

WORKING P A P E R

How Effective are Employer Return to Work Programs?

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WR-745-CHSWC

March 2010

Prepared for the Commission on Health and Safety and Workers'
Compensation

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CENTER FOR HEALTH AND SAFETY IN THE WORKPLACE

A study by the RAND Institute for Civil Justice

How Effective are Employer Return to Work Programs?

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March 1, 2010

Abstract

Reducing the recovery time for workers who are injured or disabled by a workplace accident is a key policy goal. This has motivated the promotion of employer-based return to work programs, despite a lack of systematic evidence on the effectiveness of such programs. We combine data on duration of time out of work for workers' compensation claimants with information on employer return to work programs to estimate the impact of the programs on time out of work. Discrete-time hazard estimates suggest that the workers in a program return approximately 1.4 times sooner compared to workers injured at a firm without a program. This corresponds to a reduction of between 3-4 weeks in median duration of time to return to work for all workers in our sample. The effect is stronger for men than for women, likely due to occupational differences between the two groups, and are robust across different specifications. Back-of-the-envelope calculations suggest that these programs are cost effective for large employers. More work is needed to determine whether these programs could be adopted successfully by smaller firms.

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Summary

Introduction

Workplace injuries and illnesses are extremely costly. In addition to the pain and suffering due to the injury itself, workers can experience severe and prolonged earnings losses. Accidents are costly to employers as well. Employers face the cost of reimbursing their injured workers, and also face indirect costs such as lost productivity. As part of their ongoing efforts to mitigate these costs, policymakers are continuously motivated to find new ways to reduce the duration of work-related absence and improve early return to work, a key metric for the impact of an injury on both workers and employers.

Many policy initiatives that are intended to improve return to work for injured or disabled workers operate through the employers. For instance, some states offer subsidies to offset the costs to employers of hiring, retaining or accommodating disabled workers. These policies are adopted, however, with relatively little consensus among the scientific literature as to the effectiveness of these employer-based efforts. While, as we describe later, there have been numerous studies that have demonstrated these policies have some impact on reducing the duration of work absences, there is very little consensus as to whether the impact is large enough to justify the cost of intervening.

This paper uses a unique data set that combines information from a firm-level survey of activities and policies designed to improve return to work matched to the post-injury employment outcomes for workers injured at these firms. The survey covered 40 large, self-insured employers in California and obtained detailed information about the formal programs and practices used to lower the duration of work-injury absences, including information such as the frequency of use of various modifications and accommodations. These survey data were matched to more than 17,000 workers injured from 1991-1995, and five years of post-injury employment data were collected. A key feature of our analysis is that some employers adopted a program during the period over which we

observe workplace injuries, allowing us to employ firm fixed effects. This allows us to eliminate the firm heterogeneity that potentially confounds the analyses of many previous studies, making it more difficult to attribute causality to the programs themselves.

Characterizing the Employer Use of Return to Work Programs

Our data combine information on the return to work practices of a sample of large, private self-insured employers in California with the post-injury employment outcomes of those workers who experienced a work-related injury from 1991-1995 and filed a workers compensation claim. Our description of return to work practices comes from a 2000 survey conducted by RAND, in which they collected information from 40 firm about the most common features of the firm's return to work program and disability management practices (if any). The survey asked employers to provide information about methods used to return injured employees to work, how often they are used, and the subjective importance of each method in relation to the overall effectiveness of the program (as of the time of the survey, 2000).

Table S 1 summarizes the most common transitional work accommodation characteristics of the programs in our sample and the perceived level of importance as reported by each employer. The four primary characteristics we report are modified work tasks, providing a modified workstation or modified equipment, reduced time and work schedule changes, and providing a different job in either the same or a different department. Modified work is any temporary change in work tasks or functions, modified workstations and modified equipment allow injured workers to perform work functions while recovering from an injury, and reduced time/work schedules and providing a different job are examples of actions employers may take to facilitate the return of an injured worker to the workplace.

Modified work tasks were the most common among employers in our sample, with 82% of the firms reporting that they use this method frequently or quite often. Roughly half of the sample reported providing a modified workstation or modified equipment frequently, or most of the time.

Reduced time and work schedule changes were fairly common with 45% of the sample reporting use, and 32% of the firms reported providing a different job in either the same or a different department as used frequently or quite often.

Table S 1. Perceived importance and frequency of use of leading methods for transitioning injured employees back to the workplace.

| Method | Used Frequently or Quite Often | Used Occasionally | Used Rarely or Not at All | Perceived Importance Level: Scale 1-5, 5=Very Important |
|---|---------------------------------------|--------------------------|----------------------------------|--|
| Modified work tasks | 82% | 14% | 5% | 4.68 |
| Modified work station/equipment | 50% | 27% | 18% | 4.10 |
| Reduced time/work schedule change | 45% | 27% | 18% | 3.86 |
| Different job in same or different department | 32% | 41% | 23% | 3.71 |

Notes: Table reports the results from a survey of return to work and disability management practice of 40 large, self-insured firms in California.

Programs are Associated with Lower Duration of Injury-Related Absences

To estimate the impact of program use on return to work, we combine the survey information with data on the post-injury employment outcomes of workers at the surveyed firms. We link workers’ compensation claims information—was the claim temporary or permanent, how much was paid out in benefits, how many weeks were benefits received, etc.—collected directly from the employers to administrative data on wages. We use quarterly earnings data of all workers’ compensation claimants in our sample for up to 20 quarters after injury. As our primary measure of return to work, we estimate the number of weeks until an injured worker returns to work in two subsequent quarters after their temporary disability benefits have been exhausted.¹

¹ We also demonstrate that our main findings persist if we use an alternative measure, the number of weeks of temporary disability receipt.

Figure S 1. Cumulative and Instantaneous Hazard Rates by Return to Work Program Participation

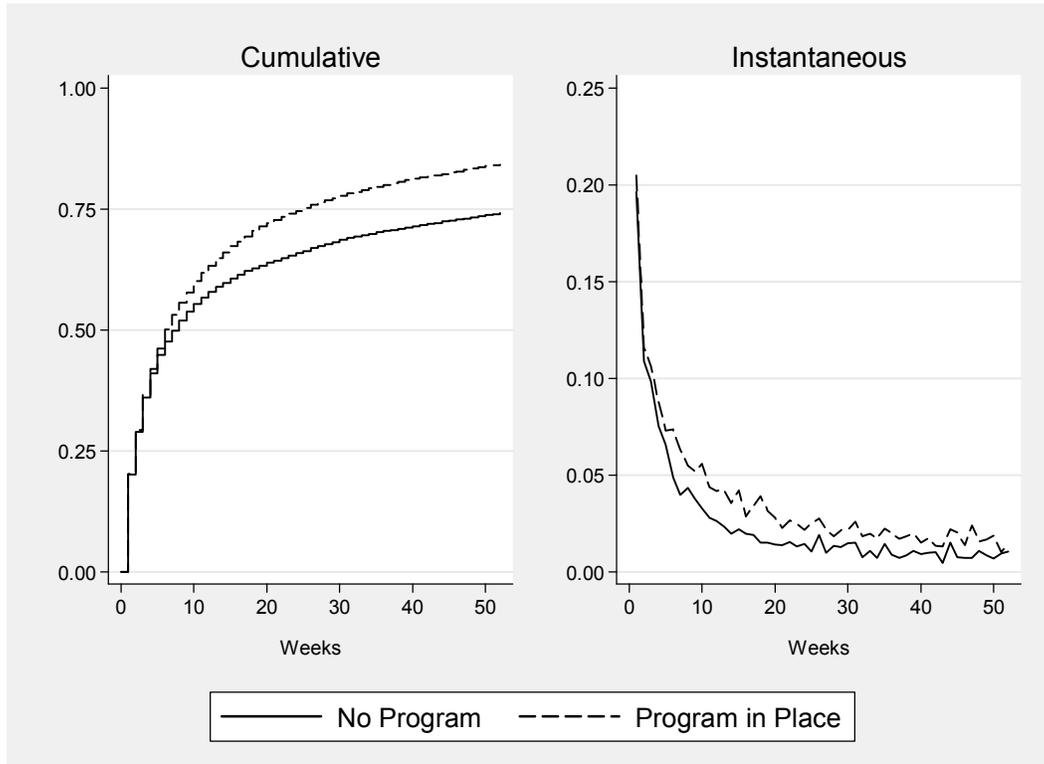


Figure S 1 illustrates the difference in return to work rates for employees who are injured with and without a program in place. The left panel in the figure reports the cumulative hazard rate for return to work, interpreted as the cumulative percent of workers who have returned by a given week. The figure shows that more than half of workers with or without a program return in the first 10 weeks. If a program is in place, however, there is a noticeable difference by 10 weeks, with workers in a program being more likely to return. This gap persists and widens over the entire first year after the date of injury. The right panel in the figure represents the instantaneous hazard rate for return to work, interpreted as the percent of the stock of workers that remain out of work who return in a given week. As with the cumulative hazard, the figure shows that workers injured with a program in place are more likely to return early on, and the difference persists over time.

Table S 2. Estimated Change in the Median Weeks Before Return to Work with a Program in Place

| | All Workers | | Positive PPD | |
|---|---|-----------------|------------------|------------------|
| | Median Number of Weeks (Mean in Parentheses) | | | |
| | 1 | 2 | 3 | 4 |
| Weeks Until Return to work: No Program | 9.0 (41.1) | 8.9 (40.8) | 39.7 (69.5) | 35.5 (65.2) |
| Difference | -3.8 (-15.7) | -3.6 (-15.1) | -18.8 (-25.9) | -12.6 (-17.6) |
| Firm Fixed effects | No | Yes | No | Yes |

Notes: The table reports estimated median and mean weeks to return to work for workers not in a program, and the difference compared to workers who participated in a program.

While instructive, this descriptive analysis fails to control for potentially confounding individual and firm characteristics. We employed a number of statistical models to estimate the program effect while controlling for these characteristics. Table S 2 summarizes our key results. The table reports the median number of weeks a hypothetical injured worker would be out of work with no program in place, and then reports the estimated change in weeks that would occur if a program were in place. We report medians as our primary estimates because the means are skewed by a relatively small number of workers with large estimates, but we also report means and mean differences in parentheses.

Column 1 reports that the median number of weeks until return to sustained work is 9.0. Our estimates suggest that having a program in place reduces the median number of weeks that a worker is absent by 3.8, a difference of 42%. If we look at the mean difference, we see that the worker returns 15.7 weeks sooner on average, a 38% drop. We include different columns to indicate regressions that include either firm-level average characteristics or a firm-level dummy variable that controls for all time-invariant characteristics of the employer, and our findings are consistent across both specifications.

Part of the skewness in the data is driven by the large differences in injury severity. Workers with permanent disability represent 40% of the sample, and the table reports that the median injury

duration for a worker with permanent disability is 39.7 weeks (the mean is 69.5 weeks). The impact of the program is to reduce the median duration for those with a permanent disability by 18.8 weeks, or 47%. The effect is somewhat smaller if we include fixed effects and look at the mean difference, but this still represents a drop of 27%. This suggests that much of the program effect is driven by the large reduction in injury duration for the most severely injured workers.

