

DIVISION OF THE HUMANITIES AND SOCIAL SCIENCES
CALIFORNIA INSTITUTE OF TECHNOLOGY

PASADENA, CALIFORNIA 91125

SAFETY REGULATION*

Nina Cornell
Brookings Institution

Roger Noll
California Institute of Technology

Barry Weingast
California Institute of Technology



SOCIAL SCIENCE WORKING PAPER 122

*Published in Henry Owen and Charles L. Schultz, eds.,
Setting National Priorities: The Coming Decade, Brookings
Institution, Washington, D.C., 1976.

April 1976

SAFETY REGULATION

Nina Cornell, Roger Noll and Barry Weingast*

Since the late 1960s, Congress has enacted several laws that expand and amplify the role of the federal government in intervening in private market decisions on matters relating to the safety of products and workplaces. This legislation has increased the number of policy instruments available to the government with respect to safety issues, and has created several new government agencies with safety regulatory responsibilities. So dramatic has been the appearance, if not the reality, of increased government control over product and worker safety that these activities, along with environmental controls, recently have come to be called the "new regulation."

As used herein, the term "safety regulation" refers to policies that seek to prevent parties to private market transactions from taking certain risks that they would otherwise assume. The distinction between safety regulation and environmental regulation is that the latter involves limits on the risks that parties

*Part of the costs of preparing this manuscript were paid from a grant from the National Science Foundation program for Research Applied to National Needs, grant #APR75-16566.

to transactions can impose on others. In practice, the line between safety and environmental regulations is fuzzy since both attack many of the same problems. As defined here, radiation inside a nuclear power plant is a safety issue since it constitutes a hazard for employees at the facility, while radiation outside the facility but emanating from it is an environmental problem because it affects everyone in the area, regardless of their employment status or their consumption of electricity. Or, a manufacturing process that involves the use of a dangerous chemical may threaten workers at the plant if it is released into the workplace, consumers of the product if they are exposed to an unsafe amount of it, and people in general if the waste products of the manufacturing process are released into the atmosphere or waterways. Consequently, environmental, occupational and consumer safety regulatory activities are not always clearly distinguishable.

THE SCOPE OF FEDERAL SAFETY REGULATION

Despite the recent burst of regulatory legislation, there is nothing new about the existence of government regulation of safety. The Food and Drug Administration is one of the oldest federal regulatory agencies, having been established in 1906. Control of radiation hazards at nuclear power facilities is as old as the technology, dating from the early 1950s.

The flurry of activity in creating new safety-related agencies and passing new regulatory laws has led to only an incremental increase in the number of items and activities covered by regulatory activity. In most cases, concern by the federal government predated the new regulatory law or the creation of a new agency. Some of the new agencies devote much of their effort to enforcing laws that were shifted from one agency to another. For

example, the Consumer Product Safety Commission (CPSC) was assigned responsibility for the Federal Hazardous Substances Act and the Poison Prevention Packaging Act, formerly the domain of the FDA, and the Flammable Fabrics Act, previously administered by the Federal Trade Commission. In the first two years of the CPSC, twenty-one of the twenty-nine petitions that were granted by the agency dealt with inherited acts.^{1/} In other instances

^{1/} See CPSC Index, Office of the Secretary, April 1975.

new agencies were formed by pulling together offices from a variety of departments in the executive branch, as was the case in the creation of the Environmental Protection Agency. Finally, several of the major statutes of this period are acts that amend older legislation dealing with the same class of problems. Obvious examples are the 1970 air and 1972 water pollution control acts and the Federal Environmental Pesticide Control Act of 1972, which are merely the latest in a fairly long stream of attempts to cope with these problems.^{2/}

^{2/} For more detail on the history of air and water pollution control efforts see Allen Kneese and Charles Schultze, Pollution, Prices and Public Policies, Brookings Institution, Washington, D. C., 1975.

Although the proliferation of laws and agencies may not have led to a large increase in the number of regulated items and activities, it has led to overlapping jurisdictions. For example, both the Consumer Product Safety Commission and the Environmental Protection Agency have jurisdiction over hazardous house-

hold chemicals, the former because of its administration of the Poison Prevention Packaging Act and the Hazardous Substances Act, and the latter because of its concern with the disposal of hazardous materials. When EPA forced farmers to switch from using DDT and related compounds to the organo-phosphates because of the environmental hazards of the former, rules were established to protect farm workers from the new pesticides, which are highly toxic. Both EPA and the Occupational Safety and Health Administration had the authority to set the rules; they were finally set by EPA because OSHA's formulation was challenged in court.

Another consequence of recent safety-related legislation has been a shift of regulatory responsibilities from the states to the federal government. The Occupational Safety and Health Act of 1970 converted what had been almost exclusively a state function into a federal one.^{3/} The legislation recognized the historic

^{3/} One exception was the Longshoremens' and Harbor Worker's Compensation Act of 1927 which established federal job safety regulation for longshoremens by the Department of Labor's Bureau of Labor Standards. These responsibilities were eventually absorbed by OSHA.

responsibility of the states by permitting them to submit plans to OSHA for running their own occupational safety and health programs. OSHA is required to approve state plans if they are at least as stringent as the federal program. Money has been available to the states for these activities on a fifty-fifty cost sharing basis. Because the states only receive fifty percent federal financing, compared to one-hundred percent

federal funds for "letting OSHA do it," states have been reducing their involvement in policing on-the-job safety and health. Of fifty-six jurisdictions entitled to submit plans to OSHA and receive federal money, only twenty-two now have approved plans and the number is declining. North Dakota, Montana, New Jersey, New York, Illinois and Wisconsin all have removed themselves from occupational safety regulation despite having approved plans.^{4/}

^{4/} New York Times, 1975.

OSHA budget reviews reveal that Congress indeed intended to make occupational safety predominantly a federal activity. Table 1 shows the budget submissions to Congress by OSHA for enforcement activities and the actual appropriations, broken down between federal and state activities. While the Administration consistently requested more appropriations for state enforcement activities (where the federal money would be matched by an equal amount of state money), Congress consistently cut the amount slated for the states and increased the amount requested for OSHA's own inspection staff. The final outcome of the federal appropriations process has not only been to shift responsibility from the states to the federal government. In addition, the total amount spent on enforcement has indirectly been reduced because the shift to federal enforcement reduced state matching expenditures. At the same time, federalization of safety regulation reduces compliance costs of firms by eliminating the problem of trying to satisfy conflicting standards.

A similar shift in responsibility from the states to the federal government took place with the passage of the Safe Drinking Water Act of 1974. Until the passage of this act, the safety of drinking water supplies was a federal concern only when the water

TABLE 1
OSHA ENFORCEMENT BUDGET

	1974		1975		1976	
	OSHA Request	Congressional Appropriation	OSHA Request	Congressional Appropriation	OSHA Request	Congressional Appropriation
Federal Enforcement Activities	23,285	26,241	24,939	29,891	37,171	42,177
State Enforcement Activities	29,975	25,000	30,080	23,000	46,000	41,000
Total Enforcement Activities	53,260	51,241	55,019	52,891	83,171	83,177
					41,040	48,050
						52,653
					30,371	48,500
						88,253

* Note: These figures represent a slightly different categorization than the others and hence are not strictly comparable. The new scheme lists training expenditures for state enforcement officers as "Training, Information and Education," whereas the old scheme included these as part of "State Programs" under "Compliance and Enforcement."

Sources: 1973 OSHA Request: Department of Labor and Health, Education, and Welfare Appropriations for 1973. Hearings before the Subcommittee on Department of Labor and Health, Education and Welfare appropriation of the House Appropriation Committee, 92nd Congress, 2nd Session, (1972) Pt. 6, p. 454.
 1973 Congressional Appropriations: Department of Labor and Health, Education and Welfare Appropriations for 1975. Hearings before the Subcommittee on Department of Labor and Health, Education and Welfare Appropriations of the House Appropriations Committee, 93rd Congress, 2nd Session (1974) Pt. 1, p. 438.
 1974 OSHA Request: Department of Labor and Health, Education and Welfare Appropriations for 1974. Hearings before the Subcommittee on Department of Labor and Health, Education and Welfare Appropriations of the House Appropriations Committee, 93rd Congress, 2nd Session (1973) Pt. 6, p. 894.
 1974 Congressional Appropriations and 1975 OSHA request: Department of Labor and Health, Education and Welfare Appropriations for 1975. Hearings before the Subcommittee on Department of Labor and Health, Education and Welfare Appropriations of the House Appropriations Committee, 93rd Congress, 2nd Session (1974) Pt. 1, p. 507.
 1975 Congressional Appropriations and 1976 OSHA request: Department of Labor and Health, Education and Welfare Appropriations for 1976. Hearings before the Subcommittee on Department of Labor and Health, Education and Welfare Appropriations of the House Appropriations Committee, 94th Congress, 1st Session (1974), Pt. 5, p. 653.
 Second 1975 Congressional Appropriation and 1976 Congressional Appropriation: U. S. Office of Management and the Budget, Budget of the U. S. Government, Fiscal 1977, Appendix (Washington, D. C., Government Printing Office, 1975) p. 523.

crossed state boundaries. The Safe Drinking Water Act made drinking water supplies a matter of federal concern. It calls for standards of purity to be established by the federal government and requires that all drinking water systems conform to the standards within a year of their adoption. Primary enforcement responsibility can be given to the states provided that they establish procedures at least as stringent as those of the federal government.^{5/} Although

^{5/} Safe Drinking Water Act: Report to Accompany HR 13002, House of Representatives, 93rd Congress, 2nd Session, Report No. 93-1185.

the Safe Drinking Water Act provides seventy-five percent federal financing for approved state plans, rather than the fifty percent provided for occupational safety and health regulation, the possibility of full federal preemption that has led states to abandon their own job safety programs could also lead to decisions on the part of states to let the federal government assume total responsibility for determining safe levels of chemicals and bacteria in drinking water and for setting and enforcing standards.

Another effect of the new safety legislation is that it has increased the number of regulatory rules and procedures that a specific plant or firm may face. Each law established different procedures that the responsible agency may or must use. For example, both OSHA and FDA regard the presence of rats in a food processing plant as an unacceptable hazard, the former because of danger to employees and the latter because of danger to consumers. If an inspector from the Food and Drug Administration finds rats on the premises, the processor can only be fined if the inspector can convince the local U. S. attorney to prosecute and the case is

won.^{6/} If an OSHA inspector finds the plant out of compliance

^{6/} For an examination of FDA procedures and their consequences, see Melvin Hinich and Richard Staelin, "A Process Model of Food Regulation," mimeo, Virginia Polytechnic Institute, 1976.

with OSHA regulations on vermin control, the manufacturer can be cited and fined virtually on the spot. Because of overlapping regulations by FDA and OSHA, the same violation can lead to very different outcomes depending upon which agency smells the rat.

The proliferation of regulatory tools is exemplified by the various actions that could have been taken against Life Science Products Company, the manufacturer of Kepone. Discharges of Kepone by Life Sciences into the public sewage system of Hopewell, Virginia, led to contamination of the entire James River estuary, causing large losses to the fish and shellfish industries that were based there. Unsafe production practices within the plant led to severe illness and disability for many of the plant's workers. Massive discharges of Kepone from the factory into the air were worrisome for those who breathed it because Kepone is a known carcinogen.^{7/}

^{7/} For more detail on the Kepone contamination from the Life Sciences plant, see the Washington Post, January 1, 2, 3, 4, 1976.

At least four different federal regulatory laws are applicable in this case: the Clean Air Act Amendments of 1970, the Federal Water Pollution Control Act Amendments of 1972, the Federal Environmental Pesticide Control Act of 1972, and the

Occupational Safety and Health Act of 1970. Only the latter two laws could have brought federal inspectors directly into the plant in connection with the production of Kepone; the former two depend upon there being discharge limits on Kepone or its components.

