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Author
Robinson, James C

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James C. Robinson, University of California (Berkeley)

Abstract. Recent policy initiatives in occupational safety and health have emphasized strategies that provide workers with information about workplace exposures. It is not clear, however, what effect this new information has had or will have on worker self-help initiatives. This paper analyzes individual and collective worker responses to information on job hazards using five sources of data on workers and industries in the United States. Levels of expressed dissatisfaction, discharges for cause, and strike frequencies are found to be significantly higher in hazardous jobs than in safe jobs. Individual quit strategies are not consistently found to be associated with higher hazard levels. These findings have potentially important implications for the design of future information-oriented health and safety policies.

One of the most important developments in occupational health policy over the past decade is the generation and dissemination of information on job hazard exposures and possible health effects. A large number of states and localities have promulgated worker "right to know" statutes that require employers to inform workers about the toxic properties of the materials they use on the job (Bureau of National Affairs 1984; Wallerstein 1984). These state and local initiatives motivated the chemical industry to press the federal Occupational Safety and Health Administration (OSHA) to set a single national standard for worker information (Ashford and Caldart 1985; Baram 1984). A standard devised under the Carter administration guaranteed workers access to company medical and industrial hygiene records (Ashford 1986). Labor unions, university programs, and management groups have received OSHA funding to establish working training programs (Office of Technology Assessment 1985). The National Institute for Occupational Safety and Health (NIOSH) has been embroiled in a controversy over whether it is obligated to inform the hundreds of thousands of workers regularly exposed to high levels of known carcinogens of the risks they face (Schultze and Ringen 1984).

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This focus on information and education has been the result of a remarkable convergence of conservative and liberal political views. Conservatives have traditionally preferred private initiatives to public regulations, and see the provision of information as a means to enhance the working of market mechanisms (Zeckhauser and Nichols 1978). Liberals, on the other hand, have emphasized worker training out of disenchantment with OSHA's standards enforcement system. Fifteen years of experience has shown that the responsible state and federal agencies lack the budgetary means and political will to enforce stringent exposure limits in the face of concerted industry opposition, and liberals have come to rely on workers and labor unions to watchdog management compliance (Boden and Wegman 1978).

This policy shift towards worker education has occurred without much evidence about how workers actually respond to information about job hazards. A view often espoused by those favoring direct regulation is that educational strategies will produce only meager effects, since the individual workers employed in hazardous positions have few job alternatives (and hence little bargaining power) and since union leaders are indifferent to the working conditions faced by their members (Page and O'Brian 1973; Akerlof and Dickens 1982). On the other hand, a number of economists and policymakers have promoted information strategies under the hypothesis that educated workers will shun employment in hazardous jobs unless management pays extra-high wages.

This paper seeks to provide a unified theoretical and empirical treatment of how workers respond to occupational safety and health hazards as a foundation for "right to know" and other information-oriented policy initiatives. Contrary to the traditional theory of worker ignorance and indifference, the study finds that very high percentages of workers do recognize major hazards on the job. In contrast to the existing economic studies of worker responses to hazard information, the analysis finds that collective "voice" responses were more common than individual "exit" responses during the time period under consideration.

The next section of the paper discusses alternative models of worker responses to perceived hazards. The data and methods used in studying worker responses are described in the following section. The paper next presents statistical evidence on worker initiatives and management counterinitiatives as measured by quit intentions and quits, expressed dissatisfaction, discharges for cause, and strikes, and a final section discusses the implications of the empirical findings for the debate over the appropriate mix of regulatory and market-oriented strategies for occupational health policy.

Theories of worker responses to hazard

Viscusi (1979; Viscusi and O'Connor 1984) proposed one well-articulated theory of how workers respond to new information concerning safety and health risks on the job. He argued that workers are often unsure of the level of hazard

in their jobs at the time of initial employment, but gradually learn more about those hazards through their experiences and those of their coworkers. Workers choose jobs based on their initial evaluation of the value of all relevant job characteristics, including wages, promotion possibilities, and working conditions. If over time a worker discovers that any job characteristic is in fact less desirable than initially perceived, the job as a whole becomes less valuable relative to other job options and the worker becomes more likely to quit. Using data from the late 1960s and early 1970s, Viscusi found that quit rates in several data sets are higher in hazardous jobs than in safe jobs, controlling for other job and worker influences on quit probabilities.

