

Claims Reporting and Risk Bearing Moral Hazard in Workers' Compensation

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Workers covered by workers' compensation insurance generate two types of moral hazard: "risk bearing" moral hazard in which higher benefits induce workers to take more ex ante job risks given a higher level of ex post injury compensation and "claims reporting" moral hazard in which higher benefits have no effect on actual injuries (risk is unchanged) but does induce more claims filings. In this empirical study of indemnity and medical trends the quantitative impact of these two types of moral hazard are separated. In our specifications a positive claims reporting moral hazard more than offsets the negative risk bearing moral hazard. The presence of claims reporting moral hazard suggests that even though workplace injuries may be declining over time (i.e., real safety has increased), reported claims will actually increase as real benefits increase.

If changes in workers' compensation indemnity benefits (more generally, in any insurance coverage) affect workers' real or reported safety behavior then there is a classic moral hazard problem: the liability of the firm (or its insurer) is affected by actions of the workers about which the firm has incomplete information. In the absence of moral hazard effects, an increase in the expected indemnity payment will still increase expected costs in a naive actuarial sense: when the expected weekly indemnity payment increases by 10 percent this increases expected costs by roughly 10 percent as long as the higher benefits do not induce any change in the real or reported behavior of the workers. However this one to one relationship between benefits and costs is broken when moral hazard is present.

The worker's incentive to file a claim for any level of risk will increase as benefits rise since this lowers the cost (mostly in terms of forgone earnings) of

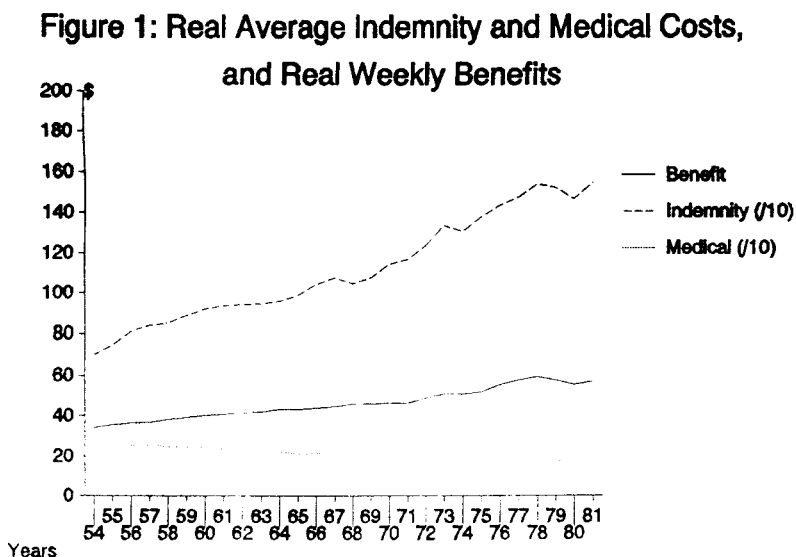
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being on a claim. This results in two types of moral hazard response: an increase in benefits will increase the propensity to file a claim either because the worker will be willing to undertake more risk than before and consequently more injuries will occur, or because the worker has a greater incentive to file a claim for any given level of risk (and its concomitant level of injuries). This article makes the first empirical distinction between the former real and the latter nominal types of moral hazard, presenting estimates of the empirical magnitude of each. Figure 1 provides the context for various types of incentive effects due to changes in the level of indemnity payments. Were the additional claim losses arising from higher benefits generated by the firm or by the worker? Did they represent a real change in safety behavior (risk bearing moral hazard) or did they simply reflect a greater propensity to report claims (claims reporting moral hazard)?