Although the Kepone plant was eventually closed by Virginia public health officials, three other authorities could also have acted. EPA could have forced the company to register its output as a pesticide under the 1972 Federal Environmental Pesticide Control Act, which would have required the company to submit test data to EPA on Kepone and its environmental effects. This would have given EPA the right to inspect the plant to ensure compliance with the various provisions of the pesticide act. OSHA could have inspected the plant without advance warning, and could have closed the plant under the "imminent hazard" clause of the Occupational Safety and Health Act.^{8/} In addition, the city could have closed the

^{8/} P.L. 91 - 596, Sec. 6(c) (1)

factory by denying it connection to the sewer system. Before the discharges went into the James River, they passed through the Hopewell sewage treatment plant, killed the bacteria that digested the sewage, and thereby disabled the city's treatment facilities.

Although safety regulation is not new, its scope and emphasis have changed dramatically. The federal government is obviously devoting much more attention to the problems of product and worker safety than it has in the past. This is evident in the number and extent of new laws that have been passed and in the federal budgetary outlays to finance these regulatory activities. For example, the Occupational Safety and Health Administration,

created in 1971, now spends over \$100 million annually on federal regulatory activities that are for the most part new. Another strong signal that the impact of safety regulation has grown is that the new agencies and policies are extremely controversial. The business community, in particular, sees the new safety regulatory fervor as a source of major, unnecessary increases in the costs of doing business and has said so repeatedly in Congressional hearings and court appeals to regulatory decisions.

Attention to safety measures basically stems from two concerns. One is to ensure that preventive measures are taken whenever prevention is less expensive than the damages that would otherwise occur. A second concern is with equity: losses due to hazards do not fall evenly on the population, and some loss in overall efficiency may be considered appropriate in order to prevent sudden drastic losses that fall unevenly on relatively few people.

Several approaches can be taken to achieve the objectives that underlie a concern over safety. In principle, at least, the government could choose not to intervene. The market, dominated by a principle of buyer (and worker) beware (caveat emptor), would then determine the extent to which preventive measures would be taken. A purely market approach assigns responsibility for damages to consumers and workers, who would, in turn, alter their economic behavior in a manner that would cause prices and wages to reflect the associated risks.

Several types of intervention can be imposed upon the caveat emptor market system. One is to establish a body of tort principles (liability laws) and to permit those damaged to sue for compensation on a case by case basis. A second is to establish some form of no-fault liability and compensation system that eliminates the need to prove responsibility on a case by case basis. This could be done either through some form of mandatory insurance

or through a tax on injuries. Still a third option is intervention to increase the information available to those who enter the market, whether strictly caveat emptor or modified by the existence of some form of liability and compensation system. Finally, the government can set safety standards.

The purpose of this paper is to contribute some insight into the problem of deciding how and when the government ought to intervene to affect product and occupational safety. The next section examines the workings of the market, develops a set of criteria for government intervention, and discusses the alternative policy instruments available to the government. Next, the paper assesses the performance to date of two safety regulatory agencies, the Consumer Product Safety Commission and the Occupational Safety and Health Administration. Finally, it presents some recommendations for policy changes.

THE RATIONALE FOR GOVERNMENTAL INTERVENTION

The obvious stated purpose of safety regulation is to reduce the incidence of death, illness and injury due to unsafe products and workplaces. Presumably the decision to achieve these goals by means of safety regulation involves two judgments: that in the absence of government intervention, products and workplaces will not be "safe enough" and that the most effective form of intervention is standard-setting regulation.

The first judgment requires an assessment of the likely performance of the pure private market system. Practically speaking, the range of possible institutional alternatives for such intervention does not include a completely unfettered market. Common law has long held that parties to economic transactions are accountable (liable) for some types of avoidable, damaging

consequences of the transaction that are initially borne by the other party. Nevertheless, assessing the likely performance of a purely caveat emptor economy is instructive. If a pure market system produces less safety than consumers and workers would be willing to pay for (in either higher prices or lower wages), a rationale for governmental intervention of some kind will have been shown. Examination of the source of these failures provides a set of performance criteria with which to assess the various ways the government might intervene.

The Pure Market System

Under a caveat emptor market system, any costs of accidents arising from products or employment would be borne by consumers and workers. If complete information about hazards were free, individual economic decisions would force prices of hazardous products to be lower, and wages for hazardous employment to be higher, than safer alternatives. The lower prices and higher wages would exactly cover the cost to the consumers and workers of assuming the risks of the hazards. If the cost to producers of preventing a hazard was less than the cost of damages, producers could increase their profits by taking preventive measures. Thus, under the condition of complete and free information, a purely private, caveat emptor market would minimize the total cost of prevention plus compensation for hazards.^{2/} But if information is

^{2/} See Walter Y. Oi, "The Economics of Product Safety," Bell Journal of Economics, Vol. 4, No. 1 (Spring 1973), pp. 3-28.

not free and, in any event, is incomplete, this happy result will not generally obtain.

The problem of information costs

Information about risks is acquired in two ways: experience and study. Experience is gained by observing the consequences of one's own decisions as an employee and consumer and by observing the fate of others. Study consists of an active search for information about product or workplace characteristics, such as by studying technical information, health and injury statistics, or journalistic reports.

Neither method of acquiring information is free. Learning by experience requires accepting unknown risks until sufficient information is gained about the safety consequences of various decisions, which can be costly if the true risk is higher than initially expected. Learning by experience also takes time, and requires that for some period an individual must expect to make decisions that are less satisfactory to him than would be the decisions based upon more complete knowledge.

The desirability of a strategy of learning by experience obviously depends crucially on the nature of the decision and the extent of the risk. The costs associated with learning by experience are relatively low for inexpensive, frequently purchased consumer products which are associated with only minor potential safety problems. In such a circumstance, information about the consequences of using a product can be gained relatively cheaply and quickly, without running the risk of a serious undesirable effect. At the other extreme, if a particular economic action is infrequently taken, has a substantial cost and requires the assumption of a potentially very serious hazard, the costs of gaining

information through experience about the frequency and nature of the hazard are relatively high.

Learning through study provides an alternative to accepting unknown risks in order to learn through experience. In order to adopt this strategy, an individual must be able to acquire and comprehend relevant information from secondary sources about the hazards associated with a decision.

Some kinds of safety-related information are relatively easy to obtain, such as through the publication of product testing results by consumer groups or the inclusion of pertinent information on product packages. Nevertheless, a private market economy is likely to provide too little information about hazards. One source of difficulty is that a firm has no incentive to advertise the danger of its product, especially when its competitors do not warn of the hazards of their own products. Another source of difficulty is that a firm in the business of providing valuable information cannot usually charge all who use it. Through casual personal contacts information can be transmitted from person to person, with only the first person in the chain paying for it, such as by lending a testing report to a friend. And, the higher the price charged for the published information, the greater the likelihood that a particular individual will attempt to seek out an informed friend, rather than purchase the information directly. The greater the cost of testing the nature of a hazard and disseminating the results, the less likely it is that a private organization can recoup its costs by selling the information even though the value of the information to its users exceeds its costs.

Even if the supplier of information can effectively cover costs by selling test results, the extent to which the information is disseminated is still likely to be too restricted. Once a test has

been completed, no costs other than those associated with communicating the result need be incurred to add one person to the list of those receiving the information. Information is a type of public good; increasing the number of people who have access to it has no effect on the costs that were incurred in generating it. As long as the price of the information exceeds the costs of communicating it -- that is, the price covers some of the cost of generating the information -- some people will regard the information as too expensive even though they are willing to pay the true costs to society of giving it to them.

The preceding discussion leads naturally to the conclusion that a potentially useful role for government is to provide information on the risks of product and employment hazards. Since the socially efficient price for information is the cost of communicating it, the system that generates and disseminates information must, if it is to be efficient, generate less revenue than the costs it incurs. In such a situation, the government can collect the shortfall of revenues in relation to costs through the taxation system, using the revenues gained thereby to subsidize the production of information.

Alternatively, the government could require that producers keep workers and consumers fully informed about the hazards of workplaces and products as a necessary condition for doing business. Government would then assume an enforcement responsibility, checking to see that information was being adequately communicated and spot-checking the quality of information by performing its own tests.

Unfortunately, assuring that all that is known about a hazard is available to individuals at a price equal to the cost of communicating it to them will not necessarily make products and

workplaces sufficiently safe. The costs associated with learning by study are more than simply the costs of acquiring a relevant publication or printing a more informative description of a product. Once the information is acquired, it must be studied, and if it is complicated or technically sophisticated the costs associated with comprehending it can be very high. As is the case with the production of the information, the process of comprehending and interpreting the information is itself a public good as long as the tastes of individuals are roughly the same. That is to say, if one person is sure that another person is equally desirous of avoiding cancer, the first person can avoid the costs of processing information by observing the economic behavior of the second person after the latter has received, comprehended and interpreted a report about the carcinogenic properties of a product. The first person is, in essence, delegating the power of assessing the hazards associated with a decision to the second. While this delegation reduces the likelihood that the decision will exactly reflect the tastes of the first person, it also reduces the total costs of making the decision. The more homogeneous the tastes of Person I and Person II and the greater the costs of acquiring and processing the information, the more likely that both will find delegation of the decision to one person the more efficient mechanism for evaluating safety information.

The formation of a regulatory agency is the ultimate form of delegation. One dimension of the problem of evaluating the desirability of a regulatory institution is whether the costs it saves with respect to information generation and evaluation offset the costs it imposes because its standards are not consonant with the tastes and perceptions of risk of those it is trying to protect. Quite obviously, an agency need not -- and probably can not -- perfectly

reflect all perceptions of risk and tastes for safety. The more divergent are tastes for safety among members of society, the less likely it is that individuals will, on balance, regard the agency's standards as providing a net benefit to them.^{10/}

^{10/} For a more thorough treatment of this approach to understanding safety regulations, see Melvin J. Hinich, "A Rationalization for Consumer Support for Food Regulation," mimeo, VPI, January 1975.

The preceding analysis has focused on the problem of possessing sufficient information to make valid judgments about a particular economic decision. In theory, at least, the informational requirements for any decision to be strictly rational are more stringent than the preceding discussion suggests. To the extent that each economic action represents a choice among alternatives, the requirement for the optimal response to risks of hazards is that information be available for all of the alternatives. In order for a consumer's decision to buy a product bearing a particular hazard to incorporate the price discount that is appropriate to the risk, the hazards associated with alternative products must also be known. For this reason, imposing informational requirements on some producers of hazardous products but not others can actually be counterproductive. In the absence of other information, a consumer might reasonably assume that an unlabeled product was of average hazardousness, or even better than average on the grounds that government had not chosen to force its producers to advertise the risks associated with it. In this situation, the consumer might reallocate consumption expenditures in favor of unlabeled products in a manner that actually increased exposure

to hazards.

For the same reason, safety standards for some products but not for others will, if not related to the extent of the hazard, unjustifiably reallocate expenditures in favor of the products that lack standards by raising the price of the products that must be made more expensively to satisfy the regulatory rules. Consequently, the order in which standards are promulgated or information requirements are imposed, as reflected in the priorities of the agency, should be selected on the basis of the indirect effects of each standard on exposures to other hazards as well as on the basis of the direct threats associated with the hazard that a standard is designed to reduce.

The problem of uncertainty

Of course, it is unrealistic to expect that complete information about the hazards of all products and occupations is available. If the nature of a hazard is uncertain, the very concept of a rational decision is not well defined.

An event is uncertain if the probability that it will occur cannot be known exactly. Uncertainty is normally distinguished from risk because the two differ with respect to their implications for decision-making. An event is risky, but not uncertain, if it is neither impossible nor sure (that is, the probability of its occurring is between zero and one), but its probability is nevertheless known exactly.