Viscusi's learning and turnover model is part of a larger evaluation of the incentives generated by competitive labor markets for firms to improve working conditions. The quits predicted by the learning process impose significant costs on management, since departing workers must be replaced and new employees must be trained. These turnover costs motivate management to adopt a combination of safety investments, wage premiums, and other inducements to reduce hazard-related quits. Under certain conditions, these market incentives could fully supplant OSHA's role in the sense that they could provide the socially optimal degree of pressure on management to improve working conditions. Based on this model and his empirical findings, Viscusi advocates the elimination of OSHA's health and safety standards. In their place he would substitute information strategies (not including the "right to know" strategy as it is usually conceived), monitoring adverse health effects (i.e., lung function tests), and changes in the way Worker's Compensation premiums are calculated so as to better reflect injury experiences (Viscusi 1983).

While Viscusi's theory of hazard-related quits is plausible, a number of intervening factors might impede a worker's decision to quit in response to new information on job hazards. In many jobs, workers receive training that increases their skills and makes them more valuable to their employer. On-the-job training is one reason why employers often institute wage scales that rise with the length of time a worker has been with the company and offer pension plans which lose their value if the worker quits. At the same time that a worker is becoming more knowledgeable about workplace hazards, his costs of quitting are increasing.

Worker knowledge of hazards may improve not only on the basis of personal experience but also as a result of labor union educational efforts. Workers in hazardous jobs are considerably more likely than workers in safe jobs to be unionized (Leigh 1982; Worrall and Butler 1983; Hirsch and Berger 1984). A number of studies have shown, however, that unionized workers are substantially less likely to quit their jobs during any given period of time than are comparable nonunion workers, due to both the higher wages the union wins for them and the union's grievance and arbitration system, which provides a means for resolving disputes without quits (Freeman 1980).

Another reason workers receiving new information on job hazards may not quit is more subtle and perhaps most important from a social point of view. The

benefits produced by worker quits (safety investments, wage premiums) accrue to the workers who do not quit. The costs of quitting (the necessity of searching for alternative employment, the possibility of some time unemployed) are paid by those workers who do quit. Each individual worker has the incentive to stay put and hope his or her colleagues are the ones who actually do the quitting. The level of quits and the incentives those quits create for management to improve working conditions will thus be too low. A well-known dictum of economic theory states that unregulated market mechanisms produce socially inefficient outcomes when important externalities of this type are present.

If workers are reluctant to quit when they learn that their jobs are more hazardous than previously imagined, they will try to press management for direct improvements rather than seek better working conditions elsewhere. In the parlance developed by Hirschman (1970), they will adopt a "voice" rather than an "exit" strategy. Workers have many ways of exerting pressure on their employers. Individual acts of militancy may take the form of chronic absenteeism ("Monday morning sickness"), effort restriction ("working to rule"), or calling an OSHA inspection. Allen (1981a, 1981b) finds a consistently positive association between hazardous conditions and absenteeism using two quite different sources of data. This association holds both for health-related absenteeism and for absenteeism not directly due to injuries suffered by the absent worker. Collective forms of pressure can include negotiation for safety improvements in the union contract, use of the union's grievance and arbitration system, and strikes.

Unfortunately, it is extremely difficult to obtain empirical measures of worker voice responses to information on hazards. Voice responses take many forms and often are covert due to fear of reprisal. However, insights into the extent of these responses can be obtained by a number of indirect means.

Dissatisfaction is a necessary condition for both exit and voice responses, with choice between exit and voice strategies having important implications for the persistence of hazard-related dissatisfaction. By definition, exit responses terminate dissatisfaction with a particular employment relation because they terminate the employment relation itself. Voice responses, on the other hand, are consistent with the persistence of dissatisfaction, since the employment relation is maintained and the voice strategy may be slow or ineffective in achieving the desired improvement in working conditions. A higher measured level of worker dissatisfaction in hazardous relative to safe jobs would thus constitute evidence consistent with the joint hypothesis that workers have obtained new information concerning workplace hazards and that they have not chosen an exit strategy in response.[1]

Other evidence on voice responses to hazard may be obtained from data on worker discharges for cause and on strike rates. Discharges are most common

1. For general economic analyses of job satisfaction and dissatisfaction (not related to working conditions) see Freeman (1978).

in nonunion environments where workers lack third-party adjudication of differences. Strikes, on the other hand, are largely confined to unionized workforces, at least in the United States. They may take the form of relatively spontaneous refusals to resume work unless a particular problem is resolved or well-planned walkouts when union contracts come up for renewal. Workers engaging in hazard-related strikes during the course of the contract are protected by many provisions of the National Labor Relations Act (Ashford and Katz 1977; Drapkin 1980). Similar protections do not extend to individual workers refusing to perform hazardous tasks; these individuals are directly subject to being discharged for cause.

