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Is Workers' Compensation Covering Uninsured Medical Costs?

Evidence from the 'Monday Effect'

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ABSTRACT

A growing fraction of U.S. workers face a dual system of medical insurance, with generous coverage through the Workers' Compensation system for work-related injuries, but limited or non-existent coverage for off-the-job illnesses or injuries. Uninsured and under-insured workers have an economic incentive to report off-the-job injuries as work accidents. Many analysts have interpreted the high rate of Monday injuries -- especially for hard-to-detect injuries like back sprains -- as evidence of this incentive. We combine administrative data on workplace injury claims with Current Population Survey data on medical insurance coverage to compute the fraction of Monday injury claims for workers who are more and less likely to have medical insurance. We find that workers with lower medical coverage rates are no more likely to report a Monday injury than other workers.

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As medical technology has advanced over the twentieth century, the Worker's Compensation (WC) system has evolved from a program of death and disability benefits into a major third-party provider of health care. At present just under 6 percent of all government health expenditures in the U.S. are paid by WC.¹ The rising costs of medical care, coupled with a declining fraction of workers with medical care insurance (Olson (1994)) have led to a growing concern that WC is paying the costs of some off-the-job illnesses and injuries. If medical costs for on-the-job injuries are fully covered (with no deductibles and generous reimbursement schedules²) while medical costs for off-the-injuries are uninsured, employees have a powerful economic incentive to misreport the timing and/or cause of an injury.

Perhaps the strongest evidence of this incentive comes from the relatively high fraction of certain kinds of injuries on a Monday. Smith (1989) showed that WC claims for strains and sprains are more likely to arise on a Monday, whereas harder-to-conceal injuries like cuts and lacerations are about equally as likely on a Monday as on other weekdays. Figure 1 presents corroborating evidence of this pattern in a large sample of WC injuries from the state of Minnesota.³ As in Smith's analysis, the fractions of burns, cuts and fractures are roughly constant from Monday to Friday. By comparison, the fraction of sprains attributed to a "slip or fall" and the fraction of back injuries (of all types and causes) is about 25 percent higher on Mondays than on other weekdays. Although circumstantial, this evidence is consistent with the

¹Statistical Abstract of the United States, 1993 edition, Tables 149 and 154.

²Baker and Krueger (1993) and Zaidman (1990) show that medical costs for similar procedures are far higher for WC claimants than Blue Cross claimants in Minnesota.

³The data set is described more fully in the next section of the paper.

hypothesis that some workers "postdate" weekend back injuries and strains in order to obtain medical coverage and indemnity benefits through WC.

In this paper we develop more explicit evidence on the extent of false reporting of off-the-job injuries, based on the link between the 'Monday effect' in injury rates and the presence or absence of medical insurance. Specifically, we compare the fraction of excess Monday injuries for workers who are more or less likely to have medical insurance coverage. We combine individual-specific data on the availability of medical insurance from the March Current Population Survey (CPS) with data on the timing of injuries from administrative data for the Minnesota WC system. We also use May 1985 CPS data to check that workers with different probabilities of medical coverage are as likely to work on Mondays as on other weekdays.

We find no evidence that higher injury rates on Monday are correlated with the absence of medical insurance. Although medical coverage rates vary significantly across the population, the fraction of excess Monday injuries is no different across groups. Furthermore, insurers and employers are no more likely to deny liability for Monday injuries among workers with lower probabilities of medical coverage. We also investigate the link between Monday injuries and the relative generosity of temporary total disability benefits. Despite the fact that workers with higher replacement rates have a stronger incentive to postdate their injuries, we find no evidence that these workers have higher Monday injury rates.

I. The 'Monday Effect' in Injury Rates

We begin with a re-examination of the 'Monday effect' in WC injury claims. Our analysis is based on a 10 percent random sample of the "first reports" of injury filed with the Minnesota Department of Labor and Industry between 1985 and 1989. A first report is posted by employers for more serious injuries that may eventually lead to an indemnity claim (and for all injuries that actually generate an indemnity claim). The data set thus excludes minor injuries that only required medical treatment and/or up to 3 days of lost work time.⁴ Some 50,000 first reports were filed annually in the mid-1980s in Minnesota, resulting in a total of 25,563 injuries in our sample.

The first column of Table 1 presents descriptive statistics for the overall sample, including about 10 percent of injuries for which no wage data are available. The other columns of the table show the characteristics of the subsample of injuries with a valid pre-injury wage, classified by the day of the week on which the injury occurred. Wages are a key predictor of the likelihood of medical coverage (see below). Hence, for most of our analysis we concentrate on injuries records with available wage information.

The first reports categorize injuries by nature (e.g. burn or fracture), body part (e.g. upper back), and cause (e.g. struck by falling object). The most likely injury is a sprain to the back caused by a slip or fall. Interestingly, all three characteristics are more prevalent among Monday injuries than among injuries on other weekdays.

⁴Because of a waiting period for disability benefits, injuries that result in no more than 3 days of lost work time (including the day of the injury) do not generate an indemnity claim and do not require a "first report of injury".