Figure 1

Real Average Indemnity and Medical Costs, and Real Weekly Benefits



While the real and nominal incentives facing the worker are mentioned above, note that the firm also faces similar incentives to alter its behavior. In terms of the nominal incentives of the firm, if experience rated, then higher benefits increase insurance costs on average. Consequently, the firm has an incentive to engage in nominal (and perhaps real) claims reduction practices. One way is simply by resisting more claims that arise (i.e., by discouraging claim filing without improving real safety conditions). Without experience

rating, the firm faces no such nominal incentives, but may still have real incentives with respect to benefit increases.¹

Real firm effects exist when changes in the indemnity benefits affect the safety behavior of the firm. Higher levels of real benefits could conceivably increase safety. The argument is that as benefits increase, risk bearing is shifted from the worker to the firm and there are unrealized economies of scale in risk shifting. Whereas the worker previously bore the injury risk and received compensating wages for it, now as benefits increase the firm bears relatively more risk for the ex post outcomes through its payment of the workers' compensation insurance premiums. This risk shifting may induce some economies if the cost of overall (firm and worker) financial risk falls both because the firm is risk neutral where the workers were risk averse, and because the firm can spread the risk over a large number of workers whereas the risk averse workers could not in the presence of substantial transactions costs between the workers.² There may also be economies of scale for the firm in providing safety devices, offering training and otherwise engaging in cost saving activities. If these real firm effects outweigh the real worker effects, then risk bearing moral hazard may actually fall as indemnity benefits increase.

Virtually all studies of claim usage in workers' compensation find that an increase in indemnity benefits increases claim frequency.³ These include studies using aggregate data (Butler, 1983; Butler and Worrall, 1983; Chelius, 1982; Krueger and Burton, 1990; Ruser, 1985; and Worrall and Appel, 1985) as well as those using microeconomic data (Leigh, 1985; Krueger, 1988; and Ruser, 1989). However, one disaggregated analysis by Moore and Viscusi (1988) finds—contrary to the aggregate analysis by Butler (1983)—that a lower rate of fatal risk is associated with higher workers' compensation benefits.

To their sample of individual workers, Moore and Viscusi impute not only various measures of benefits but also a risk variable that varies on the basis of

¹ The assumption is that the firms in question cannot self insure, and that they are in a workers' compensation risk classification large enough so that their insurance costs are unrelated to their individual safety (both real and nominal) behavior.

² The argument that there are real effects hinges either on unexploited economies of scale (but if such economies existed, why had not the cost minimizing firm already taken advantage of them) or on a corner solution such as a benefit increase being too large to be offset by a decline in the workers' wage premium for risk.

While there may be transactions costs between workers that prevent them from collectively self-insuring in the absence of the firm facilitating such collective decisions, the authors have implicitly assumed that there are effectively no transactions costs between the worker and the firm. This is why all changes in behavior are interpreted as moral hazard problems, such changes are only possible in a profit maximizing setting because of incomplete information on the part of one of the parties.

³ Krueger and Burton examine employers costs of insurance but not claim usage. They find that employers costs rise more than one to one when instrumental variable techniques are employed to estimate the impact of higher benefits on an employer's workers' compensation costs, consistent in their quantitative impact with the positive net moral hazard effects presented here.

the employee's state of residence and reported industry.⁴ Viscusi and Moore argue that employer responses are stronger than employee responses in workers' compensation, therefore higher levels of workers' compensation payments actually save employers money by promoting workplace safety. They did not attempt to distinguish between risk bearing and claims reporting moral hazard; and perhaps their finding that higher benefits reduce death rates reflects only risk bearing moral hazard because it almost surely could not measure any claims reporting moral hazard effects.

A simulation by Kneiser and Leeth (1989) helps reconcile the Moore and Viscusi results with those of earlier researchers. Kneiser and Leeth use a simulation of the workers compensation system using a complex model of the labor market (based in part on previously estimated workers' compensation effects), and find that safety incentives do increase (i.e., the number of real accidents and risk bearing moral hazard fall). Although, in the same simulation the number of workers' compensation claims increased dramatically. Even if the Moore and Viscusi estimates are correct, they use more of a real measure of safety in their analysis and not one that is sensitive to claims reporting moral hazard problems (such as the other disaggregated studies by Kruger, Leigh, and Ruser). Hence, it may not be altogether surprising to find that the number of actual injuries falls (Moore and Viscusi), while the number of reported injuries rises (all the other studies).

Moral Hazard Estimates from Indemnity and Medical Cost Regression

The current research is the first to empirically distinguish between risk bearing and claim reporting moral hazard. The key to this separation is how expected benefits differentially affect indemnity and medical costs. This involves two key elements: properly deflating medical expenditures and computing benefits so that actuarial and moral hazard effects can be separated.

