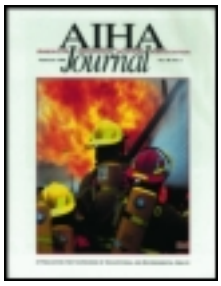

AIHAJ - American Industrial Hygiene Association
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/uaah20

Industrial Responses to Constrained OSHA Regulation

David H. Pedersen [a]

[a] Health Related Energy Research Branch, Division of Surveillance, Hazard Evaluations and Field Studies, National Institute for Occupational Safety and Health, (MS R-44) 4676 Columbia Parkway, Cincinnati, Ohio 45226

Available online: 04 Jun 2010

To cite this article: David H. Pedersen (2000): Industrial Responses to Constrained OSHA Regulation, AIHAJ - American Industrial Hygiene Association, 61:3, 381-387

To link to this article: http://dx.doi.org/10.1080/15298660008984547

Industrial Responses to Constrained OSHA Regulation

AUTHOR
David H. Pedersen

Health Related Energy Research Branch, Division of Surveillance, Hazard Evaluations and Field Studies, National Institute for Occupational Safety and Health, (MS R-44)
4676 Columbia Parkway, Cincinnati, Ohio 45226

As part of the effort to reduce the size and economic impact of the federal establishment, congressional conservatives are proposing legislation to restrict the regulatory activity of the Occupational Safety and Health Administration (OSHA). These proposals push OSHA toward a purely consultative role, at a corresponding cost in direct regulatory capability. The Clinton administration's reinvention of government initiative is also moving OSHA toward a consultative role based on a strategy of cooperative compliance or industry self-regulation with a strong coercive foundation. Since both camps appear to agree that self-regulation can assure a safe and healthy workplace, the remaining debate concerns the extent to which coercive regulation is still needed. National survey data on the industrial provision of occupational safety and health services in the manufacturing sector were used to measure changes in industrial safety and health activity between 1972–74 and 1981–83. In conjunction with data on OSHA command-and-control regulatory activity from 1972 to 1979, these data permitted an examination of the relationship between command-and-control regulatory activities and changes in industrial behavior that could be regarded as a form of self-regulation. This analysis showed that coercive regulation by OSHA in the 1970s was significantly related to industry self-regulation efforts, although the relationship varied by industrial facility employment size and type of regulatory coercion. These results indicate that coercive regulation should be retained as an industrial incentive in any self-regulation policy paradigm. The results also provide evidence that OSHA regulatory policy should be based on anticipated differences in industrial response to various coercive measures.

Keywords: OSHA, safety and health, regulatory activity

The author is a commissioned officer of the U.S. Public Health Service, currently assigned to the National Institute for Occupational Safety and Health within the Centers for Disease Control and Prevention. This research was performed as part of an outside self-supported educational activity, and the opinions and conclusions in this article are those of the author, and not those of the U.S. Public Health Service, the National Institute for Occupational Safety and Health, or the Centers for Disease Control and Prevention.

The effectiveness of the regulatory efforts of the Occupational Safety and Health Administration (OSHA) has been the subject of policy debate and research for many years. Governmental policy debates over the role of OSHA are highly visible, and academic research on OSHA regulation has created a rich body of policy literature. The net effect of all the policy debates and resulting congressional action can be viewed as a ''constrained regulation'' that may lack the resources to be truly effective[1,2] in achieving the statutory goal of a safe and healthful workplace.

Two major factors defined and encouraged this reexamination of the effects of command-and-control regulation by the Occupational Safety and Health Administration (OSHA). The first of these is the movement of OSHA away from its traditional regulatory policies as a result of political activity. The second factor is the inconclusive results of OSHA regulation studies that find OSHA to be either ineffective or a qualified success. In fact, certain of these studies have shown that the real effect of OSHA regulatory activity may have been to encourage industry self-regulation. Each of these major factors is discussed at length in the following text.

Political activity affecting OSHA includes action by both the Clinton administration and the congress. While it is still unclear whether OSHA was originally intended to accomplish its goals through direct regulatory action or through cooperative safety and health programs,[3] current political developments can be seen to be moving OSHA toward cooperative regulation, including self-regulation, and away from conventional coercive enforcement methods.[4–11]

The Clinton administration has been engaged in unprecedented executive activity as part of the ''Reinventing Government'' initiative, seeking to address the criticisms of centralized regulation[6–12]

