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Claiming Behavior in Workers' Compensation

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Abstract

Using administrative data on workers' compensation claims in Michigan combined with data collected from a sample of workers identified by physicians as having work-related pain in their backs, wrists, hands, or shoulders, this article provides evidence that a substantial number of potentially eligible workers do not file workers' compensation claims. Multivariate analysis identifies the effects of various factors on the probability of filing a workers' compensation claim, conditional on having a work-related health problem. We find that the severity of the worker's condition and the worker's general health are the most important determinants of the decision to file, and that the generosity of wage loss benefits also affects the decision of an eligible worker to file. Finally, claims propensities vary considerably across workplaces, holding all other measured factors constant.

Introduction

The broad objectives of workers' compensation are straightforward: to provide medical care and wage-replacement benefits to employees injured or made ill in the course of work. However, the availability of benefits provides a less straightforward set of behavioral incentives to employees. Because wage-replacement benefits essentially compensate individuals for not working, employees have an incentive to exaggerate the severity of existing injuries, miss more work than necessary, and/or to inaccurately

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attribute an injury to work.[1] This risk is termed "moral hazard" and arises out of information asymmetries, where the worker has full knowledge of the cause and severity of his/her injury but the employer does not.[2]

Typically, the presence of moral hazard has been tested by examining the change in claims rates in response to increases in benefits. In general, the research has supported that an increase in benefits leads to an increase in claims (Meyer, Viscusi, and Durbin, 1995; Kreuger, 1990).[3] One drawback to the moral hazard research, however, has been an inability to distinguish between injury and claims rates, so that one cannot tell whether claims increased because of some underlying shift in work hazardousness or because employees were taking advantage of more generous benefits. The purpose of this article is to examine claiming behavior independently of injury effects.

There is a substantial empirical literature that explores the implications of moral hazard, in particular the question of whether changes in the generosity of benefits affect various measures of workplace safety or program usage. Much of the research has been based on data on injury rates or workers' compensation claims rates at the state, industry, or occupational level, although more recent studies have made use of individual-level data.[4] This literature has identified a number of factors that influence injury rates and the number of claims filed, and offers fairly compelling evidence of the existence of a relationship between the generosity of benefits and reported injury or claims rates. However, the existing data sources do not allow comparisons between the number of workers actually injured and the number of workers' compensation claims filed.

In this article we combine administrative data on workers' compensation claims in Michigan with data collected from a sample of workers who were identified by physicians as having work-related pain in their backs, wrists, hands, or shoulders.[5] We present evidence that a substantial number of workers who have been independently

[1] There is also a moral hazard risk with workers' compensation medical benefits for those employees without other medical insurance or who have insurance with a co-payment or deductible.

[2] See Butler and Worrall (1991) for a more complete discussion of moral hazard in workers' compensation.

[3] As Ehrenberg (1988) points out, the extent to which a workers' compensation program affects employer and worker behavior also depends on the extent to which wages adjust to compensate employees for job risk.

[4] Ehrenberg (1988) and Kreuger (1990) contain surveys of the empirical literature relating to the determinants of claims rates and injury rates. Kreuger (1990) and Hirsch, Mcpherson, and DuMond (1997) use individual level data, but still are only able to look at the determinants of an individual's decision to file, without conditioning on whether the individual has actually experienced a work-related injury or illness.

[5] In Michigan, where the data used in this study were collected, injured workers are entitled to wage replacement equal to 80 percent of their after-tax earnings, subject to a maximum equal to 90 percent of the state's average weekly wage. There is a waiting period of 1 week, during which no wage-loss benefits are paid, but if the time lost from work exceeds 2 consecutive weeks, the claimant is paid benefits for the waiting period.Wage-loss benefits are paid for the duration of the lost time. Benefit payments can be stopped if the claimant is thought to have recovered or has refused a "*bona fide* offer of reasonable employment." Injured workers are also entitled to reimbursement for all medical care related to the injury, and rehabilitation if

identified as having these work-related injuries do not file workers' compensation claims. We use a multivariate analysis to estimate the effects of various factors on the probability that workers with such work-related ailments file for wage-loss benefits. Specifically, we examine four possible effects. Because workers' compensation is designed to offer benefits during periods of ill health, we examine the effect of health and injury severity on claim probability. We find that the severity of the worker's condition and the worker's general health are the most important determinants of the decision to file. Next, we examine the effects of monetary incentives and find evidence that, holding constant health and severity measures, the generosity of wage-loss benefits affects the decision of an eligible worker to file a workers' compensation claim. We then examine the effects of individual human capital, demographic and job attributes. We consistently find a significant effect of age on the decision to file, but varied results for the other human capital and job attribute variables. Finally, we find that claims propensities vary considerably across workplaces, holding health and benefit levels constant.

The "Data" section describes a data set of individuals with work-related health problems assembled for this article, and our methods for identifying who among them filed for workers' compensation benefits. The "Sample Evidence on Claiming Behavior" section presents the evidence on workers' compensation-claiming behavior provided by those data. The "Factors Affecting the Decision to File for Wage-Loss Benefits" section uses the data to explore the determinants of the decision to file for workers' compensation wage-loss benefits, while the last section summarizes the article.

DATA

Data Collection

The data set used in this study combines information from a two-wave survey of Michigan workers suffering from work-related health problems with administrative data from Michigan's Bureau of Workers' Disability Compensation (BWDC). Michigan law requires all health care providers to report "known or suspected" cases of occupational illness to the state's Department of Consumer and Industry Services.[6] These reports are independent of any workers' compensation claim filing activity. These occupational disease reports provided the sampling frame for this study. Although the reports are required only for occupational illness, repetitive trauma injuries (RTI) are considered as a type of occupational illness by the U.S. Department of Labor (1992, pp. 111-112). We limited our sample to workers with shoulder, back, wrist, or hand RTIs. Although this sample is not representative of the universe of workers' compensation claims, it does include workers with injuries that account for a large share of workers' compensation claims. The Bureau of Labor Statistics (BLS) reports that in 1995, 40.2 percent of nonfatal occupational injuries and illnesses involving

the injury is likely to result in long-term disability. Workers are required to go to a health-care provider of the employer's choosing for the first 10 days, then may choose their own provider. A medical fee schedule determines the maximum a provider may charge for various services.