Program Use is Cost-Effective for Employers

Our estimates indicate that the employer return to work programs reduce the duration of injury-related absences, but does that make their use profitable for firms? Sometimes the accommodations required can be quite costly, and ultimately we are interested in whether the benefits from improved return to work outweigh the costs to implement and maintain the programs. In Table S 3 we report some estimates of the cost-effectiveness of a program for employers in different scenarios. For our estimate of the program benefits to employers we use the dollar savings on TTD payments from shorter injury durations. Our different scenarios reflect different levels of weekly wages for employees, with higher weekly wages reflecting higher weekly benefits (and thus greater benefits of returning workers sooner). We compare these against different levels of average program costs per injured workers, using a range reflected by the survey data.

Table S 3. Break-Even RTW Program Treatment Effects, Measured in Weeks to Sustained RTW

| | | <i>Program Cost per Injured Worker</i> | | | | | |
|--------------------|----------------|--|----------|----------|----------|----------|----------|
| | | \$ 500 | \$ 1,000 | \$ 1,500 | \$ 2,000 | \$ 2,500 | \$ 3,000 |
| <i>Weekly Wage</i> | Low: \$ 347 | 1.4 | 2.9 | 4.3 | 5.8 | 7.2 | 8.6 |
| | Medium: \$ 438 | 1.1 | 2.3 | 3.4 | 4.6 | 5.7 | 6.8 |
| | High: \$ 757 | 0.7 | 1.3 | 2.0 | 2.6 | 3.3 | 4.0 |

The table reports the number of weeks of injury duration a program must reduce in order for the program to break-even. For example, in the low-benefit, low-cost scenario, the break-even estimate is equal to 1.4 weeks and any additional reductions in average durations generate a net benefit for the employer. Comparing our treatment effect estimates with the break-even numbers, the

programs generate net benefits for all but the most expensive programs when wages (and thus weekly benefits) are high. With average wages, the programs are beneficial when the program cost per injured worker is below \$1,500, and with low wages, the programs are beneficial when the program cost per injured worker is below \$1,000.²

This table should not be taken to indicate that adopting a return to work program would be cost-effective for any employer. Ultimately, our findings suggest that return to work programs are highly effective when adopted at large, self-insured firms. It is by no means obvious that the programs would be as effective if adopted by a different set of firms. The costs per worker are likely to be higher for smaller firms if there are fixed costs of setting up a program (particularly likely for a program making a heavy emphasis on physical modifications). The effectiveness of programs may differ for different types of workers—smaller firms or firms with more homogenous job functions might find it more difficult to offer modified work. Future work should study how return to work programs can be implemented effectively at small firms.

² Note that we use the use the median effects rather than the mean, because we feel that the mean effects better represent the gains the employer would observe in the highest number of cases. If we were to focus on the mean differences, the programs would be cost-effective in this example in all cases.

I. Introduction

Despite occupational safety and health improvements in the workplace in recent years, occupational injuries continue to be a prominent public health concern. There were over 4 million total injury cases reported in 2007 in the U.S. with 1.2 million of them involving days away from work (BLS, 2008). The costs associated with workplace injuries can be substantial for both injured workers and employers. Workers suffer both economic and noneconomic hardships that can persist for years. Employers must pay medical and indemnity benefits, lose worker productivity, and often bear the costs of replacing the lost worker. Estimates suggest that the costs of injuries total tens or even hundreds of billions of dollars per year (Leigh, Landrigan and Markowitz, 2000).

One factor that is generally considered to be closely linked with the costs associated with a given workplace injury or illness is the duration of work absence that result. Obviously, the duration of work absence is closely related to injury or disability severity. Even conditioning on severity, however, early return to the at-injury employer is associated with significant declines in long-term earnings losses for disabled workers (Reville et al., 2005), presumably by minimizing the extent of career disruption. Injury duration poses direct and indirect costs on employers: the direct cost of higher disability indemnity benefit payments, and indirectly through the value of lost productivity.³ These costs associated with the duration of work absences make the promotion of early return to work for workers' compensation claimants an important priority for policymakers.

³ Nicholson et al. (2006) estimate the indirect cost of worker absenteeism to employers from absenteeism, encompassing the lost productivity of the worker, the loss of specific human capital, and any replacement or retraining costs. While the estimates vary by occupation, they find that a welder, for example, who is out of work for 2 weeks costs the employer about 133% of his or her daily wage, about \$1,604 total.

Many policy initiatives that are intended to improve return to work for injured or disabled workers operate through the employers. For instance, some states offer subsidies to offset the costs to employers of hiring, retaining or accommodating disabled workers. These policies are adopted, however, with relatively little consensus among the scientific literature as to the effectiveness of these employer-based efforts. While, as we describe later, there have been numerous studies that have demonstrated these policies have some impact on reducing the duration of work absences, there is very little consensus as to whether the impact is large enough to justify the cost of intervening.

This paper uses a unique data set that combines information from a firm-level survey of activities and policies designed to improve return to work matched to the post-injury employment outcomes for workers injured at these firms. The survey covered 40 large, self-insured employers in California and obtained detailed information about the formal programs and practices used to lower the duration of work-injury absences, including information such as the frequency of use of various modifications and accommodations. These survey data were matched to more than 17,000 workers injured from 1991-1995, and five years of post-injury employment data were collected. A key feature of our analysis is that some employers adopted a program during the period over which we observe workplace injuries, allowing us to employ firm fixed effects. This allows us to eliminate the firm heterogeneity that potentially confounds the analyses of many previous studies, making it more difficult to attribute causality to the programs themselves.

Our estimates suggest that employer return to work programs are highly effective at reducing the duration of absence associated with work-related injuries. We find that having a program in place is associated with about a 3.6 week reduction in the median number of weeks

away from work for an injured worker. For workers with a permanent disability, the program reduces the median number of weeks out of work by 12.6 weeks. The effects appear to be dominated by males, though this might be due to unobserved variation in occupation by gender. Using perform back-of-the-envelope estimates of program costs, these findings suggest that the return to work programs are highly cost-effective. We do note, however, that our data do not comprise a representative sample of employers, and more work is needed to assess how generalizable our findings would be if the same principles were introduced to a different sample of firms. In particular, it remains to be seen whether and how such programs could be successfully implemented among small employers.

In the next section of this paper we discuss the background of the Workers' Compensation system, self-insured firms, RTW policies, and related literature. In Section III, we outline a conceptual framework of a workers' decision to return to work and an employers' decision to adopt a return to work program. In Section IV, we present our data and explanatory variables as well as results from the employer RTW survey, and in Section V, we present the results of our analysis. Section VI concludes with a discussion of the policy implications of our findings.

II. Background

Workers' Compensation and Self-Insurance

The workers' compensation "system" dictates the compensation that employers are required to provide workers who suffer from an occupational injury or illness. First appearing in the U.S. in the early 20th century, workers' compensation laws created a no-fault system making employers responsible for providing injured workers with full medical and partial indemnity benefits. Prior to workers' compensation, workers were only due compensation in the

event of an occupational injury if they could demonstrate in the tort system that their employers were negligent. By offering lower benefits than were available in the tort system but without having to show fault, workers' compensation was seen as a compromise position that increased cost certainty for employers and greater security for workers (Fishback and Kantor, 1998).

The characteristics of workers' compensation vary by state, including the required benefit levels, methods of insurance, and extent of coverage. In most states, employers are required to cover all medical expenses and provide approximately two-thirds of pre-injury earnings, subject to a cap, for an extended period subsequent to the injury. The indemnity benefits are tax free, and the levels differ according to whether or not the injury results in permanent disability. For our purposes, a key feature of temporary disability benefits is that they are paid weekly and are typically paid as long as the injured worker remains out of work or is no longer recovering.⁴ This means that an employer's costs associated with a workers' compensation claim are directly increasing in the length of time the injured worker remains out of work.

Workers' compensation policies fix employer obligations and then regulate how they guarantee that those obligations will be met. The majority of employers purchase insurance to cover their workers' compensation liabilities. That insurance may be purchased from the private market or in some states from a state fund, which may or may not compete with private insurers. However the obligations are met, participation in the system is mandatory in every state except for Texas, which allows employers to opt out. The vast majority of workers are covered, though, in some states, very small employers are not required to offer coverage.

The data used in our analysis consists of injured workers at self-insured firms in California. California employers wishing to self-insure must obtain a certificate of consent from the Department of Industrial Relations (DIR). To obtain the certificate, the employer must have

⁴ At which point the injured worker is said to have reached maximal medical improvement (MMI).

a net worth of at least \$5 million, average annual revenue of \$500,000 over the past five years,⁵ and be able to pay expected workers' compensation payments to their employees.⁶ To satisfy the third requirement, an employer must provide an estimate of future workers' compensation liability and maintain a deposit of no less than \$220,000 with the DIR totaling 125% of the self-insurers estimated expected future liability for compensation and 10 % of estimated future legal and administrative costs.^{7,8} Another option that has become increasingly popular in recent years is for employers to combine efforts with other employers to self-insure as a private group, or as a joint public authority (JPA).

The DIR requirements for self-insurance and the implications of choosing to self-insure generate differences between self-insured and privately insured firms, which has implications for the generalizability of our findings. The most glaring descriptive difference between self and privately insured firms is size. Self-insured firms represent less than 1 percent of all firms in California, though most of the largest employers and almost all of the public employers are self-insured.⁹ As of 2007, private self-insured firms and public self-insured agencies accounted for roughly 16 and 10 percent of employment in California, respectively.¹⁰

Whether a firm is insured or self-insured has potential implications for the duration of work absences. While privately insured firms pay a premium based on their expected workers' compensation liability, many firms are imperfectly experience rated (particularly small firms). Self-insured firms, on the other hand, bear the full cost of their workers' compensation claims and are, thus, perfectly experience rated. Therefore, self-insured firms may be more likely to

⁵ 8 Cal. Code of Regulations, 15203(b).

⁶ California Labor Code, Section 3700(b).

⁷ California Labor Code, 3701.

⁸ California Labor Code, 3700.5.

⁹ In 2007 there were more than 1.2 million employers in California, however only 1,085 were self-insured, of which 584 were private and 501 were public agencies.⁹ In addition, there are 28 private group self-insurers with 2,279 members, and there are 99 joint public authorities (JPA) that are self-insured as a group.

¹⁰ Self-insured employer data is from the California SIP, and total employment data is from the California EDD.

adopt a return to work program than privately insured firms because their incentives are based entirely on workers' compensation liability concerns and minimizing workers' compensation payments.

Empirically, self-insurance does appear to correlate with the duration of injury-related work absences. Reville et al. (2001) found that time out of work in the first 3 months after an occupational injury was 15% lower at self-insured firms than at insured firms in California. Similarly, Kruger (1990) found that workers at self-insured firms in Minnesota had lower duration of absences after an injury. More generally, workers injured at larger firms generally experience less time off work than workers injured at smaller firms (Galizzi and Boden, 1996; Cheadle et al., 1994). This evidence is consistent with the idea that large, self-insured firms have greater incentives to adopt return to work programs. It is unclear, however, how much of this difference can be attributed to the actual programs, rather than some other features of the firms (e.g., the fact that large firms have higher-earning workers, who may be more motivated to return to work).

Strategies for Improving Return to Work

In principle, the process to determine whether and when an injured worker returns to work should be relatively straightforward. The recovery of injured workers is monitored by physicians, who can then determine when they have sufficiently recovered to resume their work activities. If a worker's condition is no longer improving but the worker cannot fulfill the necessary functions of the original job, that worker can file for permanent disability benefits and must then search for alternate employment. In a competitive labor market with full information and zero transaction costs, disabled workers will find employment in a new job in which the wage equals their post-injury marginal product.

