

8 OCCUPATIONAL SAFETY AND HEALTH IN THE 1990S

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The Occupational Safety and Health Administration (OSHA) continues to be justifiably maligned as one of the least effective federal regulatory agencies. Congress initiated this agency with the Occupational Safety and Health Act of 1970. The impetus for the establishment of this new branch of the U.S. Department of Labor was based in part on a misleading rise in some measures of industry risk levels. In spite of these ominous trends, most measures of risks to occupational safety and health continued to display a downward trend. Specifically, the *total* injury frequency rate for manufacturing rose 2.4 percent annually from 1958 to 1970, but several measures of disabling injuries and death rates were either constant or exhibited a steady decline (Viscusi, 1983). This pattern is consistent with a possible reporting bias due to the problem of defining what constitutes a job-related injury. The advocates of the establishment of OSHA did not assess the mixed statistical signals, but focused on the one rising injury trend as an indication of an alarming escalation in workplace risks.

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Congress saw the establishment of OSHA as a mechanism for reversing what was in fact an illusory upsurge in injuries. In addition, Congress envisioned that OSHA would have sweeping effects on the control of risks in the workplace.

The high expectations accompanying the establishment of OSHA were similar to those for other efforts launched at the time. Seat-belt regulations instituted by the U.S. Department of Transportation are another prominent example. In each case, there was a widely held belief that the technological solution to our safety problems would yield dramatic gains. This usually meant, it seems, the expectation that it would be possible to reduce risks by at least half from their existing levels.

The reality has been quite different. OSHA began its operations in response to the structure established by its enabling legislation. The agency, predictably enough, adopted as its regulatory strategy an approach of setting regulatory standards that would be treated as mandatory guidelines to be enforced by inspectors with the authority to assess penalties on non-complying firms. The original safety standards consisted of the adoption of thousands of previously voluntary industry standards. These industry standards had been developed as discretionary guidelines — as conventions or norms — with little apparent thought to the idea that they might become mandatory throughout industry. OSHA's only modification to these standards was largely editorial — it replaced the discretionary *should* to a more mandatory *shall*. With these minor editing changes in place, OSHA was in business — armed with thousands of regulations — on a broad front of safety issues.

Not surprisingly, the agency became the object of widespread ridicule. Many of the standards were not well conceived and were most inappropriate as mandatory guidelines. Bridge workers were required to wear orange life vests regardless of whether the riverbeds over which they worked were dry. Detailed specification standards for ladders, handrails, and machine guards dictated specific workplace design without regard for alternatives that might have provided greater safety. Across a wide range of technological choices, OSHA assumed the role of a technology-forcing agency.

The enormity of the regulatory task, coupled with the infeasibility of promulgating uniform design standards that would be cost-effective in all contexts, led to a predictable backlash by the firms that had to pay the price for this regulation. Since stringent and sweeping regulations were coupled with weak and inconsistent enforcement, OSHA came to epitomize bureaucratic incompetence rather than a positive force for safety.

The second era of OSHA operations is marked by the advent of the

Carter administration. First, the Department of Labor undertook a number of substantial revisions in the OSHA standards. This effort resulted in the elimination of many petty regulations that had been the most dramatic examples of regulatory excess. The second theme was a shift in the agency's focus from safety issues to health issues. This seemed justified in view of the relatively greater likelihood of poorly understood health hazards as opposed to more readily monitorable safety risks. This shift in emphasis was coupled with an overambitious commitment to the stringency of such regulations. As a result many of the proposed OSHA standards were involved in battles within the Carter administration or in the courts.

With the coming of the Reagan administration in 1981 the emphasis throughout the federal government shifted to deregulation. Unfortunately, this new emphasis did not involve a restructuring of OSHA's regulatory approach but rather a retrenchment across a broad spectrum of regulatory activity. OSHA did not try to do different things, or the same things better. Rather, the mandate was to do less of what it had already been doing — and not very well at that.

One exception to this pattern was in the area of hazard communication standards. This innovation, proposed at the end of the Carter administration, was finalized during the Reagan administration. This new information standard greatly expanded the domain of OSHA regulations to include the provision of risk information. The intent was to foster involvement of worker actions to promote and encourage greater workplace safety. Overall, however, the Reagan administration's plan for OSHA involved little more than a scaling back of the agency's efforts. This retrenchment led to a new wave of criticism of OSHA. Having done little to improve safety and health conditions in the workplace, the agency was now seen as abandoning even its minimalist role. Although such criticism had long been prominent in the economics literature, the strong proponents of job-safety regulations became quite vigorous in their attacks. These attacks might be understood if we consider, in greater detail, the regulatory standards used by OSHA.

