severity rating of 5% (of the whole person) and no work disability rating would receive $3,443, regardless of body part(s) injured. Eligibility for work disability substantially increase the PPD benefit: an individual with the same 5% impairment rating, a 10% work disability rating, and pre-injury weekly wage of $400 would receive $12,443. The benefit also varies significantly with the pre-injury wage: an individual with the exact same impairment and work disability ratings would receive $21,443 if her pre-injury weekly wage were $800.

Figures 1c and 1d illustrate the pre- vs. post-reform difference in the amount of benefits received as a function of impairment rating, work disability rating and pre-injury weekly wage for scheduled (Figure 1c) and unscheduled (Figure 1b) injuries for each of the three work disability and wage combinations presented in Figures 1a and 1b, respectively. Both the sign and the magnitude of the potential change in benefit due to the reform vary enormously, ranging from -$11,024 (for someone with a formerly scheduled injury, 100% impairment severity rating and no work disability rating) to upwards of $44,950 (for someone with a formerly unscheduled injury, 40% impairment severity rating, 10% work disability rating, and pre-injury weekly wage equal to the 75th percentile of the distribution).

In practice, the policy change resulted in nearly every individual receiving a different PPD benefit after 2005 compared to what she would have gotten prior to 2005. The potential changes tended to be largest for workers with injuries that would have been considered scheduled prior to the reform, but who also remaining have work disability. Because SVP is a factor in determining benefits, unskilled workers may be more likely to receive a work disability rating both before and after the policy change. However, because the total award is based on a (changing) function of the impairment rating, work disability rating and pre-injury weekly wage, there is no clear prediction for whether unskilled or skilled workers are likely to receive systematically higher or lower benefits after the reform. Indeed, as we show below, skilled and unskilled workers on average receive similarly sized benefits.

3. Data and Descriptive Statistics

3.1 Oregon Workers' Compensation Claims and Employment Data

Detailed data on injury types, disability ratings, and worker characteristics are essential to examine the effect of this policy change. We utilize several administrative datasets from the Workers' Compensation Division of the Oregon Department of Business and Consumer Services (DBCS) and the Oregon Employment Department (OED). DCBS provided claim-level data for all closed claims with workers' compensation indemnity benefits between 1987 and 2012. The database includes information about total indemnity and medical payments made on the claim, total temporary disability (TTD) days paid, and key dates including date of injury, first and last dates of TTD payments, and claim closure date. Worker characteristics included in the database are date of birth, gender, pre-injury weekly wage, industry and importantly, occupation at the time of injury. DCBS also provided information on total PPD awards, injured body parts, and award type (e.g., impairment, work disability). Additional information about return to work at the time of claim closure is provided for the subset of claims with injury years between 2001 and 2012. The dataset also includes impairment ratings for injury years 1999-2012.

DCBS worked with OED to match PPD awards in these years to quarterly wage records in the state Unemployment Insurance (UI) database starting in the third quarter of 1999 and ending in the fourth quarter of 2012. DCBS and OED matched records using worker Social Security Numbers and excluded outlier records in the wage database as well as observations with inconsistent and incomplete data. OED and DCBS achieved approximately a 97 percent worker match rate between the UI database and workers' compensation claims records. The UI database includes quarterly data on total earnings, hours and an anonymized employer ID.

Together, these data sources give us a detailed account of claimant demographic and injury characteristics, PPD rating and other formula inputs. Additionally, we have complete employment information before and after injury for closed PPD claims in Oregon between 2001 and 2012. Because PPD claims can take years to develop and ultimately close, we apply a constant maturity screen to all injury years in our analysis and include claims that were closed within three years of the date of injury. This screen addresses concerns that slow-developing claims in later injury years might not have closed at the time of the match to the wage records and would be disproportionately excluded from the dataset.[7] Thus, we restrict our analysis sample to injuries occurring between 2001 and 2009. In practice, this restriction excludes approximately 5 percent of claims (primarily from earlier years) in the analysis. After these restrictions, our total sample size is approximately 38,000.

A limitation of the administrative claims data set is that, while it includes rich information on formula inputs, it only captures the specific inputs—or combination of inputs—required to

[7] We also applied a constant maturity screen of two years and find similar results, shown in Appendix Table 2.

calculate PPD benefits in the contemporaneous policy regime and not in the alternative regime. In particular, prior to 2005, work disability ratings (if any) were not reported separately from impairment ratings for unscheduled claims since only the sum of the ratings was needed to calculate benefits. Moreover, since scheduled claims were ineligible for work disability awards prior to 2005, we do not know exactly which of these claims would have been eligible for work disability, or what the rating would have been. Since we do not separately observe the impairment and work disability rating for pre-2005 claims, we are unable to calculate hypothetical post-2005 benefits to assess what the exact difference in their benefit would have been in the alternative regime.[8]

We correct this asymmetry by using only observable characteristics that are available for all claims in the data set as predictors of PPD benefits. As discussed in Section 2, workers are eligible for work disability if they are deemed unable to return to their pre-injury job. Conditional on eligibility, the work disability rating is a function of the worker's age, education, the specific vocational preparation required to perform the pre-injury job, and the relationship between the claimant's base functional capacity (before the injury) and residual functional capacity (after the injury). Our data set does not include work disability eligibility, education or claimants' base and residual functional capacity, but it does include a rich set of demographic, injury and occupation characteristics. Appendix Table 1 shows that indicators for whether the claimant was released to work by a physician and whether the claimant returned to work prior to claim closure are strong predictors of whether or not someone is eligible for work disability, and that the applicant's age, gender, occupation, injury type medical expenditures and TTD duration are strong predictors of the work disability rating, for the subsample of post-2005 claimants.

[8] On the other hand, the separate variables for impairment rating and work disability rating recorded after 2005 do enable us to calculate hypothetical pre-2005 benefits for all post-2005 claims.

Finally, due to the change in focus from ratings based on individual body parts to those based on the whole person, there are some differences in the way specific body parts are recorded in the database before and after the reform. For example, suppose a worker burned her hand. Prior to the reform, each finger would receive a separate scheduled rating based on the extent of the burn to that finger, and the multiple injuries would be combined to obtain a total scheduled award. After the shift to assessment of impairment for the entire person, the distinction between hand and finger no longer mattered, so the burn would more likely be reported simply as an injury to the hand. In other words, identical injuries with the same level of severity are recorded in different body parts before and after 2005. To account for this difference, we aggregate injuries into broader body systems (e.g., combining injuries to the hand and fingers).

3.2 Occupational Requirements Survey Data

To measure occupational skill levels, we use public-use data from the Occupational Requirements Survey (ORS) about the specific vocational preparation (SVP) required for each occupation. The ORS includes data on the percentage of workers with a given SVP requirement for each occupation included in the dataset. Occupations are classified using six-digit standard occupation codes (SOC codes), enabling linkages between the ORS and other data sources. In our analyses, we rely primarily on the 2018 ORS, but we append 26 additional occupations from the preliminary 2020 ORS that were not in the 2018 database. In total, we obtain SVP information for 323 unique six-digit SOC codes from the 2018 and 2020 ORS.

We take several steps in preparing this data for our analysis. First, for each occupation, we aggregate the percentage of workers with a given SVP into the three categories as defined by SSA in its Program Operations Manual: unskilled (SVP of 1 or 2), semi-skilled (SVP of 3 or 4), or skilled (SVP 5-9) (SSA 2021).[9] Then, we assign the category with the highest percentage to be the skill level for that occupation. For example, if the ORS reported that 30% of workers in a given occupation were skilled, 30% were semi-skilled and 40% were skilled, we would label this occupation as a skilled occupation. Interestingly, we observe very few semi-skilled occupations in the database: only 17 percent of all occupations have *any* share of workers with an SVP of 3 or 4. Across the 17 percent of occupations with an SVP of 3 or 4 recorded, the average share of workers in those SVP categories is less than 10 percent. In practice, this means that the semi-skilled category is not the modal skill category for any of the occupations in the database, and so we end up classifying all occupations as either skilled or unskilled.