In the majority of cases, particularly when no permanent disability is involved, the process probably does operate efficiently. There are circumstances in which complications can arise, however, particularly if the recovery time for an injury is extensive. Information is generally not perfect on either side, and disagreement can arise between workers and employers, between physicians and employers or between workers and physicians about the necessary recovery period and the extent to which workers can perform necessary job functions. These disagreements can lead to litigation, which can slow the process and potentially corrupt the employer-employee relationship. It is the desire to overcome or avoid such disagreements that, presumably, motivates the need for special policies to improve return to work.

There are numerous types of public and private policies that are designed to improve injured worker return to work outcomes. We separate these efforts into three broad categories: (1) medical management based, (2) incentive based, and (3) accommodation based. Medical management based approaches intervene in the injured worker-physician relationship, attempting to bring a greater focus on return to work to the treatment regimen. Examples of these policies can include granting control over which physician provides treatment to employers (who will presumably select a physician who places greater emphasis on return to work) and imposing treatment guidelines that are intended to improve the quality of care (and thus speed recovery). Incentive based policies essentially subsidize early return to work. Examples of this include tiered benefit schedules for permanent disability, which offer higher benefits to workers who don't receive an employment offer and lower benefits to those that do.

The medical management and incentive based approaches are largely, though not exclusively,¹¹ public interventions that are legislative in nature. The accommodation based approaches are more likely to be programs adopted by employers. We will discuss what the activities of employers in our sample in greater detail below, but accommodation based policies primarily focus on modifying the work environment to make it easier for injured workers to function in the workplace. These could be modifications to the job tasks or the physical environment, or they could be modifications to the work schedule. They could even involve the offer of a completely different job, one with requirements more suited to the injured worker's condition. During our sample time period of injuries occurring from 1991-1995 in California, these private accommodation based policies were the only options for California employers because prior to 2004 there were limited public policy efforts to improve return to work outcomes.¹²

There have been a number of past studies analyzing the effects of return to work policies on outcomes for injured workers. Many have suggested a correlation between the use of return to work policies and improved outcomes for injured workers. There is a general lack of consensus, however, on the extent to which these programs have a causal impact on improved return to work outcomes.

Some specific return to work policies that have been found to be effective in previous studies include light duty assignment, modified work, and ergonomic interventions. Baldwin et

¹¹ An example of a private medical management policy would be an employer that contracted with a health care provider to give on-site emergency care to injured workers, reducing the time between injury and treatment. This could potentially reduce the severity of the injury, improve recovery time and speed return to work.

¹² California did have an extensive vocational rehabilitation program for permanently disabled workers in place during this time period. Vocational rehabilitation in California was a state program that was designed to assist in retraining and placement for workers who were deemed medically to be unsuited for return to their at-injury employment, and included features such as counseling and cash benefits. Questions about the effectiveness of the program ultimately led to it being repealed in 2004. In any event, the vocational rehabilitation process is designed to assist workers after it has already been deemed that they cannot return to their at-injury employer, so it should not affect the relatively early return to work interventions considered here.

al (1996) found that workers with light duty assignment were 2 times as likely to have a successful return to work with a single absence and 1.6 times as likely to experience a successful return with multiple absences. Loisel et al (1996) analyze a population-based randomized clinical trial and find that subjects that received clinical and ergonomic intervention had on average 2.4 times fewer lost days from regular duty than subjects in the control group. Bernacki et al (2000) found that an early intervention return to work program reduced lost workday cases by 55% at a large urban medical center.

More generally, Franche et al. (2005) provide a systematic review of the quantitative literature on workplace-based return to work interventions dating back to 1990. The studies reviewed note that different return to work interventions reduce time to return to work by a factor of roughly 1.9 to 2.5. Krause et al. (1998) also review the return to work literature and find that modified work and other return to work policies improve return to work outcomes by a factor ranging roughly from 1 to 4 times. Tompa et al. (2008) review studies that examine the economic implications of disability management interventions and find credible evidence that programs provide financial benefits. These reviews generally conclude, however, that the lack of evidence on causality makes it difficult to assess the cost-effectiveness of these programs.

In addition to differences in return to work program strategies, differences in benefits, health care, workplace factors, and demographic characteristics also play important roles in successfully returning injured workers back to work (Krause et al. 2001). One determinant that plays an important role and has been studied thoroughly is the effect of workers' compensation benefit levels on the duration of work absences of injured workers (see e.g. Meyer et. al, 1995; Neuhauser and Raphael, 2004; Galizzi and Boden, 1996; Butler and Worrall, 1985; Johnson and Ondrich, 1990). Virtually all of these studies have found that the duration of work absences of

injured workers is positively associated with benefit levels. Meyer et al. (1995) and Neuhauser and Raphael (2004) use exogenous benefit increases to analyze the effect of a change in benefits on duration of injury. Both studies found similar duration-benefit elasticity estimates of roughly 0.3. Neuhauser and Raphael (2004) also account for selection bias where workers with less severe injuries are more likely to apply for benefits after the increase. After accounting for this selection bias, their benefit-duration elasticity estimate increases to 0.8.

Other studies have analyzed the role of demographic characteristics on return to work outcomes. Many studies have found that older workers are less likely to return to work and are out of work for longer periods after an injury than younger workers (Cheadle et al, 1994; MacKenzie et al, 1988; Tate, 1992), and workers with higher education, higher income and job seniority are more likely to return to work faster (MacKenzie et al, 1988; Tate, 1992). There are gender differences as well, as Boden and Galizzi (2003, 1999) and Johnson and Ondrich (1990) report that women are more likely to take longer to return to work and they experience greater income losses compared to men.

Return to Work Practices Used by Employers in California

To examine the impact of actual return to work practices used by employers in California during our study period, we use the results of a survey conducted in 2000 by RAND. RAND collected information from 40 large, private self-insured firms with either a telephone or written survey assessing the most common features of the firm's return to work program and disability management practices (if any). The process for collecting the survey is described in greater detail below, but here we summarize a few key results from the survey in order to describe the kinds of RTW practices we expect are most widely used.

The RAND RTW survey collected information about the characteristics of employer-based RTW programs to provide a clearer picture of a typical program. In 1980 only one firm in our sample had adopted a program but there is a positive trend in adoption rates from 1980 to 2000, including a significant rise after 1990, probably because of the implementation of the Americans with Disabilities Act (ADA).¹³ Just 9 firms (25%) reported having adopted a program prior to 1990, while 21 (58%) had adopted a program by 1996.¹⁴

The survey asked employers to provide information about methods used to return injured employees to work, how often they are used, and the subjective importance of each method in relation to the overall effectiveness of the program (as of the time of the survey, 2000). Table 1 summarizes the most common transitional work accommodation characteristics of the programs in our sample and the perceived level of importance as reported by each employer.

The four primary characteristics we report are modified work tasks, providing a modified workstation or modified equipment, reduced time and work schedule changes, and providing a different job in either the same or a different department. Modified work is any temporary change in work tasks or functions, modified workstations and modified equipment allow injured workers to perform work functions while recovering from an injury, and reduced time/work schedules and providing a different job are examples of actions employers may take to facilitate the return of an injured worker to the workplace.

Modified work tasks were the most common among employers in our sample, with 82% of the firms reporting that they use this method frequently or quite often. Roughly half of the sample reported providing a modified workstation or modified equipment frequently, or most of the time. Reduced time and work schedule changes were fairly common with 45% of the sample

¹³ Our sample includes workers injured between 1991-1995, however we also have information on the year of firm program adoption which date back to 1980 and are as current as 2000.

¹⁴ Four firms did not report a year of program adoption. These firms are dropped from the analysis.

reporting use, and 32% of the firms reported providing a different job in either the same or a different department as used frequently or quite often.

The rightmost column of Table 1 lists the perceived level of importance, as reported by employers, of each RTW method. Employers were given the option to choose whether they believed a method was extremely important, quite important, moderately important, of limited importance, or no importance at all. To quantify these answers, we used a scale from 1-5, with 5 being extremely important.¹⁵ Not surprisingly, the perceived level of importance of each method falls in line with the proportion of firms that reported use of each characteristic as frequent or quite often. More generally, these program features coincide with the standard best practices of disability management—relatively minor accommodations such as modifying tasks are used most frequently, while more disruptive changes such as relocating the employee to a different job are used as a last resort.

While there is some variation in program features across employers, we do not have sufficient variation to test in our empirical work which aspects of a program are most effective. Nor is it clear that a program with this design is necessarily optimal for any employer—employers adopting a program necessarily will choose the program that they believe *ex ante* to be most effective for them. Nevertheless, this survey data helps describe what activities the employers are taking to try and improve return to work for disabled workers. To interpret the empirical work that comes later, we are testing for the impact of the “average” program using the different practices described here.

¹⁵ The benefit of using this scale is that we can quantify and compare the survey answers. The cost is that we are assuming that the scale is linear such that, for instance, an increase from 3 to 4 is the same as an increase from 4 to 5. We do not know if this assumption is true and in fact there may be some non-linearities in the scale, however we adopt this method to analyze the results.

III. Conceptual Framework

The goal of our empirical work is to examine how return to work programs influence the duration of absences after workplace injuries. In this section we outline formally how we expect an accommodation based return to work program to affect the duration of absence. Then, we model the decision of the firm to invest in return to work programs given the predicted impact on injured workers. The purpose of this analysis is to highlight both the parameter that we estimate and the identifying assumptions necessary to obtain a consistent estimate.

Injuries and the Duration of Work Absence

Assume workers have uninjured marginal productivity of π_t^* in time t , receive an offer wage of w_t and face reservation wage of w_r . Given a competitive labor market, workers accept employment if their offer wage exceed their reservation wage, that is if $w_t = \pi_t^* \geq w_r$. When a worker experiences a work-related injury, it acts as a negative health shock that lowers their marginal productivity to π_t , where $\pi_t^* \geq \pi_t$. If the reservation wage is unchanged after an injury, then the loss of productivity makes it less likely that the wage offer exceeds the reservation wage and the injured worker is less likely to work.

There are factors, however, that could affect the reservation wage for injured workers. Neuhauser and Raphael (2004) model an injured worker's reservation wage as a function of the monetary value of recuperation time, $v(t)$, and worker's compensation benefits, b . Assume $v(t)$ and b are linearly separable in the worker's reservation wage. Then, the worker will accept employment if $\pi_t \geq v(t) + b$. In equilibrium, this suggests that the optimal time to return to employment, t^* , is defined by $t^* = v^{-1}(\pi_t - b)$.

Our focus in this paper is on the activities of employers to influence the duration of absences, but employers cannot directly influence benefit levels.¹⁶ Holding benefit levels constant, the return to employment following an injury is driven solely by marginal productivity. Suppose that injured workers experience a natural rate of recovery such that π_t increases over time, i.e., $\frac{\partial(\pi_t^* - \pi_t)}{\partial t} < 0$. The recovery rate is affected by factors such as the type of injury, the quality of the care received, worker demographic characteristics, and by the accommodations offered by employers.

Employer accommodations may include a bundle of activities, such as the provision of modified work tasks, physical modifications to the work site or the allowance of scheduling changes. Ultimately, however, the purpose of an accommodation is to bring marginal productivity for injured workers closer to its pre-injury level. Let a denote the level of firm investment in accommodations, where $\pi_t(a) - \pi_t(0) \geq 0$. This implies that the impact of

workplace accommodations on recovery is given by $\frac{\partial^2(\pi_t^* - \pi_t)}{\partial a \partial a} < 0$. If we assume that

accommodations have diminishing marginal product, then we expect $\frac{\partial^3(\pi_t^* - \pi_t)}{\partial a \partial a^2} > 0$. Using

these relationships, we can define the optimal return to work date as a function of employer accommodations as $t^*(a)$, where $t_a^* < 0$ and $t_{aa}^* > 0$.