To the extent that improved worker perceptions of workplace hazards lead to higher rates of discharges and strikes, it will be necessary to revise Viscusi's expectations concerning the potential for private worker and management initiatives, channeled through market mechanisms, to replace direct governmental regulation of workplace hazards. While the voice strategies that generate the discharges and strikes may indeed prompt management to improve conditions, the industrial conflicts they produce impose socially inefficient burdens on the economy. Discharges are costly to management as well as to the discharged workers, since replacements must be hired and trained. Strikes result in unused labor and capital resources and hence reduce the value of production available to be divided between wages, safety investments, and profits. Both workers and stockholders would be better off if the strike could have been avoided.

Rates of discharges and strikes suggest the existence of poor industrial relations. Leigh (1983, 1984) argues that strike rates would be higher in hazardous than in safe industries if hazardous employments tended to attract less risk-averse workers who were more willing to take the gamble inherent in calling a strike.[2] Leigh's own study fails to find a significant association between an independent measure of worker attitudes towards risk and the probability of being employed in a strike-prone industry. However, he does consistently find a positive association between aggregate industry injury rates and strike rates. Similarly, Byrne and King (1986) find a strong positive association between aggregate injury rates and the incidence of unauthorized (''wildcat'') strikes. A more plausible explanation for the hazard/strike relationship than the risk aversion hypothesis may be that daily threats to life and limb themselves influence worker attitudes towards management. Instead of calculating the expected costs and benefits of each action in the coolly reflective manner implied by economic models, workers may take actions that consequently hurt themselves if the actions will also hurt manage-

2. While Leigh uses data on individual workers, his injury and strike data are measured at the industry level. In effect he reports that workers employed in industries with high injury rates are disproportionately likely to be employed in industries with high strike rates. This is equivalent to using industry rather than worker-level data.

ment. A poisoned physical environment may poison the industrial relations environment.

Data and methods

This study uses information on working conditions, expressed dissatisfaction, quit intentions, quits, discharges for cause, and strikes from five complementary data sets to examine different dimensions of worker responses to job hazards.

Insights into the extent of worker awareness of the hazards faced on the job can be obtained from several large surveys conducted in the late 1970s: the 1977 Quality of Employment Survey (QES), the 1978 National Longitudinal Survey of young men (NLS-M), and the 1980 National Longitudinal Study of young women (NLS-W). Unfortunately, these studies contain the most recent data available on worker perceptions because of the substantial cutbacks in federal funding for statistical programs that began in 1981.

The QES is a random sample of the entire working population in 1977 and queries respondents about the presence of a number of hazards at work. For simplicity, this study amalgamates the QES responses into a single measure indicating whether or not each worker reports a serious level of exposure to at least one health or safety hazard. Mild hazard exposures are treated as nonexposures to control for idiosyncratic differences in the willingness of workers to report hazards. To facilitate comparison with the NLS data, the QES sample is divided into men and women.

The two NLS samples are focused on subsets of the working population: men between the ages of 26 and 37, and women between the ages of 26 and 39. These surveys ask respondents whether their jobs expose them to either "danger" or "unhealthy conditions" and if so, to what degree. As in the case of the QES, this study constructs a single measure indicating whether or not each worker is exposed to a serious level of either safety or health problems.[3]

The cross-sectional 1977 QES provides information on dissatisfaction and quit intentions. The survey asks respondents how satisfied they are with their job overall. The job dissatisfaction measure used in the study is coded as a variable that indicates whether the respondent reports himself as being "not at all satisfied" or "not too satisfied." The QES quit intentions measure is coded as a variable that indicates whether the respondent reports being "very likely" or "somewhat likely" to make "a genuine effort to find a new job with another employer within the next year."

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3. Workers tended to report that their jobs were either both unsafe and unhealthy or neither unsafe nor unhealthy. Some differences are observed between the male and female samples. Among young men, safety hazards are more common than health hazards (33 percent versus 27 percent). Among young women, health hazards are more frequent than safety hazards (20 percent versus 14 percent).