After classifying all occupations as skilled or unskilled, we then link the data on SVP to the workers' compensation claims data by six-digit SOC code. There are several caveats with this linkage. First, the claims data transitioned from using the Bureau of Labor Statistics' Occupational Coding Manual (OCC) to SOC codes around 2006. At the time of the conversion, older claims were converted from OCC codes to SOC codes as well, although many earlier claims only have OCC codes in the database. Nearly all 2001 and 2002 claims are missing SOC codes. Approximately 85 claims have a SOC code by 2004, and approximately 95 percent for claims in 2006 and after have a SOC code in the database. Secondly, even in the later years where we do have six-digit SOC codes for all occupations, we obtain a match rate with the ORS of approximately 76 percent, meaning that some of the six-digit SOC codes present in our database are not included in the ORS. In total, approximately 50 percent of our database is

[9] The O*NET database, which also contains occupational characteristics, does not report individual SVP levels but instead aggregates them into "job zones" that are based on SVP. Unfortunately the cut points for job zones do not coincide with SSA's definitions of unskilled, semi-skilled and skilled. For example, job zone 1 is defined by SVP levels 1-3 and contains a mix of unskilled and semi-skilled work; similarly, job zone 2 (SVP levels 4-5) contains a mix of semi-skilled and skilled work. Therefore we do not make use of the O*NET in this paper.

missing an SVP skill category after the initial match to the ORS – either due to the SOC code conversion in the claims data, or because the six-digit SOC code from the claims data did not have a corresponding code in the ORS.

We impute missing SVP skill categories by applying the modal SVP skill category for the 2-digit SOC code for all claims missing a match, regardless of the reason for the missing match. We also tested approaches where we assigned the minimum or maximum SVP skill category instead of the mode, but the mode comes closest to matching the observed distribution among non-imputed cases in the data. Approximately 60 percent of non-imputed occupations are classified as skilled; in our final dataset including the imputed cases, 66 percent of occupations are classified as skilled.[10]

3.3 Descriptive Statistics and Trends in Claim Characteristics Before and After the Reform

Table 1 compares observable characteristics between claims classified as skilled and unskilled. The characteristics of these workers vary in important ways. Unskilled workers are slightly younger, more likely to be female, have significantly lower pre-injury weekly wages ($485 vs. $701 in $2005, or $677 vs. $979 in $2021). They also have slightly longer claim durations, and are less likely to return and be released to work at the time of claim closure. The fact that unskilled workers are less likely to be returned or released to work implies that they could be more likely to qualify for work disability. Interestingly, however, the average PPD benefit received is similar between the two groups ($8,991 vs. $8,832 in $2005, or $12,561 vs. $12,339 in $2021).

[10] The share classified as skilled when imputing using the minimum or maximum is 32 or 78 percent, respectively.

In the overall database, the four most common occupations are production, transportation, construction, and maintenance, with over half of claims occurring in one of these four occupations. However, only 33 percent of unskilled workers work in one of these occupations. The largest differences are in production (9% of unskilled vs. 22% of skilled), construction (6% of unskilled vs. 17% of skilled) and maintenance (1% of unskilled vs. 11% of skilled). Injury types and impairment ratings, however, are similar between skilled and unskilled occupations. Unskilled workers with unscheduled injuries have slightly higher impairment plus work disability ratings on average.

Next, we examine trends in observable outcomes before and after 2005 to ensure that the composition of claims did not change dramatically with the policy reform. Figure 2 presents visual evidence as to whether there was a discontinuous change in claim characteristics coinciding with the reform in 2005 for select characteristics. The average claimant is in his or her early 40s, and no discernible discontinuous trend break in the share of claimants over age 40 after the reform was enacted. Total medical expenditures range between $14,000 and $15,000 in $2005 (approximately $20,200 in $2021). Average claim duration is approximately one year. Figure 2 shows that in fact there was a gradual declining trend in claim duration over the entire decade, but no discontinuous break in claim duration coinciding with the policy change in 2005. The share of claims from production occupations declined from 20 percent before 2005 to 14 percent afterwards, but there is no discrete break in 2005 (Figure 2).

Approximately 30-40 percent of all claims result from muscle strains or sprains. While the share of claims coming from strains/sprains is significantly lower after 2005, Figure 2 again shows that this is the result of a gradual trend. Before 2005, 60 percent of all PPD claims were for scheduled injuries; the share of injuries that would have been scheduled based on body part(s) injured is 62 percent after 2005. As can be seen in Figure 2, the percent of injuries to (previously) scheduled body parts does not change discontinuously at the time of the reform.

Next, Table 2 compares the distribution of broad body system injuries and the associated PPD ratings before and after 2005, separately for scheduled and unscheduled injuries to account for the comparability issues discussed in Section 3.1. Specifically, for scheduled injuries we show the average impairment rating as a percentage of the person before and after the reform and for unscheduled injuries we show the average combined impairment and work disability ratings.[11] As shown in Panel A, the average overall impairment rating remains steady over the entire analysis period at approximately 5 percent of the whole person for scheduled injuries. At the same time there are some statistically significant differences in the composition of scheduled injuries even when aggregating by broad body system.[12] Importantly, however, there are no statistically significant differences in the average impairment rating – the input which determines the benefit level - by body system.

Panel B shows similar trends for unscheduled injuries. Overall, the average impairment plus work disability percentage is constant around 14 percent. Again, despite the fact that there are some statistically significant differences in the composition of unscheduled injuries, there are no statistically significant differences in the average combined impairment and work disability rating by body system.

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[11] Some body system groups (specifically, arm/shoulder and leg/hip) combine body parts that were both scheduled and unscheduled before the reform. For these groups, we present the frequency and average impairment or combined rating for the subset of scheduled and unscheduled injuries within these groups. injuries.

[12] Figure A4 presents the complete time series of average percent of body system injuries by injury year for those variables with p-values less than 0.05 in Table 2.

4. Empirical strategy

Our empirical approach takes advantage of the significant change in benefits under SB 757 to isolate the income effect associated with disability benefits. Because PPD benefits are calculated at the time of claim closure and are not affected by post-closure labor supply, the elasticity of labor supply with respect to PPD benefit size can be interpreted as an income effect, without an accompanying change in the shadow price of leisure. Then, we examine the extent to which this income effect varies with SVP to assess how skills might affect the response to the generosity of benefits.

In both policy regimes, PPD benefits are functions of observable factors—specifically, impairment type (scheduled or unscheduled), impairment severity, work disability eligibility, work disability rating (if eligible) and pre-injury wage. However, an Ordinary Least Squares (OLS) regression of labor supply on PPD benefits controlling for formula inputs will identify the causal effect of the benefit only if strict functional form assumptions are met, for example, in the case where the benefit value is a non-linear function of formula inputs. Instead, we take advantage of the variation in benefits across policy regimes for observationally identical individuals to identify the causal effect of PPD benefits on labor supply using a dose-response relationship. Similar approaches have been used to study effects of disability insurance benefit generosity on labor supply in Austria (Mullen and Staubli 2016) and the impact of student aid on college enrollment (Nielsen et al. 2010).