1. The Structure of OSHA Standards

It is commonplace for legislation to mandate rather broad performance goals, and to direct the relevant governmental agency to develop explicit rules and requirements whereby — it is hoped — those goals might be achieved. This was certainly the case with occupational safety and health legislation. OSHA's enabling legislation required that it issue standards,

yet the nature of the standards was not specified by Congress. Indeed, there were few legislative constraints other than a general exhortation to promote worker health and safety. OSHA was given the mandate "to assure as far as possible every working man and woman in the nation safe and healthful working conditions"¹ and "to set mandatory occupational health and safety standards."² Several key dimensions are involved in the choice of the regulatory strategy within these broad limits. The first pertains to the focus of the standards, while the second concerns the character of particular regulations.

1.1. *The Focus of Standards*

The first concern is whether or not there should be any differential emphasis on particular types of hazards in the workplace. Recall that the economics literature draws a sharp distinction between health hazards and safety hazards. From an economic standpoint, the greatest gains are to be reaped by intervening in the situations in which the market failure is the most substantial. The general consensus in the literature is that such failures are likely to be greater for health risks than they are for safety risks. That is, in the case of safety hazards, workers have a variety of sources of information to assess their exposure to risk. Included here would be the injury record of the firm in particular industries, as well as monitorable aspects of specific jobs.

On the other hand, health hazards tend to be less visible. Moreover, because of the long time lags involved—and problems of multiple causality—health hazards tend to both poorly documented and little understood. As a general rule, therefore, the rationale for public policy involvement in the area of health hazards should be more compelling than for safety hazards.

In spite of this a priori logic, the focus of the agency's regulatory efforts has been quite the opposite. As noted above, the original OSHA standards focused almost exclusively on safety hazards. Moreover, even though there was a shift in emphasis toward health hazards during the Carter administration, these newer regulations were issued at an exceedingly slow pace. The delays in adoption, to a large extent arising from their stringency, arose because of court challenges and internal OSHA battles. The cotton dust standard, for example, was originally opposed by the economists in the Carter White House. Additionally, the textile industry pursued litigation all the way to the U.S. Supreme Court. As a result, OSHA has remained largely a safety-oriented agency.

1.2. *The Character of Standards*

The second issue in designing performance standards pertains to the precise character of the particular regulations to be put in place. The choice is between 1) a performance standard whereby the industry is required to meet a certain standard of safety or 2) a design standard that mandates specific technological aspects of workplace design. Design standards have the advantage in that they can be more readily enforced. However, their disadvantage is that design standards may impose inefficiencies since the required design may not be the most cost-effective mechanism for promoting safety in specific instances. It is not uncommon to find design standards that mandate that handrails must be 30–34" high, at least 2" thick for hardwood and 1½" thick for metal, spaced no more than 8 feet apart, and have at least 3" of clearance from a wall.

While some specifications are innocuous, others may be either ineffective or woefully incomplete. A principal disadvantage of narrow specifications is that they may not be broadly applicable mechanisms for promoting safety. For example, President Ford's task force on OSHA concluded that the machine-guard standards were so narrowly defined that they pertained to only 15 percent of all machines (MacAvoy, 1977).

In addition to the usual distinction between performance and design standards, standards can vary in the degree to which they call for protective equipment and other mechanisms that are alternatives to changes in the technology of the workplace. For instance, it will often be more cost-effective to have workers use protective equipment to reduce the risk of hearing loss than it will be to require a reduction in the overall noise level of the workplace. We observe this strategy among baggage handlers at airport gates. Similarly, individual respirators will often reduce worker exposure to hazardous substances at far less cost than will large-scale engineering controls. Finally, providing workers with information on risks and associated precautions allows individuals to take cost-effective safety precautions that do not require expensive alterations in the technology of the workplace.

Although performance-oriented alternatives are frequently attractive, their obvious drawback is that they rely on changes in worker behavior. There is no assurance that workers will wear the protective equipment or will take the suggested safety precautions. If such equipment is onerous or uncomfortable to wear or if it interferes with job operations, there will be a tendency for individuals to ignore the guidelines, thus undermining the desired effect. This tendency is compounded when workers are reimbursed on an output-based system. The reduction in productivity forces

workers to face a difficult incentive problem—exhortations to be safe versus the financial inducement to boost output.