The 1978 wave of the young men's NLS and the 1980 wave of the young women's NLS provide additional information on dissatisfaction and quits. The dissatisfaction variable used with these two surveys is constructed as a variable that indicates whether the respondent dislikes his or her current job "somewhat" or "very much." Since the NLS are panel data sets, they permit the analysis of actual quits rather than quit intentions alone. The quit variables indicate whether the respondent quit his or her job in the two years after the survey (1978–80 for men, 1980–82 for women). These waves of the NLS are only interviewed every two years.

Another measure of working conditions is available aside from that based on worker perceptions. The Bureau of Labor Statistics publishes rates of injuries each year in *Occupational Injuries and Illnesses in the United States, By Industry*. These industry data can be used with worker-level data sets by assigning each worker the average degree of risk faced by all workers in his or her industry. This was done with the QES data set but not with the NLS. The industry injury rates are based on the experience of all workers in each industry and therefore do not adequately represent the risks faced by young men and young women separately. However, the availability of the industry injury rates did permit the study to analyze two additional data sets that did not include measures of worker hazard perceptions.

Data on quits and on strike probabilities were obtained from the Panel Study of Income Dynamics (PSID), a large longitudinal data set similar in form to the NLS but covering all sectors of the workforce. The industry injury rate is matched to individual PSID workers using industry codes included in the survey. The quit measure in the PSID is coded as a variable that indicates whether the respondent quit his or her job over a twelve-month period after the interview. The strike probability measure is coded as a variable that indicates whether the respondent reports any days on strike over the twelve months after the interview. The 1977 year of the PSID was chosen to make results as closely comparable as possible with those obtained from the QES. The 1976–78 PSID waves are merged together for the strike analysis to account for the fact that union contracts are usually negotiated on a triennial basis. Since nonunion workers strike very infrequently, the strike analysis is limited to unionized PSID workers. No direct measure of job dissatisfaction is available in the PSID.

The industry injury rate is also used with a data set in which the industry itself rather than the individual worker is the unit of analysis. Bureau of Labor Statistics publications provided annual rates of injuries, quits, discharges for cause, and strikes for the manufacturing sector at the four-digit Standard Industrial Classification (SIC) level. Rates of quits were obtained from turnover data in *Employment and Earnings*. Comparable rates of discharges for cause were obtained in unpublished form from the Bureau. Data on the number of strikes were obtained for 1976, 1977, and 1978 from *Analysis of Work Stoppages*. Strike rates per worker were derived from these data by averaging the three years of strike

Table 1. Percentages of Workers Reporting Serious Health and Safety Hazards

	1977 QES Men	1977 QES Women	1978 NLS Men	1980 NLS Women
All workers	42%	30%	42%	27%
Laborers	50	57	66	39
Operatives	65	56	64	45
Craft workers	47	23	60	37
Service workers	60	33	58	50
White-collar workers	24	24	21	21

data and dividing them by the number of unionized production workers in the industry in 1977. As strike data are only available at the three-digit SIC level, all four-digit industries within a three-digit industry are assigned the same value. Three years of data are used for the strike measures due to the relationship between strike frequency and triennial contract negotiations.

In order to measure the independent effect of hazardous working conditions on levels of worker dissatisfaction and on rates of quits, discharges, and strikes, it is necessary to control for additional job and worker characteristics that influence these variables. The QES and NLS data sets provide an exceptionally rich variety of job characteristics, including union representation, wage rates, and worker-reported variables indicating whether physical surroundings are unpleasant, whether promotion possibilities are poor, whether employment security is poor, whether no opportunities exist for skill acquisition, and whether the worker's supervisor is incompetent. The PSID and manufacturing industry data sets include unionization and wage measures, but not the other working condition variables. Worker characteristics in the NLS, QES, and PSID data sets include race, sex, age, education, job tenure, self-perceived health status, urban residence, and region of residence. The PSID also includes the unemployment rate in the worker's county of residence. The manufacturing industry data set includes workforce information on the percentage that is black, female, residing in an urban area, and residing in major census regions, plus average years of age, education, and job tenure.