As demonstrated in Figures 3 and 4, SB 757 changed the value of benefits for all workers with permanent impairments. Figure 3 presents the difference between the actual PPD benefit for post-2005 claims and the hypothetical pre-2005 PPD benefit for scheduled (left panel) and unscheduled (right panel) injuries. (Figure 3 is analogous to the empirical analogue of the illustrative scenarios shown in Figures 1c and 1d.). Figure 4 shows the combined cumulative distribution of this difference for all post-2005 claims. As can be seen from the figures, 44 percent of post-2005 claimants received larger benefits than they would have prior to the reform and 56 percent—mostly those whose injuries would have been considered scheduled before 2005—received smaller benefits. The magnitude of the difference in pre- vs. post-reform benefit ranges from approximately -$15,000 to $30,000; the mean decrease was $4,223 (median $2,629) and the average increase was $5,596 (median $1,738).

To exploit the wide variation in the effect of the 2005 reform on PPD benefit levels, we implement an instrumental variables approach where we first predict each worker's benefit based on a comprehensive set of observable formula inputs and case characteristics that are comparable across policy regimes interacted with the policy regime, and then regress return-to-work outcomes on the predicted benefit.[13] Specifically, we estimate the following two-stage model:

$$(3)\ Ben_{iT} = POST_{iT} * Z_{iT} * \psi + Z_{iT}\gamma + \lambda_T + \mu_{iT}$$

$$(4)\ y_{it} = \phi\, Ben_{iT} + Z_{iT}\beta + \delta_T + \varepsilon_{it}$$

In the first stage, we predict the benefit Ben_{iT} for worker i who was injured in year T using information about observable characteristics Z_{iT} (described below), interactions between Z_{iT} and an indicator for claims that occurred after 2005 ($POST_{iT} * Z_{iT}$),[14] and injury year fixed effects. In the second stage, we regress return-to-work outcome y_{it} in post-closure year t (i.e., t years after the claim was closed) on predicted benefits from equation (3), along with controls for observable characteristics and injury year fixed effects. The coefficient ϕ represents the causal effect of a

[13] Because the reform increases benefits for some individuals and decreases benefits for others, this precludes any approach relying on comparisons that violate the monotonicity assumption, such as a Difference in Differences approach comparing those with scheduled and unscheduled injuries or a Regression Discontinuity approach based on comparing those with injury dates just before and after the January 1, 2005, cutoff date.

[14] More specifically, we interact observable characteristics with a series of injury year fixed effects to account for different benefit schedules based on changing factors (e.g., the state average weekly wage) within regime.

change in PPD benefits on return to work and can be used to derive the income elasticity of labor supply with respect to a change in unconditional benefits. We then explore how this income elasticity varies with the extent of a worker's skill level by stratifying this model for unskilled and skilled occupations.

To illustrate how our approach identifies the causal effect of benefits on labor supply, consider a case with a single binary indicator variable Z_{iT}. The "dose," or difference in benefits for two *individuals who only differ in their injury date and are otherwise identical*, is λ_1 if $Z_{iT} =0$, and $\psi+\lambda_1$ if $Z_{iT}=1$. The "response," or difference in labor supply, is $\phi\, \lambda_1+ \delta_1$ if $Z_{iT} =0$, and $\phi(\psi+\lambda_1)+ \delta_1$ if $Z_{iT} =1$. Taking differences across the two types of individuals, the change in dose is ψ and the change in response is $\phi\psi$. The ratio of the differences is ϕ.

The key identifying assumption is that, conditional on Z_{iT}, variation in observed benefits is only due to the policy change ($POST_{iT}$* Z_{iT}) and not to any unobservable factors that are correlated with labor supply (i.e., μ_{iT} must be orthogonal to ε_{it}.) Practically, this translates into two criteria that must be met. First, formula inputs and observable characteristics Z_{iT} are measured the same in both policy regimes. Second, there are no shifts in unobserved claim characteristics before and after the reform. We address each of these in turn.

First, as discussed in Section 3 above, there are differences in how work disability eligibility, impairment and work disability ratings, and injury types are recorded before and after the reform. We address this issue by restricting Z_{iT} to include only those formula inputs and case characteristics that are comparable across policy regimes (e.g., impairment rating interacted with an indicator for scheduled injuries, the sum of the impairment and work disability ratings interacted with an indicator for unscheduled injuries, and controls for broad body system groups rather than individual body parts). To address the issue of missing work disability eligibility and rating in the pre-reform period, we include as controls a comprehensive set of case characteristics that predict work disability, such as whether the claimant returned or was released to work at claim closure, age, gender, injury type, medical expenditures, TTD duration and occupation categories.

We use the known benefit formula to structure our model specification. Specifically, we follow the formula and include the following variables: for scheduled injuries, impairment rating and case characteristics, respectively, interacted with pre-injury wage; and for unscheduled injuries, the sum of impairment and work disability rating interacted with pre-injury wage, and uninteracted case characteristics. For case characteristics, we include interactions between variables that are strong predictors of work disability eligibility and those that are strong predictors of work disability ratings. We include all of these covariates in our first stage prediction and interact them with impairment ratings, indicators for scheduled claims and $POST_{iT}$ in the first stage to account for the fact that the relationship between work disability and benefit value changes after 2005.

Because the second criteria focuses on unobservable trends, it requires an assumption. However, some facts provide support for this assumption. As described in Section 2, the policy regime is determined by the injury date, and it can often take a year or longer for workers' compensation claims to reach the point of MMI, when claims are rated for PPD. In the early stages of the claim, workers are unlikely to be able to anticipate the extent of eventual permanent impairment or work restriction. Furthermore, while workers tend to be aware of the existence of workers' compensation benefits available to them, few workers are familiar with the details of the program before experiencing an injury. Even after workers experience an injury, experts in the Oregon system do not believe that many workers were aware of the details of SB 757 in a way that would enable them to anticipate what the implications of the change would be for their own benefits (Rennane and Cherney 2019). As a result, it is unlikely that workers could strategically manipulate the timing of their injury in order to qualify for a more generous benefit. As shown in Figure A1, there are no discrete changes in the frequency of claims or the share of total claims resulting in a permanent disability around 2005. Moreover, as discussed in Section 3.3, there are no discrete changes in observable claim characteristics around 2005.

Figure 5 plots the observed PPD benefit against the predicted benefit estimated from equation (3), separately for claims before 2005 (left panel) and after 2005 (right panel). The predicted benefit lines up exactly with the actual benefit for claims before 2005, as indicated by the fact that all data points fall on the 45 degree line in the chart. This is because all formula inputs required to calculate the pre-2005 benefit (i.e., impairment rating for scheduled injuries, and combined impairment and work disability rating for unscheduled injuries) are observable for all claims in our dataset, including post-2005 claims. For claims after 2005, we limit our control variables to those that are comparable across policy regimes and use observable claim characteristics to proxy for the excluded work disability measures.[15] As a result, there is more noise in the predicted benefit for post-2005 claims, but the trend still tracks the 45 degree line closely. Overall, the first stage regression has an F-statistic of 29.91 and an R-squared of 0.81, indicating that the instruments collectively are strongly predictive of the actual benefit.

5. Results

Figure 6 illustrates the reduced form relationship between the change in benefits and change in outcomes comparing matched dyads of pre- and post-2005 claims using a nearest neighbor

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[15] Figure A2 shows that when we use all available formula inputs in the post-2005 regime only, instead of proxying for work disability, we predict actual post-2005 benefits with 100% accuracy.

matching algorithm based on the following observable characteristics: age, pre-injury wage, medical expenditures, TTD duration, gender, body part of injury, return/release to work, and impairment ratings for scheduled injuries, and impairment + work disability ratings for unscheduled injuries. Within each of the resulting matched pairs, we calculated the difference between the benefits and outcomes for claims before 2005 and for claims after 2005. Figure 6 shows that for each outcome, there is a negative relationship suggestive of an income effect: as benefits increase after 2005 (indicated by a positive difference shown on the x-axis), labor supply, earnings and hours decrease.

