Environmental Protection and Economic Well-Being:

How Does (and How Should) Government Balance These Two Important Values?

Robert N. Stavins

2003

RPP-2003-09

Regulatory Policy Program

Center for Business and Government
John F. Kennedy School of Government
79 John F. Kennedy Street, Weil Hall
Cambridge, MA 02138

Citation

This paper may be cited as: Stavins, Robert N. 2003. "Environmental Protection and Economic Well-Being: How Does (and How Should) Government Balance These Two Important Values?" Regulatory Policy Program Working Paper RPP-2003-09. Cambridge, MA: Center for Business and Government, John F. Kennedy School of Government, Harvard University. Comments may be directed to the authors.

Regulatory Policy Program

The Regulatory Policy Program at the Center for Business and Government provides an environment in which to develop and test leading ideas on regulation and regulatory institutions. RPP's research aims to improve the global society and economy by understanding the impacts of regulation and creating better decisions about the design and implementation of regulatory strategies around the world. RPP's efforts are organized around the following three core areas: regulation, markets, and deregulation; regulatory instruments; and regulatory institutions and policymaking.

For Further Information

Further information on the Regulatory Policy Program can be obtained from the program's director, Jennifer Nash, Center for Business and Government, John F. Kennedy School of Government, 79 JFK Street, Cambridge, MA 02138, telephone (617) 384-7325, telefax (617) 496-0063, Email jennifer_nash@ksg.harvard.edu.

ENVIRONMENTAL PROTECTION AND ECONOMIC WELL-BEING: HOW DOES (AND HOW SHOULD) GOVERNMENT BALANCE THESE TWO IMPORTANT VALUES?

Robert Stavins*

The conference organizers have asked us to "tackle the critical conundrum" — how business, government, and communications media balance the competing values of economic growth and a healthy environment. In a sense, my focus is narrower, because I concentrate exclusively on *government* policy, and ask how government integrates economic concerns into its development of environmental policies. But in another sense, my focus is broader, because I also ask whether and how government *should* carry out such integration of economic and environmental concerns.

In this brief paper, I consider two dimensions of environmental policy, which are closely interrelated but conceptually distinct: (1) what is the appropriate (and actual) *degree* of government activity; and (2) what *form* should (and does) government activity take.[1] In this brief essay, I attempt to define the scope of these questions, and suggest criteria that can be used to evaluate responses.

1. WHAT IS THE APPROPRIATE DEGREE OF GOVERNMENT ACTIVITY IN THE ENVIRONMENTAL REALM?

The fundamental theoretical argument for government activity in the environmental realm is that pollution is a classic example of an externality (an unintended consequence of market decisions, which affects individuals other than the decision maker). Because firm-level decisions do not take into account full social costs, pollutant emissions tend to be higher than socially optimal levels. As environmental quality is thus naturally under-provided by competitive markets, a possible role arises for government regulation. Private negotiation will not internalize such externalities adequately without government intervention, and exclusive reliance on judicial remedies is

---

*Albert Pratt Professor of Business and Government, John F. Kennedy School of Government, and Director, Environmental Economics Program at Harvard University; and University Fellow, Resources for the Future. Helpful comments on a previous version of this paper were provided by Katharine Emans. The author is responsible for any and all remaining errors.

[1]There is a third important dimension of the role of government. What *level* of government should be delegated responsibility and authority: local, state, regional, Federal, multinational, or global? There is, of course, no general answer. The answer will depend upon specific characteristics of individual environmental policy issues. The debates on this question have often been analytically flawed. For clarification, see: Revesz 1997.

insufficient to the task.[2] Hence, since the time of the first Earth Day in 1970, which we may take as the beginning of the modern era of environmental policy, industrialized countries throughout the world have relied mainly upon a combination of legislative and administrative procedures to foster improvements in their natural environments.

If it is appropriate for government to be involved in environmental protection, how intensive should that activity be? In real-world environmental policy, this question becomes, "How stringent should our environmental goals and standards be?" For example, in the United States, should we cut back sulfur dioxide (SO_2) emissions by 10 million tons, or would a 12 million ton reduction be better? In general, how clean is clean enough? How safe is safe enough?