Even without monetary conflicts, problems with precautionary behavior may arise. The experience with automobile seat belt regulations is a telling illustration of failure to undertake apparently desirable safety precautions. Despite the substantial safety gains from seat belt use, a majority of motorists forego the use of seat belts and thereby make individual decisions that appear to be less than fully rational.

The second disadvantage of performance-oriented regulations arises in those instances in which risk perceptions are inadequate. Here, workers will not properly value the safety benefits from precautions and hence some mandatory rules may be needed to induce the ideal safety behavior. When such perceptions are not fully shared, safety measures will have a tendency to be opposed by unions. In a competitive market, wages will adjust in the long run to reflect the increased burdens imposed by such jobs. In unionized markets, with wages already somewhat above their competitive level, there is no assurance that there will be such an adjustment. A feasible solution in such settings may be increased negotiation between unions and firms over safety policies that are combined with contractual commitments to compensation. The issue here is added discomfort to workers versus centralized changes in technology and processes.

One final contentious aspect of design standards has been their stringency. One instructive measure of the cost-effectiveness of regulations is given by the cost per life saved. Table 8.1 provides a summary of the cost per life saved for a variety of OSHA regulations. At the low end of the scale we find highly efficient regulations that save lives very cheaply. One such example is the service standard for oil and gas wells with a cost per life saved of \$100,000. At the high end is a proposed OSHA formaldehyde standard with a cost per life saved of \$72 billion. As table 8.1 suggests, there is a wide range in the cost effectiveness of alternative government regulations, and the task for the regulatory agencies is to strike an appropriate balance between the costs and benefits of these standards.

To date, OSHA has made little attempt to make such distinctions in spite of well-established mechanisms for doing so. A substantial literature on labor market valuations of life and limb indicates the value that workers themselves place on small risks of death, and these numbers can serve as a general benchmark for establishing the benefit values for averting such risks. If one uses as the reference point a value of life figure in the range of \$3 million to \$5 million (Moore and Viscusi, 1990), then the judgment as to which standards are desirable and which are not becomes apparent. Using these value-of-life figures, all OSHA standards

Table 8.1. Cost Per Life Saved for OSHA Regulation*

Regulation	Year	Status	Annual Lives Saved	Cost Per Life Saved (Thousands of 1984 \$)
Oil & Gas Well Service	1983	Proposed	50,000	\$100
Underground Construction	1983	Proposed	8,100	300
Servicing Wheel Rims	1984	Final	2,300	500
Crane Suspended Personnel Platform	1984	Proposed	5,000	900
Concrete & Masonry Construction	1985	Proposed	6,500	1,400
Hazard Communication	1983	Final	200,000	1,800
Grain Dust	1984	Proposed	4,000	2,800
Asbestos	1972	Final	396,000	7,400
Benzene	1985	Proposed	3,800	17,100
Ethylene Oxide	1984	Final	2,800	25,600
Acrylonitrile	1978	Final	6,900	37,600
Coke Ovens	1976	Final	31,000	61,800
Asbestos	1986	Final	74,700	89,300
Arsenic	1978	Final	11,700	92,500
Acrylonitrile	1978	Rejected	0.600	308,000
EDB	1983	Proposed	0.002	15,600,000
Formaldehyde	1985	Proposed	0.010	72,000,000

* Source: John F. Morrall III, "A Review of the Record," *Regulation*, Vol 10 (1986), p. 30.

in the top part of table 8.1—including the grain dust regulation—are economically defensible. On this metric, notice that those standards with a cost per life saved at the level of the asbestos standard or greater would not pass a benefit-cost test.

The wide dispersion in the estimated cost per life saved in table 8.1 suggests the gross nature of the policy decisions that must be made. Notice, however, that it is not necessary to ascertain whether the appropriate value of life is \$3 million, \$5 million, or \$7 million. It is often sufficient to know that the value of life is in excess of \$1 million, yet falls considerably below a number such as \$20 million. The ultimate objective is to select those policies that promote risk reduction and yet achieve that objective at the least cost. Focusing regulatory efforts in this manner will further this objective.

Since the figures in table 8.1 pertain to average costs per life saved, additional refinements may be possible. Ideally, one should equate the marginal benefits of a regulation with its marginal costs. Doing so may affect the optimal degree of stringency of many of the regulations listed. Indeed, it may be the case that regulations that are attractive on benefit-cost grounds could be improved, while some regulations with exorbitant costs per life saved could be made more acceptable by altering their stringency.