Next, we estimate the two-stage IV model in equations (3) and (4) to formally examine the magnitude and statistical significance of this relationship. Table 3 shows the IV coefficients of our main specification described in equation (4). In our preferred specification, the primary outcomes of interest include an indicator for whether or not the worker returns to work in the second year after claim closure and earnings and hours worked during the second year after closure. Across all outcomes, increasing the value of the PPD benefit has a negative, small and statistically significant effect on labor supply, indicating the presence of an income effect. Column 1 shows that increasing the PPD benefit by $1,000 reduces the probability of returning to work by 0.19 percentage points. We predicted the share of individuals who would return to work at the average PPD benefit (approximately $8,900) and estimate that at this benefit level, approximately 77 percent of workers would be working in the second year after closure. Compared to this average, our estimate reflects a change of approximately 0.3 percent, and yields an elasticity of -0.022 when scaled by the relative change in benefits.

Consistent with this small but significant result, Columns 2 and 3 show that a $1,000 increase in the PPD benefit results in an approximate 2 percent decline in earnings and in hours worked during the second year after injury. Columns 4 and 5 show the results for earnings and hours in levels (including zero hours and earnings): a $1,000 increase in PPD benefits reduces earnings by approximately $44 and reduces hours by approximately 3 hours during the second year after the claim has closed. These results translate into similar elasticities as the effect on return to work (between -0.022 and -0.029, respectively). Taken together, the small results on earnings and hours and the similar elasticities imply that most of the labor supply response occurs on the extensive margin.

Figure 7 presents an event study of this effect over time, examining the effect during the four quarters before injury, the quarter of closure, and the eight quarters after claim closure.[16] Each point estimate on the graphs represents the coefficient on the PPD benefit from a separate regression where the dependent variable being the labor supply response in the quarter of interest. The four quarters prior to injury serve as a placebo test since the benefit should not affect labor supply before the worker receives the benefit. The effect is very close to zero and not statistically significant in the period prior to injury. Next, the quarter of claim closure can be viewed as a "partially treated" quarter, since claims are closed at varying points during the quarter. Indeed, the effect in the quarter of closure is statistically significant, but smaller in magnitude than in the subsequent quarters. The point estimate is largest in the second quarter after injury, after which point the point estimates decline slightly. In general, however, the effect in each of the eight quarters after injury is quite stable – similar in magnitude and statistical significance for each of our three main outcomes. In Appendix Table 2, we estimate outcomes up

[16] We omit the quarters occurring between the injury and claim closure when workers are typically out of the labor force.

to three years after injury in the sample of claims with two-year constant maturity, and find similarly stable results, although the point estimates are slightly smaller in Year 3.

Finally, Table 4 examines the extent to which these effects vary for unskilled and skilled workers. For all outcomes – return to work, earnings, and hours, there are larger effects for unskilled workers compared to skilled workers. For example, a $1,000 increase in the PPD benefit results in a decline in the probability of work by 0.26 percentage points for unskilled workers, compared to 0.12 percentage points for skilled workers. Similarly, a $1,000 increase in the PPD benefits reduces earnings by $66 and reduces hours worked by 4 for unskilled workers in the second year after claim closure. There is no statistically significant change in earnings for skilled workers, and the benefit increase reduces hours worked among skilled workers by approximately 2 hours. These outcomes all yield similar elasticities of approximately 0.03 for unskilled workers and 0.01 for skilled workers.

6. Discussion and Conclusion

In this paper, we exploit a policy change to permanent disability benefits in Oregon workers' compensation to identify an income effect in response to disability benefits, and to examine how this income effect varies with a worker's skill level. Importantly, permanent disability benefits in Oregon are provided regardless of future labor supply, so there is no disincentive to work after receiving the benefit. Taking advantage of the fact that the policy change resulted in significant changes in benefits for all injured workers relative to what they would have received in the prior range, we identify the effect of benefits on labor supply in a dose-response relationship.

We find evidence of a significant income effect in response to non-distortionary permanent disability payments in Oregon. Because the PPD payment does not contain any work disincentive, this response purely reflects workers changing their labor supply to better optimize their choice of work and leisure. While these effect sizes appear small at first glance, it is important to remember that these reflect changes in labor supply up to two years after the injury in response to a change in a one-time benefit. Most workers receive their full PPD benefit up front at the time of claim closure, or in monthly installments spread over the first few months after claim closure. As a result, the fact that we observe a persistent labor supply response even two years following the end of the claim is striking.

Because the effects on earnings and hours are similar in percentage and elasticity terms as what we observe in the margin of return to work, we interpret these findings to suggest that the main response is on the extensive margin of labor supply, rather than intensive changes in the amount of time spent working, conditional on being at work.

Finally, we find larger income effects for unskilled workers who may have a more difficult time finding a new occupation after injury. The larger response for unskilled workers could reflect these workers taking a longer time to recover and re-evaluate their job search or job goals, or workers opting out of the labor force entirely. Given their significantly lower wages, the same change in benefits likely reflects a larger percentage of pre-injury earnings for unskilled workers, which could be another factor driving the higher likelihood not to return to work. More broadly, this finding provides important evidence that disability benefits may provide a greater insurance value for unskilled workers, and importantly, that the labor supply response to benefits is not all a distortionary response to changes in the incentive to work.

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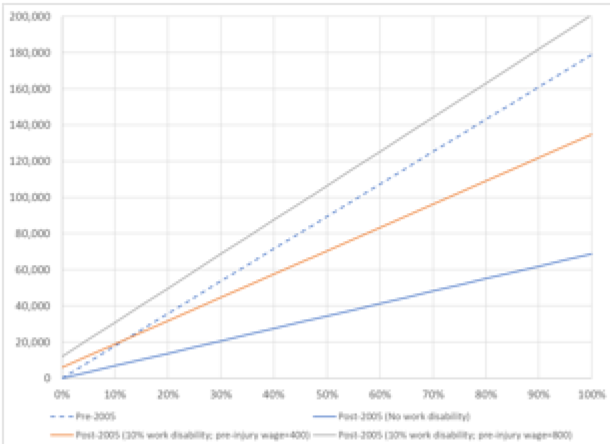
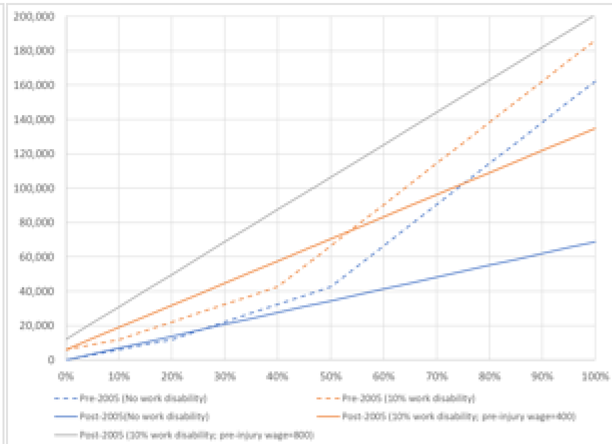
Figure 1: PPD Benefit by Impairment Rating (Percent of Person), Before and After Reform