The employer and employee characteristics of the injuries data set reflect the non-random incidence of injuries across the Minnesota labor force. Construction and manufacturing, for example, are over-represented in the industry distribution of injuries whereas trade and services are under-represented.⁵ Female and white collar workers, who account for 48 percent and 54 percent of the Minnesota labor force, respectively, account for much lower shares of injuries. The average weekly wage of injured workers (\$358) is slightly below the average weekly wage of all Minnesota workers (\$382 per week in March 1987). Nevertheless, virtually all of the wage differential between injured workers and a random sample of workers in the state is explainable by a small set of demographic, industry, and occupation controls.⁶ The industry, sex, and occupation distributions of injured workers all vary by day of the injury, particularly between weekend and weekday injuries.

Rows 15-18 of Table 1 show the percent of injury claims with positive indemnity payments (including temporary total and temporary partial benefits paid to workers during their recovery period, permanent partial benefits paid as lump sums or continuing benefits post-recovery, and other lump sum payments), the mean payment conditional on positive payments, the percent of claims with temporary total benefits, and the mean duration of temporary total disability. The subsample of injuries with a valid wage observation includes a higher fraction

⁵In the March 1987 CPS, construction and manufacturing account for 5.2% and 20.5% of Minnesota employment, whereas trade and services account for 21.7 and 33.7% of Minnesota employment.

⁶A model for the logarithm of the weekly wage fit to March 1987 CPS data (including sex, marital status, age, and 1-digit industry and occupation dummies) gives a mean predicted wage among injured workers that is within 0.5 percent of the actual mean log wage. The correlation of the predicted wage with the actual wage among injured workers is 0.57 (compared with a correlation of the actual and predicted wages in the CPS data of 0.65).

of cases with temporary total benefits (71.4 versus 65.9 percent overall). This differential reflects the fact that the temporary total benefit rate is a direct function of the pre-injury wage: the administrative files are therefore more likely to include the injured worker's wage rate in cases where temporary total benefits were paid.

Mean indemnity payments and the duration of benefits are very similar for injuries that occur on Mondays or other weekdays.⁷ Weekend injuries, by comparison, have significantly lower mean indemnity payments and significantly shorter benefit periods.⁸ In part these differences reflect the higher concentration of weekend injuries among retail trade and service workers, and the lower average severity of injuries in these industries. Even controlling for industry, however, weekend injuries are more likely to involve female, white collar, and lower-wage workers who tend to have lower cost claims. In view of the distinctive character of weekend workers and weekend injuries, we focus exclusively on weekday (i.e. Monday-Friday) injuries throughout the remainder of the paper.

Across all types of weekday injuries, 22.9% occur on a Monday. Assuming that workhours are equally distributed across weekdays (see below) the excess fraction of Monday injuries is 2.95% and is significantly different from zero at any conventional significance level.⁹ As shown in Figure 1, however, the magnitude of the 'Monday effect' varies from essentially

⁷A t-test for a difference in the mean indemnity payment between Monday and Tuesday-Friday injuries has a value of 0.66. A t-test for a difference in the corresponding durations of temporary total benefits has a value of 0.39.

⁸A t-test for a difference in the mean indemnity payment between weekend and Tuesday-Friday injuries has a value of 3.78. A t-test for a difference in the corresponding durations of temporary total benefits has a value of 2.86.

⁹The t-statistic for the hypothesis that 20% of all weekday injuries occur on Mondays is 10.77.

0 for fractures to approximately 5 percent for strains due to a slip and back injuries. Appendix Table 1 presents the excess fraction of Monday injuries for 14 categories of injuries, along with t-statistics for the test that one-fifth of weekday injuries occur on Monday. The pattern of the data is suggestive: the excess fraction of Monday injuries is higher for non-life-threatening and easy-to-conceal injuries, and lower for directly visible and/or extremely painful injuries like burns, lacerations, and fractures. Work-related occupational injuries (such as carpal tunnel syndrome) are also significantly more likely to occur on Mondays. We hypothesize that this pattern is driven by the arbitrary nature of the injury date for an occupational disease and a tendency to begin a spell of lost work time on Monday.

II. Medical Coverage and the Monday Effect

One explanation for the Monday effect in (non-occupational) injury rates is that uninsured workers post-date their weekend injuries in order to recover their medical costs through the workers' compensation system.

As noted by Smith (1989), the relative magnitude of the Monday effect also provides a simple method for measuring the fraction of illegitimate WC claims. Assuming that the off-the-job injury rate is approximately constant (per hour), a typical worker with a 9-to-5 Monday-to-Friday work schedule has a 420% higher probability of an off-the-job injury before the start of work on Monday morning than before the start of work on Tuesday-Friday morning.¹⁰ If a constant fraction of off-work injuries (of a specific injury type) are "post-dated" to the next workday, the

¹⁰An '8-to-5' worker is off work 17 hours between each weekday, and 63 hours (4.2 times longer) between Friday night and Monday morning.

relative fraction of illegitimate claims on Mondays versus other weekdays is 4.2.¹¹ Using this fraction it is possible to compute the overall rate of illegitimate WC claims by examining the excess fraction of weekday injuries that occur on Mondays.