The expected benefits variable, in the absence of moral hazard, must predict actual average costs perfectly. In fact expected benefits as calculated here are the indemnity payments for a typical worker given a state's replacement rate, its minimum and maximum benefits, and the wage distribution of its workers. For example, an increase in the maximum payment only affects covered workers who were previously constrained by the maximum. When integrating over the relevant proportion of the wage distribution, a new expected (indemnity) benefit that takes account of the higher payments now received by those previously receiving the old maximum payment is calculated. Assuming the frequency and severity of claims is unchanged, expected benefits should exactly mirror average costs per worker.⁵

⁴One referee pointed out that because of these imputations perhaps the Viscusi and Moore study should be considered an aggregate analysis.

⁵Butler (1983) gives a detailed description of this variable's construction. For this article, expected payment was calculated on a temporary total claim using the average real (nonagricultural, based on Bureau of Economic Analysis data) wage in each state. Some limited

Since workers' compensation pays for virtually unlimited medical care, trends in real medical costs represent total medical damages associated with compensable workplace injuries.⁶ When medical costs are properly deflated to account for the higher costs of medical care, the impact of expected indemnity benefits should be the same on total indemnity and medical costs in the absence of claim reporting moral hazard. If the estimated impact of expected indemnity payments is much greater for indemnity costs than it is for medical costs, this indicates that claim reporting moral hazard by the worker exceeds any real safety changes (i.e., that claims reporting moral hazard is larger than either risk bearing moral hazard by the firm or the worker).⁷ That this may be a real possibility is reflected in Figure 1, in which average (across states for the indicated year) real annual benefits, indemnity and medical payments are displayed. Indemnity and medical payments are divided by ten in order to fit them on the same graph, and medical payments are deflated by the same index used below in the empirical research-average daily costs for a hospital stay. Indemnity costs and average weekly benefit payments have been deflated by the consumer price index (CPI; 1967 = 100).

experimentation with expected benefits based on other types of benefits (permanent partial) and other average wages (the average manufacturing wage) led to similar results.

⁶In fact, there were nominal limitations on the amount of medical coverage early in the sample period, up through the mid 1960s for some states. These limitations are given in various issues of *Analysis of Workers Compensation Laws*, and the authors studied their importance extensively, although those results are not reported here.

For example, 50 percent of the states in 1954 had some kind of time limitation during which medical expenditures would be reimbursed and 40 percent had some kind of limitation on the amount of medical expenditures. These limitations fell steadily over time to about half those levels in 1972, and they quickly disappeared from most states soon thereafter. However, even the pre-1972 medical limitations were not binding constraints because most states that had limitations allowed for extensions to the limitation, and because the nominal limitation was sufficiently high (except for New Jersey from 1954 through 1959) as to be unimportant. To examine the impact of these limitations the authors fitted a chi-square distribution using the (observed truncated) mean of medical expenditures, and then calculated the number of people affected by the limitation and the proportion of number of people affected by the limitation and the proportion of all medical costs above the limitation. These were (excluding New Jersey from 1954 through 1959) zero to four decimal places in all years. Observations from New Jersey for 1950s were excluded from the statistical analysis presented below.

⁷This assumes that the mix of injuries is not substantially changed by movements in maximum and minimum payments. If an increasing maximum indemnity payment induces substantially more short duration claims to be filed (see Butler and Worrall, 1987), then the estimates given below of claims reporting moral hazard are biased downwards. Unfortunately, in this sample, no variable captures the distribution of claim types.

Two other factors also tend to bias the estimate of claims reporting moral hazard downward. First, to the extent that quality of health care is reflected in higher costs and increased indemnity payments are correlated with increases in the quality of care, then the indemnity impact on medical payments in part estimates changes in the quality of care. This tends to overestimate the degree of real risk and hence understates the level of claims reporting moral hazard. Second, to the extent that claimants fraudulently use medical services to signal severity, some claims reporting moral hazard would be present in the medical equation and the estimate of claims reporting moral hazard would be too conservative. Further, the risk bearing moral hazard would be overestimated, and claims reporting moral hazard would be underestimated.

The potential claims reporting moral hazard is revealed in Figure 1 by the apparent response in the average indemnity costs to changes in the weekly benefit amount. They seem to peak and trough at roughly the same time, generally rising together throughout the period. At the same time real average medical costs actually seem to fall. This suggests that real workplace safety may have increased even though the average real claim amount actually increased: a fall in risk bearing moral hazard was more than offset by an increase in claims reporting moral hazard.