2. Efforts at Reforming OSHA Standards

Although recent years have brought increased emphasis on regulating health hazards, and OSHA has made an effort to eliminate the more onerous regulations, the original emphasis of OSHA regulations has remained largely intact. Workplace standards remain directed largely toward safety-related problems. There have, however, been a number of changes in the character of OSHA regulations which provide important lessons with respect to the kinds of regulations that might be beneficial in the future.

The preponderance of OSHA's regulations continue to consist of the 4,000 general industry standards initially adopted by the agency. As noted earlier, the basis for these standards was the set of national consensus standards developed as voluntary guidelines by the American National Standards Institute, the National Fire Protection Association, and Federal Maritime safety standards. Under the Carter administration approximately one-fourth of these were eliminated or modified with the effect of muting the harshest criticisms that had been levied against OSHA.

As mentioned previously, the most innovative regulation in the history of OSHA, proposed at the end of the Carter administration but later to become the most costly social regulation promulgated by the Reagan administration, was the OSHA hazard communication standard. The focus of the standard was not on technological aspects of workplace design. Rather, OSHA began to realize that the number of potentially hazardous substances in the workplace was too great to address with substance-by-substance regulations. As a result, a broader approach was needed to control the risks. In overdue recognition of the role of worker actions, OSHA sought to involve worker behavior in the enhancement of safety through a hazard communication program that would alert workers to the risks and the associated precautions pertaining to chemicals in the workplace.

This regulation had several components. First, it required the labeling of hazardous chemicals used in manufacturing industries. Second, it required that workers be given safety training in the handling of such chemicals and the procedures to be followed in different warnings contexts. Third, chemical producers had to distribute material safety data sheets, and user firms had to maintain these sheets so that the ingredients to which workers were being exposed would be known. This information is most consequential in cases requiring medical treatment. Overall, the hazard communication effort represented a comprehensive and highly innovative program to make better use of precautionary behavior to enhance safety.

The potential role of worker actions in promoting safety is enormous. Although division of responsibility between workers and workplace technologies is somewhat arbitrary, all major studies of the contributors to workplace safety indicate that worker actions are important. Studies have indicated that workplace accidents account for 45 percent of all the workers' compensation cases in the state of Wisconsin, 84.3 percent of the job accidents in England, the majority of deaths of deep sea divers in the North Sea, almost two-thirds of all the accidents in the workplace that are monitored by the National Safety Council, and 95 percent of all workers' compensation cases in the state of Pennsylvania (Viscusi, 1983).

The most recent detailed study of the causation of workplace accidents is the Bureau of Labor Statistics investigation of almost 600 injuries arising in longshoring operations. Table 8.2 summarizes the different assignments of causation. Seventy-one percent of all workers cited some aspect of the worksite conditions that contributed to the accident, but some of these conditions, such as poor weather, are difficult or impossible to control. Nevertheless, many of the leading contributors to accidents, such as slippery and uneven work surfaces, are among the main targets of OSHA regulations. It is of particular interest to note that 68 percent of all workers cited factors other than worksite conditions as contributing to the accident. The speed of workplace operations, the lack of information about hazards, and co-worker actions were the main other factors contributing to the accident.

The information in table 8.2 suggests that job accidents are the result of a complex interaction of the technology of the workplace, the nature of job operations, and the safety precautions undertaken by workers. A successful safety policy must address all facets of this accident-generating process, not just one. During its initial years of operation, OSHA focused only on one of these contributing classes of factors—those pertaining to technological design. The hazard communication standard represents an

Table 8.2. Conditions or factors contributing to the accident: Injuries involving longshore operations, selected reporting periods, 1985-86

<i>Conditions or factors workers felt contributed to accident</i>	<i>Percent¹</i>
Worksite conditions	
Total, 582 injured workers	100
Too noisy	2
Poor weather conditions	6
Cluttered work area	8
Slippery work surface	17
Uneven work surface	19
Equipment broke or didn't work properly	16
Working in too small or tight an area	13
Hard to see or bad lighting	9
Work area not properly safeguarded	5
Other worksite condition	8
None	29
Other contributing factors	
Total, 582 injured workers	100
Co-worker's actions	14
Hurrying or being rushed	22
Being tired	2
Material too heavy or bulky	11
Carelessness on part of injured worker	10
Not aware of danger	20
Tool(s) in bad shape or not right for job	6
Not wearing right safety gear	2
Other factor	4
None	32

¹ Because more than one response is possible, the sum of the percentages exceeds 100. Percentages are based on the total number of persons who answered the question.