[6] According to the physician in charge of administering the occupational disease report database, the phrase "known or suspected occupational illnesss" is interpreted in practice by physicians as "almost certainly an occupationally related illness."

days away from work in private industry affected backs, shoulders, wrists, or hands (excluding fingers) (BLS, 1997).

A slice-in-time sampling strategy was employed: beginning from April, 1996, all cases filed with the Department of Consumer and Industry Services with the appropriate injury type were selected. Attempts were made to contact 2,705 workers, and 1,598 interviews were completed, with a response rate of 59 percent.[7] The median length of time between the date of the reported injury and the interview date was 57 days. The survey collected information on the worker's general health; injury severity; physical requirements of the job; job history and job characteristics; workers' compensation claim filing status, including reasons for filing or not filing; and demographic information.

One year later, a follow-up survey was conducted. Of the original 1,598 respondents, 1,118 were successfully re-interviewed and questioned about their health, activities, and involvement with the workers' compensation system since the previous interview. After both surveys were completed, the BWDC provided all records of past and currently open wage-loss claims associated with all of those in the sampling frame whom we had attempted to contact for an interview.

This sample is advantageous for studying claiming behavior, because it consists of workers who have been identified by a physician, not by self report, as having a work-related health problem. Also, the survey data provide better measures of the health status of the worker and injury severity than have been available to previous researchers. One drawback to this sample is that compliance with the reporting law is not uniform: in-house physicians are more likely to comply with the law. As a result, employees of manufacturing firms large enough to offer on-site medical services tend to be overrepresented in the sampling frame.[8] Thus, the sample consists mainly of highly paid, unionized hourly workers, with generous health- and disability-insurance benefits.

Identifying the Workers' Compensation Claimants in Our Sample

As mentioned, our data come from two sources: self-report data from two waves of survey responses and administrative data from the BWDC database. Cases from the two data sources were matched by social security number, injury type, and proximity of date of injury and physician visit date. One by-product of having two sources was that we have two measures of whether or not a claim was filed. If both data sources were completely accurate, there would be an exact correspondence between the self-reported measure of claiming and information recorded in the BWDC database, and matching survey to administrative data would be straightforward. In practice, this is not the case.

[7] A comparison of claim filing behavior of nonrespondents to respondents using records of the Michigan Bureau of Workers' Disability Compensation indicated that of 1,107 people we unsuccessfully attempted to contact, 22.5 percent had filed a wage-loss claim during 1995 or 1996. Of the 1,598 people we interviewed, the corresponding figure was 24.5 percent. This difference was not statistically significant.

[8] This does offer one advantage, in that the reporting physician is in most cases an agent of the employer, with little incentive represent the problem as work related when it is not.

The matching difficulties can be attributed primarily to the nature of RTI, which are usually gradual onset cases and lack a clear date of injury. Even within a single data source, the BWDC administrative data, it was fairly common for there to be a discrepancy between the date of injury and the claim filing date for any given injury. In the sample of claims filed by the 2,207 workers we originally attempted to interview, the median length of time between the date of injury and the date the Bureau was notified was 49 days, and the 90th percentile of the distribution was 226 days. Further, the distinction between a recurrence and a new injury is often somewhat arbitrary for RTI cases. Thus, while a worker may self report having filed a claim for the reference episode (i.e., the incident leading to the physician's report) the claim date in the BWDC database may be for months or even years earlier.

A comparison of self-reported claim behavior to the BWDC claims records found that those who reported not filing were more accurate than those who reported that they had filed. Of the 1,094 workers who reported in both surveys that they had not filed a claim, only 36 had records of claims in the BWDC with injury dates within 30 days of the date on the occupational disease report, and only 11 of those were for shoulder, back, or upper extremity problems. In contrast, out of 256 workers who reported receiving wage-replacement benefits, 218 (85 percent) have a claim record in the BWDC data.[9] Of those, only 75 (29 percent) have records with a date of injury within 30 days of the date of the first visit to the physician. For the 143 workers who appear in the BWDC data set with an unmatchable date of injury, it is likely that they were recalling payments from a claim filed for an earlier occurrence of the condition.[10] The two likely explanations for the 38 cases in which workers reported receiving wage-loss benefits but did not show up in the BWDC data are errors in coding social security numbers and workers mistaking benefit payments from some other source for workers' compensation payments.

Four Measures of Claim Filing Status

Because neither the survey data nor the BWDC data were free of measurement error, we created four alternative indicators of filing status. The first is the "self-reported claim" variable, which accepts the self reports at face value—anyone who reported filing a workers' compensation claim for any type of benefit on either of the two surveys is classified as having filed a claim. The remaining three indicators are for wage-loss claims only. The "self-reported wage-loss claim" variable identifies as claimants all who reported filing a claim for wage-loss benefits and either receiving benefits or having their claim disputed. The percentage of workers identified as wage-loss claimants by this variable represents an upper bound on the actual percentage of workers who filed wage-loss claims in response to the reference episode. A lower bound on this percentage is provided by the "confirmed wage-loss claim" variable, which identifies as claimants only those workers with time loss claims in the BWDC data that match with

[9] The BWDC data do not include claims that were only for medical benefits with no wage-loss component.

[10] In a handful of cases we can be almost certain that this is what occurred, in that after being asked when they filed the claim for an episode reported in 1996, respondents gave a date from some earlier year that corresponded to a date on a record in the BWDC data.

TABLE 1
Alternative Measures of Workers' Compensation Claim Filing in Various Samples

Sample	Number of Workers	Self-Reported Claimants (%)	Self-Reported Wage-Loss Claimants (%)	Confirmed Claimants (%)	System Users (%)
Full sample	1,598	31.5	19.8	12.9	30.0
Workers reporting lost work time	768	55.1	39.1	23.1	44.8
Workers missing more than seven days	392	71.7	58.4	29.6	57.1

respect to both body part injured and injury date.[11] Finally, the "system user" variable identifies as a claimant any worker with a record in the BWDC data of a wage-loss claim that matches with respect to body part injured and with an injury date between 1993 and 1998. This variable can be thought of as identifying workers with RTI who make use of the wage-loss insurance component of workers' compensation.