A critical check on this interpretation of the Monday effect is that Monday injuries are concentrated among workers who lack medical insurance coverage. Unfortunately, our data set contains no direct information on the medical insurance status of injured workers. We have therefore used information on medical insurance coverage in the Current Population Survey to estimate the probability that an injured worker has any medical insurance, or medical insurance provided through his/her employer. Specifically, we fit linear probability models for the likelihood of medical insurance (or employer-provided health insurance) to the sample of adult workers in the Midwest region in the March 1987 CPS who report annual earnings and annual weeks of work for the previous year.¹² We then use this prediction equation to assign to each injured worker the probability that he or she is covered by medical insurance.¹³

The predictors of insurance coverage include a quadratic function of age, the log of the average weekly wage, a set of 3 gender/marital status interaction dummies, 6 occupation dummies, 8 industry dummies, and interactions of the industry dummies and the gender dummy with the log wage. This equation is reasonably successful in predicting medical insurance

¹¹The relative rate of weekend injuries may be even larger if weekend activities (sports, home repair) are more likely to result in an injury than activities during a normal weekday evening.

¹²The model was fit to Midwest sample only since overall medical insurance coverage rates are higher in Minnesota (88.7%) and the Midwest (88.5%) than in the entire U.S. (85.8%).

¹³We "tested" our imputation procedure by fitting a similar equation for the log weekly wage using the March CPS sample, and comparing the predicted and actual wages in the injury data set. As noted above, the mean and distribution of wages among injured workers are remarkably well-described by the model fit to workers in the CPS.

coverage in the March CPS sample, with an R-squared coefficient of 0.12. The most important predictors of insurance coverage are marital status and the industry-specific wage interactions. For reference, the estimated coefficients of the prediction equations are reported in Appendix Table 2.

Table 2 illustrates the variation in medical insurance coverage rates across different employee groups and the corresponding variation in the size of the Monday effect in injury rates. Columns 1 and 2 of this table give the percentage of individuals with any medical insurance, and the percentage with medical insurance provided by their own employer, estimated from the March 1987 CPS sample. Columns 3 and 5 show the percent of all weekday injuries and the percent of all weekday back injuries that occur on Monday. Columns 4 and 6 give the Monday percentages of weekday injuries and weekday back injuries that resulted in a temporary total disability claim.

Medical insurance coverage rates are lower for younger and single workers, and for workers with lower weekly wages. Perhaps surprisingly, however, the fraction of Monday injuries is virtually constant across demographic groups and wage quartiles. These simple tabulations lend no support for the hypothesis that the higher Monday injury rate is attributable to the post-dating of weekend injuries by uninsured workers.

A more direct test of the link between medical insurance and Monday injuries is to stratify workers based on their relative probability of insurance coverage, and then compare the distributions of injury rates by day of the week across groups. Rows 4a to 4d of Table 2 present medical insurance coverage rates and percentages of Monday injuries for workers grouped by quartile of the predicted probability of insurance coverage. Again there is no evidence that

workers with lower probabilities of coverage have a higher fraction of Monday injuries. To illustrate this point graphically, the upper panel of Figure 2 plots the distribution of injuries by weekday for the four coverage-probability quartiles. The distributions of injuries by weekday are quite similar for all four groups.

The Distribution of Work Hours

An important assumption underlying the comparison of injury rates by day of the week is that the distribution of work hours across weekdays is similar for all types of workers. If the probability of working on Mondays varies with the same characteristics that determine the probability of medical insurance, however, then the comparisons in Table 2 may be invalid. To assess this possibility we used information on weekly work schedules from the May 1985 CPS to construct a sample of individuals who usually work at least one weekday per week.¹⁴ We then computed the probability of work for each weekday among regular "weekday workers".

The upper panel of Figure 3 shows the fraction of weekday workers at work by day for employees in each of the 4 quartiles of predicted medical coverage. For the three upper quartiles the probability of being at work on a given weekday is roughly constant.¹⁵ For the lowest quartile, however, the fraction at work rises monotonically through the week. This pattern is driven by the behavior of low-wage workers in the retail trade industry. Employees in retail trade have a relatively low rate of medical insurance coverage (78% nationwide versus 86% for

¹⁴The "Work Schedule and Dual Job Supplement" of the May 1985 CPS asks each individual which days of the week they normally work on their main job. Our analysis is based on non-self-employed workers who also report an hourly or weekly wage for their main job.

¹⁵Note that the sample is conditioned on working at least one weekday.

all industries) and are more likely to work later than earlier in the week. Assuming that the injury rate per hour of work is constant, the expected fraction of Monday injuries for workers with a low probability of medical coverage is therefore less than 20 percent. As a result, a comparison of excess Monday injuries by quartile of predicted insurance coverage may fail to show a higher Monday effect for the lowest quartile group, even though these workers are more likely to post-date weekend injuries.

One simple correction for the differential probability of Monday work is to exclude retail trade employees from the analysis. As shown in the lower panel of Figure 3, this exclusion effectively equalizes the probability of working on different weekdays for the first quartile group.

A more formal analysis of the correlation between medical insurance rates and the probability of working on different weekdays is presented in Table 3. This table reports the estimated coefficients of the predicted probability of medical insurance coverage in a set of linear probability models for the event of working on different weekdays. Row 1 of the Table shows coefficients for models without any other control variables, fit to the overall sample of workers. As suggested by the pattern in the upper panel of Figure 3, workers with a higher probability of medical insurance are more likely to work on any given weekday (conditional on working at least one weekday). Furthermore, the effect of the predicted coverage variable is larger on Mondays. This pattern persists in models that include demographic and industry controls in addition to the predicted coverage variable (see row 2). When the sample excludes retail trade employees, however, the effect of the predicted coverage variable is approximately equal for all 5 weekdays, with or without the addition of the other control variables (see rows 3 and 4). Thus

we conclude that the assumption of an equal distribution of work hours across weekdays is valid, providing that retail trade employees are excluded from the sample.