Uncertainty is a broad, vague term that covers several different circumstances. The least degree of uncertainty occurs when a person thinks that he probably knows how a system behaves, but has some doubts that the knowledge is exactly right. For example, in tossing a coin, a person knows that each side of a

"fair" coin is equally likely to come up, but that, owing to the fact that coins are generally not symmetrical, one side probably is more likely to come up than the other. To the extent that a person does not know exactly the probability of each outcome, the result of the coin flip is uncertain; to the extent that a person can never know the probabilities exactly, the uncertainty is irreducible.

Two other types of uncertainty are important in safety issues. One occurs when a person knows that a causal link exists between a hazard and a damage, but is unable to quantify it. For example, giving mice a massive exposure to a chemical and observing that in a short period of time the mice develop cancer establishes that a substance is carcinogenic. It does not establish the extent to which the carcinogenic effect depends upon the dosage, the type of tissue exposed, the species of the experimental subject, the method of exposure, and the other features of the environment in which the dosage was administered. Qualitatively, a person may conclude that the experimental results make it more likely that the same substance in dosages comparable to human exposure levels causes human cancer; however the extent to which the likelihood has been increased is not quantifiable.

Still another form of uncertainty arises from the realization that not all possible causal relations have been recognized. As scientific knowledge grows, so, too, does the number of perceived relations between the human environment and the health status of human beings.

The history of the use of freon and other fluorocarbons illustrates the progression of knowledge through the various degrees or types of uncertainty. Twenty years ago, the possibility that fluorocarbons, when released into the air, might destroy the protective layer of ozone in the earth's outer

atmosphere was not suspected. The uncertainty was of the last type. As scientific knowledge increased, the possibility of a causal connection grew in that laboratory experiments had shown that ozone-depleting reactions were possible. Today scientists are certain that fluorocarbons erode the ozone layer, but they are not certain of the extent of ozone depletion that can be expected or of the impact on human society of the increased exposure to ultraviolet light that will result.

The literature on decision-making principles under conditions of uncertainty stresses the desirability of avoiding catastrophic mistakes and gathering more information that will reduce the amount of uncertainty. As illustrated by the fluorocarbon story, the extent of uncertainty about a particular hazard is likely to decline over time. As a result, postponing decisions, or at least avoiding decisions that are irreversible (such as consuming a known carcinogen) or extremely costly to change, increases the likelihood that future decisions will be more rational. In addition, as uncertainty diminishes, the perceived desirability of past policy decisions will generally decline. Consequently, flexible decision-making procedures, overseen by institutions capable of recognizing and responding expeditiously to past mistakes, are also advantageous. And because more knowledge is useful for identifying better decisions, investment in research designed to reduce uncertainty is also likely to be desirable.

The preceding ideas sum to a plea for caution in dealing with unknown hazards. Instead of basing decisions on estimates of the expected consequences of alternative outcomes -- a task made impossible when probabilistic information is absent -- these guidelines point to a more conservative course of action. One

commonly used behavioral rule of this type is "minimax regret" -- that is, to adopt strategies that avoid the worst logically possible outcomes, thereby minimizing the maximum possible loss, regardless of the likelihood that the maximum loss will actually occur. The rationality of minimax regret is highly controversial, especially among economists; however, political scientists have produced convincing evidence that, regardless of its theoretical niceties, this decision rule is more consistent with observed political behavior. ^{11/} The notion that people maximize the expected value of the consequences of their decisions. ^{11/} If this

^{11/} John A. Ferejohn and Morris P. Fiorina, "The Paradox of Not Voting: A Decision Theoretic Analysis," American Political Science Review, Vol. 18, No. 2 (June 1974), pp. 525-536, and "Closeness Counts Only in Horseshoes and Dancing," American Political Science Review, Vol. 49, No. 3 (September 1975), pp. 920-925.

same behavior carries over into decisions related to safety, it would account for a political demand for controls on product safety that are more stringent than could be justified after-the-fact when additional information makes possible a conventional analysis of expected benefits and costs.

In sum, for several reasons members of society may be dissatisfied with the extent to which the private market system alone would prevent and compensate damages from hazards. If these rationales do underlie the demand for government intervention, citizens are unlikely to be persuaded of the folly of government intervention by ex post benefit-cost analyses which show that a particular safety policy generated more costs than benefits, since these analyses assume away the problems that underpin the rationales.

This is not to say that safety regulation is always worthwhile; that judgment does depend upon the absolute and relative effectiveness and costs of regulatory versus other forms of intervention.

The Liability System

Safety regulation focuses on preventing damages. A central policy issue is the extent to which the problems that regulations are designed to prevent could be better handled by compensation after the damages occur, namely by a system of legal liability.

The liability system does not lead to sole reliance on compensation of past damages. The possibility of compensation for damages causes firms to invest in preventing accidents. Businesses can estimate the amount of liability charges they can expect to pay under different operating conditions, compare these with the costs of different levels of prevention, and then choose the mix of prevention and compensation that minimizes their costs. In order for a businessman's selection of a mix of prevention and compensation to be optimal, the expected liability of the firm must equal the total expected damage arising from the firm's economic activities. Unfortunately, the liability system fails to accomplish this. One source of failure lies in damage costs that are not covered. Another source of failure arises when the extent of liability or damage is not certain.

Limits on liability

The existing liability system limits compensation in several ways.

First, the maximum extent of liability is the net worth of the defendant corporations or individuals. If a court awards

compensation in excess of the net worth of the defendants, the normal consequence is a bankruptcy proceeding in which the plaintiff in the damage case eventually receives some fraction of the compensation that was awarded.

Second, common law sets additional limits to the liability arising from a particular action. For example, certain kinds of costs arising from a hazard may not be recoverable. One can not receive compensation for the time one spends in court litigating a civil suit, nor does one receive interest payments to compensate for the delay between the time an accident occurs and when the liability judgment is rendered. Nor does it pay the legal costs of initiating action. The liability system is very expensive to operate, especially when a case must be litigated. The costs of the court system and legal representation for both sides can exceed half the amount of damages, and can take years even to come to trial.^{12/}

^{12/} Medical Malpractice, Report of the Secretary's Commission on Medical Malpractice, Dept. of HEW, Publication No. 78-88, January 16, 1973, and Hearing on H. R. 1378, House Committee on Ways and Means, 94th Congress, 1st Session, March 5, 1975.

Third, the total liability associated with a particular hazard may be limited legislatively. The Price-Anderson Act, for example, limits the liability of power companies with respect to the damages arising from an accident at a nuclear power facility. As with other factors that lead to undercompensation, liability limits also blunt the incentive for preventive action by reducing the extent of compensation that might be avoided through prevention.

The effects of uncertainty and risk

Another failure of the existing liability system to provide optimal incentives for prevention occurs when the costs and causes of damages are not known with certainty. For example, certain chemicals are known to be carcinogenic when inhaled, but not all people who are exposed to them develop cancer and not all lung cancer is caused by inhalation of any particular compound. Consequently, although the evidence establishes that a worker who is exposed to carcinogenic chemicals has a higher probability of developing lung cancer than a worker who is not, to establish a causal link between the work environment and the health status of a particular employee is very difficult.

The assessment of liability, damages and compensation depends upon the burden and standard of proof. The burden of proof in liability cases is upon the person claiming damage, and the standard of proof is that a preponderance of evidence substantiate the claim that the damage was due to a hazard that the defendant could reasonably have prevented. The standard of proof in liability law is less rigorous than that in criminal law -- the standard of no reasonable doubt -- but it is more stringent than the standard applied in the judicial review of decisions by regulatory authorities. In administrative processes, all that is required is that substantial evidence support the decision of the administrator -- that is, that a rational person could hold the same opinion as the administrator, based on the evidence at hand, even if the opinion is shaky.^{13/}

^{13/} Kenneth Culp Davis, Administrative Law Text, West Publishing Co., St. Paul, Minnesota, 1959, especially section 29.02.

The existing liability system, by assigning the burden of proof to the party claiming injury and by establishing a standard of proof that tolerates some but only a relatively small amount of risk or uncertainty, leaves some damages uncompensated, while it overcompensates others. To illustrate, suppose that the evidence indicates that the chances are one in ten that a particular hazard was reasonably avoidable and caused a particular health effect. In order for the firm to face incentives for preventive action that are appropriate, it should be liable for ten percent of the total damages that are attributable to the hazard. Of course, it is not within the realm of civil liability law to find defendants ten percent liable; they are either liable or they are not, and when the probabilities are this small, they normally are not found liable.

By similar argument, in some circumstances the existing system overcompensates for damages. The standard of proof that is applied leaves room for some probability that the cause of the damage was not the hazard at issue in the case. Suppose that a particular hazard is ninety percent likely to have caused a particular damage, and that this is sufficient to satisfy the standards of proof. Instead of awarding compensation of ninety percent of the damages (which provides the optimal incentive for taking preventive action), the legal system will award compensation for all of the damage. This error is a likely eventuality in certain kinds of medical malpractice suits. One element of proof of medical malpractice is whether the doctor or hospital followed standard medical practice in treating a patient. While standard medical practice may be more likely to cure a patient than quackery, cure is not certain -- especially in cases of critical injury or major illness. To fail to adjust compensation for the risks that are inherent in standard medical

practice leads to overcompensation. It also leads to excessive attention on actions to prevent malpractice claims, such as excessive testing of patients and excessive timidity with respect to promising but nonstandard methods of treatment.¹⁴

¹⁴/ See Medical Malpractice, op. cit, and Hearings on H. R. 1378, op. cit.

Just as overcompensation for damages promotes excessive attention to prevention, undercompensation leads to too little prevention. A rational business firm will invest in preventive measures to the point at which the last dollar spent on prevention reduces the amount of expected compensation payments by an equivalent amount. If compensation payments fall short of total damages, additional preventive measures would be worthwhile in that total damages would be reduced by more than the cost of preventing them. Furthermore, the divergence of private preventive actions from optimality is systematically related to the features of the liability system and the nature of the hazard. If the damaged party has the burden of proof, then more uncertainty attached to the link between a hazard and the extent of damage and a more stringent standard of proof will increase the likelihood that preventive action will be less than is economically warranted.

One possible mechanism for altering the incentive structure of the liability system is to reassign the burden of proof. For example, the burden could be placed upon an employer to show that an employee was not damaged by the working environment. This would lead to the payment of compensation in all cases in which the causal connection between the hazard and the damage could neither be proven nor disproven by prevailing standards of proof.

Whoever bears the burden of proof in these situations ends up paying the full damages, which can lead to overcompensation if the defendant bears the burden.

The Workman's Compensation system offers an example of the effects of both changing the burden of proof and of limiting total liability. Workmen's Compensation laws were designed to alter the liability system as it applied to accidents on the job. Basically, Workmen's Compensation laws reduce the standard of proof by eliminating the requirement that an employee show that an accident was "caused" by a failure on the part of the employer to take reasonable steps to remove hazards from the workplace. Furthermore, the laws require that employers carry insurance to secure the funds to pay off claims that may arise under the program. Both of these changes in the liability system work to increase the amount of compensation paid and the amount of prevention that employers voluntarily choose. This is mitigated by the fact that Workmen's Compensation sets fixed upper limits on the amount paid per claimant. Limiting the amount a worker can claim at least partially offsets the effects of easing the burden of proof and guaranteeing payment of proven damages. It also results in less change in the relative reliance upon prevention than would have occurred in the absence of the liability limits.

The existing Workman's Compensation system -- or any similar system one can practically imagine -- is bound to lead to serious inefficiencies. The problem is that the compensation that is appropriate from the perspective of providing proper incentives to producers is the expected value of damages before the fact, whereas the process by which damages are actually compensated is primarily a mechanism for protecting individuals against loss of income due to avoidable accidents. The former principle requires that compensation be systematically related

to the probability that the hazard caused the damage and that a particular damage actually occurred, whereas the latter principle requires that the focus be the magnitude of the loss of the damaged party.