Our research strategy can be formalized by differentiating a couple of identities. These are the definitions for the expected indemnity and expected medical costs (which we can measure directly using our aggregated data set):

$$I = P \cdot D \cdot B \quad (1a)$$

$$M = P \cdot D \cdot \pi \quad (1b)$$

where I = expected indemnity costs per worker, M = expected medical costs per worker, P = probability of a claim being filed (frequency) per worker, D = average duration of a claim that is filed, B = weekly indemnity amount, π = price of medical care per week (per worker), and τ = consumer price index. Divide both sides of 1a by the CPI; divide both sides of 1b by the medical price index; take logs of both equations; and the differentiate the equations by the log of real benefits ($\ln B$) to get

$$\begin{aligned} \frac{\partial \ln(I/\tau)}{\partial \ln(B/\tau)} &= \frac{\partial \ln P(\text{real})}{\partial \ln(B/\tau)} + \frac{\partial \ln P(\text{nominal})}{\partial \ln(B/\tau)} + \frac{\partial \ln D(\text{real})}{\partial \ln(B/\tau)} \\ &\quad + \frac{\partial \ln D(\text{nominal})}{\partial \ln(B/\tau)} + 1 \end{aligned} \quad (2a)$$

and

$$\frac{\partial \ln(M/\pi)}{\partial \ln(B/\tau)} = \frac{\partial \ln P(\text{real})}{\partial \ln(B/\tau)} + \frac{\partial \ln D(\text{real})}{\partial \ln(B/\tau)} \quad (2b)$$

where the terms in parentheses are a reminder that benefit changes can induce both real (risk bearing moral hazard) and nominal (claims reporting moral hazard) changes in workers' behavior. It's also clear from equations 2a and 2b that claims rate moral hazard reflects both changes in the probability (frequency) as well as in the duration (severity) of claims. The same is true, of course, for claims reporting moral hazard.

The estimation of the left-hand elasticities in equation 2 comes from multiple regressions like the following:

$$\ln(I/\tau) = \alpha_0 + \alpha_1 \ln(B/\tau) + \alpha_2 X \quad (3a)$$

$$\ln(M/\pi) = \beta_0 + \beta_1 \ln(B/\tau) + \beta_2 X \quad (3b)$$

where X is a vector of other control variables. As discussed above, α_1 is the sum of the following three elasticities: (1) actuarial relationship (far right term

in 2a): $\epsilon_a = 1$, (2) risk (real) bearing moral hazard elasticity: ϵ_r , and (3) claims (nominal) reporting moral hazard elasticity: ϵ_n . Since β_1 is a direct measure of risk bearing moral hazard.

$$\beta_1 = \epsilon_r = \frac{\partial \ln (M/\tau)}{\partial \ln (B/\tau)} = \frac{\partial \ln P(\text{real})}{\partial \ln (B/\tau)} + \frac{\partial \ln D(\text{real})}{\partial \ln (B/\tau)},$$

and claims reporting and risk bearing moral hazard elasticities can be solved as follows:

$$\epsilon_r = \beta_1; \epsilon_n = \alpha_1 - \beta_1 - 1. \quad (4)$$

In Table 1, the authors estimate α_1 and β_1 directly from the log (indemnity) and log (medical) cost regressions in order to compute the claims reporting and risk bearing moral hazard.

The data used in this article span from 1954 through 1981 for 33 states which report claim data to the National Council on Compensation Insurance (NCCI).⁸ A total of 728 complete observations were assembled for this present study. The dependent variable data came from the files of the NCCI's Unit Statistical Plan (the second report for both indemnity and medical costs), and it was merged with employment data available from the Bureau of Labor Statistics (BLS), and with data on self insurance for workers compensation available from several years of Social Security Bulletin information compiled by Dan Price (see Price, 1980, for example).