The reinvention initiative concerning OSHA began with a White House task force report that declared the OSHA system simply did not work well enough.[13] An internal OSHA memo then outlined some of the reinvention concepts, including planned revision of the OSHA field manual, ''Forging of Partnerships'' to develop and implement safety and health training programs, and provision of incentives for voluntary abatement of hazards.[14] Specific OSHA reinvention policy initiatives have included the Maine 200 program to identify high-hazard workplaces and offer them consultative services as an alternative to traditional regulation,[15] industrial management guidelines for in-plant safety and health programs, the provision of consultative services, and the OSHA Voluntary Protection Programs.[16]

In 1994, OSHA released a draft working paper that proclaimed that the agency's mission could not be accomplished solely through enforcement action, but required other means to encourage and support voluntary efforts by employers to create safe and healthful workplaces.[17] President Clinton then announced the ''new OSHA'' in a speech that confirmed the intention to change from command-and-control regulation to an industry choice between partnership and traditional enforcement,[18] with the intent to leverage regulatory resources.[19] OSHA's high regard for this option was reflected in an expansion of the Maine 200 concept to all OSHA-regulated states as the Cooperative Compliance program,[20] which was halted by federal court action on February 16, 1998.[21] Finally, OSHA is in the process of releasing a standard that requires employers to develop a comprehensive safety and health program to identify and control workplace hazards with the active participation of the work force.[22]

All of these administration initiatives support industry self-regulation in some manner. But, despite these initiatives, the need for a continuing exercise of command-and-control coercive regulation is still being emphasized by Clinton administration officials.[23,24]

Congress has pursued deregulation by attempting to restrict conventional regulation through legislation. A number of relatively recent legislative proposals provide substantial evidence of the specific congressional desire to limit OSHA regulatory discretion. Examples of such legislation from the 104th Congress included the Ballenger bill (HR 1834), the Greg bill (S 526), the Hutchinson bill (S 592), and the Kassebaum bill (S 1423). Similar proposals in the 105th Congress included the McInnes bill (HR 2661), the Ballenger proposals (HR 2869 and 2873), the Talent bill (HR 2579), and the Enzi bill (S 1237).

Other congressional initiatives document the prevailing desire of the congress to restrict and change traditional OSHA regulatory behavior. For example, legislation in the 105th Congress codified a consultative program to help small employers comply with OSHA standards (HR 2564) and prohibited OSHA personnel job performance evaluations on the basis of citations or penalties issued (HR 2877). These measures were passed by both the House and Senate, and forwarded for presidential signature.[25] It seems likely that OSHA will respond by attempting to shift regulatory policies toward a more cooperative and consultative paradigm, especially when executive branch initiatives have similar aims.

The second major factor framing this work was the mixed outcome of previous research on OSHA regulation. Much of this research found OSHA to be marginally successful at best, and primarily measured regulatory performance by examining changes in the illness or injury rates of American workers or by assessing the extent of compliance with OSHA regulations, concluding that OSHA regulatory activity had little or no positive effect or, at best, influenced industrial compliance investments.[26–29] While these studies found little or no significant relationship between OSHA regulatory activity and positive changes in injury rates or industrial behavior, they were limited by three factors. These factors include the confounding effects of changes in workers' compensation benefits,[30] the lack of pre-OSHA data for comparison of industrial behavior before and after the initiation of OSHA regulatory activity,[31] and a reliance on data from the Bureau of Labor Statistics for dependent variables.[27,32]

Representing an opposing viewpoint, other regulatory studies found that (1) OSHA regulatory activity had a positive effect on lost workdays in plants with larger employment;[33] (2) OSHA regulatory activity in the form of citations with penalties may positively influence injury rates;[28] and (3) OSHA regulatory activity may effectively change industry behavior or stimulate cooperative industrial efforts by focusing the attention of management on safety and health issues, sometimes through inspections that result in cited violations.[5,30–32,34–37]

Available alternatives to command-and-control regulation ideally should be objectively considered prior to their implementation. Examination of the regulatory literature shows that there are at least five recognized alternatives to command-and-control regulation, including litigation,[8] taxation,[38–40] voluntary standards,[41–45] government influence,[45,46] and self-regulation.[8,11,12,45] However, previous discussion has illustrated that the current political choice of both the executive branch and the congress is self-regulation.