Employer Investment in Accommodations

Return to work accommodations reduce the amount of time workers are absent after a

¹⁶ In reality, employers can and sometimes do offer supplementary benefits above and beyond the legislative requirements. Theory predicts, however, that any such increase will increase the duration of absence. Thus, from the standpoint of evaluating a return to work program, such supplementary benefits can be ignored.

workplace injury, so employers will invest in accommodations if the marginal cost of absence exceeds the marginal cost of accommodation. Suppose that the probability a worker is injured is given by q , the marginal cost of work absence for injured workers is c , the marginal cost of accommodation is k , and wage is w . Formally, the optimal level of employer investment is defined by the solution to the employer's profit maximization:

$$\max_a E\{(1-q)(\pi-w) + q((1-t)(\pi-w) - ct - ka)\}.$$

In the absence of an injury, employer profits equal the surplus of productivity over wages. If an injury occurs, employers earn no surplus while an injured worker is absent, but earns full surplus once the worker returns to work. Employers lose c for the period that workers remain absent, and pay k per unit of accommodation they choose to make.

In a competitive labor market, the employer earns zero profits, i.e., $(\pi - w) = 0$.

Applying this condition and substituting the optimal return time $t^*(a)$ into the profit function,

the optimal investment in accommodation is defined by the first order condition $-t_a^* = \frac{k}{c}$. Note

that this formulation assumes that accommodation costs are fully variable, in the sense that they are only paid for if a worker is injured. Suppose, on the other hand, that accommodation costs were paid for up front, prior to an injury.¹⁷ In such a model, the solution would be defined by

$$-t_a^* = \frac{k}{qc}.$$

This model identifies four factors that drive employer decisions to invest in accommodations: the effectiveness of precautions, the cost of precautions, the cost of injury absence, and (possibly) the risk of injury. Firms will be more likely to accommodate workers if

¹⁷ An example of such a cost would be hiring a full-time disability case manager to work with injured workers.

the accommodations are more effective or if the cost of accommodation is low relative to the cost of injury-related absences. If firms must bear fixed costs to accommodate workers, then firms with higher risk will also be more likely to accommodate. These predictions are important, because they suggest that underlying firm characteristics drive the decision to accommodate injured workers. Failing to account for heterogeneity across firms will potentially bias any empirical estimates of the effectiveness of these policies. In our empirical work, we describe how our estimates control for firm-level heterogeneity and identify the impact of the return to work program.

IV. Empirical Framework

Data

In this analysis we link the workers' compensation data collected from the self-insured firms to administrative data on wages from the Base Wage file maintained by the California Employment Development Department (EDD). Every quarter, employers covered by Unemployment Insurance (UI) in California are required to report the quarterly earnings of every employee to the EDD. The EDD provided the quarterly earnings of all workers' compensation claimants at the firms in our sample for up to 20 quarters after injury. The occupations and employers covered by unemployment insurance are very close to those covered by workers' compensation (Reville, 1998), so the Base Wage file should represent a near-comprehensive database of earnings for workers' compensation claimants.

To collect the workers' compensation data, RAND contacted a sample of 150 private, self-insured firms (out of a total of 466) and 150 public self-insured firms (out of a total of 432) and requested data on all indemnity claims from 1991 through 1996. The sample of contacted

firms was based on their number of claims; thus, the resulting data was representative of the sample of claims (as opposed to employers), and the sample was stratified by employer size to increase the probability of selection for small self-insured employers.¹⁸ Data was requested on paid and incurred benefits, injury dates, and individual identifiers to facilitate linking to earnings data maintained by the State of California EDD.

The full data collection process is described in detail in Reville, et al. (2001). Ultimately RAND collected useable data on workers' compensation claims from 68 employers. The 68 firms used in the final dataset represented 15 percent of self-insured, private employers, and 30 percent of indemnity claims at self-insured employers over the period of interest. These 68 firms provided the sample for survey collecting information on return to work practices. Ultimately, 40 firms responded to the survey, of which 33 had sufficient non-missing information on workers' compensation, earnings and return to work practices to include in the sample.

We utilize two different measures of injury duration in this study. The first is simply the number of weeks that an injured worker receives temporary total disability (TTD) benefit payments. Workers' are no longer eligible for TTD once they return to work, so this offers a simple measure of the duration of absence. Because it is possible that a worker runs out of TTD benefits before they actually return to their job, however, we also construct a more stringent variable to analyze durations. This second measure of injury duration is what we call the number of weeks until "sustained" return to work. This is defined as the number of weeks until we observe positive wages for an injured worker for at least two consecutive quarters after TTD

¹⁸ Several randomization validity tests were performed on the final data set (see Reville et al. 2001). The biggest source of non-randomness in the response appeared to be based on industry. In particular, public utilities were more likely to respond, and transportation firms were less likely to respond. Reville et al. (2001) tested whether controlling for the likelihood of response had any impact on estimated post-injury employment outcomes and found that the overall impact was minor.

benefits have been exhausted.¹⁹ Defining a worker as returning to work when we observe wages for one quarter in isolation is not sufficient because there may be delayed wages, or other benefits recorded, and may not indicate that a worker has successfully returned to work.²⁰

Summary Statistics

Table 2 displays the descriptive statistics for our sample of injured workers, stratified by RTW program status at the time of injury. Our sample includes 17,321 workers injured on the job between the years 1991-1995.²¹ The table summarizes our primary measures of return to work. The average and median number of weeks receiving TTD benefits is 29.5 and 6.2 weeks, respectively, for all workers in our sample. The number of TTD weeks we observe is censored at 200, and roughly 95% of our sample returned to work in this time period, in the sense that they stopped receiving TTD benefits within 200 weeks. The mean and median numbers of weeks until sustained return to work are 33.5 and 7 weeks, respectively. Weeks to sustained RTW are also censored at 200 weeks, and 91% of injured workers returned to sustained work in this time period.

Simply comparing the mean of TTD weeks, the average for workers who participated in a program was 20.44 weeks, compared to 37.44 weeks on average for workers who did not

¹⁹ Our wage data are quarterly, meaning that we did not observe the actual number of weeks until return to work. Let rtw_{2q} be the number of quarters after injury until we observe positive wages for at least two consecutive quarters, and let ttd_q be the number of quarters of TTD benefits received. If $ttd_q \geq rtw_{2q}$, then weeks to sustained RTW is set equal to weeks of TTD benefits received. We make this assumption because if a worker is still receiving TTD benefits, even if they have positive wages, then they have not fully returned to work. Or, they might return for one or more temporary spells, and receive UI wages during that spell, but then have to leave work and go back on TTD. On the other hand, if $ttd_q < rtw_{2q}$, we compute weeks to sustained return as the weeks from the initial date of injury to the midpoint of the first quarter in which they are observed back.

²⁰ Butler et al. (1995) note that return to work is a process, not an event in time, and there are many potential instances of work spells and absences. While we are not able to track multiple spells with our data, our more stringent sustained return to work measure will minimize unsuccessful cases of return to work.

²¹ Though the original data collection effort collected information on claims through 1996, only injuries through 1995 are included in the sample because the wage data include up to 5 years of post-injury earnings.

participate in a program, a 45% difference. The corresponding median times are 6 and 6.4 weeks, a 6% difference, for workers who did and did not participate in a program, respectively. The mean weeks to sustained RTW for injured workers who participated in a program was 24.13, compared to 42.05 weeks for workers not in a program, a 43% difference. The median weeks to sustained RTW for workers in a program is 6, identical to the median of TTD weeks for the same group, and it is 7 weeks for workers not in a program, a difference of 14%.

The large differences in mean durations may, in part, be due to the skewed nature of our data. The majority of workers RTW within a month after an injury, but some workers take up to 200 weeks, or longer. When comparing the two groups, a larger proportion of workers not in a program were censored at 200 weeks. Eberwein et al. (2002) note that median durations are likely to be a more robust descriptive statistic than mean durations since medians give less weight to outlying durations and rely much less heavily on the behavior of the hazard function at high and out-of-sample durations or on extreme values for any potential unobserved heterogeneity. Therefore, while we estimate mean differences, our central conclusions focus on differences in estimated medians between the two groups.

Some key worker characteristics included in our sample are weekly wage, PPD payments, gender, and age. The average weekly wage is roughly \$600, but workers who participated in a program had higher wages, on average, than workers who did not participate in a program at \$690 and \$525, respectively. Almost 40% of our sample collected any PPD payments, with an average payment of about \$5,900. The proportion of workers who obtained a PPD payments is higher for workers injured at firms with a program in place (46% to 32%, respectively), which corresponds with higher average PPD payouts for that group as well. More

than half (58%) of our overall sample is female, but an even larger proportion (63%) of workers not in a program are female.

Some firm characteristics that are of interest include indemnity and medical costs per injury, injury rates, industry, and firm size. Average indemnity costs per case measures the average amount of lost wages per injured worker, which is roughly \$4,000 in our sample. The average medical costs per case are about \$3,400, and the average firm injury rate, defined as the proportion of the number of cases to the number of employees, is 11%. The majority of workers come from firms in the service industry (60%), and 33% work in the transportation industry. Six percent of workers are in manufacturing and the least represented industry is trade, which represents 1% of the workers in our sample. The table also illustrates the large size of the firms in our sample; the majority of workers (52%) come from firms with 1,001-35,000 employees, and 47% of the workers come from firms with more than 35,000 employees.²²

Empirical Specification

To assess the effectiveness of RTW programs, we examine differences in the duration of time out of work for injured workers based on program participation. In this framework, an injured worker “survives” (i.e. remains in the sample) if they do not return to work, and “fails” (i.e. drops out of the sample) when they do return. Censored observations are those that fail to return before 200 weeks.

Let T represent the random variable denoting the time an injured worker spends out of work recovering from an injury or illness, from origin in calendar time t_0 to $(t_0 + T)$.

Furthermore, let $F(t) = \Pr(T \leq t)$ be the cumulative distribution function that describes the

²² Note that the summary statistics are at the worker level. Thus, part of the over-representation of certain industries is due to the fact that these industries have the largest firms in our sample. Similarly, the firm size distribution is skewed more towards large firms than it would be if evaluated at the firm level.

probability distribution of workers that have returned to work in time t , and

$S(t) = \Pr(T > t) = 1 - F(t)$ be the corresponding distribution that describes the converse. We can

define the *hazard rate* as $h(t) = \frac{f(t)}{S(t)} = \frac{f(t)}{1 - F(t)}$, where $f(t)$ is the probability density function.

The hazard rate represents the instantaneous probability a worker returns to work in a time period $t + \Delta t$, given they were not working in the previous time period t .

For a given level of investment in RTW policies, denoted a as above, the instantaneous probability that an injured worker returns to work in time $t + \Delta t$ is:

$$(1) \quad h_{ijt}(\pi(t, a)) = \lim_{\Delta t \rightarrow 0} \Pr\left(\frac{\pi(t + \Delta t, a) \geq v(t + \Delta t) + b \mid \pi(t, a) < v(t) + b}{\Delta t}\right)$$

We estimate h_{ijt} , and the non-parametric cumulative hazard rate, $H(t)$, to compare instantaneous and cumulative probabilities of returning to work based on program participation.²³

While it is informative to visually assess the effectiveness of RTW programs by analyzing h_{ijt} and $H(t)$, they do not provide us with useful estimates for assessing the magnitude of the effects. Furthermore, we are unable to control for observable worker and firm heterogeneity when estimating these parameters. To overcome these obstacles, we also estimate a number of duration models that control for observable heterogeneity in our sample, and allow us to generate useful point estimates to perform a back-of-the-envelope cost-benefit test.