Most economists would argue that economic efficiency — measured as the difference between benefits and costs — ought to be one of the major criteria for evaluating proposed environmental, health, and safety regulations.[3] Because society has limited resources to spend on regulation, benefit-cost analysis can help illuminate the trade-offs involved in making different kinds of social investments. In this regard, it seems irresponsible *not* to conduct such analyses, since they can inform decisions about how scarce resources can be put to the greatest social good. Benefit-cost analysis can also help answer the question of how much regulation is enough. From an efficiency standpoint, the answer to this question is simple — regulate until the incremental benefits from regulation are just offset by the incremental costs. In practice, of course, the problem is much more difficult, in large part because of inherent challenges in measuring marginal benefits and costs. But the fact that we are unable to measure benefits and costs with perfect precision ought not be taken as a compelling argument to abandon such analytical methods altogether, lest we allow the perfect to be the enemy of the good.

Concerns about "fairness" (distributional equity) also merit serious consideration. Regulatory policies inevitably involve winners and losers, even when aggregate benefits exceed aggregate costs. For this reason, assessments of the distributional implications of public policies should be (and in recent years typically are) carried out, at the same time as assessments of aggregate benefits and costs.[4] Beyond efficiency and distributional equity, non-economic factors — such as those regarding *process* — can also be of key importance. The general view from economics is that other criteria in addition to efficiency can and should be employed by policy makers, but that the existence of such criteria does not invalidate the efficiency criterion, which should remain part of social decision-making.

---

[2]Externalities in the environmental realm are *not* bilateral, but involve public goods with multi-party impacts. Transaction costs and third-party impacts preclude the possibility of private negotiation leading to simple, efficient solutions (Coase 1960). For largely the same reasons, private tort litigation — with its considerable transaction costs — will not solve the bulk of environmental problems.

[3]See: Arrow, Cropper, Eads, Hahn, Lave, Noll, Portney, Russell, Schmalensee, Smith, and Stavins (1996).

[4]During the 1990s, equity concerns played increasing roles in environmental policy debates (Hahn, Olmstead, and Stavins 2003). President Clinton's Executive Order 12866 was the first among the series of Presidential executive orders dealing with regulatory analysis to include distributional concerns. Also, the "property rights movement" in the western United States was fundamentally about the distribution of regulatory costs (particularly in the context of the Endangered Species Act and wetlands regulation under Section 404 of the Clean Water Act).

There is little doubt that a reallocation of expenditures on environmental, health, and safety regulations has the potential to save significant numbers of lives while using fewer resources. As seen in Table 1, the estimated cost per statistical life saved has varied across regulations by a factor of more than a million! Thus, a reallocation of priorities among these same regulations could save many more lives at given cost, or, alternatively, save the same number of lives at much lower cost.

Over the years, policy makers have sent mixed signals regarding the use of benefit-cost analysis in policy evaluation. Congress has passed several statutes to protect health, safety, and the environment that effectively preclude the consideration of benefits and costs in the development of certain regulations, even though other statutes actually require the use of benefit-cost analysis.[5] But this has not prevented regulatory agencies from considering the benefits and costs of their regulatory proposals. Otherwise, what are all those lobbyists doing at EPA headquarters?[6] The problem with such informal, implicit benefit-cost analysis is that it can be unsystematic, not subject to peer review, and carried out behind closed doors, with access limited to the particular friends of the administration. Thus, we ought to be concerned about this approach not only on technical grounds (poor analysis), but on process grounds — it is fundamentally undemocratic.

At the same time as Congress has sent mixed signals regarding the use of economic analysis in environmental policy assessment, Presidents Carter, Reagan, Bush, Clinton, and Bush all introduced formal processes for reviewing economic implications of major environmental, health, and safety regulations (using so-called Regulatory Impact Analysis). Apparently the Executive Branch, charged with designing and implementing regulations, has seen a greater need than the Congress to develop a yardstick against which the efficiency of regulatory proposals can be assessed; benefit-cost analysis has been the yardstick of choice.