Finally, existing studies in the literature have suggested that OSHA regulatory activity may have a direct relationship to the establishment of industry plant-level occupational safety and health programs.[33,47] Related studies indicate that publicity surrounding OSHA regulation creates an industrial expectation of regulatory presence[26] and that firms respond to actual or anticipated OSHA presence with actions intended to bring down occupational injury rates.[28] Note, however, that these actions may not be restricted to simple compliance with immediate regulatory demands, but may lead to broader programmatic efforts to reduce hazards in the workplace, possibly including safety and health programs.[34]

On the basis of these political and research literature observations, it therefore seemed appropriate to examine the possible relationship between OSHA command-and-control regulatory activity and the retention of industry-based occupational safety and health personnel as a surrogate for industry self-regulatory activity or programs. Given current events, this investigation would be particularly significant if the relationship between command-and-control regulation and industry self-regulation shows that the willingness of industry to adopt self-imposed requirements is at least partially dependent upon the credible government exercise of coercive regulation.[5,26,28,36]

METHODS AND MATERIALS

Data Sources

Data for the industry behavior (dependent) variables that were needed to test the study hypotheses were obtained from two national surveys of the workplace by the National Institute for Occupational Safety and Health (NIOSH) in 1972–1974[48] and 1981–1983.[49] Because actual OSHA regulatory activity began only in 1972, these surveys provide data that avoid the limitations of previous OSHA studies discussed earlier, since they were gathered before and after periods of OSHA regulatory activity and

make no use of workers' compensation and Bureau of Labor Statistics information on illness and injury.

Each of these NIOSH surveys was a national-level sample of the American industrial universe by industry type (Standard Industrial Classification [SIC]) and facility-specific employment size. The 1972–74 survey, the National Occupational Hazard Survey (NOHS), contained observations in 4636 industrial facilities, while the 1981–83 National Occupational Exposure Survey (NOES) contained observations from 4490 industrial facilities.

The NOHS and the NOES were both intended to describe the extent and conditions of worker exposure to chemical, physical, and biological agents in the workplace, and to describe the safety and health efforts instituted in the workplace as a result of management decisions. Data on management-directed initiatives in safety and health used in this study were gathered through use of a standardized questionnaire instrument administered to management representatives.

Each of the NIOSH survey data files contained comparable Part I management interview responses to this standardized interview questionnaire. These responses provided data for four dependent variables: (1) industrial use of an employed (in-house) occupational health professional, (2) industrial use of an industrial hygiene consultant, (3) industrial use of an employed (in-house) safety professional, and (4) industrial use of an occupational safety consultant. Note that, by NOES definition, an in-house occupational health professional or an in-house occupational safety professional may function under a variety of professional titles, but must devote at least 50% of his or her time to the "recognition, evaluation, or control of occupational health (or safety) hazards.

Data for OSHA regulatory efforts from 1972 to 1979 were obtained by special request from the Department of Labor, OSHA.[50] The file acquired for this research consisted of all OSHA inspection records from January 1972 through June 1979. Variables selected for this study included (1) regulatory inspection frequency, (2) the number of citations for nonserious violations of regulatory standards, (3) the number of citations for serious violations of regulatory standards, (4) penalty assessment frequency, and (5) penalty amount proposed.

Research Hypotheses

A comparison of data from the two national industry surveys by NIOSH projected to the national universe after the method of Sieber[51] appeared to show that industry had increased its use of in-house and consultant occupational safety and health professionals from 1972 to 1981. This was considered to be evidence of a possible industry trend toward self-regulation, on the basis that the increased presence of safety and health professionals would normally result in programmatic safety and health activity. Based on that evidence, this study was intended to test the general hypothesis that there is a direct and measurable relationship between OSHA regulation variables (inspections and other regulatory coercion such as citations and penalties) and the industrial establishment of occupational safety and health program initiatives.

Five hypotheses were constructed:

(1) There is a direct and measurable relationship between OSHA regulatory activity and observed changes in industrial utilization of employed industrial hygiene (occupational health) personnel over time.

(2) There is a direct and measurable relationship between OSHA regulatory activity and observed changes in industrial utilization of consultant industrial hygiene personnel over time.

(3) There is a direct and measurable relationship between OSHA regulatory activity and observed changes in industrial utilization of employed safety professional personnel over time.

(4) There is a direct and measurable relationship between OSHA regulatory activity and observed changes in industrial utilization of consultant safety professional personnel over time.

(5) The employment size of a facility significantly affects the industrial response to regulatory action.

Data Analysis

Several considerations constrained the data analysis in this study. First, facility-specific analysis[26,28,52,53] was not possible due to the lack of facility-specific identification across data files, so an aggregate analysis was performed.[27,28] Second, the high degree of correlation between the independent variables (ranging from 0.82 to 0.98) made multiple regression analysis of the relationship between dependent and independent variables impossible. Therefore, analysis was restricted to (1) calculation of the correlation coefficient (r) as a measure of the strength of the linear relationship between the variables and of the positive or negative nature of that relationship, (2) calculation of the coefficient of determination (R^2) as a measure of the independent variable as a predictor of the value of the dependent variable, and (3) the standard F test for significance.