Benefit Levels

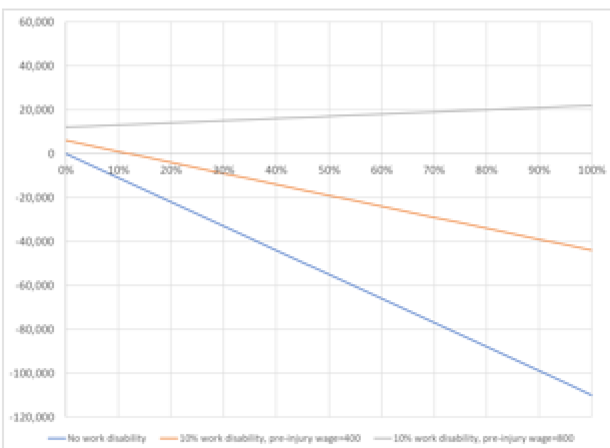


(a) Scheduled

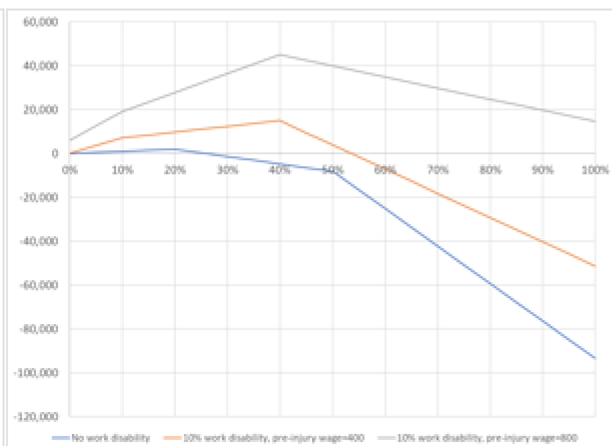


(b) Unscheduled

Difference in Levels Before and After Reform



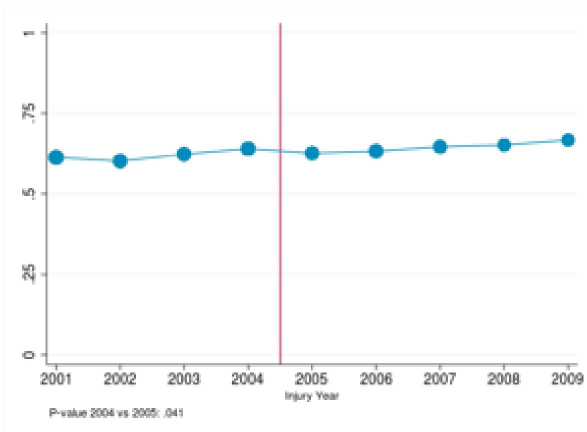
(c) Scheduled

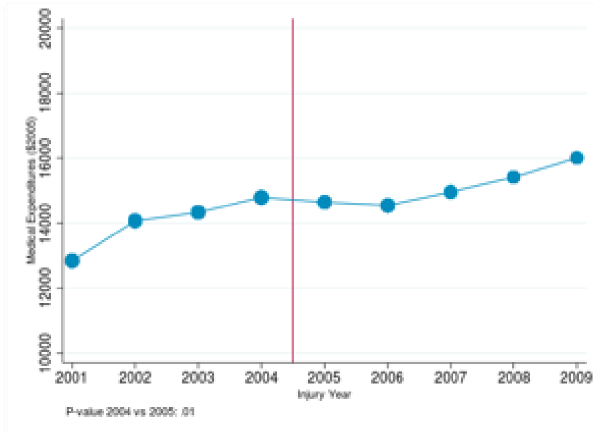


(d) Unscheduled

Notes: Author calculations based on Oregon PPD benefit formulas as described in the Oregon Disability Rating Standards, 2015.

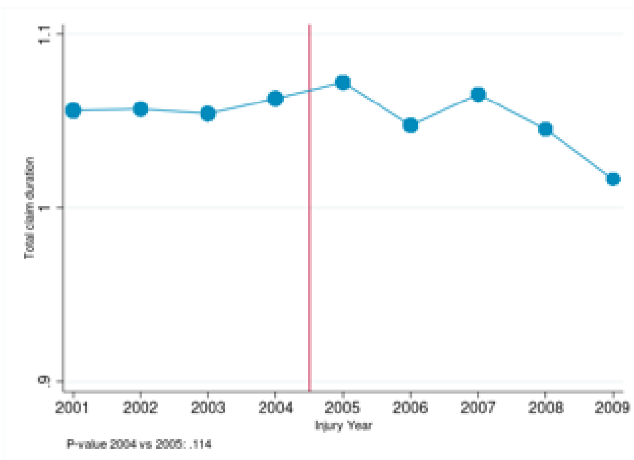
Figure 2: Trends in observable claimant characteristics by injury year

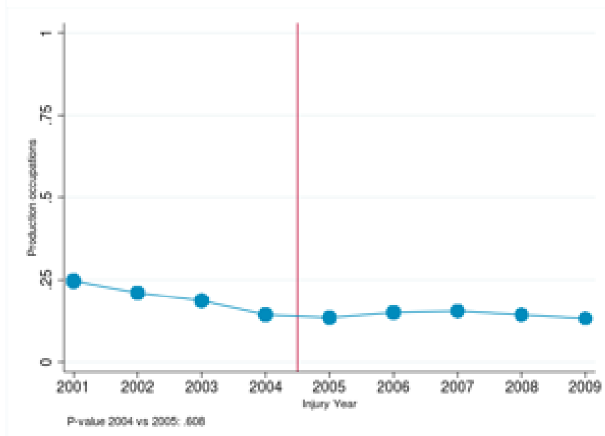




% over Age 40

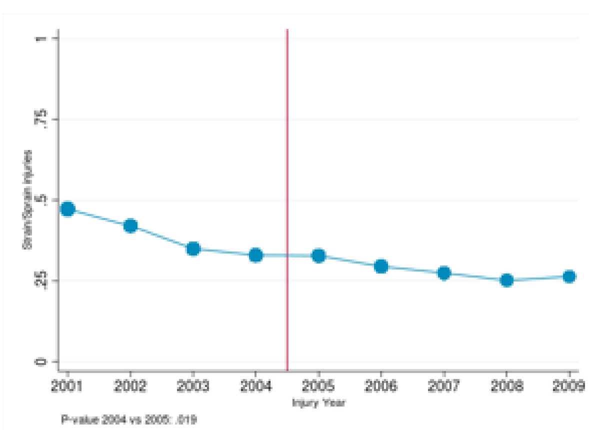
Medical Expenditures ($2005)

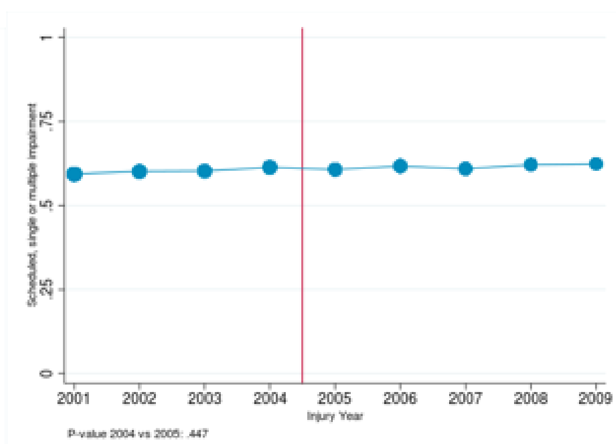




Claim Duration

% Production Occupations





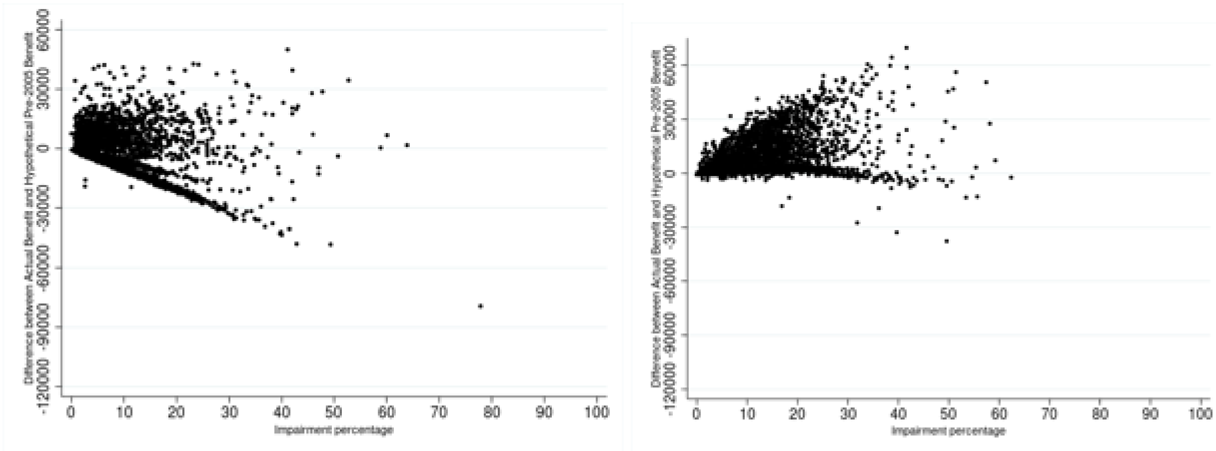
% Strains/Sprains

% Scheduled

Notes: Data from the Oregon Department of Business and Consumer Services, 2001-2009. Figures show trends in key worker characteristics shown in Table 1. We regressed the variable in the row on an indicator for whether or not the claim occurred before 2005 and a linear time trend. P-value from the coefficient on the post-2005 indicator shown at the bottom of each graph.