NOTE: The reporting period is October 1985 for New York; April 1986 for all other ports. See appendix A for the scope of the survey. Due to rounding, percentages may not add to total.

Source: U.S. Department of Labor, Bureau of Labor Statistics, "Injuries Involving Longshore Operations," Bulletin 2326 (1989), p. 10.

Subsequent analyses suggest that the behavioral response may be substantial. The potential effect of labels is illustrated by the data in table 8.3. In this case, workers at four different chemical plants were shown chemical labels for chemicals that they were told would replace the chemicals with which they now worked. The sample of workers at each plant was divided into four different groups and, on a random basis, workers in each of these groups were shown a particular hazard-warning label. One of the chemical hazards was intended to be safe—sodium bicarbonate (household baking soda). The three remaining chemicals posed various kinds of risks. Chloroacetophenone is an irritant that causes tearing, TNT is a well-known explosive, and asbestos is perhaps the best-known carcinogen. Asbestos is responsible for the majority of all product liability litigation currently in the federal courts.

What would be the effect of this new information on risk perceptions? As expected, exposure to sodium bicarbonate reduced the fraction of workers who considered their jobs to be above average in riskiness. Equally likely, exposure to the three other chemicals increased the fraction of workers who considered their jobs to be more risky than average. While none of the workers in the sodium bicarbonate labeling group required a wage increase to work with this substance, many of the workers in the other three chemical groups did require a wage premium. Moreover, in these latter groups, some workers refused to work with the chemicals at any price.

If workers were not paid extra to compensate for the added risk, there would be an effect on their likelihood of quitting. That is, exposure to the three relatively risky chemicals in the absence of a compensating wage differential would increase workers' propensity to quit from 13 percent in the case of chloroacetophenone to as much as 63 percent in the case of asbestos. Working with sodium bicarbonate instead of the current chemicals to which workers were exposed would reduce their quit rates by 23 percent. The market response to chemical labels engendered by the shift in risk perceptions is manifested in wage-risk trade offs and an impact on quit rates that follow economic predictions. In addition, for the analogous consumer risk communication case, these efforts have the expected impact on precautionary behavior as well (Viscusi and Magat, 1987).

Another innovative regulation of a performance-oriented character, but not specifically related to precautionary behavior, is the 1984 revision of OSHA's dust standard for grain elevators.³ The objective of this standard is to reduce the level of grain dust in grain elevators so as to lower the probability of explosions. Under OSHA's traditional regulatory approach the solution would be simple: OSHA would mandate a uniform

important effort to expand the range of considerations to include the nature of job operations and the precautionary actions taken by workers.

Interestingly enough, OSHA had little basis for assessing the likely impact of the hazard communication standard before it was undertaken.

requirement to be met nationwide. Instead, OSHA offered a technological solution — pneumatic dust control equipment — but it also offered alternative approaches that firms could adopt. In particular, a firm could choose to clean up the dust whenever it reached a 'specified action level' of one-eighth of an inch, or it could choose to clean up the dust on a time-based schedule of one cleanup per shift. Thus, OSHA gave the industry three different options to meet a desired safety objective thereby allowing firms to choose the option that would promote safety at the least cost.

While allowing firms to select the most cost-effective option certainly represents a remarkable shift in OSHA policy, we should note in passing that this particular regulation was not necessarily ideal. Specifically, OSHA mandated that these standards be met throughout the industry, including those grain elevators with low throughput ratios, so that all opportunities for promoting more cost-effective policies were not exploited. The same regulations applied regardless of whether or not grain dust posed an explosion hazard. That is, those elevator facilities used primarily for grain storage were liable to the same standards as elevators engaged in grain handling; the risks of explosion are much higher in the latter facilities. Cost-effectiveness requires that the compliance options should have been varied to reflect the differing severity and nature of risks depending on the dominant function of the facility.

The final example of beneficial revisions in regulatory structure pertains to the updating of regulations. Because the standards are technology based, they must be continually revised and modified to reflect the state-of-the-art technologies actually used in various industrial sectors. Hence, inefficiencies arise for firms that must make capital-investment decisions on a basis that may not coincide with the cycle of OSHA regulations. The general approach has been to base compliance on the previously existing regulatory standards through grandfather clauses. In this way, capital investments made before the new regulations are in effect can be exempt. Notice that an increased reliance on performance-oriented regulations would make the updating of firms' efforts to enhance safety more of a continual process than one that responds to the highly infrequent cycle of OSHA standards updates.