Since the dependent variable in this section of the article is based on insurance data, not all firms are included in the aggregated state data are in the sample. In particular, the data do not include information for those firms that qualify for self insurance. For this reason sample selection corrections were applied to all the models presented in this article without altering any conclusions. These sample selection correction terms are the proportion of insurance dollars that self insure for each state in a given year and its value squared (P and PSQ).⁹ Because of this sample selection, adjustments were

⁸ The states include by postal code the following: AL, AR, CO, CT, DC, FL, ID, IL, IN, IA, KS, KY, LA, ME, MD, MI, MN, MS, MO, MT, NE, NH, NJ, NM, NY, NC (just 1 observation), OK, RI, SC, SD, TX, VA, and VT.

⁹ Butler and Worrall (1983) use a similar correction on a different data set, and Butler and Worrall (1988) examine the determinants of self insurance in workers' compensation. Instead of the proportion of self insured dollars, a better (but unavailable) variable for many purposes (especially for the employment deflator discussed below) would have been proportion of self insured employment. One remains quite confident, at this level of aggregation, that the proportion of self insured dollars is an excellent proxy for the proportion of self insured employment.

One referee suggested that the difference in wages, and the difference in employment, be included as additional explanatory variables to capture substantial movements in the labor market. They were insignificant; and their inclusion did not effect the quantitative impact of the other variables (unfortunately, there is no annual series on the unemployment rate by state during the sample period). At this referee's suggestion the real wage was also included as an additional regressor: it was significant in the regression, and uniformly moved all of the estimated benefit elasticities of table 2 a little closer to zero, but did not affect the qualitative conclusions.

also made in the employment variable with which indemnity and medical costs were deflated to put them on a per worker basis. This was done by taking total nonagricultural employment and subtracting government employment (both BLS data), and then multiplying by the proportion of workers' compensation insurance dollars (Dan Price, Social Security data) that are not self insured.

Ordinary least square estimates employing two different measures of benefits are presented in Table 1. The expected benefit variable was constructed as described above and is used in the four left columns to estimate the claims reporting and risk bearing moral hazard elasticities. A risky employment variable, EMPMIX, (i.e., the proportion of employment in manufacturing and construction) and dummy variables for each state were used as control variables in order to hold workplace risk and administrative differences constant.

Also included was a post-1971 dummy variable for the National Commission on Workmen's Compensation laws to account for its impact on subsequent trends in the administration of the workers' compensation system. This "NC dummy" is interacted with the benefit measures under the expectation that claims reporting moral hazard may have actually increased in the post-1971 period.¹⁰ Such a phenomenon would help explain why claims are increasing even as the workplace seems to be getting safer. (This is an anecdotal judgement that is often heard, consistent with the trends in real medical expenditure reported in Table 1).

The benefit coefficient in the far left regression indicates that after the actuarial effect of expected benefits ($\epsilon_a = 1$) is accounted for, the combined claims reporting and risk bearing moral hazard elasticity is .32. This is roughly consistent with the elasticities reported in other studies cited in the first section of this article. This means that a 10 percent increase in expected benefits leads to a 13.2 percent increase in costs: 10 percent due to the actuarial relationship

At another referee's suggestion the authors tried to find another index to deflate medical expenditures. The Medicare index (average Medicare charge per covered day of care in short-stay hospitals) was the only other one available by state and year that could be found. It is highly correlated with the average daily hospital cost index:

$$\text{SOC_SER} = -4.01 + 1.01 \text{ AVG_HOSP} \quad R^2 = .9455 \\ (-1.66) \quad (75.67)$$

and yields the same conclusions (the avghosp variable was used to project the missing values for the SOC__SER (medicare) index) when employed for the full sample period. In fact, yielded a somewhat larger claims reporting elasticity. When used for the post-1972 period (first available starting in 1971), it yielded less significant results.

¹⁰In a fully interactive model with structural shift for all the slope coefficients, the qualitative conclusions of the present model remain the same. The differences are these: overall moral hazard is about .2 in the post 1971 period, and risk bearing moral hazard is not significantly different from zero. However, in the fully interactive model only the shift in the benefit elasticity is significant for both indemnity and medical cost regressions. Hence, attention is restricted to that shift in this article.

A significant interaction can be interpreted either as nonlinearity in the benefit response (since real benefits rose after 1972), or as a type of informational or framing effect due to the publicity surrounding the National Commission's examination of the laws.