The difference in these approaches is apparent from the following illustration. Suppose a workplace presents two hazards to its employees. One is that a chemical present in the plant increases by two percent the probability that a worker will die of cancer. The other is that a particular machine is known occasionally to inflict a minor cut on the arm of a cautious operator. Thus, if a worker dies of cancer, the chances are relatively small that the workplace caused it, while if the worker is cut by the machine it is certain that the injury is work related. Under the existing system, the former case would almost surely lead to no liability judgment against the employer, while the latter would almost surely be covered by Workmen's Compensation. A substantially lower standard of proof than the present one would lead to compensation for both workers. Yet, from the perspective of economic efficiency, both systems provide a proper incentive for preventing cuts while neither system provides the proper incentive for preventing cancer. The compensation system that achieves the latter end is to award the heirs of every worker who is a cancer victim two percent of the costs associated with the worker's death and full compensation for cut arms. Of course, the latter compensation per affected worker is likely to be much smaller than the former since the damages associated with premature death are normally regarded as being far more than fifty times as serious as those arising from a minor cut.

The problem of adequate compensation versus appropriate incentives is exacerbated if, before the fact, one is uncertain about the nature of the relationship between the hazard and the damage

suffered. Then the issue of devising a system of compensation that provides proper economic incentives is incapable of resolution for the same reasons presented in the preceding discussion of uncertain events. One must, instead, rely upon appeals to principles of equity and upon the likelihood that a compensation system can be changed in response to new information in selecting the appropriate liability standards. One frame of reference for assigning liability is on the basis of who is most likely to make the most efficient choice between prevention and compensation.^{15/} If a firm is more likely than its

^{15/} Guido Calabresi, Costs of Accidents, New Haven, Yale Univ. Press, 1970. See also Peter A. Diamond and James A. Mirrlees, "On the Assignment of Liability: The Uniform Case," Bell Journal of Economics, Vol. 6 No. 2 (Autumn 1975), p. 487-516.

employees and customers to possess complete knowledge about the safety of its working conditions and products, then assigning liability to the firm will lead to lower information costs and a better choice between prevention and compensation than would result if workers and consumers were liable. Workmen's Compensation, while lowering compensation limits, saves the relatively high costs of operating the civil liability system. It also protects more people against capricious loss of income by lowering the standards of proof.

Based upon the preceding analysis, the liability system appears to be fraught with sources of inefficiency. Nevertheless, in some circumstances it probably does not fare badly in comparison with the alternatives. Because of the nature of the liability system, it should be relatively effective in dealing with events that have certain causes and that inflict damages that do not push against institutionalized limits to compensation. Its effective-

ness is severely mitigated by the costs of civil litigation, which makes it less efficient the lower the probable damage.

Insurance

Another mechanism for dealing with damage costs due to accidents is insurance. The expected loss to each person from a risky hazard can be calculated by multiplying the probability of the event times the damage it causes. If each person faces a particular hazard, if the likelihood that one person will be damaged is unrelated to the likelihood the other will also be damaged, and if during each time period each person pays the expected loss into a common fund, over the long run the fund will have sufficient resources to pay all of the damages. This is the basic notion behind insurance. An insurance fund allows a large group of people to convert an occasional, large financial loss into a regular, certain, small one. The profitability of insurance companies arises because people are, in general, willing to pay slightly more than their expected loss in order to be protected against an infrequent major setback.

If a hazard creates risk but not uncertainty, the higher wages or lower prices associated with it will differ from other prices and wages by the difference in expected loss plus some premium for assuming the risk.^{16/} This differential, in turn, can

^{16/} See Oi, op. cit.

be used to purchase insurance against the risk, assuming that the damages experienced by each person are independent of the damages experienced by others. If the damages are not independent, insurance may not be available, or if it is, will be more expensive than

in the case of independence. Moreover, insurance that protects against the total damage suffered from the hazard will still not generally be made available. Complete insurance would make insured individuals indifferent as to whether the hazardous event actually occurs, even if the threat of the hazard is premature death. Even if it were possible for people to place a value on premature death and insure against it, thereby becoming indifferent between life and death, such insurance will not be offered if the behavior of the insured person can significantly affect the probability of the damage occurring. The problem that arises is called "moral hazard," which refers to the situation in which the presence of insurance reduces the incentive of the insured party to take normal precautions against the event for which insurance is purchased.^{17/}

^{17/} Kenneth A. Arrow, "Uncertainty and the Economics of Medical Care," American Economic Review, Vol. 53, No. 5 (December 1963), p. 941-973.

As the extent of insurance coverage against hazards increases, one would expect, based upon the moral hazard argument, to find a growing disincentive to take adequate precautions against hazards. In fact, insurance companies devote considerable efforts to setting safety standards for places of employment that purchase Workmen's Compensation insurance. Individual and group medical insurance companies, however, cannot practically monitor the behavior of each person to make certain that proper safeguards against illness and accident are being taken.

Insurance also may fail to cover damages completely when there is uncertainty. If a hazard is subject to uncertainty, an

insurance scheme in which the insurance premium is systematically related to the expected loss is not possible. The reason is that the expected loss cannot be calculated if the probability of the damaging event is unknown.

The preceding arguments lead to two additional sources of demand for safety regulation. First, insurance companies perceive potential gain in safety regulation because it reduces the problems arising from moral hazard and stands to transfer some of their standard-setting activities to the government budget. Second, since insurance is, in any event, incomplete, some individuals seek more stringent safety standards to protect against capricious losses of income that are not insured.

The Role of Regulation

The foregoing discussion leads to the conclusion that in at least two situations the market system plus insurance and liability laws is likely to generate insufficient incentives for providing economically warranted prevention from hazards. One is situations in which the risks of a hazard are either known or knowable, but the costs of acquiring or comprehending information about it are high. The other is if either the full nature of the hazard or the chance of its occurring are uncertain.

In both situations more information about health and safety hazards is likely to be especially valuable. Since the private sector will normally have insufficient incentive to produce an economically warranted amount of safety information, a central role of regulators is to increase the amount of information available by undertaking research, by supporting the research of others, and by imposing informational requirements on industry.

Once a flow of information is acquired, the agency has several additional policy options. The simplest is simply to

disseminate the data, allowing individuals to alter their economic behavior in ways consistent with their own tastes and attitudes towards risk. This strategy will improve matters if the information that is produced is relevant and can be assembled and comprehended sufficiently cheaply that individuals have adequate incentive to use it. An agency could fill this role by functioning as a clearing-house for relevant product and process information: publicizing particularly important hazards as they become known, requiring that firms provide workers or consumers with accurate, complete information about the hazards associated with their activities, and maintaining communications with industrial trade associations that establish voluntary standards and practices. The private market, supplemented by insurance and liability law, would then be able to incorporate the newly obtained information into the existing incentive structure. These conditions are more likely to be met for products that are bought fairly frequently and for hazards that have a fairly high risk, for then individuals will have more incentive to use the information to their advantage.

If increased information does not lead to economically warranted prevention, the source of the difficulty may be the system of liability, compensation and insurance. If so, altering this system may be a more efficient strategy for reducing exposure to hazards than a standard-setting process. One mechanism for increasing incentives for safe products or workplaces is to increase the liability of firms, such as by lowering standards of proof, raising compensation limits in the Workmen's Compensation system, or imposing taxes on product-related or work-related accidents.^{18/} Unfortunately, safety regulators are not empowered

^{18/} For a closer examination of an injury tax, see Robert S. Smith, "The Feasibility of an 'Injury Tax' Approach to Occupational Safety," Law and Contemporary Problems, Vol. 38, No. 4 (Summer-Autumn 1974), pp. 730-744.

to alter the incentive structure of firms in these ways, leading to excessive reliance on standards.

Standards are likely to be an efficient approach to safety problems in two instances. First, when decision units are numerous and information complex, the savings in centralized information processing may offset the loss in efficiency that results if the extent of prevention is not based upon informed, individual market decisions. Second, if the nature of a hazard is subject to uncertainty, insurance markets and the liability system can fail sufficiently badly that standards -- if responsive to new information -- may be desirable.

SAFETY REGULATION IN PRACTICE

The behavior of two major new safety regulatory agencies, CPSC and OSHA, as they began operations illustrates how safety regulation works in practice, as compared with the principles sketched out above. The experiences with these two agencies offer some basis for evaluating regulatory intervention as an alternative to the admittedly imperfect world of liability law and insurance. How safety regulation actually works can be seen in part by examining how the budgets of the agencies are allocated among various functions, how priorities are set, when and how standards are prepared, and how they are enforced. The central problem of safety regulation is to provide regulators with the incentive and the resources to attack effectively the safety hazards over which they have the greatest leverage. This has not been achieved in the past, largely because Congress has adopted an inappropriate conceptual model of the nature of the problem of product and occupational safety.

Budget Allocations

Because the rationale for having safety regulation lies in part in the failure of the market to provide sufficient information, the budgets of safety regulatory bodies might be expected to include substantial expenditures for producing and disseminating information, particularly in the earlier years of regulation. Examination of the budgets for the CPSC and OSHA reveal that this is not so. Table 2 gives the CPSC budgets broken down by activity, and Table 3 gives the OSHA budget.

Ascertaining the preferences of the agency in terms of the allocation of its resources is normally extremely difficult because the Office of Management and Budget (OMB), not the agency, submits a budget request to Congress. Only if the true preferences of the agency are revealed during its oversight hearings can the nature of the OMB revisions be at least qualitatively inferred. Fortunately for purposes of analysis, CPSC, unlike other regulatory agencies, submits its budget requests directly to Congress, with OMB relegated to the position of submitting a competing budget based upon administration policies.

Congress and OMB make two types of cuts in agency budget requests.^{19/} The first is program cuts affecting the level

^{19/} Richard Fenno, The Power of the Purse, Boston: Little, Brown and Company, 1966. While Fenno analyzes budgeting in Congress, the same conceptual model applies to OMB.

of activity (across-the-board cuts). The second type is object or categorical cuts (removing certain tools available to the agency or affecting the appropriations for specific parts of the program). The former types are primarily related to fiscal responsibilities

TABLE 2
CPSC BUDGET (1000's of \$)

	1974		1975		1976	
	Congressional Appropriation	CPSC Request	Congressional Appropriation	CPSC Request	Presidential Recommendation	Congressional Request
1. Administration	4,249	5,410	7,043	7,043	7,635	10,103
2. Hazard Identification	5,801	5,922	4,822	4,822	4,935	5,703
3. Hazard Analysis and Remedy	9,129	11,488	8,605	8,605	7,212	13,931
4. Information and Education	4,125	5,054	4,501	4,501	4,736	5,922
5. Compliance and Enforcement	11,472	14,944	11,983	11,983	12,077	14,727
TOTAL	34,776	42,819	36,954	36,954	36,595	50,386
						41,820

Sources: CPSC Budget; 1974 Governmental Appropriation and 1975 CPSC Request. Agriculture-Environmental and Consumer Protection Appropriations for 1975. Hearing's before the Subcommittee on Agriculture-Environmental and Consumer Protection of the House Appropriations Committee. 93rd Congress, 2nd Session (1974) PT. 6, p. 1431.

1975 Congressional Appropriations and 1976 Presidential (OMB) Recommendation and 1976 CPSC request. Department of Housing and Urban Development -- Independent Agencies Appropriations for 1976. Hearings before Subcommittee of HUD-Independent Agencies of the House Appropriations Committee. 94th Congress, 1st Session. (1975) Pt. 4, p. 408.

1976 Congressional Appropriations; U. S. Office of Management and the Budget, Budget of the U. S. Government, Fiscal 1977, Appendix (Washington, D. C., Government Printing Office, 1975) p. 715.