The lower panel of Figure 2 shows the fractions of weekday injury claims by quartile of predicted medical coverage for the sample of weekday injuries that excludes retail trade workers. As would be expected from the patterns in Figure 3, the exclusion of retail trade raises the fraction of Monday injuries for the lowest quartile group and lowers the fraction of Friday injuries. Nevertheless, there is still no indication that workers with low medical coverage rates have more Monday injuries. In fact, the deletion of retail trade workers brings the injury distribution for the lowest quartile group closer in line with the distributions for the other 3 quartiles.

III. Models for the Relative Probability of a Monday Injury

To formalize the graphical analysis in Figure 3 we estimated a series of linear probability models for the event of a Monday injury, using various samples of weekday injuries. The key covariate in each of the models is the probability of medical insurance coverage (predicted for each worker on the basis of his or her demographic characteristics, industry, and weekly wage). Column 1 of Table 4 presents estimated coefficients of the coverage variable from models with no other control variables. Columns 2 and 3 present estimates from models that add a set of demographic and industry control variables, and a set of dummy variables describing the nature and cause of the injury, respectively. The estimates in the upper panel of the table are based on samples that include retail trade workers, whereas the estimates in the lower panel are based on samples that exclude these workers.

The coefficients in these conditional probability models measure the effect of insurance coverage on the relative fraction of weekday injuries that occur on Monday: they provide no information on the relation between medical insurance coverage and overall injury rates. In fact, tabulations of the March 1987 CPS suggest that workers without medical insurance coverage have slightly lower overall probabilities of a WC injury claim.¹⁶ However, our interest is in the effect of medical insurance on the timing of weekday injuries, rather than the number of such injuries.

The estimated coefficients in Table 4 tend to be positive, rather than negative as suggested by the hypothesis that workers without medical insurance postdate their weekend injuries to Monday. Consistent with the pattern in Figure 3, the exclusion of retail trade workers leads to a slight reduction in the coverage coefficients. Even without retail trade workers, however, the coefficients are mostly positive or very close to 0.

Since the insurance coverage variable is imputed, rather than measured directly, the (uncorrected) standard errors for the coefficients in Table 4 are biased. The imputed coverage variable can be interpreted as a linear projection of true coverage on a set of person-specific covariates. Thus the estimates in Table 4 are equivalent to instrumental variables (IV) estimates in which the first-stage equation is estimated on one sample (the March 1987 CPS) and the second-stage equation is estimated on a different sample (the first-report of injuries file).¹⁷ As

¹⁶In the entire CPS sample of adult workers with earnings in the previous year, 1.76% report receiving WC payments. This fraction is 1.57% for workers without medical insurance coverage and 1.79% for workers with medical coverage.

¹⁷See Angrist and Krueger (1992) for a general exposition of instrumental variables methods when the first and second stage equations are estimated using different samples.

is emphasized in any standard econometrics text (e.g., Maddala (1988, pp. 311-313), the correct standard errors in an IV procedure use the true values of the endogenous variable to compute the residual standard error of the second-stage equation (rather than the "instrumented" values). For the models in Table 4 this requires us to use true medical coverage status to estimate the residuals: a procedure that is impossible given the data limitations. The estimated residuals based on imputed medical coverage contain a component representing the deviation of true coverage from its imputed value. The residual standard deviations based on this feasible estimate of the residuals are therefore over-stated, leading to an over-statement of the standard errors of the coefficient estimates. In view of the fact that most of the coefficient estimates in Table 4 are positive, however, we believe that it is reasonable to conclude that the absence of medical insurance does not lead to more Monday injuries.

We have estimated a variety of alternative specifications to probe the robustness of this conclusion. In one set of alternatives we replaced the estimated probability of any medical insurance coverage with an estimate of the probability of employer-provided coverage. These models yield coefficient estimates that are very similar to the estimates in Table 4, although typically more precise. In another set of alternatives we added the log of the weekly wage as an additional covariate. When the log wage is included without the estimated medical coverage variable it tends to have a positive but statistically insignificant effect on the probability of a Monday injury. When imputed medical coverage and wages are included together the coefficients are relatively imprecise, but tend to be positive for both variables.¹⁸

¹⁸Note that even when individual characteristics and industry control variables are included in the model, imputed medical coverage and the log weekly wage are not perfectly co-linear because the imputed medical coverage variable relies on an industry-specific wage coefficient.

Denial of Liability

In about 10 percent of workplace incidents in Minnesota for which a first report of injury is filed, the insurance company and/or the employer deny liability for the injury.¹⁹ Typically, the insurer/employer either denies the existence of an injury, denies that the injury arose in the course of employment, or argues that the injury was the result of a pre-existing condition.²⁰ The pattern of denial rates by day of the week and probability of medical coverage provides further evidence on the hypothesis that the Monday effect in injury rates is attributable to the post-dating of weekend injuries by uninsured workers. Presumably, employers and insurers are more likely to deny liability for injuries that are more likely to be fraudulent -- for example, back sprains filed on a Monday. If a larger fraction of Monday injuries filed by workers with lower rates of medical insurance coverage are truly fraudulent, then one should expect to see higher denial rates for Monday injuries among low-coverage groups.