SAMPLE EVIDENCE ON CLAIMING BEHAVIOR

Table 1 shows claim behavior for workers in the sample as a whole and for two subsamples. The two subsamples are those who reported missing any time from work (selected because lost time is an indicator of injury severity), and those who missed more than seven consecutive days of work, the waiting period for wage-loss benefits in Michigan. Nearly one-third (31.5 percent) of the full sample reported having filed a claim for some form of workers' compensation benefits, over half of which were for wage-loss benefits. Only 12.9 percent of the sample had wage-loss claims in the BWDC data that matched by date and body part with their occupational disease report. However, 30 percent of the full sample filed for wage-loss benefits some time between 1993 and 1998. Thus, by any of our measures of filing behavior, less than one third of the workers in the full sample attempted to make use of the workers' compensation system.

The second row looks at the 768 workers who reported losing work time as a result of the injury. Although the proportions classified as filers in this group are all higher than those for the full sample, fewer than 60 percent of these workers report filing for any sort of benefit, and less than half filed for wage-loss benefits for the reported condition any time between 1993 and 1998. The final row of the table looks at workers who reported having missed 7 or more consecutive days from work as a result of the reported condition. All of these workers should be eligible for wage-loss benefits, but just over 70 percent of them report having filed for some sort of workers' compensation benefits in association with the reference episode. Using the self-reported time loss claim and confirmed time loss claim measures as upper and lower bounds for the

[11] The body part code on the BWDC report must be roughly consistent with the diagnosis on the Occupational Disease report (e.g., a diagnosis involving the wrist matches a body part code for the arm, wrist, hand, or "multiple injuries"), and the BWDC date of injury must be within 30 days of the date of diagnosis on the Occupational Disease report.

TABLE 2
Reasons for Not Filing Given by Various Classes of Nonfilers at Time of First Survey

Reasons for Not Filing	All Responding Nonfilers ($n = 1{,}173$)*	No Lost Time ($n = 874$)	Lost Time, Not 7 Consecutive Days ($n = 224$)	Lost More Than 7 Consecutive Days ($n = 75$)	Injury Not Serious Enough ($n = 702$)	Injury Serious Enough ($n = 471$)
Injury not serious enough	59.8%	65.1%	49.1%	30.7%	–	–
Did not expect to lose time	58.8	61.8	51.3	46.7	72.9%	37.8%
Had other sources of wage-replacement	28.3	21.6	43.3	61.3	26.2	31.4
Had other medical insurance	36.1	33.4	44.2	44.0	38.3	32.9
Injury not caused by work	20.5	21.1	17.0	24.0	19.8	21.4
Fearful of retribution	16.5	14.5	23.7	18.7	15.4	18.3

Note: Cell entries show percentage of each sample giving indicated reason. Respondents could give more than one reason, so column totals exceed 100 percent.
*Includes all nonfilers who responded to any of the questions about reasons. For each of the specific reasons between 2 and 5 percent of respondents said "don't know" or refused to respond; these responses were treated as "no."

proportion of this group that actually filed for wage-loss benefits in association with the reference episode, we can put their claim probability between 30 and 60 percent.

The important result contained in Table 1 is that even in a subsample of workers who are almost certainly eligible for workers' compensation benefits of some sort, a substantial number do not file claims. As noted earlier, this sample is not representative of the entire claims population in Michigan, and so these estimates of claiming behavior contain unmeasurable biases in both directions. These estimates are biased downward in that RTI cases are probably less likely to result in a claim than single-incident injuries, plus, given our high wage sample, Michigan's maximum benefit probably reduces the incentive to file for wage-loss benefits. However, 94 percent of this sample is unionized, and given the higher filing propensity among union members, there is also an upward bias in these estimates (Hirsch, Macpherson, and Dumond, 1997).

Some insight into why potentially eligible workers do not file for workers' compensation benefits is presented in Table 2. During the first survey, those who reported not having filed were provided a list of possible reasons for not filing and asked to note all reasons that applied to their decision not to file. Column 1 presents information on all nonfilers who responded to one or more of the items on this list. The next three columns divide the sample according to the number of days of work missed at the time of the first survey. The final two columns divide the sample using another measure of the seriousness of the injury, that is, the workers' own report as to whether the injury was serious enough to warrant filing a workers' compensation claim.

For the full sample, the most commonly given reason for not filing was that the reported condition was not serious enough, followed by the related reason that the worker did not expect to miss any time from work. Not surprisingly, workers who missed more time from work were less likely to say that the reported condition was not serious enough to warrant filing. However, among those who had already missed more than seven consecutive days, over 30 percent believed their condition was not serious enough to file, and over 46 percent said they did not file in part because they did not expect to miss any time from work.

The next two rows of the table look at whether other income replacement benefits and sources of medical insurance are viewed as substitutes for workers' compensation benefits and suggest that availability of potential substitute benefits is a factor in the filing decision. Most workers in the sample had access to generous sick leave benefits, paid vacation days, and private health insurance. Over a quarter of all nonfilers reported access to other wage-replacement benefits as a reason for not filing, and over a third said that one reason for not filing was the availability of other health insurance coverage. Among those who had missed at least 7 consecutive days, over 60 percent cited other income replacement benefits as a reason for not filing. Interestingly, although all of the reported conditions were known or suspected to be work related by a company-employed doctor, about 20 percent of the nonfilers believed that the condition for which they were reported was not work related. Finally, over 16 percent of the full sample reported that fear of their employer was involved in their decision not to file.

FACTORS AFFECTING THE DECISION TO FILE FOR WAGE-LOSS BENEFITS

In this section we investigate further the factors that influence the claim-filing decision. After presenting an empirical model of the decision of an injured worker to file for wage-replacement benefits, we report the results of estimating that model.

The Empirical Model

A worker who suffers a work-related disability must decide jointly how much time to take off work (if any), and whether or not to file a claim for wage-loss benefits. For any number of work days missed (t) there is an associated gain to the individual in the form of disutility of work avoided, a disutility that increases with the severity of the disability. There is also an associated cost in terms of forgone earnings (total foregone earnings, if t is shorter than the period required to qualify for benefits; forgone earnings minus any wage-replacement benefits received, if t is longer). The difference between the utility gain (expressed in monetary terms) and the foregone earnings costs of any duration out of work can be termed the net benefit associated with missing t days of work.