Additionally, the aggregate analysis required use of the data from both NIOSH national industry survey data files for observations of change over time for each dependent variable within a SIC.[54] Since these survey data sources were regarded as independent samples of the national universe with unknown means and variances, and no firm guidance exists on the number of individual cases necessary for each observation, a general consensus[55] suggested a minimum sample of 25 cases from each survey per observation within each SIC. This increased the available degrees of freedom in the analysis and maximized the precision of the estimated variance (the precision of the calculated change in dependent variables). In practice, these considerations meant that analysis was restricted to the two-digit SIC level within the Manufacturing sector SICs (20–39).

Differences between the coverage of the NOHS and the NOES for "small" (employing less than 200 workers) and "large" (employing 200 or more workers) facilities further restricted analysis among the 20 two-digit SICs classified as Manufacturing. Two similar subfiles were created from each survey database, consisting of small or large plant data.

Under the 25 cases procedure, analysis of the small facility universe was possible for 17 of the 20 Manufacturing SICs (all but SIC 21, Tobacco Manufactures; SIC 29, Petroleum Refining; and SIC 31, Leather and Leather Products). Analysis of the large facility universe was possible for 10 of the 20 Manufacturing SICs (missing the same three SICs as the small facilities, plus SIC 22, Textile Mill Products; SIC 23, Apparel Products; SIC 24, Lumber and Wood Products; SIC 25, Furniture and Fixtures; SIC 26, Paper and Allied Products; SIC 32, Stone, Clay, and Glass Products; and SIC 39, Miscellaneous Manufacturing).

Operationalization of Variables

A total of four dependent variables and five independent variables were constructed for this study. The dependent variables, which describe the use of consultant or employed safety or health professionals, were operationalized by calculating the proportion of observed industrial facilities for each of the 20 Manufacturing SICs for each time frame (1972–74 and 1981–83), and subtracting the observed 1972–74 percentage of facilities from the 1981–

TABLE I. Analysis Results from Manufacturing Facilities Employing Fewer than 200 Workers

Variable		INSPECT	NSVIOL	SERVIOL	PENALTY	PENAMT
EMPL.IH	r	.1941	.0825	.3787	.1359	.4551
	R^2	.0377	.0068	.1434	.0185	.2072
	sig. F	.4553	.7528	.1339	.6030	.0664
CONS.IH	r	.2809	.1391	.3318	.1966	.3106
	R^2	.0789	.0194	.1101	.0386	.0965
	sig. F	.2747	.5944	.1933	.4496	.2250
EMPL.SAF	r	.5947*	.5192*	.5926*	.5364*	.6038*
	R^2	.3536*	.2695*	.3512*	.2878*	.3646*
	sig. F	.0118*	.0327*	.0122*	.0264*	.0103*
CONS.SAF	r	.2565	.2158	.1548	.2232	.0375
	R^2	.0658	.0466	.0240	.0498	.0014
	sig. F	.3203	.4055	.5530	.3891	.8864

*$P \leq .05$.

83 percentage. The dependent operational variables were therefore expressed as changes in the percentage of observed facilities within a two-digit SIC, and became (1) EMPL.IH = change in use of employed industrial hygienists; (2) CONS.IH = change in use of consultant industrial hygienists; (3) EMPL.SAF = change in use of employed safety professionals, and; (4) CONS.SAF = change in the use of consultant safety professionals.

The original OSHA data file contained certain undesired records. Only those records indicating actual regulatory compliance activity within a SIC code of 20 through 39 (Manufacturing) were retained. Further selection by facility employment size (less than 200, or 200 or more) created the file used in this research.

The five independent variables derived from the OSHA data set were standardized by using estimates of employment from the 1972–74 NOHS and 1981–83 NOES survey databases and averaging them to reflect average employment totals by SIC strata for the 1972–1983 time frame. They were also expressed as per 1000 workers employed in both the small (<200 employees) and large (200 or more employees) strata. The operationalized independent variables then became (1) INSPECT (number of inspections per 1000 workers within a SIC/size strata); (2) PENALTY (number of inspections with penalty per 1000 workers within a SIC/size strata); (3) NSVIOL (number of inspections with nonserious violations per 1000 workers within a SIC/size strata); (4) SERVIOL (number of inspections with serious violations per 1000 workers within a SIC/size strata, and (5) PENAMT (amount of proposed penalty per 1000 workers within a SIC/size strata).

RESULTS

The final results of the analysis in this study are displayed in Tables I and II. These tables present the correlation coefficients (r), coefficients of determination (R^2), and significance (F test) for each paired dependent and independent variable. Analytical results in the table matrix that are significant at $p \leq .05$ are noted by asterisks in the tables.