Figure 4 shows the rates of denial of liability by day of the injury and quartile of predicted medical coverage. Perhaps surprisingly, the overall denial rate is no higher for Monday injuries than for injuries on other weekdays. Broken down by quartile of predicted medical coverage, the denial rate for Monday injuries is actually lowest for employees in the first quartile. These patterns do not suggest that employers and/or insurers are more likely to

¹⁹See chapter 4 of Minnesota House of Representatives Research Department (1988) for an analysis of litigation involving issues of primary liability in the WC system of the state.

²⁰To be considered a compensable incident, the courts have typically required (1) that there was a personal injury (2) resulting from an accident (3) arising out of employment and (4) occurring during the course of employment (Burton (1992, page I-123)).

question the legitimacy of Monday claims by groups of employees with low insurance rates (or indeed by any group of employees).

We have also estimated a series of statistical models for the probability of denying liability among weekday injuries. These models included various sets of control variables in addition to 3 key covariates: (1) the predicted probability of medical insurance coverage; (2) a dummy for a Monday injury; and (3) the predicted coverage variable interacted with the Monday dummy. If employees without medical insurance are more likely to file a fraudulent Monday injury claim, and if insurers and/or employers are more likely to deny suspicious claims, then one would expect a positive coefficient on the Monday*coverage interaction. As suggested by the denial patterns in Figure 4, however, the estimated interaction term is uniformly negative, although typically small and statistically insignificant.²¹ The evidence from employer/insurer denial rates is therefore consistent with the conclusion that uninsured employees are no more likely to post-date weekend injuries than other groups.

IV. What Explains the Monday Effect?

If the higher rate of back injuries, strains, and similar injuries on Mondays is not attributable to the claim behavior of uninsured workers, what is it attributable to? One hypothesis is that workers who are injured over the weekend report their injuries on Monday -- regardless of their medical insurance status -- in order to collect temporary disability benefits.

²¹For example, in a model that includes industry dummies, worker characteristics, and dummies for the nature of the injury, the estimated Monday coefficient in the linear probability model for denial is 0.009 (standard error 0.044), the coefficient on the imputed medical coverage variable is -0.088 (0.039) and the coefficient on their interaction is -0.014 (0.049).

This hypothesis is testable insofar as workers have different propensities to collect temporary disability benefits relative to returning to work.

Simple economic models of the tradeoff between working and collecting WC benefits identify the ratio of temporary total disability benefits to the pre-injury wage as a key determinant of the propensity to return to work (see e.g. Krueger (1990, section 3.2)). In Minnesota, as in other states, the temporary disability benefit rate is a function of the pre-injury wage. Specifically, the benefit level is 66.7% of the pre-injury wage, subject to maximum and minimum benefit rates linked to the state average weekly wage.²² The combination of minimum and maximum rates implies that the benefit-replacement ratio falls into 5 categories, as follows:

Pre-Injury Wage Relative to State Average	Percent of Workers	Replacement Rate
< 20%	1.8	> 1.0
20-50%	12.5	1.0
50-75%	22.4	0.67-1.0
75-150%	46.0	0.67
> 150%	17.4	< 0.67

Because of the maximum and minimum benefit rate provisions of the law, high-wage workers face lower replacement rates whereas low-wage workers face higher rates. Other things equal,

²²Minnesota laws prior to 1993 set a subminimum benefit (\$75.20 per week in October 1987) that is a lower bound on all benefits, and a minimum such that claimants whose benefits would be below the minimum using the 66.7% formula receive the lower of the minimum benefit and their weekly wage.

low-wage workers therefore have a stronger incentive to post-date weekend injuries and begin a spell of temporary disability on Monday, rather than work with an injury.

A graphical analysis of the effect of this incentive is presented in Figure 5. Here we have plotted daily injury rates for workers with pre-injury wages in the 5 ranges identified above. There is no indication that workers with higher replacement rates have more Monday injuries. To the contrary, the group of employees with the lowest replacement rate (workers with a weekly wage in excess of 150% of the state average wage) have the highest fraction of Monday injuries.

As noted earlier, a comparison of the fraction of injuries on different days implicitly assumes that workhours are equally distributed across weekdays. To check this assumption we divided weekday workers in the May 1985 CPS into 5 relevant wage ranges (using the Minnesota replacement rate formula for 1985) and estimated a series of linear probability models for the event of working on each weekday. We included indicators for each of the wage ranges in these models, as well as various sets of control variables. Not surprisingly, there is a monotonic relation between the replacement rate and the probability of working on a given weekday: workers in the lowest wage range (with the highest replacement rates) have the lowest probability, whereas workers in the highest wage range (with the lowest replacement rates) have the highest probability. The estimated effects are constant across weekdays, however, implying that the relative fraction of Monday workhours is similar for workers in the 5 wage ranges.²³

²³For example, relative to workers in the wage range with a 0.67 replacement rate, weekday workers in the lowest wage range have a 23.5% lower probability of working on Monday; a 27.0% lower probability on Tuesday; a 25.9% lower probability on Wednesday; a 25.5% lower probability on Thursday; and a 22.3% lower probability on Friday. The standard errors of these estimates are about 1.4% in every case.