TABLE 3
OSHA BUDGET (1000's of \$)

	1972		1973		1974		1975		1976	
	Congressional Appropriation	OSHA Request	Congressional Appropriation	OSHA Request	Congressional Appropriation	OSHA Request	Congressional Appropriation	Congressional Appropriation*	OSHA Request	Congressional Appropriation*
Administration	4,024	3,546	3,719	3,530	3,530	3,967	3,948	4,265	3,877	3,973
Safety and Health Hazard Identification, Analysis and Remedy	2,220	2,800	2,983	2,955	4,355	4,939	4,802	5,640	5,153	6,747
Training, Information and Education	2,294	3,294	6,517	3,491	4,491	4,892	4,874	8,911	4,838	12,635
Safety and Health Statistics	3,345	4,600	4,814	4,841	5,141	5,531	5,526	5,581	5,607	5,977
Compliance and Enforcement										
a) Federal	16,793	23,285	26,241	24,939	29,891	37,171	42,177	41,040	48,050	52,653
b) State Programs	7,781	29,975	25,000	30,080	23,000	46,000	41,000	30,371	48,500	35,600
Unobligated Funds								6,198		
TOTALS	36,457	67,500	69,274	69,336	70,408	102,500	102,321	102,006	116,025	117,585

* Note: These figures represent a slightly different categorization than the others and hence are not strictly comparable. The new scheme lists training expenditures for state enforcement officers as "Training, Information and Education," whereas the old scheme included these as part of "State Programs" under "Compliance and Enforcement."

Sources: 1973 OSHA Request: Department of Labor and Health, Education, and Welfare Appropriations for 1973. Hearings before the Subcommittee on Department of Labor and Health, Education and Welfare Appropriation of the House Appropriation Committee, 92nd Congress, 2nd Session, (1972) Pt. 6, p. 454.

1973 Congressional Appropriations; Department of Labor and Health, Education and Welfare Appropriations for 1975. Hearings before the Subcommittee on Department of Labor and Health, Education and Welfare Appropriations of the House Appropriations Committee, 93rd Congress, 2nd Session (1974) pt. 1, p. 438.

1974 OSHA Request: Department of Labor and Health, Education and Welfare Appropriations for 1975. Hearings before the Subcommittee on Department of Labor and Health, Education and Welfare Appropriations of the House Appropriations Committee, 93rd Congress, 1st Session (1973) Pt. 6, p. 894.

1974 Congressional Appropriations and 1975 OSHA request: Department of Labor and Health, Education and Welfare Appropriations for 1975. Hearings before the Subcommittee on Department of Labor and Health, Education and Welfare Appropriations of the House Appropriations Committee, 93rd Congress, 2nd Session (1974) Pt. 1, p. 507.

1975 Congressional Appropriations and 1976 OSHA request. Department of Labor and Health, Education and Welfare Appropriations for 1976. Hearings before the Subcommittee on Department of Labor and Health, Education and Welfare Appropriations of the House Appropriations Committee, 94th Congress, 1st Session (1974), Pt. 5, p. 653.

Second 1975 Congressional Appropriation and 1976 Congressional Appropriation: U. S. Office of Management and the Budget, Budget of the U. S. Government, Fiscal 1977, Appendix (Washington, D. C., Government Printing Office, 1975) p. 523.

while the latter are principally methods for affecting policy.

Table 2 shows the budgetary history of CPSC during the first three full years of its operations. CPSC began life on May 14, 1973, less than two months before fiscal 1974 began. Consequently, it had little influence on its first budget. This budget was put together the preceding February on the basis of information provided by FDA's product safety unit and, consequently, did not reflect the perceptions of CPSC on how the commission should be financed.

In both FY 75 and FY 76, CPSC Chairman Simpson asked for a thirty percent increase in his budget, arguing that the first budget could not be considered a "base." Congress did not see things this way. Senator Proxmire, reviewing CPSC budget request for FY 76 in light of 1975 appropriation of \$36.95 million and an OMB FY 76 recommendation of \$36.59, commented,

The commission has the authority to submit a budget request directly to Congress. That request is for \$50,386,000, an increase of \$13,432,000, or more than one-third over fiscal 1975 budget. We certainly want to receive a detailed justification for budget increase of that magnitude.

20/ Dept. of Health, Education and Welfare and Certain Independent Agencies Appropriation for Fiscal Year 1976. Hearings, Subcommittee of the Senate Committee on Appropriations, 94th Congress, 1st Session, 1975, Pt 2, pp. 817 and 868.

In FY 1974, the largest single budgetary item was "Compliance and enforcement," representing about one third of the budget. This primarily finances the activities performed under acts inherited by the CPSC from other agencies. The second largest item is "Hazard analysis and remedy." This refers to the

resources allocated to the standards development process.

The appropriations figures show that Congress and the President favor compliance activities relative to analytical capacity. For FY 75, CPSC asked for a twenty-six percent increase in standards analysis and a thirty percent increase in compliance and enforcement. Congress appropriated a six percent decrease for standards and a five percent increase for compliance and enforcement. For FY 76, CPSC asked for a sixty percent increase in resources for analysis. The President's budget recommended over a fifteen percent decrease, and Congress eventually provided an increase of about six and one half percent, which was insufficient to offset inflation. For enforcement for Fiscal Year 1976, CPSC asked for a twenty-two percent increase while the President's budget recommended a one percent increase. Congress appropriated a three percent increase.

As CPSC Chairman Simpson put it,

Such a reduction [in analytical capability] will especially impact upon the ability of the commission to address the development of mandatory product safety standards and will limit the overall evaluation of the offeror concept as embodied in the CPSA.

Such a large and absolute reduction in funding, along with continued constraints on staffing, will have a devastating impact on this commission. . . Further, if such funding restrictions are maintained in the long term, the commission has no choice but to consider substantial structural changes and adjustments to provide the adoption of a purely reactive approach to product safety rather than the planned and systematic standards development approach now envisioned.^{21/}

^{21/} Ibid., pp. 817 and 868.

OSHA's budgetary history is similar to that of CPSC. The largest element of the OSHA budget is compliance activities, as seen in Table 3. Congress, in acting upon the OSHA budget requests, has consistently added to the amounts requested for OSHA's enforcement activities and decreased the amount requested for supporting state enforcement activities. Standard setting by OSHA receives a very small portion of the budget: OSHA budget submissions by OMB have requested between four and five percent of its budget for this purpose, while Congress has allocated between four and six percent. Information gathering activities have not fared much better: actual appropriations have been rising but less rapidly than the total budget of OSHA, leading them to fall from nine percent of its allocation in 1972 to five percent in 1975.^{22/}

^{22/} Because of a change in aggregation methods, the 1976 numbers can not be reconstructed on a basis comparable to past years from available publications.

Since 1972, the OSHA process for setting standards has been all but stymied by inadequate appropriations. One major basis for OSHA standards is supposed to be research by the National Institute of Occupational Health and Safety (NIOSH). NIOSH is responsible for gathering data on job-related hazards and performing scientific analyses of particular situations and substances that constitute hazards to workers. NIOSH findings are summarized in "criteria documents," which are to be the basis of the standards adopted by OSHA. As a result, OSHA's ability to set standards is limited by the resources available to NIOSH to investigate hazards. These resources, in turn, have not been exactly generous.

In the health field alone, NIOSH estimates that there are at least 42,000 chemicals used in industry that are possibly hazardous to workers' health. Of these, it has selected 400 as particularly worthy of attention.^{23/} NIOSH does not have sufficient staff and

^{23/} "Labor Report/OSHA Launches Dual Effort to Reduce Job Health Hazards," National Journal Reports, December 7, 1974, p. 1831.

research resources to make much headway against these hazards. In fiscal 1972 and 1973, the section of NIOSH responsible for preparing criteria documents had a total of 31 positions, including clerical and secretarial personnel, and managed to turn out thirteen documents.^{24/}

^{24/} Senate Hearings, p. 1072.

These data indicate that Congress does not want to place as much emphasis on information gathering and evaluation capacity as safety regulatory agencies desire. This suggests that Congress does not fully recognize the informational problems associated with effective safety regulation, and that budgetary policies may be deflecting regulators from focusing on the very types of hazards that it makes the most sense to regulate.

Establishing Priorities

Before a regulatory agency can begin to regulate exposure to hazards, it must first set up procedures for identifying the hazards that are worth regulating. This requires that procedures be established for assessing the relative importance of hazards.

In establishing priorities, CPSC relies heavily on a Hazards Index that is derived from a ranking of the severity of injuries and the accident data from the National Electronic Injury Surveillance System (NEISS).^{25/} NEISS provides aggregate frequency and

^{25/} A close examination of NEISS and some of its failings can be found in Steven Kelman, "Regulation by the Numbers - A Report on the Consumer Product Safety Commission," The Public Interest, No. 36, Summer 1974, pp. 82-102.

severity data on accident cases from a sample of hospital emergency rooms. Each month the total number of accidents associated with each product class are reported. For each product, the number of accidents causing a particular type of injury is multiplied by an index of the "mean severity" of that injury. These calculations are summed to produce a score for each product.^{26/}

^{26/} Consumer Product Safety Commission. NEISS News. Washington, D. C. Vol 4 # 1, July 1975.

The rank ordering of products according to this score is used by CPSC in deciding which products to regulate.

As calculated, the Hazard Index is unbelievably arbitrary. The numerical weights assigned to injuries of different severity are without any rational foundation. Thus, a death is scored as 2,516 points^{27/} against a product, whereas a sprained ankle is

^{27/} As Kelman points out, this is down from 34,721, which was abandoned because the agency decided the latter number made the index too dependent on deaths.

worth ten points. To note that most people would gladly trade one death for 252 sprained ankles misses the main point of this fantastically arbitrary scale. While considerable attention was devoted to constructing a qualitative ranking of the severity of various kinds of injuries, no effort was devoted toward establishing some foundation for aggregating injuries or even for testing the sensitivity of the Hazard Index to alternative aggregation schemes.

Another important shortcoming of the Hazard Index is that it takes no account of the age or frequency of use of the product. Since voluntary safety standards are changed every few years, product age data are relevant to determining whether still more stringent standards are necessary. Data on the frequency of exposure would enable the CPSC to distinguish between products that have a low accident rate per exposure but that are associated with a relatively large number of accidents because they are ubiquitous, and products that are less frequently used but, when used, especially hazardous. This distinction is important since it provides some insight into the leverage the CPSC is likely to have on the safety of the product. The failure of CPSC to take account of exposure rates has led the agency to launch proceedings to set standards for several high-ranking sources of accidents over which the CPSC is likely to have little, if any, control. For example, the CPSC is hard at work investigating the possibility of safety standards for matches, kitchen knives and staircases. While many people suffer burns, cut themselves and fall down stairs, one wonders exactly how effective the commission can be in significantly reducing the incidence of any of these accidents, short of specifying that match flames be cold, knives be dull and stairways be horizontal.

Because the Hazard Index fails to provide age-adjusted and exposure-adjusted information, it is unable to separate two quite distinct sources of a decline in accident rates associated with a product. Promulgation of a safety standard may cause accident rates to decline because they actually make the product safer. Or accidents may fall off because a totally ineffective safety standard forces up the price of the product enough to cause a major decline in its use. Even if the purpose of the agency were narrowly defined to be the elimination of the most important sources of accidents, the latter effect could be achieved far more effectively by simply imposing a tax or complete, unadjudicable liability on the product, rather than by requiring that scarce resources be used to manufacture an ineffective safety device that reduces accidents only because it makes the product expensive.

The CPSC adopted the Hazard Index while fully aware of most of the problems associated with it. While the complete set of reasons for this decision are not known, two factors were clear. First, the agency was under considerable pressure from Congress to begin regulating, and the agency was concerned that if it failed to act with dispatch Congress might legislate its priorities. Second, reflecting in part the attitudes of Congress, the agency specifically rejected the use of economic analysis in setting priorities. The Bureau of Economic Analysis at the agency plays no role in setting priorities. Its role is to provide the CPSC with estimates of the economic impact of proposed standards. The rejection of economic analysis effectively prevented the agency from developing a method of setting priorities that included consideration of concepts such as the potential leverage of the agency on the safety of a product or the economic magnitude of the benefits it might provide through regulation. While the agency was correct in concluding that

economic analysis could not provide a definitive judgment on whether a product ought to be regulated owing to inadequacies in the available information, the CPSC threw out the baby with the bath by going to the extreme of regarding economic information as irrelevant.