Findings

Table 1 presents percentages of QES and NLS workers who report serious hazards, both for the entire samples and by major occupational category. The most striking feature of this table is the relatively high percentage of workers who perceive their jobs as posing serious hazards to health and safety. Approximately one-third of all workers report serious hazards; men are substantially more likely to report exposures than are women. Blue-collar workers are particularly likely to report hazard exposures, as one would expect. Approximately two-thirds of men in blue-collar occupations report serious levels of hazard exposures.

Table 2. Quit Intentions, Individual Quits, and Quit Rates in Hazardous and Safe Employments[a]

	Worker Reports Serious Hazard in Job	Worker Reports No Serious Hazard in Job	*P* Value
Percent intending to quit (1977 QES)	39.7	28.8	<.0001
Percent quitting (1978–80 NLS men)	13.7	15.3	.3427
Percent quitting (1980–82 NLS women)	18.5	21.3	.2236
	Hazardous Industries	**Safe Industries**	***P* Value**
Percent intending to quit (1977 QES)	30.9	36.6	.2744
Percent quitting (1977–78 PSID)	11.0	10.1	.3790
Quit rate (1977 manufacturing)	24.8	21.9	.0005

a. These figures control for the influence of other job and worker characteristics, as discussed in the "Methods" section. Full regression results are presented in the Appendix, Tables 1–4.

These survey data do not allow the analyst to discern the accuracy of worker hazard perceptions, since no objective measures of working conditions are included. Needless to say, some workers are ignorant of the hazards they face and some deny the evidence of health hazards presented to them. On the other hand, some workers no doubt overstate the severity of the hazards they face. Nevertheless, these data suggest that workers can and will come to understand the general implications of working conditions for health status.

Table 2 presents rates of quit intentions, individual quits, and industry quit rates in hazardous and safe employments after controlling for the other determinants of voluntary turnover. These figures are derived from logistic regressions (for the worker-level data)[4] and log-linear least squares regressions (for the in-

4. The logistic distribution assumes that the probability P of the event in question occurring is:

$$P = 1/(1 + \exp - XB)$$

where X is a vector of job and worker characteristics (including hazards) and B is the associated parameter vector. In order to derive estimates for the effect of differences in hazard levels on the probability that a worker reports dissatisfaction, quit intentions, quits, or strike participation, one differentiates the logistic function with respect to the hazard variable:

$$dP/dH = bH(1 - H)$$

dustry-level data).[5] Full regression results are presented in the Appendix. Hazardous jobs are defined as those in industries where the injury rate is equal to or greater than the sample average and those where the worker reports substantial exposures. Safe jobs are defined as those in industries with below-average injury rates or those in which the worker reports no exposure or mild exposure.

The figures in Table 2 are decidedly mixed and provide no consistent support for the hypothesis that workers adopted exit responses to new information on workplace hazards during the period under consideration. QES workers describing their jobs as hazardous were more likely to report quit intentions than comparable workers in safe jobs, and the annual rate of quits in 1977 was higher in manufacturing industries with high injury rates than in those with low rates. These results parallel those obtained by Viscusi, who used comparable data from earlier years. For most of the other data sets and hazard measures, however, quit rates were lower in hazardous jobs than in safe jobs, although not significantly so. Viscusi reports a significantly positive association between injury risks and quits

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where b is the logistic parameter on the hazard variable H. The adjusted percentage of workers in hazardous jobs who respond in the manner under consideration (i.e., express dissatisfaction, quit), P_H, is then calculated as:

$$P_H = (P + [(1 - H)dP/dH]) \times 100$$

where P and H are the sample averages of the response and hazard variables, respectively. The corresponding figure for workers in safe jobs, P_S, is calculated as:

$$P_S = (P - [HdP/dH]) \times 100$$

5. The log-linear specification assumes that unit changes in the values of the independent variables produce logarithmic or percentage changes in the value of the dependent variable Q:

$$\log Q = XB + u$$

where u is an additive error term and X and B are defined as in footnote 4. In order to derive estimates of the effect of differences in industry injury rates on quit, discharge, and strike rates in manufacturing when these rates are measured in logarithmic terms, one differentiates the logarithmic function with respect to the injury variable:

$$\frac{d}{dH} \log Q = \frac{dQ}{dH} \frac{1}{H} = b$$

and hence

$$\frac{dQ}{dH} = bH$$

where b is the ordinary least squares parameter on the injury rate and H is evaluated at the sample mean of the injury variable. The adjusted rates of quits, discharges, and strikes in hazardous industries are calculated as:

$$Q_H = Q + ([H_H - H]dQ/dH)$$

where H_H is the average injury rate in hazardous industries. The corresponding figure for industries for low injury rates, Q_S, is:

$$Q_S = Q + ([H_S - H]dQ/dH)$$

Table 3. Dissatisfactions, Discharges, and Strikes in Hazardous and Safe Employments[a]