Since our outcome variables are measured in weeks, and to allow for flexibility in the specification of the hazard function, we estimate discrete time logistic hazard models of the form:²⁴

²³ The cumulative hazard rate is the integral of the hazard rates over the given duration:

$$H(t) = -\log S(t) = \int_{t=0}^t h(u) du.$$

²⁴ In the Appendix we discuss the robustness of our findings to different empirical specifications.

$$(2) \quad h_{ijt} = (1 + \exp(-weeks_{ij}(t)))^{-1}$$

where

$$(3) \quad weeks_{ij}(t) = \pi a_{jt} + \delta_t + \beta x'_{ijt} + \gamma z'_{jt} + \lambda_j + \kappa \ln(t) + \varepsilon_{ijt}.$$

Taking the log of both sides allows us to write our estimating equation as:

$$(4) \quad \ln\left(\frac{h_{ijt}}{1-h_{ijt}}\right) = \pi a_{jt} + \delta_t + \beta x'_{ijt} + \gamma z'_{jt} + \lambda_j + \kappa \ln(t) + \varepsilon_{ijt}.$$

Using the earlier notation, a_{jt} represents investments in accommodations, but we measure this using an indicator that equals one if firm j had a program in place in time t and zero otherwise. The coefficient π represents the change in hazard ratios for workers in the “treatment” group—those injured with a program in place—compared to the controls. Additionally, we include year of injury fixed effects, δ_t , and we control for worker heterogeneity by including, x'_{ijt} , a vector of characteristics such as the log of pre-injury weekly wage, age, gender, and PPD payments. We use PPD payments as a proxy for injury severity.²⁵

Identification

The key challenge to identifying π is the potential for unobserved heterogeneity of firms to confound our estimate. Table 2 suggests that there are some observable differences in those injured workers who are and are not exposed to a program. Some of these differences can be explained by differences in factors such as industry, firm size and injury risk, and we include these factors in the vector of firm characteristics, z'_{jt} . Since we do not have time-varying

²⁵ Key to our analysis is the fact that PPD benefits in California are determined according to a physician’s evaluation of injury severity, and do not depend on employment status. Thus, they are not endogenously influenced by return to work, and we can use them to proxy for injury severity.

information on these characteristics, we test separate specifications that include these characteristics and others that include firm fixed effects, λ_j

These controls will work well and our model will be identified as long as any unobserved heterogeneity correlated with program status is time invariant. If program adoption is spurred by changes in unobservable characteristics, however, then clearly we will not be identified. The model discussed above provides some insight as to how likely such a scenario is. The factors that drive program adoption are the marginal product of adoption, the risk of injury and the relative cost of a program compared to the cost of injury duration. The marginal productivity of adoption and the risk of injury are likely driven by factors such as firm size and production technology, things that are unlikely to change significantly over a small period of time.

The relative cost of accommodations versus injury duration could be affected by policy changes, such as workers' compensation reform. The only significant policy changes to California's workers' compensation system over our period of interest, however, were reforms to the insurance system. Assembly bill 110 in California was passed in 1993 and took effect January 1, 1995, and it opened the California workers' compensation market to competitive pricing. Because the employers in our sample are self-insured firms, however, it seems unlikely that this reform would have had a significant impact on their willingness to adopt a return to work program. We also note that such a program would likely decrease the cost of workplace injuries, by leading to lower premiums and lower workers' compensation costs, suggesting that it would make employers less willing to adopt.

Perhaps the reform that had the biggest impact on employer willingness to adopt a return to work program was the introduction of the ADA. Since 1992, the ADA has required firms with more than 15 employees to make "reasonable" accommodations to disabled workers.

The threat of exposure to civil suits under the ADA if they were unwilling to accommodate disabled workers may have made employers in our sample more willing to undergo the cost of a return to work program, supported by the sharp increase in adoption observed after ADA passage in 1990.²⁶ If that is so, then adoption is likely to be uncorrelated with underlying trends in return to work. That is not to say that adoption would be random, however, as we would still expect firms for whom the programs would be most effective to be the most likely to adopt after ADA enactment. Thus, our results should be interpreted as capturing the effect of “treatment on the treated.”

Ultimately, our discussion of the impact of the ADA on program adoption by employers is simply conjecture. We lack sufficient data to formally test whether it was a decisive factor for firms. We do, however, test whether pre-adoption trends in average return to work rates of employers were correlated with adoption. These results, reported in the appendix, find no evidence to suggest that average return to work rates in the pre-adoption period had any effect on the likelihood of adoption.

V. Results

Descriptive Findings

Here we display some descriptive findings for differences in return to work rates for workers injured with a program in place (using sustained return to work as the duration measure). The left panel of Figure 1 illustrates the cumulative hazard rates for injured workers based on program participation for up to 52 weeks after injury. The cumulative rate, which indicates the fraction of workers returning by that date, displays a noticeable difference after five

²⁶ The survey asked firms whether the ADA was a contributing factor in the decision to adopt a return to work program after 1990, and 7 or 17 firms (41%) said it was at least “moderately” important.

weeks, subsequent to which injured workers participating in a program have a higher cumulative return to work rate at each week.²⁷ Further visual analysis shows that once the rates diverge after five weeks, the gap widens and persists up to 52 weeks after injury.²⁸

The right panel of Figure 1 illustrates the instantaneous hazard rate—the proportion of workers that return to work in time t , given that they haven't returned yet. In the first week after injury, roughly 21% of workers in the treatment group return to work compared to 20% from the control group. There is a significant decline in both curves after the first week, but the decline is sharper for workers injured without a program in place. After about four weeks, there is a persistent difference where workers injured in an employer with a program in place are about two percentage points more likely to return in a given week. We further note that the shape of the instantaneous hazard rate suggests that time out of work exhibits negative duration dependence, with the conditional probability of returning to work falling as time from injury increases.

Figure 2 illustrates the cumulative and instantaneous hazard rates for men only. Graphically, the effect of program status appears consistent, even stronger, for men. Both the cumulative and instantaneous hazard rates diverge after about 5 weeks, with workers injured with a program in place significantly more likely to have returned to work. The instantaneous hazard displays a consistent 2 to 3 percentage point higher probability of returning to work for men injured with a program in place compared to those injured without. In

²⁷ To test the statistical significance of the differences in the cumulative hazard rates for Figures 1-4 we performed a log-rank test of equality of the corresponding survivor functions, with the null hypothesis that the functions are equal. The results, summarized in the appendix, suggest that the differences are significant in all cases.

²⁸ We show each cumulative and instantaneous hazard rate graph up to 52 weeks after injury for space considerations but the trends in rates continue to 200 weeks after injury.

Figure 3 we compare the cumulative and instantaneous hazard rates by program status for women. We can see from the figure that the effect of having a program in place is considerably weaker for women. While the cumulative hazard rate is consistently higher for women in a program, the difference is considerably smaller than for men. The difference in the instantaneous hazard rates for women is negligible. We also compare the hazard rates for workers in our sample who received positive PPD benefits. These are the most severely injured workers in our sample, so we expect the return to work outcomes to be worse.

Figure 4 shows that, while the overall return to work rates are lower for the positive PPD sample, there is still a pronounced difference by program status. The cumulative hazard is more than 20 percentage points higher for workers injured with a program in place one-year after injury. Interestingly, the instantaneous hazard rate is significantly higher for workers with a program in place even for the first several weeks after an injury. For the other samples, the instantaneous hazard was similar for workers with and without a program in place in the first few weeks after injury. This suggests that the benefits of a program to the most severely disabled workers can have immediate effect. In fact, the difference appears greatest for the first 15-20 weeks in this sample; still, a clear difference persists throughout the 52 week period.

Duration Model Findings

While the descriptive findings about the impact of return to work programs are suggestive, they fail to control for potentially confounding individual and firm characteristics. Table 3 reports the estimated results from our discrete-time hazard model. Each column in the table represents a separate regression specification, varying by the sample used and the presence of firm fixed effects. Columns 1 and 2 report the results for all workers in our sample, columns 3 and 4 report the results for men, columns 5 and 6 report the results for women, and columns 7

and 8 report the results for the most severe injuries (those who collected PPD benefits). All models include year dummies and controls for individual worker characteristics. We report the hazard ratios and coefficients for the program effect as well as the estimate of duration dependence (the log time variable). The top panel displays the results for the preferred measure of sustained return to work, while the bottom panel shows the results for weeks receiving TTD benefits. All standard errors are adjusted to allow for clustering within employers (see e.g. Woldridge (2003); Moulton (1990); Liang and Zeger (1986)).

The estimated hazard ratios on the treatment indicator suggest that, even controlling for individual and firm heterogeneity, the presence of a program is associated with a significant reduction in the duration of work-related absences. Using weeks receiving TTD benefits as the dependent variable, the hazard ratios for the entire sample are 1.38 and 1.36 with and without fixed effects, respectively, with both estimates statistically significant at the 1% level. This suggests that the hazard rate of workers injured at firms with a program is roughly 1.4 times higher than that of workers injured without a program in place.

Consistent with the descriptive analysis, the estimate for men is considerably stronger at approximately 1.48 without and 1.52 with the fixed effects. Similarly, the effect is noticeably weaker for women; the hazard ratio for women is 1.26 without fixed effects and 1.18 with, and both estimates are significant at the 5% level. Also consistent with the descriptive analysis, the program effect is large and statistically significant when we restrict the sample to workers with permanent disability. There are several possible explanations as to why the effect is so much larger for men. We do not have any controls for occupation, so it could be that men work in more physically demanding jobs that require greater accommodations in order to continue working after an injury. Alternatively, it could be that they work in riskier jobs and so are

targeted more heavily when a firm adopts a program. We lack sufficient data to try and uncover the precise mechanism that makes the programs so much more effective for the men in our sample. In the model without firm fixed effects, the hazard ratio is 1.56 times higher for injured workers with a permanent disability who have a program in place.

The estimated hazard ratios follow a similar pattern when we use the weeks receiving temporary disability benefits as the dependent variable. The magnitude is slightly higher in most cases, with the hazard ratio reaching as high as 1.66 for the PPD sample without fixed effects. We note, however, that the impact on women falls even more when we use TTD weeks as the dependent variable. If we restrict the sample to women and include firm fixed effects the hazard ratio is just 1.06, and it is not significantly different from zero. We also note that the estimates suggest that there is negative duration dependence, as we saw with the descriptive analysis.

While the hazard rate estimates indicate that the return to work programs have a significant impact on improving return to work, they have limited use in terms of simulating the program effect for a cost-benefit analysis. We estimated the median and mean differences in the duration of absence associated with a program, and report the findings in Table 4.²⁹ Column 1 reports that the median number of weeks until return to sustained work is 9.0. The mean number of weeks is 41.1, reflecting the skewed nature of injury absences. Our estimates suggest that having a program in place reduces the median number of weeks that a worker is absent by 3.8, a

²⁹ The mean duration is defined as $\sum_{t=0}^{200} h(t)$, where $h(t)$ is the average hazard rate for each week. The median duration is defined as the point where the survivor function $S(t) = 0.5$. In each case, the survivor function was never exactly equal to 0.5, so we imputed the median using this formula provided by Eberwein, Ham, and LaLonde (2002) as: $\frac{S(t+1) - 0.5}{S(t+1) - S(t)} * (t) + \frac{0.5 - S(t)}{S(t+1) - S(t)} * (t+1)$. In this case, if the median duration of time to return to weeks is between 6 and 7 weeks, then $(t) = 6$, $(t+1) = 7$, $S(t)$ is the value of the survivor function when $(t) = 6$, and $S(t+1)$ is the value of the survivor function when $(t) = 7$.

difference of 42%. If we look at the mean difference, we see that the worker returns 15.7 weeks sooner on average, a 38% drop. These estimates are similar with or without firm fixed effects.