In addition to the Hazard Index, the CPSC also takes action on the basis of individual case information. The Consumer Product Safety Act establishes a complaint process by which citizens and groups can request that the agency investigate the safety of a particular product or brand of product. In addition, the follow-up interviews from NEISS cases also are used as a means of suggesting further action. Finally, the CPSC has field offices spread across the country which provide an additional source of information through their contact with the public and their enforcement activities.

The main difficulty with these methods of generating information -- and the rationale for a more systematic process such as NEISS -- is that they are somewhat haphazard, possibly providing a biased sample of signals about which products actually constitute consumer hazards. The problem is particularly worrisome if the clients of the regulatory agency are diffuse, disorganized, and perhaps unaware of its data collection processes and if the agency has a relatively small field office system, as is the case with CPSC.

Like CPSC, which inherited NEISS from the Department of Health, Education and Welfare, OSHA, too, uses information systems developed by the Department of Labor on the incidence of on-the-job accidents. It also relies upon complaints filed directly by workers and labor unions. OSHA also has an exceptionally large field inspection staff compared to CPSC, and, finally, has developed a process for identifying target industries and target health hazards.

OSHA's compliance activities are governed by the following set of priorities established in 1973.^{28/}

^{28/} Senate 1974 OSHA Hearings, p. 973.

PRIORITY	CATEGORY
First	Investigation of evidence of imminent danger
Second	Catastrophe and/or fatality investigations
Third	Complaint investigations
Fourth	Special programs including target industry and target health hazard inspections
Fifth	General inspections and related activities

The first and third categories are not very different. Both are triggered by complaints from employees or union representatives. The "target industry" and "target health hazard" categories represent OSHA's attempt to concentrate its resources on workplaces with the worst records. This set of priorities responds to the wishes of Congress as revealed by the legislative history of the Occupational Safety and Health Act.^{29/} The target industries

^{29/} Ibid.

and health hazards were identified in the following way:

On the basis of their relatively high injury rates, OSHA selected five target industries for the fourth priority category: longshoring; lumber and wood products; roofing and sheet metal; meat and meat products; and manufacturing of mobile homes and other transportation equipment.

OSHA also selected five health hazards as special targets for inspection coverage in the fourth priority category. These were asbestos, cotton dust, silica dust, lead, and carbon monoxide. According to OSHA

the selection of the health hazards was based on (1) extent and severity of employee exposure, (2) existence of standards, and (3) ability to adequately measure exposure levels.^{30/}

^{30/} Senate 1974 hearings, p. 974.

If the target programs are to be judged by the statistics on the results of OSHA's inspections, they have not picked the worst industries and hazards as targets. From July 1973 through May 1974, OSHA made 8,642 inspections in target industries, 2,251 in industries which might have target health hazards, and 60,957 general inspections. The percentage of initial inspections (as opposed to follow-up inspections or reinspections) that resulted in citations was sixty percent for the target industries, seventy-six percent for those suspected of having target health hazards, and seventy-nine percent for the general category industries.^{31/}

^{31/} Senate hearings, p. 976.

As with CPSC, the OSHA method for establishing priorities, while on the face of it apparently systematic and rational, is not based on a solid conceptual model of why safety regulation might be worthwhile. It stands to reason that the hazardous occupations and substances that are most commonly known would also be most likely to be at least imperfectly understood by workers and employers, and that, as a result, more effort would be made in these cases to develop safety precautions. The most complex, long-term problems are the ones least likely to be dealt with adequately. By overlooking the rationale for safety regulation, the safety regulatory authority has ignored the issue of the amount of change in safety that it can bring about through regulatory intervention.

The OSHA data-gathering process suffers from other problems as well. Before OSHA was established, job-related accident statistics were collected by the Bureau of Labor Statistics as well as by the National Safety Council. Because new definitions and procedures for collecting data were developed when OSHA was created, recent statistics are not comparable with the old. Thus, it is not possible to tell what effect OSHA has actually had upon accident and illness rates in the aggregate or what has been the impact of specific OSHA standards.

Finally, OSHA, like CPSC, does not base its priorities or evaluate its standards on the basis of economic analysis. In fact, the legislation dealing with the standard-setting process specifically rejects the weighing of costs and benefits as a criterion for judging the desirability of standards, instead mandating prevention as the only relevant objective of the agency. As a result, OSHA, like CPSC, is required to throw away valuable information.

Standards Development

The heart of safety regulatory policy as practiced by existing agencies is the setting of minimum standards of protection from hazards. Legislation and case law have established procedural and substantive boundaries for standard setting activities. The effects of these rules on the standards that eventually are promulgated are sometimes quite subtle and, perhaps, even unintentional.

All regulatory agencies could adopt informational strategies rather than set standards. As a practical matter, they rely almost exclusively on standards. For example, the Consumer Product Safety Act gives equal billing to both strategies:

A consumer product safety standard shall consist of one or more of any of the following types of requirements:

(1) Requirements as to performance, composition contents, design, construction, finish or packaging of a consumer product.

(2) Requirements that a consumer product be marked with or accompanied by clear and adequate warnings and instructions, or requirements respecting the form of warnings or instructions.^{32/}

^{32/} Dept. of Housing and Urban Development-Independent Agencies Appropriations for 1976. Hearings Before the Subcommittee on H. U. D. -Independent Agencies of the House Appropriation Comm. 94 Congress, 1st Sess. (1975) Pt. 4, p. 764.

The major elements of the CPSC's informational strategy have been the consumer "hotline" -- in essence, a mechanism for providing information over the telephone to consumers who call in with questions -- and short analyses and tips to consumers in press-release style. The CPSC has not seriously considered mandatory labeling as a substitute for standards. For example, instead of regulating the design of power mowers, CPSC could require manufacturers to label varying models according to the nature of the safety devices on each model, the kind of accidents the safety devices prevent, and the probability of serious injury, based upon data generated from NEISS, associated with each model of mower.

One impediment to adopting this kind of informational strategy is that the members of Congressional oversight committees are not enthusiastic about this approach. Congress has been very critical of even the current minimal reliance on information strategies. The references to the "hotline" in the various appropriations hearings for 1975 and 1976 were all negative. For example, Congressman Traxler commented,

This costs \$115,000 and on the surface it would appear to be a good idea. However we understand that over ninety-eight percent of the [70,000] calls received during this fiscal year represented requests for information.^{33/}

^{33/} Ibid.

This statement reflects a House Appropriations Committee Investigation Report which labeled these as "of an innocuous informational nature," and "consequently the need for this expenditure seems questionable." Given these signals from Congress, agencies cannot be expected to place much reliance on informational strategies.

As indicated above, standards are set in response either to petitions from interested parties or to systematic data-gathering and evaluation activities within the agency. Surprisingly enough, industry has been quite active in using the petitioning process to initiate regulation of its own products. At the CPSC during the first two years of the agency's life, industry sources filed over seventy percent of the petitions that were received by the agency, and two-thirds of the petitions that were granted (Table 4). Since many of these petitions requested specific exemptions and relaxations with respect to existing standards, the gross figures overstate the importance of business participation. Nevertheless, business petitions were the single most important source of agency actions to begin developing standards.

Table 5 contains the nature and source of the petitions filed under the Consumer Product Safety Act during the same two years (Column 1 in Table 5). Forty percent of the requests to regulate a product under this Act came from the industry producing

TABLE 4
 PETITIONS TO CONSUMER PRODUCT SAFETY COMMISSION
 May 1973 to July 1975

Action	Consumer Product Safety Act	Flammable Fabrics Act	Hazardous Substance Act	Poison Prevention Packaging Act	Administrative Procedures Act	Total
Firms and Industries	16	23	20	66	0	125
Consumer Groups	10	3	11	0	1	24
Individuals	12	1	2	1	0	17
Government	3	1	1	0	0	5
Labor	1	0	0	0	0	1
Total	42	28	34	67	1	172

Source: Consumer Product Safety Commission Index, 2nd Quarter 1975, Office of the Secretary.

TABLE 5
 CONSUMER PRODUCT SAFETY ACT PETITIONS
 May 1973 through April 1975

Source of Requests	Action Requested				Total
	Regulation	Change of Law Applied to Product	Order Ban or Recall	Other	
Firms and Industry	11	3	0	2	16
Consumer Groups	5	1	3	1	10
Individuals [*]	7	0	2	3	12
Government	3	0	0	0	3
Labor Organizations	1	0	0	0	1
Total	27	4	5	6	42

* Affiliation, if any, not identified.

Source: CPSC Index, Office of the Secretary, April 1975.

the product. Among the standards-setting proceedings initiated by industry are dockets dealing with swimming pool slides, extension cords, glass bottles, architectural glass, power mowers, aluminum wiring and fire extinguishers. Nonindustry sources are responsible for several proceedings, notably those dealing with aerosol sprays, space heaters, playground equipment, paint guns and step ladders.

The Consumer Product Safety Act sets out detailed procedures that govern the development of standards by the CPSC. The Act severely constrains the ability of the CPSC to develop its own standards by requiring that it seek out other parties -- "offerors" -- to develop safety standards that deal with the problems it has identified.^{34/} It may scrutinize these proposals (subject to its own

^{34/} PL 92-573, sections 7(b) (4) and 7(d) (1). The CPSC can develop standards if no suitable offeror outside of the regulated industry can be found or if an offeror fails to develop a satisfactory standard.

resource limitations), and may contribute to an offeror's costs.

If an offer is accepted under this subsection, the Commission may agree to contribute to the offeror's cost in developing a proposed consumer product safety standard, in any case in which the Commission determines that such contribution is likely to result in a more satisfactory standard than would be developed without such contribution. . . .^{35/}

^{35/} PL 92-573, section 7(d) (2).

The commission has interpreted the intent of this passage as establishing a policy of only partial reimbursement. Without full cost reimbursement, groups other than those connected with the industry are not likely to find it worthwhile to become offerors. Peter Schuck, director of the Washington office of Consumer's Union, which undertook to be offeror on the issue of power mower safety, raised this exact point with the oversight committee.

[The commission] has indicated that all other things being equal it will look favorably upon consumer candidates to be offerors. But therein lies the problem. All other things are not equal. In particular -- and here the degree of my understatement cannot be overstated -- consumer organizations are not equal to industry groups in terms of financial resources necessary to develop a technically complicated safety standard as offeror. Indeed, I can say without fear of contradiction that so long as the funding for the offeror programs remains at its present level no consumer organization, with the possible exception of Consumer's Union, can afford to be an offeror. . . . I daresay . . . Consumer's Union will have to think long and hard before it makes this sort of expenditure again.^{36/}

^{36/} Consumer Product Safety Commission Oversight Hearings Before the Subcommittee for Consumers of the Senate Commerce Committee, 94 Congress, 1st Session (1975), p. 23.

CPSC's reimbursement policy all but prevents the commission from developing the various consumer groups as a clientele and as a source of major input to the standards development process. It also means the industry will be writing its own standards.

The very first standards case at the CPSC made the impact of the offeror reimbursement policy abundantly clear. An industry trade association successfully petitioned the CPSC to write standards for architectural glass, and then submitted a proposal that it be selected as an offeror. In addition, a consumer organization -- National Consumers League (NCL) -- also proposed to be an offeror in conjunction with the American Society for Testing and Materials. The CPSC, upon reviewing these and two other proposals, unanimously agreed that the NCL proposal ranked first while that of the trade association ranked second. NCL insisted on full reimbursement of the costs of developing the standards -- including salary compensation for consumer representatives participating in the process. Eventually the CPSC broke off negotiations with NCL,

expressing the belief that adequate consumer representation could be obtained gratis. Subsequently, the trade association won the offeror contract, settling for reimbursement of only \$14,175 to pay travel and per diem for the consumer representatives that it intended to consult. The trade association absorbed the remaining costs, which were considerable judging from its initial reimbursement request for \$451,500.^{37/}

^{37/} "Opinion of Commissioner Barbara H. Franklin on the Selection of an Offeror to Develop a Safety Standard for Architectural Glass," CPSC, October 8, 1974.