The fact that we observe some workers who do not file for benefits even though they appear to be eligible leads us to assume that there is a cost in time and trouble (and perhaps potential employer retribution) to filing a wage-replacement claim. If so, we will observe an worker filing a wage-replacement claim only if (a) the duration t at which the net benefit of taking time off work is maximized is long enough to establish eligibility for wage-replacement benefits, and (b) the value of the net benefit at that value of t is greater than the cost of filing a claim.

Within this framework, workers whose disabilities are more severe (or whose general health is worse) are more likely to file. Increased generosity of wage-replacement benefits increases the chance of filing; while the effect of wages on the likelihood of filing depends on the relationship between wages and the level of benefits. Because wage-loss benefits are subject to a maximum, the gap between wages and benefits is increasing in wages. Under these circumstances, the likelihood of filing decreases as the wage increases, other things remaining equal. Finally, the probability of filing increases with the physical requirements of the job.

This is the logic that motivates our empirical specifications, which take the form

$$P(CLAIM_i = 1) = \beta_0 + \beta_s X_{si} + \beta_h X_{hi} + \beta_g X_{gi} + \beta_r X_{ri} + \beta_e D_i + \varepsilon_i, \qquad (1)$$

where $CLAIM_i$ is a variable indicating filing status, X_{si} includes the variables measuring the type and severity of the reported condition; X_{hi} is a vector of the variables measuring the worker's general health; X_{gi} is a variable measuring the generosity of the wage-loss benefits the worker would receive; and X_{ri} is a vector of variables measuring individual human capital and the physical requirements of the job. D_i is a vector of establishment dummies, designed to capture otherwise unmeasured differences across plants and firms that might affect the decision to file. The logic behind including human capital and physical job requirements is the assumption that the more discretion the individual has over how to do one's job, the more likely that person can work while injured. The physical job requirement variables directly measure this, and the human capital measures proxy place within the organization and thus discretion. Unmeasured factors affecting the decision to file are subsumed in the ε_i term. Table 3 contains descriptions and summary statistics for the independent variables used in estimation.

We use OLS linear probability regressions to estimate models based on Equation (1), using the three measures of wage-loss-claiming behavior as dependent variables. Under the assumption that ε_i is uncorrelated with the independent variables of the model, the OLS coefficients will be the unbiased estimates, expressed in percentage points, of the marginal changes in the probability of filing brought about by changes in the independent variables. The heteroskedasticty inherent in linear probability models is addressed by calculating robust standard error estimates.[12]

Generosity of benefits is measured by the replacement rate, that is, the ratio of the weekly benefit amount to weekly earnings. To construct a weekly earnings variable for each respondent, we divided by 52 their report of how much they earned per year from their job, including bonuses, tips and overtime pay. To estimate benefits, we used the BWDC algorithm to calculate after-tax weekly earnings, and then a weekly benefit variable was constructed for every observation with sufficient data.[13] Thus the

[12] We have two reasons for preferring the OLS linear probability approach to probit for estimating the models. First, the OLS approach does not require normality of the error term for unbiased estimation. Second, using probits to estimate models with establishment dummies would require dropping observations from several smaller establishments in which none of the sample workers filed for benefits.

[13] The algorithm estimates state and federal taxes, based on weekly earnings, marital status, and number of children, and also subtracts off FICA contributions.

TABLE 3
Variables Used in the Analysis

Variable Name	Description	Mean	Standard Deviation
	Measures of general health (higher values indicate better health)*		
PF	"Physical functioning" scale measuring effect of health on ability to perform physical tasks*	76.5	23.3
RF	"Role functioning" scale measuring effect of health on housework and job activities*	62.6	43.8
MH	Scale measuring mental health*	70.9	21.8
CH	Scale measuring current health*	62.5	27.8
GH	Scale measuring general health*	68.7	22.2
	Measures of the type and severity of the worker's reported condition		
BACK	Dummy variable equals one if reported condition involves back	0.07	–
SHOULDER	Dummy variable equals 1 if reported condition involves upper extremity or shoulder	0.39	–
WRIST	Dummy variable equaling 1 if reported condition involves wrist	0.54	–
SEVWRIST	Scale measuring the severity of wrist condition; higher values indicate greater severity*	39.3	23.4
SEVBACK	Scale measuring the severity of back condition; higher values indicate greater severity*	60.0	23.6
SEVSHLD	Scale indicating the severity of shoulder condition; higher values indicate greater severity*	37.6	26.0
	Demographic and family structure variables (related to disutility of work/utility of leisure)		
AGE	Worker's reported age	40.8	9.9
FEMALE	Dummy equaling 1 if worker is female	0.59	–
NONWHITE	Dummy equaling 1 if worker is nonwhite	0.32	–
MARRIED	Dummy equaling 1 if worker is married	0.58	–
KID13	Number of children under 13 living in home	0.38	–
MARFEM	Interaction of MARRIED and FEMALE	0.40	–
KIDFEM	Interaction of KID13 and FEMALE	0.22	–
	Physical demands of job (related to disutility of work)		
CONTROL	Scale measuring worker's perception of control over work activities*	38.4	28.3
EXERT	Scale measuring physical exertion required for job (higher values indicate more exertion required)*	41.6	23.7
MOTION	Scale measuring the amount of movement associated with job (higher values indicate more motion required)*	77.1	19.3
PTTIME	Dummy equaling 1 if worker is part time	0.08	–

(*continued*)

TABLE 3
(Continued)

Variable Name	Description	Mean	Standard Deviation
	Economic variables, including measures of benefit generosity		
INCOME	Family income (midpoints of brackets)		
EARN1	After-tax weekly earnings measure based on question about annual earnings	630.3	182.5
EARN2	After tax weekly earnings measure based reported hourly wage and typical weekly hours	593.5	163.7
BEN1	Weekly benefit value calculated based on EARN1	462.6	73.0
BEN2	Weekly benefit value calculated using EARN2	440.4	105.2
BENRATE1	BEN1 divided by EARN1	0.75	0.08
BENRATE2	BEN2 divided by EARN2	0.76	0.07

*Scale is standardized to range from 0 to 100. More detailed description can be found in the Appendix.

measure is expected rather than actual benefits. The expected replacement rate was then calculated as expected weekly benefits divided by weekly after-tax earnings.