While these effects are large, they are skewed somewhat by the large differences in injury severity. Workers with permanent disability represent 40% of the sample, and the table reports that the median injury duration for a worker with permanent disability is 39.7 weeks (the mean is 69.5 weeks). The impact of the program is to reduce the median duration for those with a permanent disability by 18.8 weeks, or 47%. The effect is somewhat smaller if we include fixed effects and look at the mean difference, but this still represents a drop of 27%. This suggests that much of the program effect is driven by the large reduction in injury duration for the most severely injured workers. The bottom panel of these table shows that the estimated effects are of comparable magnitude when we use the number of weeks receiving TTD benefits as the dependent variable.

The Cost-Effectiveness of Programs

Our estimates indicate that the employer return to work programs reduce the mean and median durations of injury absences. The magnitudes are significant, but sometimes the accommodations required can be quite costly. From the perspective of promoting the use of return to work programs as a policy initiative, ultimately we are interested in whether the benefits from improved return to work outweigh the costs to implement and maintain the programs. Here we conduct a back-of-the envelope analysis of the costs and benefits in order to assess whether the net benefit of program adoption appears to be positive.

It can be difficult to define the costs of a return to work program, because there can be fixed costs (e.g., the cost of hiring a disability case manager, or building a wheelchair accessible ramp in the entryway), variable costs (e.g., installing ergonomic modifications for an injured

worker) or indirect costs (e.g., if the accommodations only partly overcome the injured workers disability, then the opportunity cost of lost productivity from simply rehiring a new worker is a program cost). Some limited information on program costs were recorded in the RAND survey. In particular, firms were asked to indicate the annual cost of their programs in the survey year (2000). Only 12 firms reported an annual cost, which ranged from \$40,000 to \$6,000,000. Dividing the total reported annual program cost by the number of injured workers at the same firm indicates that the average program cost in our sample was \$1,174, but the range varies from \$500 to \$3,000. We feel this number probably underestimates the total costs, because indirect costs are unlikely to be included, and it is unclear whether or not certain types of fixed costs are included.

For our estimate of program benefits we use the dollar savings on TTD payments from shorter injury durations. This weekly benefit level is equal to two-thirds of the firm's average weekly wage, which averages \$438 per week in our sample. We evaluate benefits ranging from the 25th percentile at \$347 in our sample up to the maximum weekly benefit of \$757, to consider how the benefit of a program compares to changes in the cost. While these dollar amounts represent the direct benefits to employers, they almost certainly understate the true benefits of a program. In particular, these benefits do not account for reductions in replacement costs and higher productivity levels from experienced workers.³⁰ In addition, we ignore the benefits to injured workers of getting back to work sooner and reducing the adverse economic impacts of an injury. While these indirect benefits and benefits to workers are instructive from evaluating the programs from a social perspective, the direct benefits will have the strongest impact on employer decisionmaking.

³⁰ Nicholson et. al. (2006) estimate that a two-week absence costs employers 133% of the weekly wage in indirect costs.

Table 5 reports the number of weeks of injury duration a program must reduce in order for the program to break-even. For example, in the low-benefit, low-cost scenario, the break-even estimate is equal to 1.4 weeks and any additional reductions in average durations generate a net benefit for the employer. Comparing our treatment effect estimates with the break-even numbers in Table 5, the programs generate net benefits for all but the most expensive programs when wages (and thus weekly benefits) are high. With average wages, the programs are beneficial when the program cost per injured worker is below \$1,500, and with low wages, the programs are beneficial when the program cost per injured worker is below \$1,000.³¹ Compared to our sample average program cost per injured workers of \$1,174, virtually all of the treatment effect and wage scenarios deem the programs to be beneficial to firms.

VI. Conclusion

One of the most common themes in workers' compensation policy discussions is the desire to promote the return to work of disabled workers. Many public policies are designed to give employers the incentive to adopt accommodations that make it easier for disabled workers to return, but the evidence on the impact of such programs has been mixed. In this paper we examine the effectiveness of employer-based return to work programs adopted by a sample of large, private, self-insured employers in California. We find that the programs lead to a significant reduction in the duration of injury absences. Having a return to work program in place at the time of injury is associated with a 3-4 week reduction in the median injury duration, and about a 15 week reduction in the average injury duration.

³¹ Note that we use the use the median effects rather than the mean, because we feel that the mean effects better represent the gains the employer would observe in the highest number of cases. If we were to focus on the mean differences, the programs would be cost-effective in this example in all cases.

Much of the impact of the program appears to be driven by a large improvement in return to work for the most severely injured workers, those with permanent disabilities. This is an important finding, as previous work has demonstrated that improving the early return to work of permanently disabled workers can lower long-term earnings losses by as much as one-third (Reville et al., 2005) several years after disability onset. This suggests that the use of employer programs that promote return to work could have a sustained, positive effect on worker outcomes.

If the gains to workers are imperfectly passed on through to employers—say, through a reduction in the compensating wage differential—there could be external benefits of return to work programs and employer adoption would be sub-optimal.³² If such external benefits existed, this would argue in favor of promoting the use of these kinds of programs more generally, for example with direct subsidies to accommodations or with insurance premium discounts. Our results offer some simple guides as to which employers would most need such subsidies. In particular, employers will be less willing to adopt policies for low wage workers, even though these workers are harder hit by workplace injuries (Reville et al., 2001). Similarly, employers with workforces with less ability to transfer skills and human capital across different tasks or jobs—that is, employers with less ability to modify the required activities of injured workers—will find return to work programs less profitable. This almost certainly applies to smaller firms.

The issue of small firms highlights some of the limitations of our study, which affect the generalizability of our findings. Ultimately, our findings suggest that return to work programs

³² There are many reasons why compensating wage differentials may not fully adjust, meaning that the full gains to workers will not be recognized by employers when deciding whether or not to adopt. Workers may be uncertain about the economic impact of disability, and probably lack sufficient information to estimate the gains associated with a return to work program. Workers could also have time-inconsistent preferences, and may not themselves fully value the gains *ex ante*. The empirical evidence offers little guidance, as economists have traditionally found it difficult to estimate compensating wage differentials for job risks, particularly non-fatal job risks (c.f., Viscusi, 1993).

are highly effective when adopted at large, self-insured firms. It is by no means obvious that the programs would be as effective if adopted by a different set of firms. Small firms, in particular, would likely find it difficult to offer the kinds of modifications that are prevalent in the return to work programs we study. The firms we study are all extremely large, at least when compared to the average or median employer, so we do not have a means with our data to identify any kind of threshold below which the programs are ineffective.³³ Future work should study whether and how return to work initiatives provide a cost-effective means of improving employment outcomes for disabled workers at small firms.

³³ Any such threshold would likely vary considerably according to worker and firm characteristics, regardless.

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Figure 1. Cumulative and Instantaneous Hazard Rates by Return to Work Program Participation, All Injured Workers

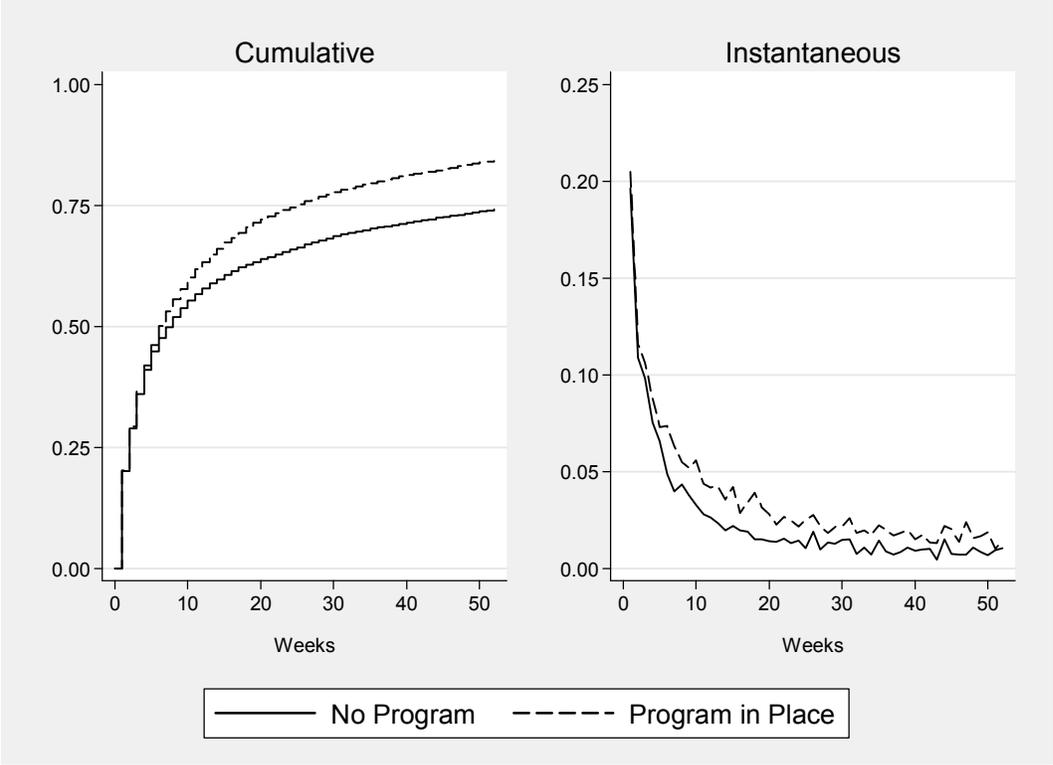


Figure 2. Cumulative and Instantaneous Hazard Rates by Return to Work Program Participation, Male Injured Workers

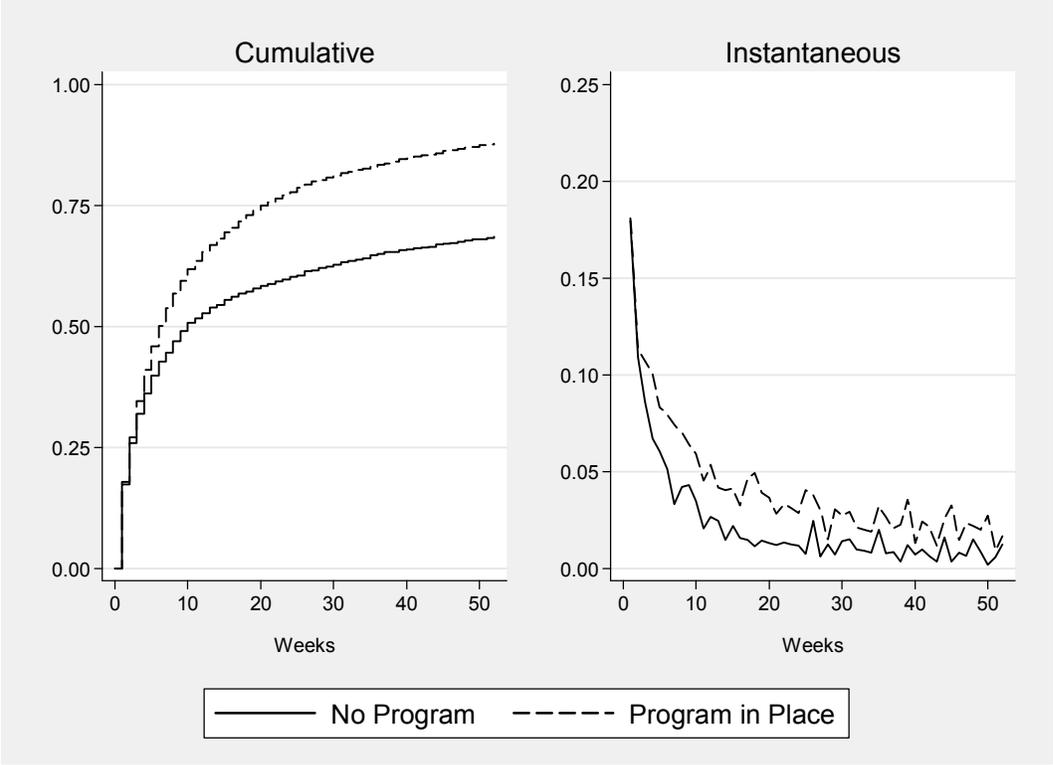


Figure 3. Cumulative and Instantaneous Hazard Rates by Return to Work Program Participation, Female Injured Workers