<u>Figure 3: Difference Between Actual Benefit After 2005 and Hypothetical benefit Before 2005</u>

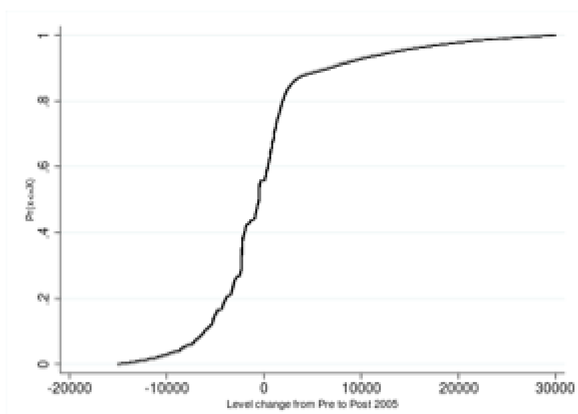
<u>(*Post-2005 Claims Only*)</u>



Scheduled   Unscheduled

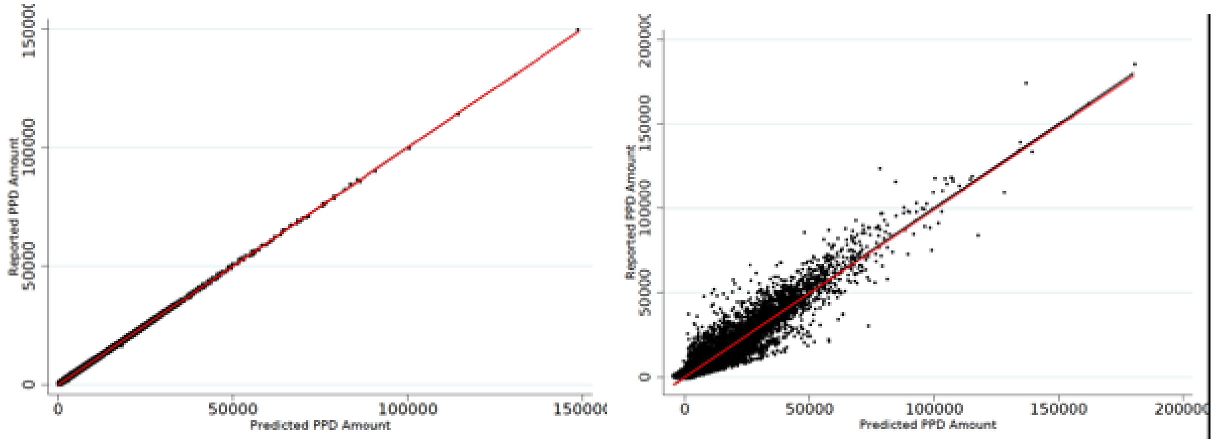
Notes: Based on data from the Oregon Department of Business and Consumer Services and author calculations. Hypothetical benefit before 2005 calculated using Oregon benefit formulas as described in in the Oregon Disability Rating Standards, 2015.

<u>Figure 4: Distribution of change in benefits from hypothetical pre-2005 benefit to actual post-2005 benefit (*post-2005 claims only*)</u>



Notes: Based on data from the Oregon Department of Business and Consumer Services and author calculations. Hypothetical benefit before 2005 calculated using Oregon benefit formulas as described in the Oregon Disability Rating Standards, 2015.

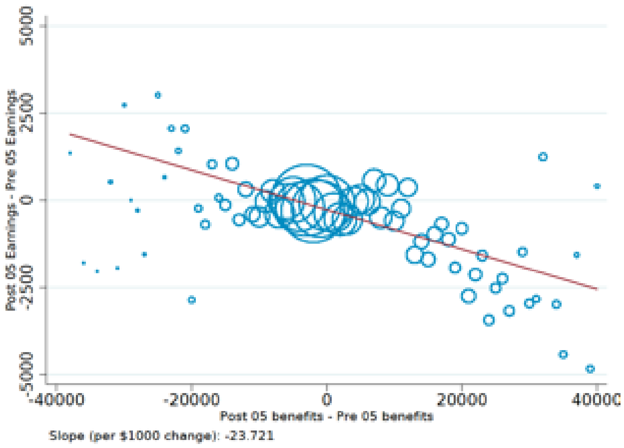
Figure 5: First Stage – Reported vs. Predicted PPD Benefit from Formula Inputs



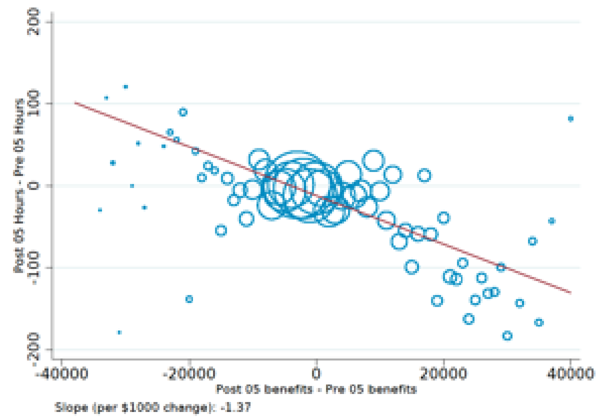
Pre 2005 Post 2005

Notes: Based on data from the Oregon Department of Business and Consumer Services, 2001-2009.

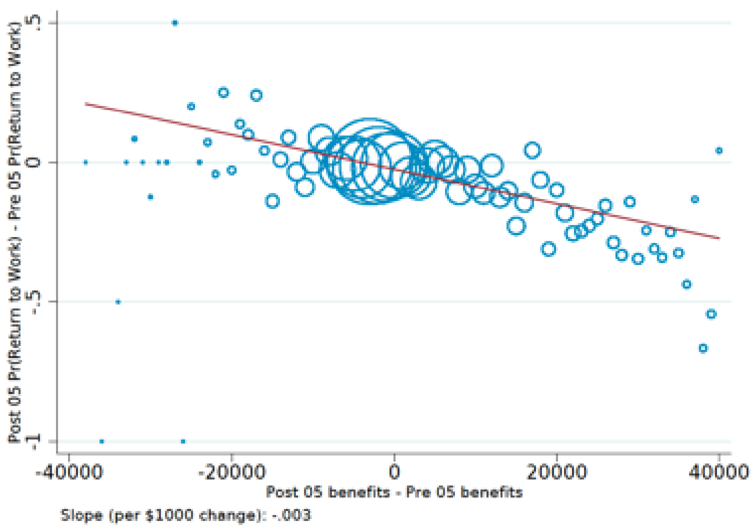
Figure 6: Reduced form: change in labor supply vs. hypothetical change in benefits