Although formal benefit-cost analysis should *not* be viewed as either necessary or sufficient for designing sensible public policy, it can provide an exceptionally useful framework for consistently organizing disparate information, and in this way, it can greatly improve the process and hence the outcome of policy analysis. If properly done, benefit-cost analysis can be of great help to agencies participating in the development of regulations, and it can likewise be useful in evaluating agency decision making and in shaping statutes.

Despite such arguments, formal benefit-cost analysis has only infrequently been used to help set the stringency of environmental standards. The politics of environmental policy have favored a very different set of approaches to setting standards, such as that embraced by the Clean Air Act: set the standard to "protect the most sensitive member of the population with an adequate margin

---

[5]Statutes that have been interpreted (in part, at least) to restrict the ability of regulators to consider benefits and costs include: the Federal Food, Drug, and Cosmetic Act; health standards under the Occupational Safety and Health Act; safety regulations from National Highway and Transportation Safety Agency; the Clean Air Act; the Clean Water Act; the Resource Conservation and Recovery Act; and the Comprehensive Environmental Response, Compensation, and Liability Act. On the other hand, parts of the Clean Water Act, the Consumer Product Safety Act, the Toxic Substances Control Act, the Federal Insecticide, Fungicide, and Rodenticide Act, and the Safe Drinking Water Act explicitly allow or require regulators to consider benefits and costs.

[6]More importantly, there is rigorous, empirical evidence that agencies take into account benefits and costs of regulatory decisions, even when governing statutes do not encourage or allow such analysis to affect decisions. See, for example: Cropper *et al.* 1992.

of safety." Economists and legal scholars have spent a great deal of time arguing that such criteria are neither reasonable nor well defined, but little change has occurred. The significant heterogeneity of costs per life saved under existing statutes, portrayed in Table 1, suggests that in the absence of a benefit-cost test aimed at achieving efficiency, much could be accomplished through greater attention to simple cost-effectiveness, that is, achieving given goals or standards at minimum cost.

In the 104th Congress, a major part of the Republicans' "Contract with America" was a regulatory reform August 25, 2003bill that would have made meeting a benefit-cost test a *necessary condition* for a broad set of regulatory actions. That bill was narrowly defeated in the Senate, and would have faced a certain Presidential veto, in any case.[7] Subsequently, Congress considered but did not enact legislation (introduced by former Senator Fred Thompson and Senator Carl Levin) which would have required agencies to conduct (*non-binding*) benefit-cost analyses of new regulations and periodically of existing ones. Congressional efforts at such generic "regulatory reform" are unlikely to disappear from the policy landscape, and there will continue to be attempts — sometimes successful — to introduce benefit-cost tests into individual environmental statutes.[8]

2. WHAT FORM SHOULD GOVERNMENT ACTIVITY TAKE IN THE ENVIRONMENTAL REALM?

Once the goals or standards of any given environmental policy are established (whether on political, scientific, economic, ethical, or any other grounds), policy makers are left to ask what *form* should government involvement take. In other words, what means — what policy instruments — should be used to achieve the established ends? Economists consistently have urged the use of "market-based" instruments — principally pollution taxes and tradeable permits — rather than so-called "command-and-control" instruments, such as design standards, which require the use of particular technologies, or performance standards, which prescribe the maximum amount of pollution that individual sources can emit. At least in theory, market-based instruments are cost effective, that is, they minimize the aggregate cost of achieving a given level of environmental protection, and provide dynamic incentives for the adoption and diffusion of cheaper and better control technologies. Despite these advantages, however, market-based instruments have been used far less frequently than command-and-control standards.[9]

Gradually, the political process has become more receptive to market-based instruments. Beginning in the 1970's, the U.S. Environmental Protection Agency (EPA) offered states the option of employing variants of tradeable permits for the control of localized, criteria air pollutants. More

[7]But President Clinton did sign the Small Business Regulatory Reform Act of 1996, which provides an opportunity for the Congress to pass legislation that nullifies a regulation that does not pass a benefit-cost test (the nullification itself is then subject to possible Presidential veto, like any act of Congress).