Table 1
Moral Hazard: Indemnity and Medical Cost, 1954-1981
(Absolute t Statistics)

Independent Variables	Using (Actuarially) Expected Payments		Using Actual Maximum Payments					
	log (indem. costs)	log (medical costs)	log (indem. costs)	log (medical costs)				
Intercept	-7.69 (21.8)	-6.44 (15.8)	-1.21 (3.17)	-6.23 (20.0)	-5.17 (15.03)	-.48 (1.65)	-1.37 (4.26)	
Expected benefits	1.32 (17.5)	1.04 (11.8)	-.36 (5.22)	-.11 (1.32)	—	—	—	
[exp. ben.]* [NC dummy]	—	.05 (5.8)	—	-.05 (5.68)	—	—	—	
Maximum benefits	—	—	—	—	.96 (17.3)	.74 (11.5)	-.26 (5.06)	-.07 (1.23)
[max/ben]* [NC dummy]	—	—	—	—	—	.05 (6.55)	—	-.05 (5.88)
Empmix	-.54 (4.1)	-.26 (1.9)	.87 (6.94)	.61 (4.68)	-.29 (2.01)	.00 (.01)	.80 (5.06)	.56 (4.09)
Prob. self ins.	6.72 (10.2)	6.56 (10.22)	6.94 (11.36)	7.09 (11.85)	5.70 (8.58)	5.70 (8.8)	7.22 (11.68)	7.21 (11.96)
(Prob. self ins) ²	-9.38 (6.8)	-8.94 (6.62)	-8.90 (6.92)	-9.30 (7.38)	-7.99 (5.73)	-7.73 (5.7)	-9.26 (7.15)	-9.48 (7.49)
R ²	.788	.798	.725	.737	.786	.799	.724	.737

Notes: there were 728 observations used in the analysis. Dummy variables for each state were included in all regressions, but state effects are not reported in the tables (the states by postal code are: AL, AR, CO, CT, DC, FL, ID, IL, IN, IA, KS, KY, LA, ME, MD, MI, MN, MS, MO, MT, NM, NY, OK, RI, SC, SD, TX, VA, and VT). All pecuniary variables are in real 1967 dollars (CPI deflator), except medical costs which have been deflated by average daily hospital costs. Benefits and employment mix, as well as the dependent variables, are measured in logs.

between expected benefits and costs and an additional 3.2 percent increase due to the combined moral hazard (incentive) effects. How much of this incentive effect is due to claims reporting incentives and how much to real safety incentives? Since the $-.36$ benefits coefficient in the log (medical costs) regression measures the risk bearing moral hazard ($\epsilon_r = -.36$), the implied claims reporting moral hazard elasticity is $.68$ ($\epsilon_n = .68$) using equations 2a and 2b. In terms of real safety behavior, the firm's incentives to increase safety apparently dominant the worker's incentive to bear more risk: as benefits increase, there is less risk taking (less real injuries on the job). But at the same time, there is even a larger (more than offsetting) increase in the worker's propensity to file claims. Hence, even though the workplace is getting safer as benefits rise (the firm's incentives dominant), the number (and severity) of claims actually increases. The reporting effect is greater than the real effect, and insurance costs increase with increases in the real benefits.

To check for consistency in the interpretation of results, two further checks of the specification are examined: the change in claims reporting elasticity in the post National Commission period and reanalysis of the same regressions using another (nonactuarial measure) of benefits. Both of these checks tend to reinforce earlier conclusions. There has been a relative shift towards an increase in claims reporting moral hazard since 1971, which more than offset the real risk bearing decline.¹¹ Another specification check involves using another measure of benefit response that does not mirror expected costs in the way that expected benefits are constructed to mirror those costs. So the basic specification is repeated in the four right columns but with the real maximum payment rather than the expected benefits. The maximum payment does not fully reflect the actuarial change in costs since no weight is given to the effect of either minimum benefits or the shape of the wage distribution (as they are in the calculation of expected benefits). In fact, under the interpretation of the benefit coefficients in equation 1 above, the maximums should have a smaller impact on the indemnity costs than do expected benefits since they overestimate the average (or expected) benefit change.¹²

Note that the implied maximum benefits follow exactly the pattern expected: they are consistently smaller than the corresponding coefficients for the expected benefit variables but always have the right sign and the correct relative magnitudes.