	Worker Reports Serious Hazard in Job	Worker Reports No Serious Hazards in Job	*P* Value
Percent dissatisfied (1977 QES)	16.6	9.1	.0554
Percent dissatisfied (1978 NLS men)	7.3	7.6	.8086
Percent dissatisfied (1980 NLS women)	12.7	5.7	.0393
	Hazardous Industries	**Safe Industries**	***P* Value**
Percent dissatisfied (1977 QES)	15.9	6.3	.0010
Discharge rate (1977 manufacturing)	6.0	4.8	<.0001
Strike rate (1976–78 manufacturing)	4.3	3.0	.0047
Percent on strike during year (1976–78 PSID)	10.0	6.0	<.0001

a. These figures control for the influence of other job and worker characteristics, as discussed in the "Methods" section. Full regression results are presented in the Appendix, Tables 1–4.

using the 1974 PSID, no significant association between injury risks and quits using the NLS young and mature men's surveys, and does not report his findings on injury risks and quit intentions in the 1969 precursor to the QES. The main divergence between this study and his regards the PSID. The lack of association reported here was also obtained using the 1976–77 and 1978–79 PSID waves.

Table 3 presents levels of dissatisfaction and rates of discharges and strikes in hazardous and safe employments after controlling for other relevant influences. These various measures of worker voice responses reveal a strong and consistent pattern. Worker dissatisfaction, discharges for cause, and strikes are significantly higher in hazardous than in safe jobs, using all five data sets and both measures of workplace hazards, with one exception. Among QES workers, dissatisfaction levels are 82 percent greater in hazardous than safe employments, controlling for other job and worker characteristics that influence attitudes towards employment. Among young women surveyed by the NLS, the percentage of workers reporting dissatisfaction is over twice as great in hazardous jobs as in safe jobs. Although dissatisfaction levels are significantly higher among NLS men in hazardous jobs than among those in safe jobs, this association is due to other related job and

worker characteristics. Once these additional characteristics are controlled for, no statistically significant association remains between hazard exposure and worker dissatisfaction, as indicated in the second row of Table 3.

The annual rate of discharges for cause in 1977 was 20 percent higher in manufacturing industries with high injury rates than in otherwise comparable manufacturing industries with low injury rates. Within the manufacturing sector, strike rates during the 1976–78 period were 56 percent higher in hazardous industries than in safe industries, other factors being equal. The PSID data, which cover all sectors of the economy, indicate that workers in hazardous industries between 1976 and 1978 were 70 percent more likely to participate in a strike than similar workers in safe industries. These findings are consistent with those reported by Leigh and by Byrne and King.

Conclusion

The various educational strategies in occupational health policy, including guarantees of the worker's "right to know" about workplace hazards, ultimately rest on the assumptions that workers will utilize new information on exposures and related medical effects in socially desirable manners. The findings presented in this paper extend a small but growing body of knowledge that is generally supportive of these strategies in the sense that workers are observed to be aware of many of the hazards they face and to take a number of active responses. Hazardous working conditions have been found to be associated with higher levels of expressed dissatisfaction, absenteeism, discharges for cause, authorized and unauthorized strikes, and (though not consistently) higher quit rates. These responses all impose burdens on the economy and on society. This suggests that the full potential of information strategies will not be realized without institutional changes in the ways labor market discontent and conflict are channeled.

From a policy point of view, an obvious difficulty with the worker responses documented in this paper is that they are only tenuously linked to the socially desired outcome—improved health and safety conditions. To the extent that quits, insubordination, and strikes related to working conditions increase the cost of production, they provide incentives for management to improve conditions. The very existence of these responses, which impose costs on workers as well as on management, suggests that the current market system responds to financial incentives of this sort in a socially suboptimal manner. The value of production lost due to the industrial conflicts these variables measure could in principle have been devoted to investments in workplace health and safety. Occupational health policy in the United States may have much to gain from efforts made by other nations in the area of industrial jurisprudence, including special labor courts and collective bargaining mechanisms. These institutional mechanisms aim to reduce industrial conflict by providing generally acceptable forums for dispute resolution. Occupational health policy in the United States has already benefited from

examples set by Sweden, the Federal Republic of Germany, and other nations regarding direct reduction of workplace exposures. A potentially fruitful area for future research and policy initiatives may focus on indirect means that may be used to achieve the same ends.