As is well known, self-reported earnings measures often contain nontrivial measurement errors (Duncan and Hill, 1985). Measurement error in our earnings variable will lead to measurement error in the replacement rate variable, and could bias the estimated coefficient of that variable. We attempt to correct this problem with an instrumental variable procedure that uses an alternative and independent measure of earnings available in our data to construct instruments for the replacement rate variable calculated using the annual earnings question.

In the course of the first survey, workers were asked their rate of pay on the job held at the time the occupational disease report was filed, and the overwhelming majority reported an hourly wage. They were also asked how many hours they worked in a typical week. An alternative weekly earnings measure was constructed from these questions that was then used to calculate alternative measures of after-tax earnings, weekly benefits, and the replacement rate.[14] Each earnings measure contains error.

The earnings variable based on the annual earnings question is subject to recall and rounding error. The alternative earnings variable is based on what is probably a fairly reliable report of the wage rate, but is tainted by use of a "typical hours" measure. Based on the assumption, however, that the measurement errors in the two earnings variables are uncorrelated, it is possible to use the alternative earnings and

[14] For workers reporting an hourly wage rate, weekly earnings were defined as hours up to 40 per week multiplied by that wage, plus hours beyond 40 were multiplied by 1.5 times that wage. For workers reporting earnings per some other time unit, the obvious calculations were made.

TABLE 4
Factors Affecting Filing of Wage-Loss Claim—OLS Estimates

	Dependent Variable		
	Self-Reported Wage-Loss Claimant	Confirmed Wage-Loss Claimant	System User
PF	−0.0008	−0.0006	−0.0014*
	(0.0006)	(0.0005)	(0.0007)
RF	−0.0013**	−0.0003	−0.0005
	(0.0004)	(0.0003)	(0.0004)
MH	0.0006	0.0002	0.0007
	(0.007)	(0.0006)	(0.0007)
CH	−0.0013**	−0.0013**	−0.0017**
	(0.0006)	(0.0005)	(0.0007)
GH	−0.00002	0.0008	0.00003
	(0.0006)	(0.0005)	(0.0006)
BACK	0.017	−0.015	−0.058
	(0.066)	(0.056)	(0.062)
SHOULDER	0.026	−0.022	0.019
	(0.037)	(0.032)	(0.046)
SEVWRIST	0.0025**	0.0019**	0.0032**
	(0.0007)	(0.0006)	(0.0008)
SEVBACK	0.0003	0.0011	−0.0006
	(0.0016)	(0.0015)	(0.0016)
SEVSHLD	0.0007	0.0023**	0.0023**
	(0.0008)	(0.0007)	(0.0009)
BENRATE2	0.28*	0.18	0.32*
	(0.16)	(0.14)	(0.18)

(*continued*)

benefits measures as instrumental variables to correct for the measurement error in our primary replacement rate variable.

Accordingly, our instrumental variables (IV) estimation of Equation (1) involves a first stage in which the main replacement rate variable is regressed on the alternative replacement rate measure, the alternative after-tax earnings measure, and the alternative benefits measure.[15] Then, the predicted values from this regression are used as the replacement rate variable in estimating versions of Equation (1).

Results

Table 4 reports the results of estimating Equation (1) by OLS. There are three columns of coefficient estimates corresponding to the three different measures of wage-loss-claimant status. The first five variables reported are measures of the workers' general health, reflecting the assumption that general health affects the disutility of work. They are derived from subsets of questions from the widely used SF-32 survey (Ware,

[15] The R^2 of this regression is 0.38.

TABLE 4
(Continued)

	Dependent Variable		
	Self-Reported Time-Loss Claimant	Confirmed Time-Loss Claimant	System User
AGE	0.0033*	0.0027*	0.0043**
	(0.0018)	(0.0016)	(0.0020)
FEMALE	0.027	0.030	0.024
	(0.038)	(0.034)	(0.045)
NONWHITE	−0.038	−0.030	−0.039
	(0.026)	(0.022)	(0.030)
MARRIED	0.015	0.070**	0.021
	(0.033)	(0.029)	(0.039)
KID13	0.043	−0.033	0.012
	(0.031)	(0.027)	(0.036)
MARFEM	−0.061	−0.112**	0.002
	(0.048)	(0.042)	(0.056)
KIDFEM	0.025	0.074*	0.042
	(0.048)	(0.042)	(0.055)
ED1	−0.072*	−0.052	−0.082
	(0.042)	(0.038)	(0.049)
ED3	−0.018	−0.044**	−0.032
	(0.024)	(0.021)	(0.027)
ED4	0.0058	0.016	−0.048
	(0.0534)	(0.050)	(0.055)
TENURE	−0.00004	−0.0032**	−0.003
	(0.0018)	(0.0016)	(0.002)
PTTIME	−0.032	−0.097**	−0.071
	(0.0435)	(0.037)	(0.051)
CONTROL	−0.0005	−0.00003	0.00002
	(0.0004)	(0.0004)	(0.0005)
EXERT	0.0013**	0.0004	0.0016**
	(0.0006)	(0.0005)	(0.0006)
MOTION	0.0012*	0.0003	0.0005
	(0.0007)	(0.0006)	(0.0008)
R^2	0.17	0.16	0.17

Note: Cell entries are coefficient estimates from linear probability models. Huber/White standard errors reported in parentheses under coefficient estimates. Sample size = 1,221. Models also include 27 establishment dummies.
*Coefficient significant at the 10 percent level, two-sided test.
**Coefficient significant at the 5 percent level, two-sided test.

Sherbourne, and Davies, 1992), and each is intended to measure a distinct aspect of health (see the Appendix for more details on these measures). Only the variable measuring current health status has a significant effect on all three dependent variables, in the expected direction. The current health measure is based on responses to five

questions asking about the individual's perception of his or her health, with higher values indicating better health. A coefficient estimate of −0.0012 implies that a one standard deviation increase in this variable is associated with about a 3 percentage point decrease in the probability of filing. There are no significant differences in the propensity to file associated with the three different injury types in the sample, other things equal, but the variables that measure the severity of the wrist injuries on a 100 point scale are significantly related to all three measures of filing behavior, and the shoulder severity measure to two of the three, which is again consistent with the notion that an increase in the disutility of working in the injured state will increase the probability of filing.