There is no systematic relation between the weekly wage range and the relative probability of working on Mondays.

Table 5 presents a series of regression models that complement the simple comparisons in Figure 5. The columns of this table present alternative linear probability models for the event of a Monday injury (among the subset of weekday injuries). The key explanatory variables in these models are indicators for the range of the pre-injury wage, corresponding to different values of the replacement rate. The specifications in columns 2 and 4 of the table also include the weekly wage directly, and rely on the non-linearity of the replacement rate formula to separately identify the replacement rate effects. The results confirm the conclusion from Figure 5: workers with replacement rates of 100% or higher have about the same relative fraction of Monday injuries as workers with a 66.7% replacement rate (the base group in the regression models). Workers with lower replacement rates (who receive the maximum weekly benefit) have a small (2-3%) but statistically significant excess fraction of Monday injuries. We conclude that the 'Monday effect' is not driven by the claims behavior of high replacement-rate workers.

V. Summary and Conclusions

The analysis in this paper is motivated by a simple observation: certain types of injuries are more likely to arise on Mondays than on other weekdays. This 'Monday effect' has been interpreted as evidence that some fraction of employees who are injured off-the-job during the weekend report their injuries as having occurred at work (Smith (1989)). Workers without medical care insurance have a particularly strong incentive to "postdate" weekend injuries and file an injury claim on Monday. To evaluate the effect of this incentive we combine injury data

by day of the week from the Minnesota Workers Compensation system with medical insurance coverage data from the March Current Population Survey. Contrary to our expectations, however, employees with low rates of medical insurance coverage are no more likely to file a Monday injury claim than other workers.

One potential explanation for our findings is that employees with low probabilities of medical insurance coverage are less likely to work on Mondays. Indeed, low-wage workers in retail trade have below-average medical coverage rates and are less likely to work earlier in the week. When we exclude retail trade employees from our analysis, however, we continue to find that medical insurance coverage rates and the relative fraction of Monday injuries are unrelated.

Insurers and employers deny liability for about 10 percent of workplace injuries. If a higher fraction of Monday injuries among uninsured workers are fraudulent, we would expect to see higher denial rates for these injuries. Consistent with our conclusions based on the relative fraction of Monday injuries, we find that denial rates for Monday injuries among workers with higher and lower rates of medical insurance are about equal.

A final aspect of the 'Monday effect' is the relatively strong incentive for workers with high benefit replacement rates to begin a disability spell, rather than continue working during their recovery period. In Minnesota, 15 percent of injured workers actually receive temporary disability benefits as high or higher than their pre-injury wage. At the other end of the earnings distribution, 15 percent of workers receive less than two-thirds of their pre-injury wage while on disability. A comparison of the injury distributions for groups of workers with substantially different replacement rates shows no evidence that high replacement-rate workers are more likely

to report a Monday injury. Indeed, the highest relative fraction of Monday injuries arises among high-wage workers with the lowest replacement rates.

All of these patterns point to two conclusions. First, concern that the Workers' Compensation system is covering the medical costs of off-work injuries for workers without medical insurance may be over-stated. Second, our research suggests that the interpretation of the 'Monday effect' in injury rates as evidence of fraudulent claim behavior may be inappropriate. A higher fraction of back sprains, strains, and similar injuries occurs on Monday than other weekdays. However, these injuries are very evenly distributed across the workforce. If anything, our results suggest that "excess" Monday injuries are more prevalent among high-wage workers -- workers who have the highest rates of medical insurance coverage and the weakest economic incentive to claim disability rather than continue working. An alternative explanation for the 'Monday effect' is that a higher fraction of sprains and strains truly arise on Mondays: perhaps as a consequence of the return to work after a weekend hiatus. We believe that the evidence is more consistent with this hypothesis than with alternatives based on fraudulent claim activity.

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Appendix Table 1: Excess Fraction of Weekday Injuries on Monday,
By Nature of the Injury

	Number of Injuries	Percent on Monday	T-test for Excess Mondays ^a
1. Burns	443	19.19	0.43
2. Lacerations	2,375	21.18	1.44
3. Fractures	1,274	19.86	0.12
4. Strains	9,560	23.73	9.12
5. Contusions	1,453	23.33	3.17
6. Dislocations	602	24.75	2.91
7. Hernias	416	20.91	0.46
8. Inflammations	642	23.21	2.03
9. Heart/Vascular	145	19.31	0.21
10. Occupational Injuries	860	26.51	4.77
11. Insect Bites, Ulcers Seizures	153	22.88	0.89
12. Other Injuries: Amputations, Electric Shock, Concussions, etc	935	21.93	1.48
13. Unknown	2,312	23.17	3.81
14. Not Coded	143	18.18	0.54
15. All Injuries	21,314	22.95	10.77

Notes: Based on sample of weekday injuries with valid weekly wage data. See Table 1 for source.

^aT-test for hypothesis that 20% of injuries occur on Monday.