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Appendix

Table A1. Determinants of Worker Dissatisfaction and Quit Intentions: The 1977 Quality of Employment Survey

	Industry Injury Rate Measure of Workplace Hazard		Worker-Reported Measure of Workplace Hazard	
	Worker is Dissatisfied	Worker Intends to Quit	Worker is Dissatisfied	Worker Intends to Quit
Injury rate	0.153 (0.046)	−0.040 (0.037)	—	—
Worker-reported hazard	—	—	0.711 (0.219)	0.492 (0.163)
Unpleasant surroundings	0.969 (0.211)	0.498 (0.165)	0.817 (0.219)	0.360 (0.170)
No training	0.728 (0.234)	0.335 (0.198)	0.682 (0.237)	0.300 (0.200)
No promotions	0.921 (0.246)	0.166 (0.158)	0.849 (0.245)	0.131 (0.159)
Bad supervisor	0.524 (0.231)	0.217 (0.189)	0.494 (0.232)	0.204 (0.191)
Insecure	0.570 (0.219)	0.589 (0.172)	0.527 (0.221)	0.578 (0.173)
Annual earnings ($1000s)	−0.021 (0.017)	−0.017 (0.011)	−0.038 (0.021)	−0.025 (0.013)

Table continues on following page.

Table A1. *Continued*

	Industry Injury Rate Measure of Workplace Hazard		Worker-Reported Measure of Workplace Hazard	
	Worker is Dissatisfied	Worker Intends to Quit	Worker is Dissatisfied	Worker Intends to Quit
Life insurance	0.329	−0.270	0.413	−0.266
	(0.250)	(0.172)	(0.254)	(0.173)
Pension plan	−0.192	−0.390	−0.159	−0.369
	(0.259)	(0.181)	(0.263)	(0.181)
Union	−0.497	−0.649	−0.476	−0.753
	(0.250)	(0.183)	(0.249)	(0.185)
Tenure	−0.021	−0.056	−0.017	−0.056
	(0.020)	(0.015)	(0.020)	(0.015)
Black	0.230	0.439	0.200	0.401
	(0.350)	(0.264)	(0.353)	(0.265)
Female	−0.066	−0.175	−0.331	−0.088
	(0.246)	(0.176)	(0.242)	(0.173)
Age	−0.019	−0.037	−0.016	−0.034
	(0.010)	(0.007)	(0.010)	(0.007)
Education	0.045	0.012	0.042	0.029
	(0.050)	(0.035)	(0.049)	(0.034)
Healthy	−0.240	0.089	−0.193	0.148
	(0.309)	(0.245)	(0.310)	(0.247)
SMSA	−0.070	0.123	0.103	0.181
	(0.232)	(0.170)	(0.235)	(0.172)
Northeast	0.284	−0.009	0.188	−0.020
	(0.285)	(0.212)	(0.286)	(0.213)
Central	0.114	0.035	0.141	0.055
	(0.272)	(0.192)	(0.273)	(0.193)
West	0.302	0.597	0.284	0.601
	(0.313)	(0.220)	(0.314)	(0.221)
Intercept	−3.521	1.035	−3.034	0.417
	(0.889)	(0.634)	(0.840)	(0.594)
−2 Log L	671.71	1137.84	667.64	1130.64
N	1087	1085	1088	1087

Table A2. Determinants of Worker Dissatisfaction and Quits: The 1978–82 National Longitudinal Surveys