[8]Proposals for the use of a benefit-cost test for setting environmental standards have found a more receptive audience among the states. As of 1996, some 25 of 35 states surveyed reported significant environmental regulatory reform efforts, defined as including the establishment of benefit-cost criteria for promulgation of regulations (Graham and Loevzel 1997).

[9]Diverse factors have caused command-and-control instruments to so dominate environmental regulation. See: Keohane, Revesz, and Stavins (1998).

significantly, tradeable-permit systems were used in the 1980's to accomplish the phasedown of lead in gasoline, and to facilitate the phaseout of ozone-depleting chloroflourocarbons (CFC's); and in the 1990's to implement stricter air pollution controls in the Los Angeles metropolitan region, and — most important of all — to control acid rain under the Clean Air Act amendments of 1990 (Table 2). This last program — the trading of sulfur dioxide (SO_2) emissions allowances to reduce acid rain — is saving the country $1 billion per year in compliance costs, while achieving the statutory goal more quickly than could have been accomplished by a conventional approach.[10]

Given the historical lack of receptiveness by the political process to market-based approaches to environmental protection, why has there been a relatively recent rise in the use of market-based approaches?[11] It would be gratifying to believe that increased understanding of market-based instruments had played a large part in fostering their increased political acceptance, but how important has this really been? In 1981, Steven Kelman surveyed Congressional staff members, and found that support and opposition to market-based environmental policy instruments was based largely on ideological grounds: Republicans, who supported the concept of economic-incentive approaches, offered as a reason the assertion that "the free market works," or "less government intervention" is desirable, without any real awareness or understanding of the economic arguments for market-based programs. Likewise, Democratic opposition was based largely upon ideological factors, with little or no apparent understanding of the real advantages or disadvantages of the various instruments (Kelman 1981). What would happen if we were to replicate Kelman's survey today? My refutable hypothesis is that we would find increased support from Republicans, greatly increased support from Democrats, but insufficient improvements in understanding to explain these changes.[12] So what else has mattered?

First, one factor has surely been increased pollution control costs, which have led to greater demand for cost-effective instruments. By the late 1980's, even political liberals and environmentalists were beginning to question whether conventional regulations could produce further gains in environmental quality. During the previous twenty years, pollution abatement costs had continually increased, as stricter standards moved the private sector up the marginal abatement-cost function. By 1990, U.S. pollution control costs had reached $125 billion annually, nearly a 300% increase in real terms from 1972 levels (U.S. Environmental Protection Agency 1990; Jaffe, Peterson, Portney, and Stavins 1995).

Second, a factor that became important in the late 1980's was strong and vocal support from some segments of the environmental community.[13] By supporting tradeable permits for acid rain control, the Environmental Defense Fund (EDF) seized a market niche in the environmental

---

[10]For a detailed survey of the use of market-based instruments for environmental protection in the United States, as well as other nations, see: Stavins (2003).

[11]For a more thorough exploration of the answers to this question, see: Stavins (1998).

[12]But there has been some increased understanding of market-based approaches among policy makers. This has partly been due to increased understanding by their staffs, a function — to some degree — of the economics training that is now common in law schools, and the proliferation of schools of public policy (Hahn and Stavins 1991).

[13]But the environmental advocacy community is by no means unanimous in its support for market-based instruments. See, for example, Seligman 1994.

movement, and successfully distinguished itself from other groups.[14] Related to this, a third factor was that the SO_2 allowance trading program, the leaded gasoline phasedown, and the CFC phaseout were all designed to *reduce* emissions, not simply to *reallocate* them cost-effectively among sources. Market-based instruments are most likely to be politically acceptable when proposed to achieve environmental improvements that would not otherwise be feasible (politically or economically).