One controversial standard promulgated during the Carter administration concerned cotton dust. Perhaps this controversy encouraged the Reagan administration to undertake a reassessment of the performance and the merits of the regulation.⁴ A retrospective assessment of the actual benefits and costs of the standard indicated that some loosening of the standard appeared to be desirable. The difficulty arose because noncomplying firms were found to have had very high costs of compliance as

Table 8.3. Worker Responses to Hazard Warnings

	Sodium Bicarbonate (n = 31)	Chloroacetonone (n = 106)	Asbestos (n = 102)	TNT (n = 96)
Initial risk	.12	.10	.09	.10
Risk after receiving warning	.06	.18	.26	.31
Annual risk premium required (\$1982) ^a	0.0	1,919.01	2,995.59	5,158.31
Would not stay on job at any wage	.00	.02	.11	.17
Intend to quit if no wage increase	.00	.23	.65	.73
Would take the job again if no wage increase	.90	.58	.11	.07

Source: W. Kip Viscusi and Wesley Magat, *Learning About Risk: Consumer and Worker Responses to Hazard Information* (Cambridge: Harvard University Press, 1987), p. 113.

^a The risk premium figures are conditional upon facing an increased risk and being willing to accept a finite risk premium.

compared with the firms that readily complied. In addition, changes in workplace operation — and worker rotation — were found to accomplish the same level of health benefits as investing in new capital equipment under the existing OSHA standard.

Despite the strong economic case for variation or relaxation of the standard, OSHA chose not to relax the standard. This inaction may seem difficult to reconcile with other Reagan administration actions intended to scale back regulatory initiatives. However, a main reason for maintaining the existing standard is that the major firms in the industry, which had originally lobbied against the standard and had taken their appeals to the U.S. Supreme Court, had by that time made the investments necessary for compliance. Having undertaken expensive investments to comply with the standards, these firms now opposed any effort to relax the standard. Of particular concern was the prospect for introducing greater use of protective equipment or worker rotation that would enable other firms to avoid the safety-oriented capital investments they had already incurred by part of the industry. Of such logic are arguments of fairness constructed.

The lesson in the cotton dust case is clear. However ill-conceived industry officials claimed the OSHA standards to be, once those standards are in place it is unlikely that there will be a constituency for reverting to the pre-regulation world of the 1960s. Instead, reform efforts should focus on how the current approach can be modified, recognizing that the same firms that once vigorously opposed OSHA now have a substantial stake in OSHA's past policy actions.

3. The Need for Effective Enforcement

The primary lesson of regulation is that promulgating regulations does not ensure compliance. If owners and managers of firms are rational, as most economists assume, they will base their compliance decisions on whether the expected benefits of compliance exceed the expected costs of non-compliance. In particular, firms will comply with an OSHA regulation if

$$\text{Expect Costs of Compliance} < \text{Probability of Inspection} \times \text{Expected No. of Violations per inspection} \times \text{Average Penalty per Violation}$$

The gains from complying with OSHA regulations depend on the sanctions that will be avoided, while the costs of complying with OSHA regulations will often include substantial investments as reflected in the cost per life saved statistics presented in table 8.1. Unfortunately, OSHA

has coupled fairly stringent regulations with lax enforcement. The enforcement effort consists of two components. The first component is that the probability of an inspection and discovery of a violation. It follows that without an inspection, OSHA will not become aware of a workplace violation. Yet the probability of seeing an OSHA inspector has been likened by one author to the chance of spotting Halley's comet (Smith, 1976). More recently OSHA is said to have a probability of inspecting any given firm of 1/100 per year (Viscusi, 1983). Although OSHA inspections rose from 28,900 in 1972 to 90,300 by 1976, during the latter half of the 1970s the level of inspections declined to an average of about 60,000 per year.

Given a low probability of inspection and discovery, the sanctions for a violation must be substantial to induce firms to make a major investment in safety. These incentives have, for the most part, been minuscule. OSHA penalties reached a peak of \$25.5 million in 1980, but have generally been much less, with amounts such as \$6.4 million in 1983 or \$8.2 million in 1975. Although fines in the millions may appear to be substantial, they provide little financial incentive when compared with the other mechanisms now in place. For instance, the marketplace provides for \$70 billion in compensating differentials for job risks, which in turn generates powerful incentives for safety (Viscusi, 1983). In addition, the workers' compensation system imposes premiums in excess of \$20 billion which also provide for safety incentives.