	Worker is Dissatisfied		Worker Quits	
	1978 Men	1980 Women	1978–80 Men	1980–82 Women
Worker-reported hazard	−0.042 (0.175)	0.388 (0.188)	−0.131 (0.138)	−0.177 (0.145)
Unpleasant surroundings	0.995 (0.176)	0.958 (0.187)	0.133 (0.143)	−0.118 (0.146)
No training	0.543 (0.171)	0.784 (0.184)	−0.285 (0.158)	−0.054 (0.141)
No promotions	1.350 (0.216)	1.090 (0.253)	0.475 (0.138)	0.404 (0.134)
Bad supervisor	1.007 (0.171)	0.714 (0.191)	0.476 (0.156)	0.221 (0.157)
Insecure	0.593 (0.176)	0.378 (0.193)	0.061 (0.154)	0.082 (0.149)
Hourly wage	−0.104 (0.038)	−0.084 (0.046)	−0.041 (0.021)	−0.008 (0.026)
Union	0.063 (0.183)	−0.339 (0.208)	−0.659 (0.154)	−0.417 (0.149)
Tenure	−0.020 (0.023)	−0.024 (0.026)	−0.185 (0.021)	−0.240 (0.025)
Black	0.505 (0.210)	0.588 (0.207)	−0.450 (0.185)	−0.318 (0.152)
Age	−0.032 (0.029)	0.053 (0.031)	−0.029 (0.022)	−0.031 (0.020)
Education	0.014 (0.036)	0.052 (0.042)	−0.034 (0.027)	0.070 (0.028)
Healthy	−0.336 (0.279)	−0.135 (0.271)	−0.162 (0.243)	−0.094 (0.205)
SMSA	−0.024 (0.189)	0.477 (0.227)	0.088 (0.143)	0.297 (0.144)
South	−0.076 (0.193)	−0.181 (0.203)	−0.050 (0.142)	0.137 (0.132)
Intercept	−2.713 (1.070)	−6.523 (1.188)	0.792 (0.788)	−0.678 (0.779)
−2 Log L	1062.83	905.57	1673.40	1702.64
N	2511	2027	2250	1877

Table A3. Determinants of Worker Quits and Strikes: The Panel Study of Income Dynamics

	Worker Quits, 1977	Worker Strikes, 1976–78
Injury rate	0.0289	0.1661
	(0.0328)	(0.0335)
Hourly wage	−0.1847	0.0471
	(0.0269)	(0.0198)
Union	−0.1339	—
	(0.1435)	
Tenure	−0.0255	−0.0173
	(0.0110)	(0.0113)
Black	−0.8600	−0.2613
	(0.1568)	(0.1796)
Female	−0.0329	0.0267
	(0.1576)	(0.2457)
Age	−0.0220	0.0020
	(0.0062)	(0.0070)
Education	0.0403	−0.0491
	(0.0248)	(0.0282)
Healthy	−0.2688	0.4518
	(0.2038)	(0.3093)
Unemployment rate in county	−0.0194	0.0852
	(0.0349)	(0.0315)
SMSA	0.0813	−0.1642
	(0.1259)	(0.1527)
Northeast	−0.1268	0.2058
	(0.2071)	(0.2259)
Central	0.2601	0.2191
	(0.1533)	(0.1815)
West	0.2928	0.0994
	(0.1942)	(0.2406)
Intercept	−0.4061	−4.0443
	(0.5030)	(0.6142)
−2 Log L	2100.60	1723.47
N	3438	3367

Table A4. Determinants of Discharges, Quits, and Strikes in Manufacturing Industries

	Log of Discharge Rate, 1977	Log of Quit Rate, 1977	Log of Strike Rate, 1976–78 Average
Injury rate	0.048	0.028	0.079
	(0.010)	(0.008)	(0.028)
Percent union	−0.843	−0.874	—
	(0.217)	(0.179)	
Hourly wage	−0.211	−0.311	−0.405
	(0.063)	(0.052)	(0.164)
Median tenure	0.0004	−0.003	−0.013
	(0.0039)	(0.003)	(0.011)
Percent black	0.734	−0.944	−3.678
	(0.587)	(0.486)	(1.696)
Percent female	−0.241	0.248	−2.128
	(0.222)	(0.183)	(0.637)
Mean education	−0.360	−0.140	0.329
	(0.077)	(0.064)	(0.206)
Mean age	0.006	−0.014	−0.059
	(0.017)	(0.014)	(0.047)
SMSA	0.597	0.123	−0.694
	(0.223)	(0.185)	(0.629)
Northeast	−0.047	−0.914	−0.335
	(0.266)	(0.220)	(0.751)
Central	0.816	0.109	1.040
	(0.247)	(0.204)	(0.668)
West	1.335	0.899	−1.539
	(0.277)	(0.288)	(0.766)
Intercept	6.056	7.138	−2.228
	(1.014)	(0.839)	(2.893)
R^2	0.53	0.67	0.17
N	420	420	413