Fundamentally, the data displayed in Tables I and II show that there is a significant relationship between command-and-control regulatory activities and industry self-regulation. The data indicate that while there was an apparent difference in response based on employment size, companies in both employment size strata responded to regulatory pressures.

The results displayed in Tables I and II indicate different responses to OSHA regulation by small and large plants, as predicted in Research Hypothesis 5. As expected, both small and large plants appeared to respond to regulatory activity with increased safety efforts due to the preponderance of OSHA safety-related activity in the 1970s. However, it is obvious that large plants responded positively only when confronted with serious violation citations and increasing penalties, whereas small plants responded positively to all forms of regulatory action tested.

Specifically, small plants responded to OSHA regulatory activity tested by increasing their use of employed safety personnel

TABLE II. Analysis Results for Manufacturing Facilities Employing More than 200 Workers

Variable		INSPECT	NSVIOL	SERVIOL	PENALTY	PENAMT
EMPL.IH	r	.1265	−.0250	.4865	.0214	.5929
	R^2	.0160	.0007	.2195	.0005	.3516
	sig. F	.7276	.9441	.1721	.9533	.0708
CONS.IH	r	−.2986	−.1995	−.6569*	−.2488	−.6677*
	R^2	.0891	.0398	.4316*	.0619	.4459*
	sig. F	.4021	.5806	.0390*	.4881	.0349*
EMPL.SAF	r	.5085	.3329	.6707*	.4077	.6940*
	R^2	.2586	.1108	.4499*	.1663	.4816*
	sig. F	.1334	.3473	.0338*	.2422	.0260*
CONS.SAF	r	.1392	.1567	−.4075	.1340	−.5974
	R^2	.0194	.0245	.1661	.0180	.3569
	sig. F	.7014	.6656	.2424	.7210	.0682

*$P \leq .05$.

(EMPL.SAF) (significant at p = .05 or less). This confirms Hypothesis 3, but was contrary to the expectations underlying Hypothesis 4, which assumed that small plants would preferentially retain consultants (CONS.SAF) due to lower expected costs in comparison with employed safety professionals. This outcome is also in contrast to an expectation that small firms would not voluntarily cooperate with enforcement efforts due to financial constraints even when injury rates were high.[56] The data in Table I also indicate that from 26 to 36% of the observed variance in small plant use of employed safety professionals can be explained by fluctuations in OSHA regulatory activity.

In addition, there is a significant (at p = .0664) correlation between small plant employment of industrial hygienists (EMPL.IH) and the amount of regulatory penalty proposed by OSHA (PENAMT), but no significant relationship between regulatory activity and use of safety consultants (CONS.SAF). While this seems to confirm Hypothesis 1, it is counter to the economic expectations underlying Hypothesis 2, which assumed that small plants would adopt a lower cost response to regulation. A partial explanation for these unexpected findings may be that enough of the plants in the analytical data files are near the 200-employee threshold to bias the results toward responses expected of large plants and their greater economic resources. Furthermore, as previously noted, the NOES accepted a response of occupational health activity as positive if there was professional effort (50% or more of an individual's time) related to the recognition, evaluation, and control of occupational health hazards, regardless of the actual professional title involved. However, this does not automatically mean that the observed tendency for small plants to respond to any of the tested forms of OSHA activity is not true.

Table II shows that large plants appeared to respond positively only to regulatory citations for serious violations or to increased penalty amounts (significant at $p \leq .05$). These regulatory activities appear to explain from 44 to 48% of the observed variation in large plant employment of safety professionals, which was accompanied by a significant (p = .0390 or less) decrease in the use of consultant industrial hygiene professionals. These observations confirmed Hypothesis 3 regarding increased employment of safety professionals, but were contrary to Hypothesis 2 regarding increased use of industrial hygiene consultants as a lower cost response to regulation.

This limited large plant response to regulatory presence may be a function of economic size (small penalties don't mean much) and the availability of greater in-house expertise due to greater economic capability. These factors could understandably lessen the impact of implied or minimal regulatory threats such as inspection frequency, nonserious citations, or smaller penalties.