The estimated effect of the replacement rate on the probability of filing is positive for all three definitions of filing and statistically significant for two. The estimated coefficient of 0.28 on the replacement rate variable in the self-reported time loss claim equation implies that a one standard deviation increase in the replacement rate leads to about a 2 percentage point increase in the percentage of workers reporting a time loss claim (using the mean replacement rate of 0.75 and standard deviation of 0.08). Alternatively, since the proportion of the estimation sample reporting a time loss claim is about 0.2, the coefficient of 0.28 translates to an elasticity near unity.

Other things remaining equal, including subjective assessments of health and the severity of the condition, older workers with work-related RTIs are more likely to file for wage-replacement benefits. This is contrary to the findings of Kreuger (1990) and Hirsch, Macpherson, and DuMond (1997) that the probability of a worker receiving workers' compensation benefits declines with age. The latter authors attribute their finding, however, to the greater care taking and experience of the older workers, that is, older workers are less likely to be injured in the first place. Since our results are conditional on an injury having occurred, this reason for a negative relationship between age and filing would not apply to our results. Variables related to family structure have significant coefficients only when the confirmed time loss claim measure is used as the dependent variable.

The human capital variables, education, job tenure, and part-time status, were included to proxy level in the organization, the logic being that the higher in the organization, the more likely one has discretion over how to do one's job and thus less need to miss work and file a claim. The tenure coefficient provides weak support for this idea in the confirmed wage-loss and system-user models. There is no consistent pattern with respect to the education variables across the three models. Otherwise, while the coefficient signs are as expected, the levels of significance are not. The argument that those in more physically demanding jobs would be more likely to choose to miss work and file for benefits, conditional on being injured, is borne out by the positive (and occasionally significant) coefficients for the measures of physical exertion (EXERT) and motion (MOTION) required by the job.

There are workers from 54 different establishments in the sample, with many of the establishments being plants for one of two large manufacturing firms. We controlled for only 28 establishment categories, however: 27 corresponding to individual workplaces, and one containing 121 workers from the 26 remaining establishments that are each represented by few workers in the sample. The inclusion of the establishment

dummies increases the explanatory power of the models considerably. In a sense, the importance of the establishment dummies in these regressions signals our lack of specific measures of key factors that affect the decision of an injured worker to file; such factors may include the quality of industrial relations or the management style prevailing at the plant level.

The impact of benefit generosity on the extent to which workers make use of the workers' compensation system has been a main focus of previous research. The results in Table 4 are consistent with previous findings that benefit generosity is positively related to the probability of filing a claim; Table 5 reports the results of some alternative specifications of Equation (1) intended to test the robustness of this result.

Previous research into claim filing behavior using individual level data has not controlled for family income, and our main specifications reported in Table 4 have followed that practice. However, the data set does contain a rough family income measure. The survey asked respondents to place their family income in a bracket, and created a continuous family income variable by assigning each respondent the midpoint of the bracket they chose. *A priori*, the relationship between family income and the probability of filing, holding the replacement rate constant, is not clear. Higher family income may generate a greater taste for leisure, or may indicate the presence of a larger "safety net" should time off work be taken. Alternatively, it may indicate a greater work ethic, or access to more paid vacation days or sick leave to be used in lieu of workers' compensation. It is positively correlated to earnings and thus negatively correlated to the replacement rate ($r = -0.38$), so that its inclusion will lower the precision of the estimated effect of the latter variable.

The first panel of Table 5 reports the coefficients of the income variable and the replacement rate variable when income is included in the three models reported in Table 4. Income enters negatively in all three specifications, and is significant in the model that uses self-reported filing status as the dependent variable. The point estimates of the effect of the replacement ratio remain positive, but their magnitudes have fallen and their standard errors grown. This result is consistent with a situation in which the coefficient on the replacement ratio in the Table 4 models in part reflects a negative income effect on filing, but also with a situation in which the addition of an (error ridden) measure of family income increases multicollinearity and lessens the precision of the estimates.

The second panel of Table 5 reports the coefficients of the replacement rate variable when the Table 4 models are estimated by probit rather than by OLS, both with and without the income variable included. The reported estimates are of marginal effects, so are directly comparable to the coefficient estimates reported in Table 4 and in the first panel of Table 5. Overall, the estimated effects from the probit specifications are similar to those from the linear probability models; a full report of the probit results can be found in Table A1.

The final panel of Table 5 reports the results of applying the IV procedure described earlier, in which a measure of the replacement rate based on an earnings variable is used as an instrument. In both the self-reported claim model and the confirmed claim model, the coefficient on the benefit rate is more than twice its OLS counterpart in

TABLE 5
Estimates of the Effect of Benefit Generosity on Measures of Filing Behavior From Alternative Specifications

	Dependent Variable		
	Self-Reported Time-Loss Claimants	Confirmed Claimants	System Users
	Including family income, $n = 1{,}197$		
BENRATE	0.17	0.23	0.28
	(0.17)	(0.15)	(0.20)
INCOME	−1.07e–6*	−2.95e–8	−7.75e–7
	(5.7e–7)	(4.9e–7)	(6.49e–7)
	Probit specification		
	$n = 1{,}184$	$n = 1{,}143$	$n = 1{,}221$
BENRATE	0.31*	0.19	0.39*
(INCOME excluded)	(0.18)	(0.14)	(0.22)
BENRATE	0.19	0.24	0.35
(INCOME included)	(0.19)	(0.15)	(0.23)
	IV estimates		
BENRATE	0.75**	0.69**	0.51
(INCOME excluded)	(0.29)	(0.25)	(0.36)
BENRATE	0.62**	0.73**	0.41
(INCOME included)	(0.33)	(0.28)	(0.40)

*Coefficient significant at the 10 percent level, two-sided test.
**Coefficient significant at the 5 percent level, two-sided test.

magnitude, and statistically significant whether or not the income variable is included in the regression. The point estimates rise in magnitude in the system-user model as well, but are not statistically significant.

This result is consistent with a situation in which measurement error has biased the OLS coefficient of the replacement rate toward zero, and the IV procedure has corrected the bias. However, for the IV estimates themselves to be consistent, the measurement error in each of the replacement rate measures must be classical. This measurement error exists because of measurement error in earnings, and there is reason to believe that measurement error in self-reported earnings is not itself classical (Bollinger, 1998). Further, earnings enters the calculation of the replacement rate variable in a nonlinear way, making it difficult to sign the bias that would be induced in the IV estimates by nonclassical error in the measurement of earnings. Thus the IV estimates, although suggestive of a possible downward bias in the OLS coefficients of the replacement rate, may not be entirely reliable.