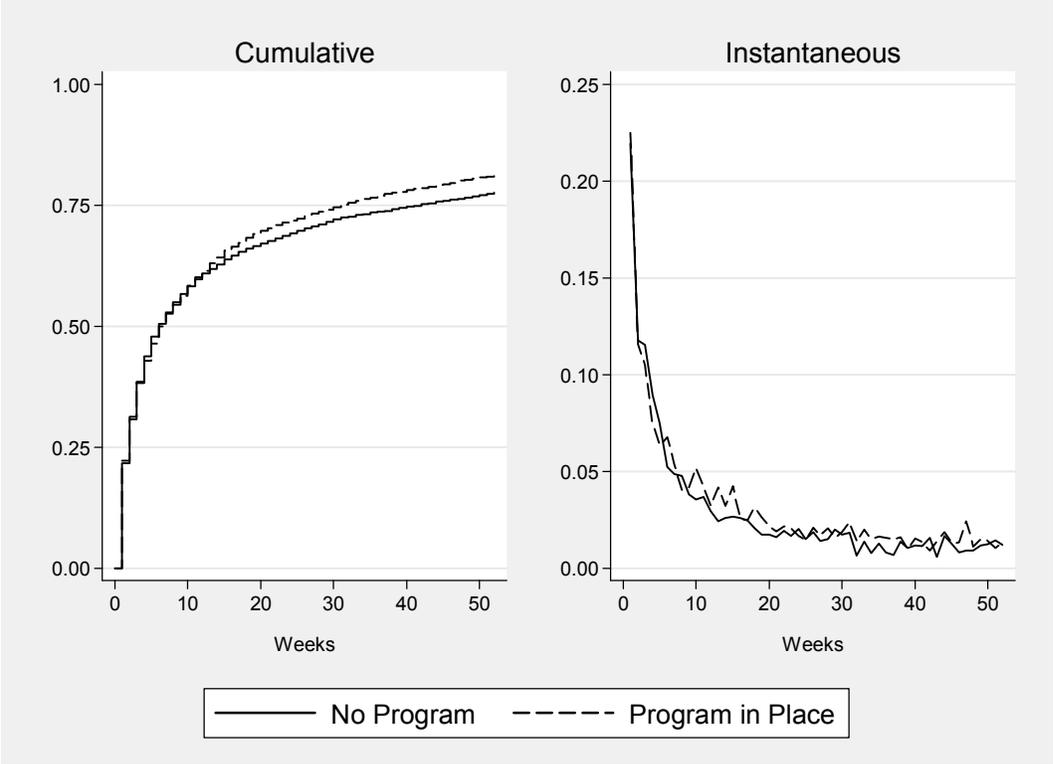


Figure 4. Cumulative Hazard Rates by Program Participation and Injury Duration Measure

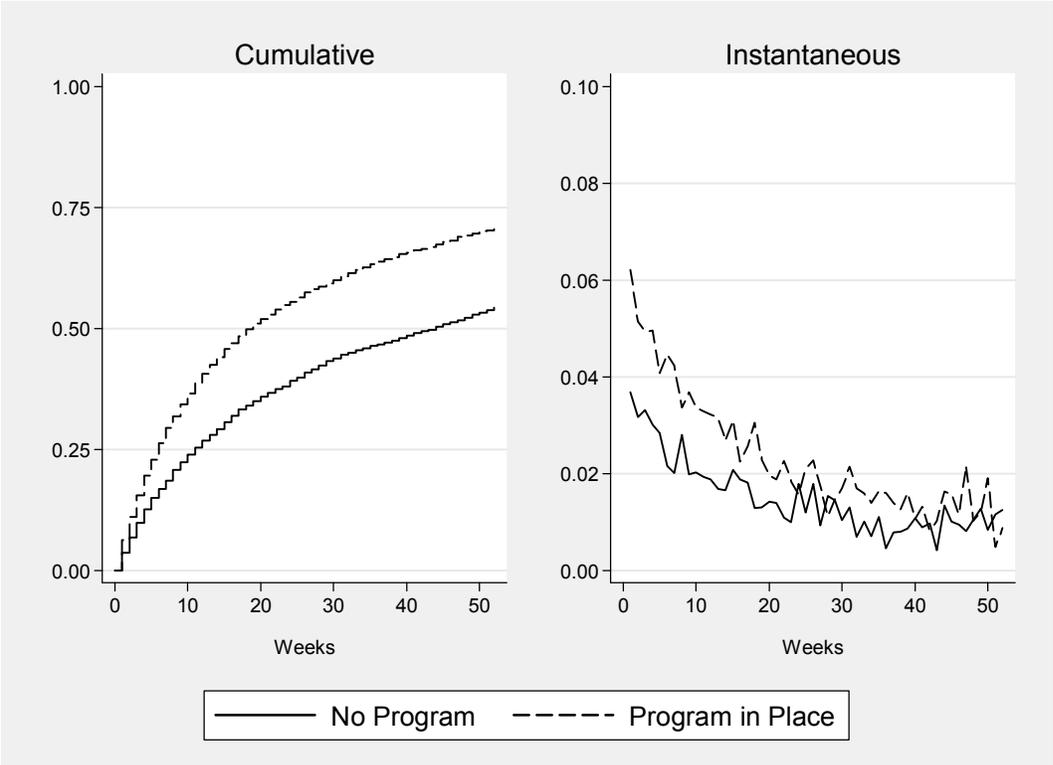


Table 1. Perceived importance and frequency of use of leading methods for transitioning injured employees back to the workplace.

| Method | Used Frequently or Quite Often | Used Occasionally | Used Rarely or Not at All | Perceived Importance Level: Scale 1-5, 5=Very Important |
|---|---------------------------------------|--------------------------|----------------------------------|--|
| Modified work tasks | 82% | 14% | 5% | 4.68 |
| Modified work station/equipment | 50% | 27% | 18% | 4.10 |
| Reduced time/work schedule change | 45% | 27% | 18% | 3.86 |
| Different job in same or different department | 32% | 41% | 23% | 3.71 |

Notes: Table reports the results from a survey of return to work and disability management practice of 40 large, self-insured firms in California.

Table 2. Summary Statistics.

| | Total Sample N = 17,312 | Program in Place N = 8,082 | No Program N = 9,230 |
|--|------------------------------------|---------------------------------------|---------------------------------|
| <i>Worker Characteristics</i> | | | |
| TTD Weeks | 29.50 (51.90) | 20.44 (34.99) | 37.44 (62.01) |
| Returned to Work | 0.94 (0.23) | 0.96 (0.19) | 0.93 (0.26) |
| Weeks to Sustained RTW | 33.68 (56.04) | 24.13 (40.90) | 42.05 (65.32) |
| Sustained RTW | 0.91 (0.29) | 0.93 (0.25) | 0.89 (0.31) |
| Weekly Wage | 601.21 (429.21) | 690.18 (295.30) | 523.31 (506.16) |
| Positive PPD | 0.39 (0.49) | 0.46 (0.50) | 0.32 (0.47) |
| PPD Payments | 5,861.30 (18,898.59) | 6,864.40 (19,284.29) | 4,984.33 (18,394.99) |
| Female | 0.58 (0.49) | 0.53 (0.50) | 0.63 (0.48) |
| Age | 41.57 (10.44) | 42.19 (9.73) | 41.02 (10.99) |
| <i>Firm Characteristics</i> | | | |
| Indemnity Cost Per Case (\$) | 4,008.38 (1,501.80) | 4,454.63 (1,411.08) | 3,617.63 (1,469.68) |
| Medical Cost Per Case (\$) | 3,415.73 (1,271.48) | 4,130.08 (1,370.16) | 2,790.23 (741.89) |
| Firm Injury Rate (# cases/ # employees) | 0.11 (0.03) | 0.11 (0.02) | 0.10 (0.03) |
| Transportation | 0.33 (0.47) | 0.36 (0.48) | 0.31 (0.46) |
| Trade | 0.01 (0.08) | 0.01 (0.17) | 0.00 (0.04) |
| Service | 0.60 (0.49) | 0.51 (0.50) | 0.68 (0.46) |
| Manufacturing | 0.06 (0.23) | 0.12 (0.33) | 0.00 (0.05) |
| <i>Firm Size</i> | | | |
| Number of employees | 20,937 (10,485) | 20,221 (10,403) | 21,583 (10,517) |
| Less than 1,000 employees | 0.01 (0.09) | 0.02 (0.13) | 0.00 (0.04) |
| 1,001-35,000 employees | 0.52 (0.50) | 0.43 (0.50) | 0.60 (0.49) |
| More than 35,000 employees | 0.47 (0.50) | 0.55 (0.50) | 0.40 (0.49) |

Notes: The table reports means with standard deviations in parentheses.

Table 3. Discrete Time Hazard Model Results.

| | All Workers | | Men | | Women | | Positive PPD | |
|---|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| <i>Dependent Variable: Weeks to Sustained RTW</i> | | | | | | | | |
| Program Effect | 1.38** [0.321] (0.065) | 1.36** [0.309] (0.023) | 1.48** [0.393] (0.088) | 1.52** [0.417] (0.047) | 1.26** [0.228] (0.058) | 1.18** [0.161] (0.028) | 1.56** [0.446] (0.097) | 1.35** [0.300] (0.073) |
| ln(weeks) | 0.59** [-0.522] (0.024) | 0.60** [0.508] (0.022) | 0.60** [-0.505] (0.046) | 0.61** [-0.498] (0.045) | 0.59** [-0.520] (0.017) | 0.60** [-0.503] (0.011) | 0.76** [-0.273] (0.025) | 0.77** [-0.265] (0.025) |
| Fixed effects | No | Yes | Yes | No | No | Yes | No | Yes |
| <i>Dependent Variable: TTD Weeks</i> | | | | | | | | |
| Program Effect | 1.42** [0.348] (0.053) | 1.39** [0.33] (0.032) | 1.64** [0.492] (0.070) | 1.64** [0.494] (0.051) | 1.11** [0.105] (0.050) | 1.06 [0.057] (0.036) | 1.66** [0.507] (0.085) | 1.47** [0.382] (0.081) |
| ln(weeks) | 0.64** [-0.441] (0.022) | 0.65** [-0.429] (0.020) | 0.66** [-0.421] (0.047) | 0.66** [-0.417] (0.046) | 0.64** [-0.443] (0.025) | 0.65** [-0.424] (0.018) | 0.82** [-0.197] (0.024) | 0.83** [-0.192] (0.024) |

Notes: The table reports estimated hazard rate ratios, coefficients, and standard errors from discrete time logistic hazard models that include the log of duration of time to return to work as the baseline hazard as well as other covariates. The first two columns report the estimates for all injured workers, columns three and four report estimates for males, columns five and six report estimates for females, and columns 7 and 8 report estimates for workers with positive PPD benefits. Hazard ratios are reported with coefficients in brackets. Robust standard errors are presented in parentheses, adjusted to allow for clustering by firm. A * or ** represents statistical significance at the 10 percent or 5 percent or better levels, respectively.