Appendix Table 2, continued

Wholesale Trade	-0.172 (0.149)	0.168 (0.201)
Retail Trade	-0.256 (0.114)	-0.087 (0.154)
Finance, Insurance and Real Estate	-0.076 (0.137)	0.448 (0.185)
Services	-0.243 (0.112)	-0.034 (0.151)
Public Administration	-0.062 (0.154)	0.101 (0.208)
<u>Industry*Wage Interactions:</u>		
Agriculture, Forestry, and Mining	0.041 (0.020)	0.255 (0.026)
Construction	0.180 (0.015)	0.314 (0.021)
Manufacturing	0.080 (0.009)	0.207 (0.012)
Transportation, Commun. and Utilities	0.115 (0.015)	0.257 (0.021)
Wholesale Trade	0.083 (0.018)	0.260 (0.024)
Retail Trade	0.089 (0.010)	0.286 (0.013)
Finance, Insurance and Real Estate	0.067 (0.016)	0.210 (0.021)
Services	0.090 (0.008)	0.281 (0.011)
Public Administration	0.068 (0.020)	0.277 (0.026)
R-squared	0.120	0.332

Notes: Standard errors in parentheses. Estimated on 15,701 Midwest workers in March 1987 CPS. Mean probability of any medical coverage is 89.4%. Mean probability of employer-provided medical coverage is 65.0%. Omitted occupation category is managerial, professional, and technical. Omitted industry category is agriculture, forestry and mining.

Figure 1: Injury Claim Distribution

Figure 2: Fraction of Weekday Injuries, By Quartile of Predicted Medical Coverage

Figure 3: Fraction of Weekday Workers At Work, By Quartile of Predicted Medical Coverage

Figure 4: Denial of Liability Rates

Figure 5: Injury Distribution by Replacement Rate

Table 1: Characteristics of Injuries by Availability of Wage Data and Day of Injury

		Injuries With Valid Wage Data:			
	All Injuries	All	Monday	Tuesday-Friday	Weekend
<u>Injury Characteristics:</u>					
1. Percent Back Injuries	29.8	31.3	34.3	30.2	33.1
2. Percent Caused by Slip	27.9	28.5	29.2	28.7	25.3
3. Percent Burns & Cuts	13.4	13.2	12.0	13.6	13.4
4. Percent Fractures	5.6	5.9	5.2	6.2	5.6
5. Percent Strains	43.0	45.0	46.4	44.4	47.0
<u>Employer Characteristics:</u>					
6. Percent Self-insured	20.3	20.6	21.1	20.3	21.4
7. Percent Construction	11.3	11.9	12.6	12.6	5.0
8. Percent Manufacturing	29.7	31.5	33.6	32.7	19.1
9. Percent Trade	18.9	19.2	18.3	18.3	27.3
10. Percent Services	22.9	22.8	21.7	21.5	33.8
<u>Employee Characteristics:</u>					
11. Percent Female	31.1	31.0	29.3	29.9	42.2
12. Average Age	35.1	35.2	35.4	35.3	33.6
13. Percent White Collar	35.4	35.4	32.0	33.1	58.7
14. Average Weekly Wage	\$358	358	367	362	312
<u>Claim Characteristics:</u>					
15. Percent With Indemnity	71.2	75.8	76.8	75.6	76.1
16. Mean Indemnity Amount (for positive claims)	\$6488	6336	6667	6429	4998
17. Percent With Temporary Total (TT) benefits	65.9	71.4	72.9	71.2	71.3
18. Mean Duration of TT Benefits (weeks)	10.8	10.7	10.7	10.9	9.2
19. Sample Size	26,563	23,747	4,892	16,422	2,360

Notes: Sample consists of 10% sample of injuries reported to Minnesota Department of Labor and Industry between 1985 and 1989.

Table 2: Probability of Medical Coverage and Relative Probability of Monday Injury,
by Worker's Characteristics

	Probability of Medical Coverage		Percent of Weekday Injuries On Monday		Percent of Weekday Back Injuries On Monday	
	Any	Own Job	All	With TT ^a	All	With TT ^a
1. All Workers	89.4	65.0	23.0	23.4	25.3	25.9
2. <u>By Age/Marital Status/Sex:</u> ^b						
a. Younger Single Men	74.5	38.2	23.1	24.7	25.9	27.1
b. Older Single Men	85.6	75.7	22.9	23.4	25.2	27.1
c. Younger Married Men	89.9	72.2	23.0	22.5	26.5	26.3
d. Older Married Men	96.2	82.7	23.3	23.2	25.8	25.7
e. Younger Single Women	77.2	36.1	22.6	23.4	24.6	27.1
f. Older Single Women	85.7	70.5	22.5	23.4	21.8	23.2
g. Younger Married Women	91.9	47.9	23.7	23.2	25.7	23.4
h. Older Married Women	95.2	47.3	22.3	22.4	25.0	25.3
3. <u>By Quartile of Weekly Wage:</u>						
a. Quartile 1	76.7	22.4	23.0	23.7	23.2	24.6
b. Quartile 2	87.0	61.9	22.2	22.2	25.8	25.3
c. Quartile 3	95.7	83.4	22.6	23.0	25.9	26.8
d. Quartile 4	97.5	90.2	24.0	24.6	26.1	26.9
4. By Quartile of Predicted <u>Probability of Medical Coverage:</u> ^c						
a. Quartile 1	71.3	32.1	22.5	23.5	23.4	25.3
b. Quartile 2	91.1	63.6	23.2	23.4	25.7	25.5
c. Quartile 3	97.0	75.0	23.0	23.2	25.8	26.7
d. Quartile 4	98.1	84.1	23.1	23.3	26.1	26.1

Notes: Entries in columns 1-2 are for Midwestern workers in March 1987 Current Population Survey who report earnings and weeks of work for the previous year. Entries in columns 3-6 are for injuries in Minnesota during 1985-89.