In Krueger (1990) survey of studies that use reported injury or claims rates as the dependent variable, the elasticity of these rates with respect to changes in the replacement ratio were almost all below 1 in absolute value, and Krueger's own estimates for all workers range from 0.45 to 0.74. In contrast, the OLS estimates of Table 4 suggest

an elasticity of claiming, conditional on injury, in the neighborhood of unity, and if our IV estimates are to be believed, the elasticity is perhaps greater than 2. In addition, the estimated elasticities from earlier studies should, in principle, represent the sum of the elasticity of the true injury rate with respect to the replacement rates and the elasticity of the probability of filing, conditional on injury, with respect to the replacement rate.

We believe that there are at least two reasons for the large elasticity estimates produced by our sample. First, as mentioned before, our sample is highly unionized. Hirsch, MacPherson, and Dumond (1997), using individual level data, report elasticities of workers' compensation recipiency with respect to the replacement rate for both union and nonunion samples. Although both elasticities are below 1 in absolute value, the elasticity estimate from the unionized sample is over twice that of the nonunion sample. Second, our sample is made up of workers with soft-tissue RTI. It has been argued that injuries such as these are likely to be more sensitive to changes in nature of workers' compensation benefits because, being hard to diagnose and confirm, they offer greater opportunity for moral hazard on the part of the workers. Butler, Durbin, and Halvacian (1996) and Ruser (1998) offer empirical support for this proposition. In addition, Johnson, Baldwin, and Butler (1998) show that the impact of changes in the replacement rate on return to work behavior is greater for back injuries and carpal tunnel syndrome than for easy to diagnose injuries, which is consistent with the proposition that hard to diagnose injuries offer greater opportunities for moral hazard. Consider the estimates reported in Ruser (1998), which indicate that a 10 percent increase in the replacement rate would lead the percentage of all claims that were for carpal tunnel syndrome to rise from 3.6 to 4.3 percent.[16] If we assume that total claims rose by 5 percent in response to a 10 percent increase in the replacement rate (an elasticity of 0.5), this would imply an increase of 25 percent in total claims for carpal tunnel syndrome. In that light, considering that over half of the injuries to our sample are for pain in the wrists and hands, often explicitly diagnosed as carpal tunnel syndrome, even our IV elasticity estimates do not seem unreasonably large. If our large elasticity estimates are accepted at face value, this implies that, at least with respect to RTIs, a significant portion of the relationship between the number of injuries reported or workers' compensation claims filed is due to a reporting effect or take-up effect—eligible workers are more likely to request workers' compensation benefits when those benefits are relatively more generous.

SUMMARY

We analyzed a sample of workers, all of whom were reported by physicians as having repeated trauma injuries known or suspected to be work-related in order to explain injured workers' decision to file a workers' compensation claim. Using both measures of filing status derived from survey responses and measures based on workers' compensation administrative data, we found that a significant proportion of these workers did not make use of the workers' compensation system, even if their injury resulted in lost work time. The primary self-reported reason given was that they did

[16] These figures are based on the first model reported in Table 5 of Ruser (1998). Other models produced similar results.

not perceive the reported injury to be sufficiently serious. But even among those who missed more than 7 consecutive days of work (making them eligible for wage-loss benefits) almost 40 percent reported making no attempt to receive wage-loss benefits, and 27 percent reported that they did not file for any sort of workers' compensation benefits. Many of the nonfilers among these more seriously injured workers reported having access to alternative programs offered by their employers, such as sick leave.

We then modeled three definitions of filing status using variables measuring health and injury severity, economic incentives, human capital and individual job attributes, and establishment dummy variables. This analysis showed that factors related to the workers' health and the severity of the reported condition were the most important determinants of the decision to file. The addition of a replacement rate variable provided evidence that injured workers who were eligible for more generous benefits were more likely to file for workers' compensation, other things being equal. This evidence was strengthened when the models were estimated using a procedure meant to control for measurement error in the benefit variable, but was still equivocal. Job arduousness variables also influenced the probability of claiming, and our estimates indicated that conditional on an injury having occurred, older workers were more likely to file a claim.

The addition of the establishment dummy variables significantly improved model fit for all three definitions of claim. These results strongly suggest that there are as yet unmeasured characteristics that vary from workplace to workplace and that have a significant effect on the claim behavior of injured workers. However, even with the addition of these variables, these models explain no more than 17 percent of the variation in claiming behavior.

There are several implications of these results. One is that participation in the workers' compensation system should not be viewed as an automatic consequence of work-related injury or illness. Despite workers' compensation benefits being a form of an entitlement for workers legitimately, injured in the course of work, all of those who are eligible do not file. Further, what are commonly thought to be the explanatory factors—health status/injury severity, economic incentives, and personal characteristics—provide only a limited understanding of filing behavior. That the addition of establishment variables adds to explanatory power indicates that managerial style, corporate culture, and/or formal or informal workplace policies and practices contribute to the filing decision. Answers to direct questions by nonfilers give a partial explanation in that they cite the availability of other benefits as a reason of not filing.

Why workers might choose an alternative benefit source to workers' compensation deserves further investigation. Proposals for reforming the workers' compensation system or changing the structure of benefits should be examined in the light of the evidence presented here. The results for health and injury severity lend support to programs designed to promote safety and health. The replacement rate results support the belief that there is a labor supply effect. However, the self-report alternative benefit availability result and the effect of the establishment dummy variables suggest that workplace policies and practices may be important factors and should be more of a focus in public policy. Clearly, more research is needed into the

determinants of workers' choices in dealing with work-related health problems, including how the options available to the worker for dealing with such problems affect his or her probability of using the workers' compensation system.

APPENDIX

Scales Used in the Multivariate Analysis

All scales were standardized to range from 0 to 100.

PF. The measure of physical functioning is a subscale of six items from the 20-Item Short-Form Health Survey (SF-20), developed by Ware, Sherbourne, and Davies (1992). The items measure physical limitations and capacities, mobility, and ability to care for oneself. Respondents choose among three responses: limited for more than 3 months, for 3 months or less, not limited at all. Sample item: Would you say your health has limited you in bending, lifting, or stooping? $\alpha = 0.75$.