The implied elasticities for claims reporting and risk bearing moral hazard are given in Table 2 with the absolute value of the t-statistic in parentheses. The t-statistic tests the hypothesis that the moral hazard (benefit elasticity) effect is significantly different from zero. Only the risk bearing moral hazard is insignificant (at the 5 percent level) in the pre-National Commission period,

¹¹ The authors regard the relatively large decrease in the overall measured moral hazard elasticity as somewhat problematic. This may indicate specification problems with the present model. In the future, the authors hope to find microeconomic data and replicate the study.

¹² The relationship between expected benefits and maximum and minimum benefits for this same sample period is given in Butler and Appel (1990).

Table 2
 Claims Reporting and Risk Bearing Moral Hazard Elasticities
 (Absolute t-statistic of test that $\epsilon = 0$)

Overall Moral Hazard ($\epsilon_r + \epsilon_n$)	1954-1981	
	Claims Reporting M. H. (ϵ_r)	Risk Bearing M. H. (ϵ_n)
.32 (4.22)	.68 (11.18)	-.36 (5.22)
Overall Moral Hazard ($\epsilon_r + \epsilon_n$)	1954-1971	
	Claims Reporting M. H. (ϵ_r)	Risk Bearing M. H. (ϵ_n)
.04 (.43)	.15 (2.31)	-.11 (1.32)
Overall Moral Hazard ($\epsilon_r + \epsilon_n$)	1972-1981	
	Claims Reporting M. H. (ϵ_r)	Risk Bearing M. H. (ϵ_n)
.09 (1.04)	.24 (3.99)	-.15 (1.97)

consistent with the specification discussed in footnote 10. However, all the benefit elasticities have the correct sign with the claims reporting elasticity always significantly different from zero.

Conclusions: Benefits Effects, More and Less

Although the results of the present studies are subject to the usual caveats associated with aggregated data sets, they suggest that rising benefits may lead to more claims at the same time that they lead to fewer injuries. This reconciles the seeming contradiction between a decrease in injury frequency and an increase in claim frequency (and severity). The public policy and ratemaking implications are clear. One of the primary goals of the state workers' compensation system is to internalize costs while providing safety incentives. If results reported here are sustained by further research then apparently the system does provide real safety incentive.¹³ As benefits increase, employers

¹³A very careful analysis of firm-level data by Ruser (1990) that came to the authors attention only after submitting this article, finds that increases in workers' compensation benefits are associated with decreases in the rate of occupational fatalities but increases in other types of injuries. Ruser, consistent with the evidence reported here, interprets the difference between the fatal and nonfatal injury response to an absence of reporting effects (claims bearing moral hazard) in the case of fatal injuries. He is not able, however, to measure the relative size of the claims reporting and risk bearing moral hazard as is done here.

attempt to reduce their costs by providing safer workplaces. However, as more workers adopt a disability status or lengthen the durations of nonwork spells at any given level of real injuries, the claims costs rise.

Such rising claims costs could lead one to the mistaken belief that the workers' compensation system does not provide an incentive to reduce real injuries, or that an employee's incentive to bear more real risk is stronger than an employer's incentive to reduce injuries. The evidence is virtually unanimous: approximately 20 claims frequency studies show that employee effects dominate. However, none of these studies has separated out the real injury rate effects from the claims reporting effects.

Insurance economists and actuaries use the term benefit utilization to indicate claim frequency and severity effects holding the real injury rate constant. When actuaries attempt to price workers' compensation insurance and forecast workers compensation losses, they are vitally concerned with such benefit utilization. The present research indicates that their concern is not misplaced. At levels of workers' compensation costs of around \$20 billion, an average benefit increase of 10 percent would lead to a \$640 million reduction in direct workers' compensation costs due to a reduction in real injuries, and a \$1.36 billion increase due to increased claims filing (and claims severity) in addition to the \$2 billion increase in costs generated at the old claims frequency (and severity) level.¹⁴ As workers' compensation costs continue to rise, and states search for explanations, understanding claims reporting moral hazard and estimating its impact should receive a high priority. The present research should be replicated with micro data sets, but this preliminary evidence should not be ignored. Benefit increases lead to increased claim filing, not necessarily to increased injuries.

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¹⁴To these costs, the productivity and utility gains from injury avoidance (after adjusting for changes in the compensating wage) would need to be added.

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