Earnings



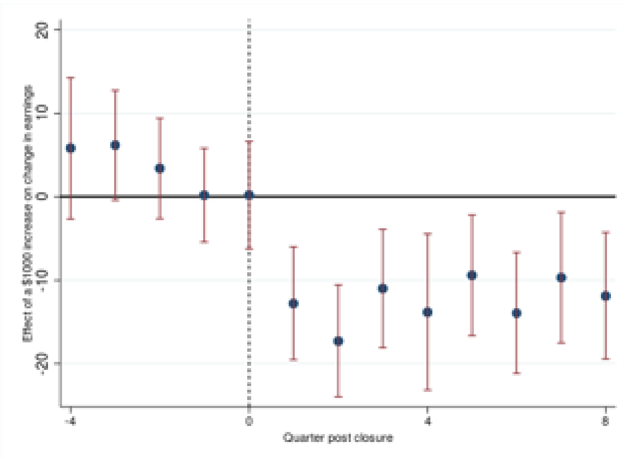
Hours



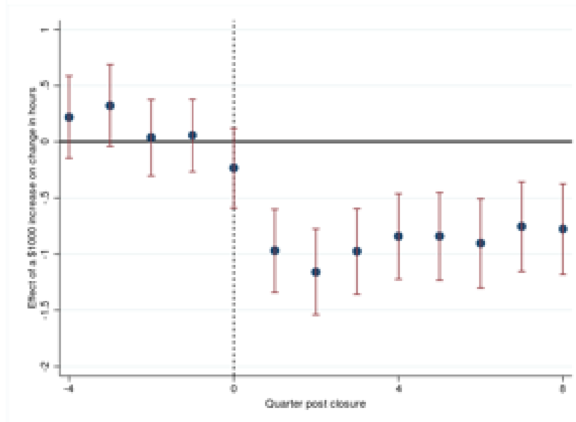
Pr(Return to Work)

Notes: Based on data from the Oregon Department of Business and Consumer Services and Oregon Employment Department, 2001-2010. The difference in benefits and outcomes is calculated based on comparing observed benefits between similar post-2005 and pre-2005 claims. We matched post-2005 claims to pre-2005 claims based on a nearest neighbor match based on a series of observable characteristics including age, pre-injury wage, medical expenditures, TTD duration, gender, body part of injury, return/release to work, and impairment ratings for scheduled injuries, and impairment + work disability ratings for unscheduled injuries. The difference in benefits is collapsed to $1,000 cells for the sake of presentation in the figure above.

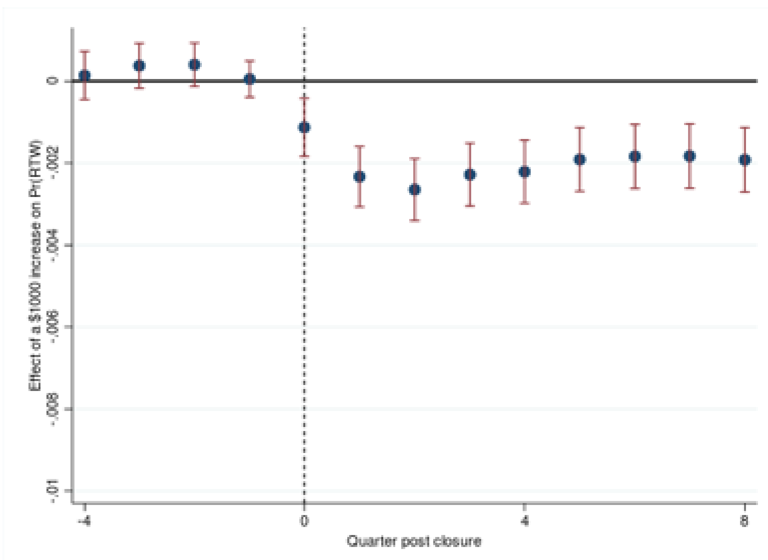
Figure 7: Trends in estimated effects over time



Earnings



Hours



Pr(Return to Work)

Notes: Based on data from the Oregon Department of Business and Consumer Services and Oregon Employment Department, 2001-2010. Each point on the graph is the coefficient from a separate regression from Equation 4 regressing the outcome of interest listed in the figure header for a different quarter before or after claim closure. 95 percent confidence intervals shown in the red bars.

Table 1: Claim Demographic Characteristics, Unskilled vs. Skilled

	Unskilled	Skilled	P-value
Claimant Characteristics			
Age	42.48	43.96	0.00
Age > 40	0.60	0.65	0.00
% male	0.62	0.76	0.00
Pre-injury weekly wage ($2005)	484.97	701.38	-
Medical expenditures ($2005)	14,382.96	14,492.16	0.58
TTD days	62.85	57.90	0.00
% returned to work at claim closure	0.60	0.67	0.00
% released to work at claim closure	0.75	0.80	0.00
Claim Duration (years)	1.07	1.04	0.00
PPD benefit ($2005)	8,991.30	8,832.39	0.22
Pre-injury occupation			
Production	0.09	0.22	0.00
Transportation	0.18	0.19	0.01
Construction	0.06	0.17	0.00
Maintenance	0.01	0.11	0.00
Other Occupation	0.67	0.30	-
Injury Characteristics			
Trauma/unexpected	0.14	0.15	0.21
Fracture/break	0.31	0.33	0.00
Strain/sprain	0.35	0.34	0.02
Wounds, cuts, burns	0.08	0.08	0.50
Other	0.12	0.11	0.00
Scheduled injuries	0.59	0.61	0.00
Multiple injuries	0.04	0.05	0.00
Impairment rating (scheduled)	4.83	4.90	0.38
Impairment + work disability rating (unscheduled)	14.18	13.32	0.00
Observations	11,884	23,909	-

Notes: Data from Oregon Department of Consumer and Business Services, 2001-2009. We regressed the variable in the row on an indicator for whether or not the claim occurred before 2005 and a linear time trend. The p-value shown is the p-value from the coefficient on the post-2005 indicator.

Table 2: Formula Inputs and Body Codes, Pre and Post 2005 Reform

Scheduled Injuries						
	Percentage of All Injuries			Impairment Percentage		
	Pre 2005	Post 2005	P-value	Pre 2005	Post 2005	P-value
Overall	60.22	61.52	0.45	4.87	4.95	0.26
Leg/Hip	25.15	23.98	0.00	4.24	4.38	0.07
Hand/Finger	17.87	17.62	0.88	4.19	4.32	0.29
Arm/Shoulder	15.69	13.01	0.00	6.70	6.81	0.59
Toes/Foot	7.89	6.92	0.00	4.77	4.54	0.23
Ear	0.49	0.46	0.85	12.86	12.66	0.90
Eye	0.11	0.13	0.38	7.28	8.13	0.79
Unscheduled Injuries						
	Percentage of All Injuries			Impairment + Work Disability Percentage		
	Pre 2005	Post 2005	P-value	Pre 2005	Post 2005	P-value
Overall	39.78	38.48	0.45	13.60	13.67	0.70
Arm/Shoulder	15.96	19.82	0.00	12.35	12.18	0.47
Low back	14.25	11.52	0.57	15.16	15.64	0.14
Neck	4.44	3.52	0.89	13.78	14.65	0.14
Back - multiple	2.16	1.98	0.77	12.06	11.62	0.60
Other body systems	0.82	0.67	0.25	15.23	15.28	0.97
Brain	0.44	0.64	0.43	21.62	20.97	0.79
Leg/Hip	0.14	0.31	0.49	15.73	20.84	0.22

Notes: Data from Oregon Department of Consumer and Business Services, 2001-2009. We regressed the variable in the row on an indicator for whether or not the claim occurred before 2005 and a linear time trend. The p-value shown is the p-value from the coefficient on the post-2005 indicator. Some arm, shoulder, leg and hip injuries are classified as scheduled and unscheduled prior to 2005, so we show the share of injuries within this category classified as scheduled or unscheduled, respectively, in each panel. Total percent of all injuries summed across categories exceeds 100 percent prior to 2005 due to claims with multiple injuries.