The Table II data also point out other significant correlations that show that large plants may have reacted to regulatory actions by simultaneously increasing their use of employed safety personnel and decreasing their reliance on consultant industrial hygienists (note the negative correlation coefficients and significant R^2 values [$p \leq .05$] for consultant industrial hygienists). The data also indicate that regulatory activity accounts for over 40% of the observed variance in on-site safety professional employment. And, regulatory activity (serious safety violations or increased regulatory penalties only) appears to account for nearly half (R^2 = .4499 to .4816) of the variance in large facility use of employed safety professionals (significant at p = .0260 to .0338). It is also interesting to note that small plants in this study duplicated the large plant tendency to employ industrial hygienists when confronted with increased penalties, although these results were not significant at quite the same levels (p = .06 to .07). This result may be due to the higher proportion of OSHA safety inspections compared with health inspections from 1972–1979, as discussed elsewhere.

DISCUSSION

The research hypotheses tested assumptions that industry would respond to traditional command-and-control regulation by initiating safety and health efforts by professional personnel, which was viewed as a surrogate for safety and health program activity. The research outcome can reasonably be viewed as an endorsement of current OSHA policy initiatives directed at encouraging self-regulation, which include the Voluntary Protection Programs, the Cooperative Compliance program, and the pending safety and health program standard.

Conversely, the research also provides evidence that, if the resources allocated to enforcement activity drop below the levels seen in the 1970s (adjusted for changes in the facility universe from the 1970s to the present), regulation may not foster industry efforts at self-regulation.[31,32] This argues against unconsidered cuts in allocations for traditional enforcement activity, as does other recent research.[57]

The research evidence showing that the effects of regulatory presence varies by the employment size of business suggests that different enforcement and consultative strategies must be employed by OSHA for different employment size strata, echoing the conclusions of other analysts.[58] For example, based on the significant response of small business to all of the tested forms of regulatory presence, the provision of consultative activity may be a more efficient form of regulation for small business than the more resource-consuming traditional inspection. Continuation of this small business sensitivity to OSHA presence may be heavily dependent on maintenance of a credible traditional enforcement effort, given the natural inclination to be unresponsive to regulatory demands.[59] This is particularly relevant to regulatory success, since conventional direct regulation of small plants is a literal impossibility, given the number of such plants and expected OSHA enforcement resources.

Conversely, the research showed that inspection activity in larger and potentially uncooperative plants resulted in change only in the case of serious violations and/or increasing penalty amounts, which are characteristic of coercive regulation. This indicates that such regulatory resources should be concentrated in larger plants, especially since conventional regulation of conditions in larger plants is more efficient if measured by the number of workers covered per inspection.

Finally, in demonstrating the safety-oriented reaction of industry to the predominately safety-related inspection[60] activities (82.4% of the 199,700 OSHA inspections considered in this research) of OSHA in the 1970s, the analysis also indicates that industry, regardless of employment size, is sensitive to regulatory emphasis. This stresses that clearly stated OSHA policy expectations, accompanied by uniformity of field application across OSHA field offices, is critical to the achievement of regulatory goals.

FUTURE RESEARCH

The aggregate analysis performed in this study addressed industry at a somewhat crude level. Additional data would make it possible to perform an improved analysis at more detailed levels of industry, pointing out differences in response to regulatory demands between industries that may be masked by the two-digit

SIC approach. It is possible that current large-scale industry surveys being conducted by OSHA,[61] in conjunction with new data from the OSHA Management Information System, will provide the data for improved analyses. Such an analysis might also help determine the "critical level" of enforcement activity that marks the point at which the implied threat of regulatory sanctions is no longer an inducement for industry cooperation and self-regulation.

And, since it has been recognized that facility employment size is an important factor in regulation of the workplace, future research could be directed at the employment size variable and its role in determining industrial response to OSHA regulatory demands within specific industries. Additionally, research could determine whether employment size as a variable in regulatory response is simply a surrogate for economic capability to respond to requirements, for working environment complexity, for expected occupational safety and health awareness at the facility level, or for a combination of these and other factors.