^aInjuries with temporary total (TT) disability payments.

^bYounger workers are those with age under 30. Older workers are those age 30 or higher.

^cProbability of medical coverage is predicted using data on age, sex, marital status, average weekly wage, industry, and occupation. Individuals are then sorted into quartiles based on their predicted probability of medical coverage.

Table 3: Effect of Predicted Medical Coverage on the Probability
of Working on Alternative Weekdays

Coefficient of Predicted Medical Coverage in a Linear Probability Model for the Probability of Working on:					
	Monday	Tuesday	Wednesday	Thursday	Friday
<u>I. All Industries:</u>					
1. No controls	0.60 (0.02)	0.54 (0.02)	0.53 (0.02)	0.46 (0.02)	0.35 (0.02)
2. Demographic and Industry controls	0.91 (0.04)	0.86 (0.04)	0.73 (0.04)	0.75 (0.04)	0.73 (0.04)
<u>II. Excluding Retail Trade:</u>					
3. No controls	0.32 (0.02)	0.27 (0.02)	0.24 (0.02)	0.26 (0.02)	0.31 (0.02)
4. Demographic and Industry controls	0.67 (0.02)	0.64 (0.02)	0.63 (0.02)	0.61 (0.02)	0.71 (0.02)

Notes: Standard errors in parentheses. All models are estimated on sample of 11,982 individuals in the outgoing rotation groups of the May 1985 Current Population Survey who report hourly or weekly wages and whose regular work schedule for their main job includes at least one weekday. Entries in the table are estimated coefficients from linear probability models for the likelihood of working on Monday, Tuesday, etc. The independent variable is an individual-specific estimate of the probability of medical coverage, predicted from data on age, sex, marital status, average weekly wage, industry and occupation (see text). Models in rows 2 and 4 also include sex, age, marital status, industry, and an indicator for white-collar occupations.

Table 4: Estimated Effect of Predicted Medical Coverage on the Conditional Probability of a Monday Injury

		Models with Additional Controls for:	
	No Controls	Worker Demographics & Industry	Injury Type/Cause Worker Demographics & Industry
<u>I. All Industries:</u>			
1. All Injuries	0.03 (0.03)	0.05 (0.05)	0.00 (0.05)
2. Back Injuries	0.09 (0.06)	0.10 (0.10)	0.11 (0.10)
3. Burns and Cuts	0.04 (0.08)	0.07 (0.14)	0.06 (0.14)
4. Strains Caused by Slips/Falls	-0.03 (0.09)	-0.02 (0.16)	-0.01 (0.16)
5. All Injuries With TT Benefits	0.00 (0.04)	0.07 (0.06)	0.05 (0.07)
6. Back Injuries With TT Benefits	0.05 (0.07)	0.14 (0.12)	0.13 (0.12)
<u>II. Excluding Retail Trade:</u>			
7. All Injuries	0.01 (0.03)	0.01 (0.05)	-0.03 (0.06)
8. Back Injuries	0.00 (0.08)	0.08 (0.13)	0.07 (0.13)
9. All Injuries With TT Benefits	-0.04 (0.04)	0.01 (0.07)	-0.02 (0.08)
10. Back Injuries With TT Benefits	0.00 (0.08)	0.08 (0.13)	0.07 (0.13)

Notes: Standard errors in parentheses. Table entries are estimated coefficients from linear probability models for the probability of a Monday injury, estimated on the sample of weekday injuries. The independent variable is a individual-specific estimate of the probability of medical coverage -- see note to Table 3. Models in column 2 include control variables for sex, age, marital status, industry, and white collar occupations. Models in column 3 include 24 additional controls for the nature and cause of the injury.

Table 5: Estimated Models for the Conditional Probability of a Monday Injury

	(1)	(2)	(3)	(4)
Indicators for Replacement Rate: ^a				
1. RR > 1	0.009 (0.020)	0.015 (0.034)	0.015 (0.020)	0.017 (0.035)
2. RR = 1	0.003 (0.010)	0.007 (0.018)	0.005 (0.010)	0.006 (0.018)
3. RR between 0.67 and 1.0	0.007 (0.008)	0.009 (0.011)	0.007 (0.008)	0.008 (0.011)
4. RR < 0.67	0.026 (0.009)	0.024 (0.012)	0.026 (0.009)	0.025 (0.011)
5. Log Weekly Wage	--	0.003 (0.015)	--	0.001 (0.015)
Controls for Nature and Cause of Injury: ^b	no	no	yes	yes

Notes: Standard errors in parentheses. Table entries are estimated coefficients from linear probability models for the probability of a Monday injury, estimated on the sample of weekday injuries. Sample size is 21,314.

^a Models include indicators for the range of the temporary benefit replacement rate (RR). Indicator for RR=0.67 is excluded.

^b All models include age, gender, marital status, interaction of gender and marital status, white collar occupation dummy, and 8 dummies for major industry. Models with 'yes' also include 24 dummies for nature and cause of the injury, an indicator for injuries involving the back, and an indicator for injuries at employers with Minneapolis-St. Paul address.