Table 3: IV Estimates of the Effect of PPD Benefit on Labor Supply in First and Second Year Post-Closure: Main Results

	(1)	(2)	(3)	(4)	(5)
	Return to work	Log Earnings	Log Hours	Earnings (uncond)	Hours (uncond)
PPD Benefit/1000	-0.0019***	-0.0023*	-0.0022*	-44.31***	-3.23***
	(0.0004)	(0.0012)	(0.0011)	(13.70)	(0.74)
Predicted Y-mean at average benefit	0.767	9.880	7.133	22175	1201
Pct change in Y-mean	-0.25%	-0.20%	-0.12%	-0.25%	-0.33%
$1000 change as pct of average benefit	11.2%	11.2%	11.2%	11.2%	11.2%
Elasticity	-0.022	-0.018	-0.011	-0.022	-0.029
Observations	37,797	31,558	31,203	37,797	37,797
First stage F-statistic	214.9	179.8	177.2	214.9	214.9

Notes: Data from Oregon Department of Consumer and Business Services and Oregon Employment Department, 2001-2010. Table shows IV coefficients on PPD benefits from the second stage of the specification described in Equation 4. Additional controls in the second stage regression include the following: for scheduled injuries, impairment rating and case characteristics, respectively, interacted with pre-injury wage; and for unscheduled injuries, the sum of impairment and work disability rating interacted with pre-injury wage, and uninteracted case characteristics. For case characteristics, we include interactions between variables that are strong predictors of work disability eligibility and those that are strong predictors of work disability ratings. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4: IV Estimates of the Effect of PPD Benefit on Labor Supply in Second Year Post-Closure: Heterogeneity by SVP

	Return to Work		Earnings (unconditional)		Hours (unconditional)	
	(1)	(2)	(1)	(2)	(1)	(2)
	Unskilled	Skilled	Unskilled	Skilled	Unskilled	Skilled
PPD Benefit/1000	-0.0026***	-0.0012**	-61.62***	-31.70	-4.29***	-2.17*
	(0.0007)	(0.0006)	(21.26)	(23.59)	(1.30)	(1.13)
Observations	11,850	23,873	11,850	23,868	11,850	23,868
First-state F-statistic	163.5	10.43	163.5	11.94	163.5	11.94
Ymean Pre-05	0.741	0.783	15941	25540	1105	1257
Average benefit in quartile	8,991	8,832	8,991	8,832	8,991	8,832
% change in Y-mean	-0.35%	-0.15%	-0.39%	0	-0.39%	-0.20%
1000 as % change in benefit	11%	11%	11%	11%	11%	11%
Elasticity	-0.032	-0.014	-0.035	0.000	-0.035	-0.017

Notes: Data from Oregon Department of Consumer and Business Services and Oregon Employment Department, 2001-2010. Table shows IV coefficients on PPD benefits from the second stage of the specification described in Equation 4 run on separate regressions for the top and bottom quartiles of the variables listed in the panel headers. Additional controls in the second stage regression include the following: for scheduled injuries, impairment rating and case characteristics, respectively, interacted with pre-injury wage; and for unscheduled injuries, the sum of impairment and work disability rating interacted with pre-injury wage, uninteracted case characteristics, and injury year FE. For case characteristics, we include interactions between variables that are strong predictors of work disability eligibility and those that are strong predictors of work disability ratings. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Appendix Table 1: Predictors of Work Disability and Work Disability Percentage

Predictors of Work Disability Percentage (conditional on receiving work disability)		
	(1)	(2)
Age > 40	2.61538***	2.63692***
	(0.23414)	(0.23440)
Male	-0.59392**	-0.62674**
	(0.29169)	(0.29203)
Traumas	-0.16221	-0.15834
	(0.36344)	(0.36381)
Fractures/breaks	-0.48183	-0.51080
	(0.32436)	(0.32440)
Sprain/Strain	-0.53611*	-0.55187*
	(0.29842)	(0.29850)
Wound/cut/burn	0.17094	0.15981
	(0.82156)	(0.82233)
Medical Expenditures (1000s, $2012)	0.02910***	0.03062***
	(0.00451)	(0.00445)
Body System - First Impairment		
Upper extremities	3.94060**	3.85578*
	(1.99520)	(1.99623)
Shoulder	3.91009**	3.80402*
	(1.98947)	(1.99135)
Lower extremities	2.13636	2.02858
	(1.99661)	(1.99842)
Back	3.90908*	3.83417*
	(1.99417)	(1.99601)
Head	2.56746	2.44012
	(2.02977)	(2.03236)
Internal	1.26057	1.19134
	(2.30983)	(2.31235)
Body System - Second Impairment		
Upper extremities	0.47183	0.41503
	(1.48067)	(1.48061)
Shoulder	1.17638	1.22848
	(2.23217)	(2.23199)
Lower extremities	-1.07971	-0.97523

	(1.56379)	(1.56408)
Back	0.49983	0.39107
	(2.20006)	(2.20167)
Head	2.32468	1.99954
	(2.79479)	(2.79523)
TTD Duration/10	0.03081***	
	(0.00692)	
Constant	6.30706***	5.79635***
	(2.01947)	(2.15794)
Observations	3,234	3,234
R-squared	0.15467	0.15791
Ymean	11.58	11.58
Include occupation FE?	Yes	Yes
Include TTD duration decile?	No	Yes

Predictors of Work Disability

	(1)	(2)
Return to work at closure	-0.05681***	-0.04472***
	(0.00337)	(0.00342)
Released to work at closure	-0.77485***	-0.74782***
	(0.00399)	(0.00412)
Constant	0.82046***	0.77749***
	(0.00275)	(0.00503)
Observations	19,507	19,507
R-squared	0.78462	0.79024
Ymean	0.166	0.166
Include TTD duration decile?	NO	YES

Notes: Data from Oregon Department of Consumer and Business Services, 2001-2009. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Appendix Table 2: IV Estimates of the Effect of PPD Benefit on Labor Supply: Two-Year Constant Maturity Sample

	(1) Return to work	(2) Log Earnings	(3) Log Hours	(4) Earnings (uncond)	(5) Hours (uncond)
First Year Post-Claim Closure					
PPD Benefit/1000	-0.0026***	-0.0029**	-0.0027**	-55.39***	-4.09***
	(0.00040)	(0.00139)	(0.00133)	(14.68775)	(0.77796)
Second Year Post-Claim Closure					
PPD Benefit/1000	-0.0019***	-0.0024*	-0.0023*	-46.93***	-3.17***
	(0.00043)	(0.00136)	(0.00123)	(15.75250)	(0.83920)
Third Year Post-Claim Closure					
PPD Benefit/1000	-0.0019***	-0.0010	-0.0001	-39.18**	-2.41***
	(0.00044)	(0.00134)	(0.00117)	(15.88895)	(0.84379)
Observations	34,168	28,917	28,609	34,168	34,168
First stage F-statistic	181.5	159	160.3	181.5	181.5

Notes: Data from Oregon Department of Consumer and Business Services and Oregon Employment Department, 2001-2010. Table shows IV coefficients on PPD benefits from the second stage of the specification described in Equation 4. Additional controls in the second stage regression include the following: for scheduled injuries, impairment rating and case characteristics, respectively, interacted with pre-injury wage; and for unscheduled injuries, the sum of impairment and work disability rating interacted with pre-injury wage, and uninteracted case characteristics. For case characteristics, we include interactions between variables that are strong predictors of work disability eligibility and those that are strong predictors of work disability ratings. Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$