As a consequence, the net impact of OSHA regulations and penalties on safety has been rather minimal. Many studies of the effect of OSHA regulations indicate that there has been no statistically significant effect on safety. Indeed, recent estimates of the effect of OSHA — which are among the highest in the literature — indicate that on a percentage basis the effect of OSHA on the injury rate is at most 2.6 percent. OSHA's effect on the total rate of lost workdays, which captures more severe injuries, is at most 6 percent (Viscusi, 1986). In contrast, a recent study of the safety incentives generated by workers' compensation indicates a much more dramatic effect on worker death risks from the workers' compensation program (Moore and Viscusi, 1990). That study indicated that in the absence of workers' compensation, fatality rates in the U.S. workforce would increase by 20 percent. Contrasted with the consensus estimate of no significant effect of OSHA on safety — indeed, even given the most favorable estimates of the safety effect of OSHA — one finds that there is much less impact of OSHA's efforts than the billions of dollars of safety incentives created through the merit rating structure of workers' compensation. It is also noteworthy that the safety effects of

workers' compensation are particularly great in the case of large firms. This finding further bolsters the case for incentive effects since large firms are more likely to be strongly merit-rated with premiums tied very closely to their injury experience.

Although OSHA's inspection strategy has undergone some refinement, it has generally remained unchanged. An OSHA inspection has always remained a rare event, and there is no indication that it will change. This need not be the case, and it generally is not in other Federal agency contexts. For example, the EPA water pollution program has a similar kind of regulatory approach, relying on discharge permits rather than on regulatory standards. In the case of EPA effluent standards, the agency not only requires that firms submit monthly reports of pollution discharges to the agency, but it also inspects all major polluters an average of once per year. Not surprisingly, the compliance rates are much higher, and the effect of inspections is much greater, in water pollution cases (Magat and Viscusi, 1990).

It is also noteworthy that EPA gathers water pollution information on a regular basis while OSHA receives injury-rate information for each firm as part of the data surveys of the Bureau of Labor Statistics (BLS). During the Reagan administration, OSHA officials would visit firms in an effort to obtain data that the Bureau of Labor Statistics would not share with the agency. It seems obvious that much could be gained in targeting inspections if Congress would give OSHA the authority to require the reporting of injury rate data directly to OSHA rather than to the BLS. Although some biases in reporting may result, the gains in worker safety would probably offset such biases. Indeed, current data series may already be biased by the effect of records check inspections (Ruser and Smith, 1989).

Although the Reagan administration's drastic reductions in the penalty structure have been reversed by the Bush administration, agency officials have never expressed any sense of the importance of increasing the level of financial incentives. In the absence of such changes, the financial incentives for safety will continue to be low. That means that OSHA will remain a minor player in the drive for greater safety in the workplace.

4. Where Now for OSHA Policy?

Research indicates that the impact of OSHA regulations has consistently been very modest, with many studies indicating no significant effect on worker safety. This finding is not altogether surprising in view of the

modest financial incentives generated by OSHA enforcement efforts. In addition, the considerable financial incentives generated by market forces, and by workers' compensation, create powerful incentives for increased worker safety. Hence, OSHA regulations are operating in an environment that is not far removed from substantial levels of safety. If the risk reduction incentives of the status quo, and of workers' compensation premiums, were not in effect, then the scope for OSHA to influence worker safety would be much greater. The unrealistically high expectations for OSHA can be traced, at least in part, to legislators' failure to appreciate the importance of the other safety incentives already in place.

The substantial effect on fatality rates of workers' compensation premiums highlights the potential role that can be played by an injury tax. Economists have long advocated a pollution tax in environmental policy and there have also been advocates of the imposition of an injury tax for workplace injuries. The basic idea is that such a tax would create financial incentives for safety that would be directly linked to workplace injuries. These incentives for safety are no less influential in promoting workers' well-being than would be the penalties levied by OSHA through its current inspection process. In addition, because these penalties could be levied on a decentralized basis, it would be possible to increase considerably the scale of the financial incentives generated from the meager incentives that now result from OSHA enforcement efforts.