Letting industry write its own standards is not necessarily fatal to the development of reasonable regulatory actions. If the commission knew what the standard ought to be, it could effectively ensure it as an outcome. The Act requires CPSC to develop regulations governing acceptance of offerors proposals. These regulations are about 150 pages long, and provide ample justification for any proposal not meeting CPSC expectations to be rejected. If the commission has strong beliefs about the best way to solve a safety problem, it can invoke this section either to move the offeror closer to its own ideas or to reject the proposal as not representing satisfactory progress so that it can find another offeror or begin its own development of a standard.^{38/} If the commission had sufficient analytical capabilities

^{38/} PL 92-573, section 7(e) (2).

the outcomes of this process via the offeror system might not differ much from those if the commission developed its own standards.

If financial and personnel resources are not abundant, the commission must limit its scrutiny of this process and hence its influence on the form, scope, and quality of the standards. The

resources of the CPSC are severely limited, as revealed by the analysis of its budget. The scarcity of analytical resources, coupled with the CPSC offeror provisions, effectively relegate the commission to a judicial position. It can assess proposals on the basis of whether they address the problems the commission has cited, but it lacks the analytical resources to determine whether the standards actually solve the problem. The problem is compounded by the time limits imposed by the CPSC, which require that the standards proposed by an offeror be adopted within thirty days.^{39/} If it fails

^{39/} An offeror must be picked 30 days after a notice to set a standard is published. The offeror has 150 days to report a standard after being selected. Since the entire process is limited to 210 days, this leaves 30 days for evaluating an offeror's proposal. See PL 92-573 86 Stat. 1221, Sec. 7.

to act in this time, a new regulatory proceeding, including the search for another offeror, must be opened if the product is to be regulated.^{40/}

^{40/} The agency can extend a proceeding, but to do so it must show cause, which in turn can be challenged in court and, in any event, leads inevitably to Congressional criticism at the next budget hearing, as discussed below.

Industry has several incentives for wanting a standard-setting procedure that is under the strong influence of business. First, if industry controls the standards, the economic uncertainties associated with safety regulation are reduced: industry is unlikely to impose so stringent a standard that it effectively puts itself out of business. Second, because safety standards often cannot be distinguished from design standards, the regulatory process offers the possibility of creating an enforceable cartel to reduce competition, something a voluntary trade association's standards could not do as

easily because they cannot be enforced.^{41/}

^{41/} See Michael Hunt, "Trade Associations and Self-Regulation: Major Home Appliances," in Richard E. Caves and Marc Roberts, Regulating the Product: Quality and Variety, Cambridge: Ballinger, 1975.

One egregious example of the latter has already occurred at the CPSC. The offeror for developing safety standards for bicycles was the trade association for American bicycle manufacturers. The initial set of standards it proposed included complicated design standards that would have effectively excluded foreign-made bicycles from the U. S. market.^{42/} The CPSC, unaware of

^{42/} John Forester, "The Toy Bike Syndrome," Bike World, October 1973.

this feature of the proposed standards, initially adopted them; however, in response to heated outcries from cyclists, recalled the standards and started the standard development process over again. Only because the product in question had a dedicated, organized, well-informed group of consumers did an anticompetitive standard fail.

OSHA, perhaps reflecting the better organization of labor unions compared to consumers, is not set up to be quite so reliant on industry for developing standards. For two years after it was established, OSHA was permitted to adopt as its own standards that had been set either by government agencies or by certain kinds of consensus organizations. (After 1972, the standard-setting procedure changed, being based on NIOSH "criteria documents.") In these two years, OSHA adopted numerous consensus standards.

One feature of the standards OSHA has borrowed from others is that these standards are not as rigorous as the standards adopted by other federal regulatory agencies that regulate exposure

Table 6

OCCUPATIONAL (OSHA) VERSUS GENERAL
POPULATION (EPA) ENVIRONMENTAL STANDARDS

<u>Ambient Atmospheric Results</u>		
<u>Pollutant</u>	<u>OSHA(TLV)</u>	<u>EPA</u>
SO ₂ (ppm).....	5	Annual mean 0.03 Maximum 24 hr, once per year 0.14 Maximum 3 hr, once per year 0.50.
CO (ppm).....	50	Maximum 8 hr, once per year 9.0 Maximum 1 hr, once per year 35.0
NO ₂ (ppm).....	5	Annual mean 0.50
Particulates(mg/m ³)....	5 ¹ 55 ²	Annual mean 0.075 Maximum 24 hr, once per year 0.66
Lead(μg/m ³).....	550	30 day mean (Calif.) 1.5

1 Responsible fraction

2 Total dust

Source: Testimony of Samuel S. Epstein, M. D., Case Western Reserve University Medical School, in Occupational Safety and Health Act of 1970 (Oversight and Proposed Amendments), Hearings before the Select Subcommittee on Labor of the Committee on Education and Labor, House of Representatives, Ninety-Third Congress Washington, D. C. 1975, p. 162.

to the same hazards by other classes of people. Table 6 gives a comparison of some OSHA standards and the standards set by EPA for exposure to the same chemicals. In each instance the EPA standard is much more stringent.

A second feature of the standards that came from consensus organizations is that they have evolved much more slowly than have industry standards in response to new information. One businessman from Texas wrote to his congressman that he was caught in a bind by this kind of inflexibility:

One specific point is in regards to the pressure vessels which we manufacture in our plant for the oil and gas industry and refineries. In order to retain our certification to build pressure vessels in accordance with ASME Boiler & Pressure Vessel Code, we must construct them in accordance with the latest edition of the Code. However, the OSHA Regulations still refer to previous editions of the Code. Therefore, we could get caught in the middle in providing equipment for our customers.^{43/}

^{43/} House 1975 Hearings, p. 4.

Now that OSHA must rely on NIOSH in developing standards, the process has become more cumbersome, in part because NIOSH has produced so few criteria documents and in part because the standard-setting process is slower when the analysis is done internally. NIOSH produced six criteria documents in 1972; by July 1, 1974 only one had resulted in a standard.

The charge of slow proceedings has also been levied at the CPSC. Despite a statutory limit of 210 days in developing standards, CPSC normally has taken far longer. Commenting on this performance, a report of the House Appropriations Committee in 1975 said: "The Consumer Product Safety Commission has been in existence two years and its record of achievement to date is lacking in every area of its responsibilities."^{44/} Senator McGee, Chairman of the Senate

^{44/} Dept. of Housing and Urban Development, Independent Agencies Appropriations for 1976. Hearings Before the Subcommittee on H. U. D., Independent Agencies of the House Appropriations Committee, 94th Congress, 1st Session (1975), Pt. 4, p. 629.

subcommittee that oversees CPSC appropriations, was also critical about the "lack of an initiative on the part of the commission for setting new standards under the act. The charge is made that you inherited several standards from older legislative acts that were transferred to you, but you have not come up with any new ones."^{45/}

^{45/} Agriculture, Environmental and Consumer Protection Appropriation, Fiscal Year 1975. Hearings, Senate Appropriation Committee, 93rd Congress, 2nd Session (1974), Pt. 2, p. 1640.

One source of Congress' chagrin is the performance on the petitions reported in Table 5. In 1975, the CPSC revealed in its oversight hearings that it had received forty-two petitions under the Consumer Product Safety Act. Four that were resolved had taken, on average, 265 days, and ten more had taken an average of 326 days and were still pending.^{46/} Of course, the Congress did not

^{46/} Dept. of Health, Education and Welfare and Certain Independent Agencies Appropriations for Fiscal Year 1976. Hearings, Subcommittee of the Senate Committee on Appropriations, 94th Congress, 1st Session (1975), Pt. 2, p. 885.

look to its own budgeting decisions as a source of this lack of progress, or even ask whether rapid action is a desirable characteristic of sensible safety regulation.

Compliance and enforcement

The compliance activities of safety regulatory agencies fall into two categories. First, agencies attempt to enforce the product, process and exposure standards that they have promulgated by inspecting facilities and products. In this mode, the standards provide a concrete set of criteria for determining whether the inspected firm is in compliance. Second, safety regulatory law also contains provisions that allow agencies to take action in the absence of a standard if the hazard is determined to be sufficiently serious. Both types of activities serve not only to weed out bad actors, but also to increase the incentives of firms to take actions to reduce hazards.

As an example of the range of permissible enforcement activities, the Consumer Product Safety Act permits the CPSC to take certain remedial actions if it finds a particular product a "substantial product hazard," either because it does not meet a standard or because it possesses a "defect. . . which creates a substantial risk of injury to the public."^{47/} The remedial actions

^{47/} P. L. 92-573 86 Stat. 1221 Sec. 15(a).

available include requiring the manufacturer, distributor or retailer to take any combination of the following actions: (1) to give notice that the defect exists to the public, to other businesses manufacturing, distributing or retailing the product, or to known consumers of the product; (2) to repair or replace the product; or

(3) to refund the purchase price of the product (less a "reasonable allowance for use").^{48/} In the context of this section of the law,

^{48/} Sec. 15 (c) and (d).

the term "defect" has been interpreted to mean any characteristic of the product that is hazardous. It is not applied just to an atypical mistake -- such as the actions the FDA might take in discovering botulism in a few cans of soup -- but to entire product lines that are discovered to be hazardous in design. Thus, to enforce this part of the law requires on-the-spot development of a performance standard for an aspect of a product that has not previously been regulated. Even though agency actions are subject to judicial review, the scope of possible actions available to the agency, combined with the relatively low standards of proof the judiciary normally applies to administrative decisions, makes this an especially powerful tool.

One of the by-products of effective use of recall, repair and refund requirements is the impact they can have on small businesses and on competition. The first three "substantial product hazard" cases dealt with by the CPSC demonstrate how roughly equivalent treatment of big and small firms is far more devastating to the latter than to the former.

Two of the cases dealt with products produced by corporations of moderate size: a proceeding regarding the "Mini-Mac" chain saw, manufactured by McCulloch Corporation, and a proceeding regarding Presto electric frying pans, manufactured by National Presto Industries. The third proceeding dealt with the Wel-Dex Electric Arc Welder, produced by a small Texas firm, Relco, Inc.

In all three instances the Commission sought essentially the same action: a notification of distributors and customers that the product constituted a hazard, and an agreement to repair, replace or refund, as per the provisions of the Act. The first two cases were terminated within a few months without the necessity of a formal opinion and order by the commission, as both companies agreed to undertake corrective measures acceptable to the commission.^{49/}

^{49/} Orders Terminating the Proceeding, Docket 74-1 (undated) and Docket 74-2 (May 9, 1975), CPSC.

Relco, Inc., could not agree to these corrective measures because the financial implications were too great. The defects cited by the Commission could not be repaired, and replacement or refund was financially impossible. The company estimated that, of the 200,000 units it was asked to recall, if as many as 10,000 actually were returned the company would be bankrupted.^{50/}

^{50/} Interim Decision and Initial Order, Docket 74-4, April 28, 1975, CPSC.

Nevertheless, the CPSC persisted in demanding the remedy it desired, rejecting proposals by Relco to limit the number of models to be recalled.

A small firm, producing only a few models in its product line, is more vulnerable to any kind of action against it with respect to either regulatory intervention or civil liability actions, for the penalties or damage awards are more likely to exceed its net worth. But regulation is more threatening because of the lower standards of proof. In the Wel-Dex case, Relco could not have been found

liable for anything, for none of the 200,000 welders that it had sold had been known to cause a single injury. The basis of the CPSC decision was not any actual accidents, but an engineering study that pointed out several design features of the device that could cause injury.