Table 4. Estimated Change in the Median Weeks Before Return to Work with a Program in Place

| | All Workers | | Positive PPD | |
|---|---|-----------------|------------------|------------------|
| | Median Number of Weeks (Mean in Parentheses) | | | |
| | 1 | 2 | 3 | 4 |
| <i>Weeks Until Sustained Return to Work</i> | | | | |
| Weeks Until Return: No Program | 9.0 (41.1) | 8.9 (40.8) | 39.7 (69.5) | 35.5 (65.2) |
| Difference | -3.8 (-15.7) | -3.6 (-15.1) | -18.8 (-25.9) | -12.6 (-17.6) |
| <i>Weeks Receiving TTD Benefits</i> | | | | |
| Weeks Until Return: No Program | 7.8 (35.3) | 7.7 (35.0) | 32.8 (60.1) | 30.1 (56.8) |
| Difference with Program | -3.2 (-15.1) | -3.0 (-14.3) | -16.0 (-26.3) | -12.0 (-20.0) |
| Firm Fixed effects | No | Yes | No | Yes |

Notes: The table reports estimated median and mean weeks to return to work for workers not in a program, and the difference compared to workers who participated in a program. Differences are based on the fixed-effect models reported in Table 3.

Table 5. Break-Even RTW Program Treatment Effects, Measured in Weeks to Sustained RTW

| | | | <i><u>Program Cost per Injured Worker</u></i> | | | | | |
|--------------------|---------|--------|---|----------|----------|----------|----------|----------|
| | | | \$ 500 | \$ 1,000 | \$ 1,500 | \$ 2,000 | \$ 2,500 | \$ 3,000 |
| <i>Weekly Wage</i> | Low: | \$ 347 | 1.4 | 2.9 | 4.3 | 5.8 | 7.2 | 8.6 |
| | Medium: | \$ 438 | 1.1 | 2.3 | 3.4 | 4.6 | 5.7 | 6.8 |
| | High: | \$ 757 | 0.7 | 1.3 | 2.0 | 2.6 | 3.3 | 4.0 |

Appendix

Alternative Empirical Specifications

To verify the robustness of our results, we estimate three additional versions of our duration model: a discrete time hazard model with a flexible piece-wise constant baseline hazard, a continuous hazard model with a Weibull hazard distribution and a Cox proportional hazard model (CPH). One of the benefits of estimating a discrete time hazard model with a flexible piecewise-constant proportional hazard is that the hazard is allowed to be different (albeit constant) over each time interval (Wooldridge, 2002). We tried a number of specifications, including weekly dummy variables, and by varying the groups of the piece-wise components of the baseline hazard. In each specification the estimate of interest didn't vary significantly so we report the most parsimonious version that uses the quarterly time dummy variables.

The first continuous time model we estimated assumes a Weibull distribution conditional on the characteristics of the worker, firm, and program status. In this case, the hazard rate is parameterized as $h(t) = \alpha t^{(\alpha-1)} \exp(x'\beta)$ and the duration of time an injured worker is out of work directly affects the hazard rate. When $0 \leq \alpha < 1$, there is negative duration dependence. The CPH model classifies the hazard rate as $h(t) = h_o(t) \exp(x'\beta)$, where $h_o(t)$ is the baseline hazard function, and we adjust for heterogeneity by including $\exp(x'\beta)$. In each case, $x'\beta$ includes all control variables included in equation (3). The benefit of the CPH estimation procedure is that the baseline hazard is estimated non-parametrically, so we do not have to assume any distribution. However, we do have to assume that the difference in hazard rates by program status is proportional and constant over time. From our earlier analysis, the data seem very consistent with a Weibull distribution with negative duration dependence.

Appendix Table 1 displays the results of our alternate specification estimations. Columns 1 and 2 report the results for all workers in our sample. Columns 3 and 4, and 5 and 6, report the results when we limit the sample to men and women only, respectively. Finally, columns 7 and 8 report our results for workers with collected PPD benefits. The first estimates we report are from the discrete time logistic hazard model with a piece-wise constant baseline hazard. These results are very similar to our main discrete time hazard model results that included the log of time to estimate the baseline hazard. This isn't surprising given the similarities of our raw data with the Weibull distribution. In the discrete time hazard model the estimates for all workers and men are significant at the 1% level, however there is no significant effect on women. The final two alternate specifications we list are the continuous time Weibull hazard model and the CPH model. In both specifications, the results fall in line with our other

estimations, with a range of differences in hazard ratios by program status ranging from 1.36 to 1.46 for the entire sample and 1.58 to 1.77 for men. We do note that there are no statistically significant effects of programs on women in any of the alternate specifications.

Selection Regressions

Because of the potential nonrandom assignment of programs that we discussed earlier, we estimate a series of selection regressions that predict the probability that a firm adopts a program in time t based on firm characteristics and injury duration in time $t-1$. To estimate these equations, we collapse the data to the firm-year level for 1991-1995. Since we are estimating the probability of program adoption based on the previous years average measure of RTW, we drop 1991 because we only have injury duration information dating back to 1991. Therefore, we analyze year of program adoption from 1992 to 1996. We estimate the following empirical model with and without firm fixed effects:

$$\Pr(\text{program})_{jt} = \text{weeks}_{jt-1}\phi + \delta_t + \bar{x}_j'\beta + \bar{z}_j'\gamma + \lambda_j + \varepsilon_{jt}$$

Where *weeks* is defined as either the average weeks receiving TTD benefits or the average weeks until sustained return to work, depending on specification. Significant estimates on the lagged return to work duration measures would indicate possible selection biases in the types of firms adopting programs.

Appendix Table 2 displays the results from our selection regressions. Ultimately, the table offers little evidence to suggest that program status is driven by pre-existing trends in return to work rates. None of the four estimates in the table are statistically significant, nor are they consistent in sign. While the lack of significance could be due in part to the lack of power, we argue that the coefficients are small enough to suggest that any bias would have a negligible impact on our results. The estimates are a degree of magnitude smaller than our main results; for instance, our point estimate of -0.0029 indicates that an increase of one in the average firm level TTD weeks in time t decreases the probability the firm will adopt a program in time $t + 1$ by roughly 0.3 percentage points. Such correlation does not seem likely to be driving the relatively large impact we find of program status on return to work rates.

Appendix Table 1. Treatment Effect Estimates: Alternate Specifications.

| | All Workers | | Men | | Women | | Positive PPD | |
|---|-------------|---------|---------|---------|---------|---------|--------------|---------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| <i>Dependent Variable: Weeks to Sustained RTW</i> | | | | | | | | |
| Discrete Time | 1.36*** | 1.35*** | 1.54*** | 1.60*** | 1.09 | 1.01 | 1.57*** | 1.36*** |
| Piece-wise | [0.31] | [0.30] | [0.43] | [0.48] | [0.08] | [0.01] | [0.45] | [0.31] |
| Constant | (0.073) | (0.025) | (0.105) | (0.058) | (0.068) | (0.038) | (0.096) | (0.070) |
| Cox | 1.37*** | 1.36*** | 1.58*** | 1.59*** | 1.04 | 1.00 | 1.51*** | 1.34*** |
| Proportional | [0.31] | [0.31] | [0.46] | [0.47] | [0.04] | [0.00] | [0.41] | [0.29] |
| Hazard | (0.057) | (0.035) | (0.068) | (0.045) | (0.049) | (0.033) | (0.089) | (0.067) |
| | 1.46*** | 1.43*** | 1.77*** | 1.77*** | 1.03 | 0.98 | 1.57*** | 1.34*** |
| Weibull Hazard | [0.38] | [0.36] | [0.57] | [0.057] | [0.03] | [-0.02] | [0.45] | [0.29] |
| | (0.057) | (0.036) | (0.085) | (0.060) | (0.059) | (0.047) | (0.100) | (0.074) |
| <i>Dependent Variable: TTD Weeks</i> | | | | | | | | |
| Discrete Time | 1.41*** | 1.40*** | 1.64*** | 1.66*** | 1.04 | 0.99 | 1.66*** | 1.48*** |
| Piece-wise | [0.35] | [0.34] | [0.50] | [0.51] | [0.04] | [-0.01] | [0.51] | [0.39] |
| Constant | (0.068) | (0.043) | (0.087) | (0.060) | (0.058) | (0.042) | (0.086) | (0.088) |
| Cox | 1.37*** | 1.36*** | 1.58*** | 1.60*** | 1.04 | 1.00 | 1.62*** | 1.45*** |
| Proportional | [0.31] | [0.31] | [0.46] | [0.47] | [0.04] | [0.00] | [0.48] | [0.37] |
| Hazard | (0.057) | (0.035) | (0.068) | (0.045) | (0.049) | (0.033) | (0.084) | (0.087) |
| | 1.46*** | 1.43*** | 1.77*** | 1.77*** | 1.03 | 0.98 | 1.68*** | 1.48*** |
| Weibull Hazard | [0.38] | [0.36] | [0.57] | [0.57] | [0.03] | [-0.02] | [0.52] | [0.39] |
| | (0.057) | (0.036) | (0.085) | (0.060) | (0.059) | (0.047) | (0.089) | (0.085) |
| Fixed effects | No | Yes | Yes | No | No | Yes | No | Yes |

Notes: The table reports estimated coefficients from three separate specifications: a discrete time piecewise-constant hazard model, a continuous time Cox proportional hazard model, and a continuous time Weibull hazard model. The first two columns report the estimates for all injured workers, columns three and four report estimates for males, columns five and six report estimates for females, and columns seven and eight report estimates for workers with positive PPD benefits. Hazard rate ratios for the program effect are reported with coefficients in brackets. Robust standard errors are presented in parentheses, adjusted to allow for clustering by firm. A *, ** or *** represents statistical significance at the 10, 5 or 1 percent levels, respectively.

Appendix Table 2. Selection Regressions.

| | 1 | 2 | 3 | 4 |
|---------------------------|---------------------|---------------------|---------------------|---------------------|
| TTD Weeks | -0.0008 (0.0023) | -0.0029 (0.0020) | -0.0004 (0.0012) | -0.0028 (0.0022) |
| Weeks to Sustained RTW | 0.0026 (0.0029) | 0.0014 (0.0023) | 0.0018 (0.0022) | 0.0016 (0.0023) |
| Fixed effects | No | Yes | No | Yes |

Notes: The table reports estimated coefficients from OLS linear probability regressions of the probability a firm adopts a return to work program in a given time period against lags of the variables illustrated as well as other covariates. The first two columns report the estimates for models that include a lagged duration variable, and columns three and four report estimates for models that include a lagged duration variable and a twice-lagged program indicator variable. Robust standard errors are presented in parentheses, adjusted to allow for clustering by firm. A *, ** or *** represents statistical significance at the 10, 5 or 1 percent levels, respectively.