RF. The measure of role functioning is a subscale of two items from the SF-20. The items measure limitations in social and work activities. Sample item: Would you say your health kept you from working at a job, doing work around the house, or going to school for more than 3 months, 3 months or less, or not at all? $\alpha = 0.69$.

MH. The measure of mental health is a subscale of 5 items from the SF-20. The items measure four mental health dimensions: anxiety, depression, loss of behavioral-emotional control, and psychological well-being. Sample item: In the past month, how much of the time have you been very nervous or anxious? $\alpha = 0.84$.

CH. The measure of current health is a subscale of 4 items from the SF-20. The items measure the individual's perception of their current overall health. Sample item: I am as healthy as anyone I know. $\alpha = 0.81$.

GH. The measure of general health is a single item, where individuals rate their health on a five-point scale from excellent to poor.

SEVBACK. The measure of severity of back injury is derived from a back pain scale created by Roland and Morris (1983). The scale is composed of 24 self-reported items on a yes/no basis. The items measure the extent of limitations on movement and daily living activities. Sample item: Because of my back, I use a handrail to get upstairs. $\alpha = 0.94$.

SEVSHLD. The measure of severity of shoulder injury is derived from the self-administered shoulder pain and disability index (SPADI) developed by Williams, Holleman, and Simel (1995). The SPADI is composed of 13 items, five of which form a subscale measuring pain severity and eight of which form a subscale measuring extent of disability. Respondents rate their pain or difficulty with tasks on a 1 to 10 scale. Sample item: Using a scale of 0–10, where 0 = no difficulty and 10 = so difficult that it required help, how much difficulty to you have washing your hair? $\alpha = 0.95$.

TABLE A1
Factors Affecting Filing of Wage-Loss Claim—Probit Estimates

	Dependent Variable		
	Self-Reported Wage-Loss Claimant	Confirmed Wage-Loss Claimant	System User
PF	−0.0005	−0.0003	−0.0014*
	(0.0005)	(0.0005)	(0.0007)
RF	−0.0013**	−0.0003	−0.0005
	(0.0003)	(0.0003)	(0.0004)
MH	0.0007	0.0002	0.0009
	(0.0006)	(0.0005)	(0.0007)
CH	−0.0014**	−0.0012**	−0.0018**
	(0.0005)	(0.0004)	(0.0007)
GH	−0.00002	0.0008*	0.00003
	(0.0006)	(0.0004)	(0.0007)
BACK	0.036	−0.018	−0.110
	(0.088)	(0.056)	(0.087)
SHOULDER	0.027	−0.033	0.022
	(0.052)	(0.039)	(0.058)
SEVWRIST	0.0026**	0.0017**	0.0035**
	(0.0007)	(0.0005)	(0.0009)
SEVBACK	0.0004	0.0014	0.0006
	(0.0014)	(0.0011)	(0.0020)
SEVSHLD	0.0010	0.0022**	0.0025**
	(0.0008)	(0.0006)	(0.0009)
BENRATE2	0.31*	0.19	0.39*
	(0.18)	(0.14)	(0.21)
AGE	0.0038**	0.0029*	0.0049**
	(0.0018)	(0.0014)	(0.0022)
FEMALE	0.038	0.045	0.028
	(0.042)	(0.035)	(0.050)
NONWHITE	−0.039	−0.028	−0.044
	(0.025)	(0.019)	(0.032)
MARRIED	0.024	0.071**	0.023
	(0.035)	(0.026)	(0.043)
KID13	0.051	−0.021	0.019
	(0.033)	(0.024)	(0.039)
MARFEM	−0.061	−0.087**	−0.00007
	(0.042)	(0.021)	(0.061)
KIDFEM	0.024	0.073	0.042
	(0.051)	(0.050)	(0.061)
ED1	−0.068*	−0.040	−0.070
	(0.032)	(0.023)	(0.046)
ED3	−0.022	−0.044**	−0.033
	(0.024)	(0.018)	(0.030)
ED4	0.0034	0.015	−0.064
	(0.0576)	(0.047)	(0.066)

(*continued*)

TABLE A1
(Continued)

	Dependent Variable		
	Self-Reported Wage-Loss Claimant	Confirmed Wage-Loss Claimant	System User
TENURE	0.0005	−0.0022	−0.003
	(0.0018)	(0.0014)	(0.002)
PTTIME	−0.026	−0.062**	−0.065
	(0.0412)	(0.021)	(0.066)
CONTROL	−0.0007	−0.0002	0.0001
	(0.0004)	(0.0003)	(0.0005)
EXERT	0.0013**	0.0004	0.0017**
	(0.0005)	(0.0004)	(0.0006)
MOTION	0.0013*	0.0003	0.0005
	(0.0007)	(0.0005)	(0.0008)

Note: Cell entries are estimates of marginal effects from probit models. Standard errors reported in parentheses under coefficient estimates. Models also include establishment dummies.
*Coefficient significant at the 10 percent level, two-sided test.
**Coefficient significant at the 5 percent level, two-sided test.

SEVWRIST. Severity of hand/wrist injury was measured using a scale developed by Levine et al. (1993). The scale is composed of 19 items answered on a five-point scale. Nine items compose a subscale measuring functional limitation and 10 measure pain severity. Sample item: How severe is the hand or wrist pain that you have at night? The scale used in this study is equal to the mean of nine of the pain severity items, with the final measure standardized to range from 0 to 100. $\alpha = 0.90$.

CONTROL, EXERT, and MOTION. These three scales were adapted from the Nagi (1969) inventory of criteria for workplace evaluation. These criteria were converted into questions answered using five-point scales. The Nagi inventory is quite long. Items were selected for inclusion based on results from Wiktorin et al. (1996), who investigated the reproducibility of self-reported measures of features of work. Those with the highest reproducibility were included in our measures. Control is composed of three items. Sample item: How often can you control the choice of tasks you do in your job? $\alpha = 0.64$. Exert is composed of two items. Sample item: What degree of physical activity is usually required in your job? $\alpha = 0.68$. Motion is composed of four items. Sample item: How often are you required to stand in your job? $\alpha = 0.76$.

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