Thus, any discussion of improving the OSHA approach to worker safety must start with the concept of an injury tax. While annual collections from this tax could run in the billions of dollars, it would be much larger, if the other dimensions of worker safety did not exist. The advantage of an injury tax extends beyond the ability to impose financial incentives on hazardous firms without incurring the cost of a large cadre of inspectors. The additional benefit is that injury taxes are performance-related rather than based on design standards. Firms can choose how they will reduce workplace injuries using alternative technologies, provision of safety training, or changes in workplace operations. Thus, the injury tax is the ultimate performance-oriented policy in contrast to the rigid specification standards administered by OSHA. Moreover, in a world in which the technological options are changing, the injury tax always gives the appropriate incentives for introducing new technologies, whereas revisions of OSHA standards often occur with a substantial lag.

The introduction of an injury tax does not eliminate the need for OSHA standards, but it does greatly reduce the relative responsibility that must be borne by those standards in terms of promoting safety. Unfortunately, long-term health hazards that result in illnesses are not

readily amenable to the injury tax approach since these cannot be monitored. The main difficulty is that most job-related illnesses can also be caused by other influences as well. Moreover, in situations in which there are long time lags before the illness becomes apparent, it is generally not feasible to distinguish which illnesses are due to the job and which are due to other causes.

Shifting much of the responsibility for safety to an injury tax would enable inspectors to focus more on health hazards than they have previously. Throughout OSHA's history fewer than one-fifth of all inspections have been devoted to health risks with the bulk of all inspections focused on safety-related concerns (Viscusi, 1986b). The current emphasis on safety stems, in part, from the fact that safety conditions are more readily monitorable than health risks. Safety violations can be more easily ascertained by OSHA inspectors who, not unexpectedly, focus their efforts on these more obvious hazards.

With the introduction of an injury tax, OSHA inspectors could focus almost exclusively on health risks. To the extent that safety risks are of continuing concern, inspections could focus on the extreme safety violations as well as providing consultative services to advise firms on promising alternative mechanisms for promoting safety.

A second component of any reform effort is to establish a more consistent balance in OSHA regulations. As the figures in table 8.1 indicated, OSHA regulations are wildly inconsistent in terms of their degree of stringency. A greater number of lives could be saved at less cost by establishing a more uniform marginal cost per life saved. Although OSHA is explicitly prohibited from basing its regulations on a formal benefit-cost test, it is not prohibited from ensuring that the cost-effectiveness of alternative policies is equalized in a more sensible manner than under the present regulatory regime. Some balancing that falls short of a benefit-cost test is clearly needed so that society will benefit as much as possible from the regulations OSHA promulgates and enforces.

The third needed reform is an increased reliance on performance-oriented regulations to the extent that they can be specified in a manner that will be enforceable. By shifting more of the burden to an injury tax, the scope of safety regulations will be reduced since the financial incentives of the tax will bear the primary burden for establishing safety incentives. There also will be a stronger performance orientation in the health standards that will continue to be enforced in their present manner. Typical OSHA standards delineate permissible exposure limits, which by their very nature tend to be more performance-oriented than safety risks that specify particular kinds of machine guarding and other technological

devices in the workplace. The performance orientation could be increased further through the use of protective equipment when such choices represent a feasible compliance option. Greater attention to the potential role of safety training and hazard information of various kinds also would be a promising addition to OSHA's strategy.

Finally, by putting OSHA's regulation on a sounder footing, one would then be able to enforce the regulations that OSHA does administer more stringently. Token fines and infrequent inspections will do little to enhance safety. If OSHA has a broad injury tax to capture minor infractions—and if it focuses its inspectors' efforts on truly serious violations for which it will levy substantial penalties—then the overall impact of OSHA regulation will be enhanced.

Overall, it is clear that there is a legitimate role for OSHA to play in the economy. Worker safety and health information is not perfect, and there are a variety of gaps in market operation. Unfortunately, OSHA has not fulfilled its potential because it has focused primarily on safety risks that tend to be handled relatively well by the market, and it has coupled its focus with a weak enforcement effort. As OSHA enters its third decade, the time has come for a serious reexamination of the fundamental objectives of the agency and a reorientation of its regulatory strategy.

Notes

1. Section 26 of the Occupational Safety and Health Act of 1970, USC § 651 (1976).
2. *Ibid.*, Section 26, part 3.
3. Office of Management and Budget, OSHA's Proposed Standards for Grain Handling Facilities (1984), unpublished memorandum, and 49 Federal Register 996 (1984).
4. For a description of this study prepared for OSHA see the article by the two principal authors of the report prepared for OSHA, Kolp and Viscusi (1986).

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