REFERENCES

1. Current OSHA inspection rate once every 109 years, AFL-CIO says. *Occup. Safety Health News 27*:1663–1664 (1998).
2. **Executive News Service:** Senate bill to improve worker safety and health receives AIHA praise. Article 1849. October 23, 1997. [Online]
3. **U.S. House of Representatives:** House Report No. 91-1291, p. 19, 1970.
4. **Rees, J.:** *Reforming the Workplace*. Philadelphia: University of Pennsylvania Press, 1988.
5. **Rees, J.:** Self-regulation: An effective alternative to direct regulation by OSHA? *Pol. Stud. J. 16*:602–614 (1988).
6. **Scholz, J.T.:** Voluntary compliance and regulatory enforcement. *Law Policy 6*:385–404 (1984).
7. **Bardach, E., and R.A. Kagan:** Conclusion: Responsibility and accountability. In E. Bardach and R.A. Kagan (eds.), *Social Regulation: Strategies for Reform*. San Francisco: Institute for Contemporary Studies, 1982.
8. **Bardach, E., and R.A. Kagan:** *Going by the Book: The Problems of Regulatory Unreasonableness.* Philadelphia: Temple University Press, 1982.
9. **Nonet, P., and P. Selznick:** *Law and Society in Transition: Towards Responsive Law.* New York: Harper, 1978.
10. **Bacow, L.S.:** Private bargaining and public regulation. In E. Bardach and R.A. Kagan (eds.), *Social Regulation: Strategies for Reform*. San Francisco: Institute for Contemporary Studies, 1982.
11. **Grumbly, T.P.:** Self-regulation: private vice and public virtue revisited. In E. Bardach and R.A. Kagan (eds.), *Social Regulation: Strategies for Reform*. San Francisco: Institute for Contemporary Studies, 1982.
12. **Scholz, J.T.:** Cooperation, deterrence, and the ecology of regulatory enforcement. *Law Soc. Rev. 18*:179–204 (1984).
13. **Minter, S.:** Gore's carrot and OSHA's stick. *Occ. Haz.* 55(10):6 (1993).
14. **Occupational Safety and Health Administration (OSHA):** "Internal Memorandum on Fiscal Year 1994 OSHA Goals." October 4, 1993. D. Zeigler, OSHA Office of Public Affairs, Washington, D.C.
15. Spotlight: Dear sets new course for OSHA. *Safety Health 149*(2):30–33 (1994).
16. **U.S. Department of Labor:** *Industrial Hygiene* (OSHA doc. 3143). 1994. Document available from OSHA, Office of Public Affairs, Room N3147, 200 Constitution Ave. SW, Washington, DC 20210.
17. Revised field operations manual completed; Compliance officers given greater autonomy. *Occup. Safety Health Rep. 24(18)*:502 (1994).
18. **Clinton, W., and A. Gore:** The New OSHA: Reinventing Worker Safety and Health. February 21, 1995. [Speech]
19. Maine 200 program hailed by Dear; OSHA gets presidential reinvention award. *Labor Daily* (3 August 1995).
20. OSHA's Cooperative Compliance Programs expanded nationwide, Herman announces. *Labor Daily* (26 November 1997).
21. **Szeckely, P.:** Court halts U.S. worker safety agency's program. *Reuters News Service*. February 18, 1998. [Online]
22. **Collins, M.:** OSHA's safety and health program standard. *The Synergist 9(4)*:24–26 (1998).
23. **Reich, R.B.:** "Recognition Plus Influence Equals Opportunity." Speech presented at the American Industrial Hygiene Conference and Exposition, Washington, D.C., May 21, 1996.
24. **Jeffress, C.N.:** "Action Through Partnership—Your Profession." Speech presented at the American Industrial Hygiene Conference and Exposition, Atlanta, Ga., May 12, 1998.
25. **Executive News Service**: President Clinton urged to sign important OSHA bills. Article 1344. July 1, 1998.
26. **Viscusi, W.K.:** The impact of occupational safety and health regulation. *Bell J. Econ. 10*:117–140 (1979).
27. **Bartel, A.P., and L.G. Thomas:** Direct and indirect effects of regulation: A new look at OSHA's impact. *J. Law Econ. 28*:1–25 (1985).
28. **Scholz, J.T., and W. Gray:** A behavioral approach to compliance: OSHA enforcement's impact on workplace accidents. *J. Risk Uncertainty 3*:283–305 (1990).
29. **Lanoie, P.:** The impact of occupational safety and health regulation on the risk of workplace accidents: Quebec, 1983–1987. *J. Hum. Resources 27*:643–660 (1990).
30. **McCaffrey, D.P.:** An assessment of OSHA's recent efforts on injury rates. *J. Hum. Resources 18*:131–146 (1983).
31. **Ruser, J.W., and R.S. Smith:** Reestimating OSHA's effects: Have the data changed? *J. Hum. Resources 26*:212–235 (1991).
32. **Siskind, F.B.:** *Compliance with Standards, Abatement of Violations, and Effectiveness of OSHA Safety Inspections* (Technical analysis paper 62). Washington, D.C.: U.S. Department of Labor, 1980.
33. **Cooke, W.N., and F.H. Gautschi III:** OSHA, plant safety programs, and injury reduction. *Ind. Rel. 20*:245–257 (1981).
34. **Gray, W.B., and J.T. Scholz:** Does regulatory enforcement work? A panel analysis of OSHA enforcement. *Law Soc. Rev. 27*:177–213 (1993).
35. **Weil, D.:** If OSHA Is so bad, why is compliance so good? *Rand J. Econ. 27*:618–640 (1996).
36. **Scholz, J.T.:** Cooperative Regulatory enforcement and the politics of administrative effectiveness. *Am. Pol. Sci. Rev. 85*:115–136 (1981).
37. **Viscusi, W.K.:** *Fatal Tradeoffs: Public and Private Responsibilities for Risk.* New York: Oxford Press, 1992.
38. **Samuels, W.J., and A.A. Schmidt:** Polluters' profit and political response: The dynamics of rights creation. *Pub. Choice 28*:99–105 (1976).
39. **Mitnick, B.M.:** *The Political Economy of Regulation*. New York: Columbia University Press, 1980.
40. **Zeckhauser, R.:** Procedures for valuing lives. *Pub. Pol. 23*:419–464 (1975).
41. **Mendeloff, J.:** *Regulating Safety: An Economic and Political Analysis of Occupational Safety and Health Policy.* Cambridge, MA: MIT Press, 1979.
42. **Kelman, S.:** Occupational safety and health administration. In J.Q. Wilson (ed.), *The Politics of Regulation*. New York: Basic Books, 1980.
43. **Mintz, B.W.:** *OSHA: History, Law, and Policy.* Washington, D.C.: BNA Books, 1984.
44. **Mintz, B.W.:** History of the Occupational Safety and Health Administration. In *Fundamentals of Industrial Hygiene,* 4th ed., Barbara A. Plog (ed.). Itasca, Ill.: National Safety Council, 1995.
45. **Baram, M.:** *Alternatives to Regulation: Managing Risks To Health, Safety, and the Environment*. Lexington, MA: D.C. Heath and Co., 1982.
46. **Nichols, A., and R. Zeckhauser:** Government comes to the workplace: An assessment of OSHA. *Pub. Int. 49*:39–69 (1977).
47. **McCaffrey, D.P.:** An assessment of OSHA's recent efforts on injury rates. *J. Hum. Resources 18*:131–146 (1983).
48. **National Institute for Occupational Safety and Health (NIOSH):**