In principle, the consequence of numerous enforcement actions like that against Relco would reduce competition by winnowing out small firms. In practice, agencies have not imposed a large enough number of bankrupting penalties to make their actions constitute more than very infrequent, if random and arbitrary, events.

While compliance activities can be the result of citizen complaints, the primary method of enforcing safety standards is through on-sight inspections of randomly-selected business establishments. All safety regulatory agencies suffer to varying degrees from two difficulties in undertaking enforcement activities: the problem of identifying sites to inspect and the paucity of inspectors.

Business firms do not have to report to the relevant safety regulatory agencies that they intend to enter a business that might be of interest to the regulators. Consequently, one of the main tasks of enforcement officers is to identify firms in the industries that are subject to standards. This can present major problems if, as is the case with food regulation by the FDA, the number of plants is large and unstable.

Despite relatively large budgets for enforcement in the safety regulatory agencies, field enforcement staffs are still small. OSHA, for example, has the largest enforcement budget of all safety regulatory agencies, but has fewer inspectors than some of the insurance companies that sell Workman's Compensation insurance, even though it is

interested in a broader range of occupational safety problems than are covered by Workman's Compensation and has a bigger enforcement problem than insurers do.

A central problem for regulators is how to allocate enforcement personnel. One element of the decision has to do with the distribution of inspections by size of firm. OSHA has attempted to spread its resources over both small and large establishments. Table 7 shows the division of initial inspections made between July 1972 and May 1974 according to the size of the establishment. The OSHA field operations manual sets out the procedure for choosing industries to inspect. The directed procedure is, first, to select target counties within the region, and then to inspect at least one small and one large establishment from each two-digit SIC code group in the general industry categories. Based on the inspection history to date, a large plant is likely to be visited by an OSHA inspector once every ten years, while small plants are visited even less frequently.

The infrequency of inspections blunts the effectiveness of enforcement as an incentive to comply. Equally important are the minimal consequences of being found out of compliance. From July 1972 to March 1974, OSHA cited 364,955 safety violations. Table 8 shows the distribution of violations by severity and the remarkably small penalties that have been imposed. The National Association of Manufacturers has developed some crude estimates of the costs of complying with OSHA standards, which are shown in Table 8. The small size of fines, the infrequency of inspections and the fairly steep compliance costs make compliance worthwhile only if an employer expects to be cited for several hundred willful, repeat or imminent danger violations when the inspector finally arrives.^{51/}

^{51/} If a large plant is inspected once every ten years, the annualized expected cost of a willful violation is \$110.40. If the complying safety equipment costs \$350,000, the equipment lasts twenty years, and the firm can borrow funds for purchasing the equipment at nine percent interest, the annualized cost of compliance is about \$80,500. Dividing the latter by the former, a firm must expect more than 700 citations when the inspector finally arrives in order for the compliance actions to be worth taking.

Anything less and it is cheaper to avoid compliance and pay the fines when one is caught. Since the total number of citations in this category during the first twenty months of OSHA's inspection program was only 532, it is safe to conclude that OSHA does not provide much of an incentive to improve occupational safety. Of course, the ineffectiveness of OSHA's enforcement system to produce an incentive for compliance is not particularly important if, as argued above, the standards are not rigorous enough to have much of an effect on job-related accidents and illnesses or are developed primarily in areas where standard-setting has the lowest pay-off.

CONCLUSIONS

The preceding analysis leads to both positive and negative conclusions about the present system of safety regulation. On the positive side, it is clear that there are indeed occasions when efficient governmental intervention in the form of standard-setting regulation is called for. On the negative side, the existing safety regulatory agencies, to the extent that they follow the patterns of CPSC and OSHA, are not designed to deal effectively with the very types of cases in which standards are most appropriate.

TABLE 7

OSHA CITATIONS, JULY 1972-MARCH 1974

Category	Number of Citations	Average Fine
Non-serious	360,102	\$ 16
Serious	4,330	\$ 648
Willful, repeat, or imminent danger	523	\$1,104
Total	364,955	\$ 25

Willful and repeat violations can be either serious or non-serious.

Source: Senate Hearings, p. 967.

TABLE 8
OSHA INITIAL INSPECTIONS FROM JULY 1972
TO MAY 1974 BY SIZE OF ESTABLISHMENT

<u>Number of employees</u>	<u>Inspections</u>	
	<u>Number</u>	<u>Percent</u>
to 15	32,184	39
to 25	9,138	11
and over	40,660	50
Total	81,982	100

Source: Senate Hearings, p. 976

TABLE 9
COST OF COMPLIANCE WITH OSHA STANDARDS

<u>Number of Employees</u>	<u>Cost of Compliance</u>
1 to 100	\$ 35,000
101 to 500	73,500
501 to 1,000	350,000

Source: Robert Steward Smith, The Occupational Safety and Health Act: Its Goals and Achievements, American Enterprise Institute, Washington, D.C., 1976, p. 62.

When targets are well chosen, safety regulatory agencies can be effective. The development of mandatory standards for baby cribs illustrates safety regulation at its best, and is instructive in that it demonstrates how a sensible regulatory process works.^{52/}

^{52/} Much of the following analysis is from Kelman, *op. cit.*, pp. 84-6.

In 1968, a Presidential commission discovered that the spacing between the slats of baby cribs was sufficiently wide that, under certain conditions, the entire body of a baby could slip between the slats until stopped by its skull. The baby would then strangle itself as it hung outside the crib.

The crib problem had two features. First, no one was collecting data in a fashion that would enable anyone -- the government or the industry -- to be aware of the problem, and accidents were too infrequent for the press and consumers to have become alerted to it. Second, once the problem was recognized, no one knew what kind of safety standard would deal with it effectively.

The problem was next addressed by the trade association of crib manufacturers. Without benefit of any systematic analysis, the manufacturers voluntarily adopted a standard of 3.25 inches between slats, down from 3.5 inches prior to the investigation by the President's Commission. Next, the Bureau of Product Safety of the Food and Drug Administration -- a precursor of the CPSC -- commissioned a research project to measure the size of infants' buttocks as part of a larger project on various aspects of infant anthropometry. The study estimated that the buttocks of five percent of infants could be compressed by the pressure of their own weight to a diameter of 2.375 inches or less, nearly an inch

smaller than the industry standard. In April 1973, a mandatory spacing standard of 2.375 inches was adopted.

The key to the successful conclusion of the crib slat case was the role the FDA played in generating the information and analysis that made a rational design standard possible. The essence of the crib problem was the lack of understanding of the nature of the hazard by participants on both sides of the market. Once the FDA undertook to analyze the problem, the actual promulgation of mandatory standards was anticlimatic. Since the standards imposed essentially no costs on anyone and since the industry had already established procedures for voluntary adoption of crib slat spacing standards, the mandatory status of the federal standard was probably unnecessary once the basis for a rational standard had been established.

One major problem with the existing agencies is that the legislation establishing them and the budget appropriation process they undergo annually are based on an implicit model of setting standards that is at variance with that which accounts for the success of the crib slat case. The implicit assumptions underlying the legislation are: (1) that the essence of the safety problem is the presence of well-defined, clear-cut hazards to consumers and workers that can be avoided in a rather straightforward fashion; (2) that identifying a reasonably effective way of preventing them can be accomplished by a brief, cursory investigation; and (3) that the principal cause of inadequate product and occupational safety is "bad acts" by unethical businessmen. In keeping with these assumptions, agencies are pushed to develop a large number of standards, with underlying justifications that meet the relatively loose standards of proof required in administrative procedures, in a relatively short period of time.

The provision in the Occupational Safety and Health Act enabling OSHA, during its first two years, to adopt as mandatory standards the exposure limits recommended by national consensus organizations illustrates the Congressional desire for speed. When formulated, these standards were not intended to be made mandatory, nor were they designed to be universally applicable, nor were they expected to be permanent. The result of this approach to safety regulation is that the agencies have all too often set standards for what seem to be frivolous hazards. It is no accident that some of the earliest OSHA standards were on the type and location of toilets, for example, and that CPSC is busy regulating matches.

The main fallacy in the current approach is that the market and the liability system are far more likely to deal reasonably well with easily identifiable and easily avoidable hazards than with more complex hazards that are only partly understood. Trade associations, lacking due process procedural requirements, are likely to act more flexibly, more quickly, and more expertly than regulatory agencies in dealing with the first class of problems. Thus, safety regulatory agencies have been designed to focus on the issues on which they have the least to contribute.

Regulators have several different types of tasks. They are asked to be objective analysts in identifying the nature of a safety problem and its possible remedies. They are asked to be conduits of political values in deciding whether prevention of a hazard is worth doing. And they are asked to be a police force in finding bad actors who produce products that do not meet safety standards.

All this would be difficult enough, but Congress has designed the agencies so that they can not carry out any of these

activities effectively. Regulation makes the most sense in uncertain areas the private market can not handle. Yet the agencies have insufficient resources to do research, and in any event are made dependent upon industry for providing information and developing standards. The agencies are mandated to ignore economic analysis in setting priorities and developing standards, which prevents them from developing a decision-making process that would lead them to attack the problems they have the best chance of solving. Finally, in enforcement activities, the agencies are hamstrung by the procedural lethargy of regulatory processes and case law in penalizing violators.

If Congress is serious about safety regulation, it should focus regulatory activities on problems that markets are least able to solve. One step is to deemphasize regulation on mundane matters. For example, OSHA could be relieved of the responsibility of trying to prevent industrial accidents and left free to concentrate on the more complex problems of health hazards. Instead of setting standards as a means of reducing industrial accidents, either an injury tax or a strengthening of Workmen's Compensation would be at least as effective, and very likely cheaper. Even if Congress were not to entirely remove the S from OSHA, it could allocate most of the resources of the agency to health questions, saving safety efforts for exceptional circumstances.

Because markets are most likely to deal inadequately with the most complex safety issues, Congress should give agencies substantially larger research budgets. Research capacity should be in the agency, not separated as NIOSH is from OSHA, so that its activities can reflect the priorities of the regulatory authority. The research skills should include economic analysts as well as technicians, and both should be used in aiding the regulators in

setting priorities as well as developing standards. One criterion for opening a proceeding should be the leverage of the agency against the problem, which implies that an agency should be able to do considerable research on a particular hazard before formally opening a standard-setting proceeding. Hand-in-hand with a research strategy must come a relaxation of the time constraints on the standards development process.

Agencies should be encouraged to place greater reliance on informational strategies, especially the promotion of more effective voluntary standards by industry. This avoids the expense of cumbersome administrative procedures. Furthermore, it takes advantage of the greater flexibility of industry in changing standards, which is of value if growing knowledge rapidly makes each succeeding standard obsolete. Of course, because of the danger of industry capturing the coercive power of government, industry standards make sense only if they are voluntary and only if the agency has sufficient analytical capability to evaluate them.

Congress should also take a more active role in judging the manner and extent of enforcement of a standard. One approach would be for Congress to legislate fines, or ranges on fines, for various degrees of noncompliance with a standard once it is promulgated. This would enable Congress implicitly to make a judgment about how rigorously a standard should be pursued. Fines could be increased through time to provide increasing incentive to adopt preventive measures without causing immediate economic disruption. Alternatively, citizens could be offered bounties for finding firms that are not in compliance. In general, too little use has been made of incentives to obtain better safety performance.

Whether these actions would make regulation of product

and worker safety effective is surely problematical. These recommendations assume, for example, that agencies can attract and retain skilled analysts in significant numbers, and that patterns of increasing lethargy and industry-orientation that have become familiar in other regulatory agencies will not prevail in safety as well. But the preceding recommendations are necessary, if not sufficient, for effective safety regulation.