National Occupational Hazard Survey (DHEW [NIOSH] Publication Nos. 74–127, 77–123, and 78–114). Washington, D.C.: U.S. Department of Health, Education, and Welfare, 1974, 1977, 1978.

49. **National Institute for Occupational Safety and Health (NIOSH):** *National Occupational Exposure Survey* (DHHS [NIOSH] Publication Nos. 88–106, 89–102, 89–10). Washington, D.C.: U.S. Department of Health and Human Services, 1988, 1990.
50. **DuBois, J.:** "Request for OSHA Inspection Data." May 15, 1994. [Personal Communication] Occupational Safety and Health Administration, Division of Data Analysis, Room N3507, 200 Constitution Ave. SW, Washington, DC 20210.
51. **Sieber, W.K., Clement, J.D., Venable, H.L., and Pedersen, D.H.:** "Trends in the Provision of Blood Tests by Industry." Presentation at the Symposium on Statistical Methods for Intervention and Prevention Strategies, Atlanta, Ga., December 4, 1990.
52. **Smith, R.S.:** *The Occupational Safety and Health Act: Its Goals and Its Achievements.* Washington, D.C.: American Enterprise Institute, 1976.
53. **Smith, R.S.:** The impact of OSHA implementation on manufacturing injury rates. *J. Hum. Resources 14*:145–170 (1979).
54. **Office of Management and Budget:** *Standard Industrial Classification Manual.* Springfield, Va., National Technical Information Service, 1987.
55. **Blalock, H.M.:** *Social Statistics,* 2nd ed. New York: McGraw-Hill, 1979.
56. **Haines, F.:** *Corporate Regulation: Beyond "Punish or Persuade."* Oxford, UK: Oxford University Press, 1997.
57. **McQuiston, T., R. Zakocs, and D. Loomis:** The case for stronger OSHA enforcement—evidence from evaluation research. *Am. J. Pub. Health 88*:1022–1024 (1998).
58. **Ayres, I., and J. Braithwaite:** *Responsive Regulation: Transcending the Deregulation Debate.* New York: Oxford University Press, 1992.
59. **Shapiro, S.A., and R.S. Rabinowitz:** Punishment versus cooperation in regulatory enforcement: A case study of OSHA. *Admin. Law Rev. 49*:713–762 (1997).
60. **Pedersen, D.H.:** "Regulation Under Constraint: Occupational Health Regulation as a Private Sector Incentive." PhD diss., University of Cincinnati, Cincinnati, Ohio, 1996.
61. OSHA revises survey to gather injury data from 80,000 employers. *Labor Daily* (27 February, 1997).