Fourth, deliberations regarding the SO_2 allowance system, the lead system, and CFC trading differed from previous attempts by economists to influence environmental policy in an important way: the separation of ends from means, that is, the separation of consideration of goals and targets from the policy instruments used to achieve those targets. By accepting — implicitly or otherwise — the politically identified (and potentially inefficient) goal, the ten-million ton reduction of SO_2 emissions, for example, economists were able to focus successfully on the importance of adopting a cost-effective means of achieving that goal.

Fifth, acid rain was an unregulated problem until the SO_2 allowance trading program of 1990; and the same can be said for leaded gasoline and CFC's. Hence, there were no existing constituencies — in the private sector, the environmental advocacy community, or government — for the *status quo* approach, because there was no *status quo* approach. We should be more optimistic about introducing market-based instruments for "new" problems, such as global climate change, than for existing, highly regulated problems, such as abandoned hazardous waste sites.

Sixth, by the late 1980's, there had already been a perceptible shift of the political center toward a more favorable view of using markets to solve social problems. The George H. W. Bush Administration, which proposed the SO_2 allowance trading program and then championed it through an initially resistant Democratic Congress, was (at least in its first two years) "moderate Republican;" and phrases such as "fiscally responsible environmental protection" and "harnessing market forces to protect the environment" do have the sound of quintessential moderate Republican issues.[15] But, beyond this, support for market-oriented solutions to various social problems had been increasing across the political spectrum for the previous fifteen years, as was evidenced by deliberations on deregulation of the airline, telecommunications, trucking, railroad, and banking industries. Indeed, by the mid-1990s, the concept (or at least the phrase), "market-based environmental policy," had evolved from being politically problematic to politically attractive.

Seventh and finally, the adoption of the SO_2 allowance trading program for acid rain control — like any major innovation in public policy — can partly be attributed to a healthy dose of chance that placed specific persons in key positions, in this case at the White House, EPA, the Congress,

---

[14]When the memberships (and financial resources) of other environmental advocacy groups subsequently declined with the election of the environmentally-friendly Clinton-Gore Administration, EDF continued to prosper and grow (Lowry 1993). In 2003, the World Resources Institute was alone among environmental advocacy groups to support the George W. Bush administration's water quality trading policy.

[15]The Reagan Administration enthusiastically embraced a market-oriented ideology, but demonstrated little interest in employing actual market-based policies in the environmental area. From the Bush Administration through the Clinton Administration, interest and activity regarding market-based instruments — particularly tradeable permit systems — continued to increase, although the pace of activity in terms of newly implemented programs declined during the Clinton years, when a considerable part of the related focus was on global climate policy (Hahn, Olmstead, and Stavins 2003).

and environmental organizations.[16] The result was what may remain the golden era in the United States for market-based environmental strategies.

3. OUTLOOK

Despite the arguments made for decades by economists and many others, there seems to be little political support in the United States for broader use of benefit-cost analysis to assess proposed or existing environmental regulations. These analytical methods remain on the periphery of policy formulation. As long as leaders on both sides of the debates in the policy community continue to react on ideological bases to proposals for such "regulatory reform," the status quo is unlikely to change.[17] Perhaps the significant changes that have taken place over the past twenty years with regard to market-based environmental policy instruments can provide a model for progress.

Certainly the change has been dramatic. Market-based instruments have moved center stage, and policy debates today look very different from those twenty years ago, when these ideas were routinely characterized as "licenses to pollute" or dismissed as completely impractical.[18] Market-based instruments are considered seriously for each and every environmental problem that is tackled, ranging from endangered species preservation to regional smog to global climate change (Stavins 1997). It is reasonable to anticipate that market-based instruments will enjoy increasing acceptance in the years ahead.

Of course, no particular form of government intervention, no individual policy instrument — whether market-based or conventional — is appropriate for all environmental problems. Which instrument is best in any given situation depends upon a variety of characteristics of the environmental problem, and the social, political, and economic context in which it is being regulated. There is no policy panacea. But economic instruments are now part of the available policy portfolio, and ultimately that is good news both for environmental protection and economic well-being.

---

[16]Within the White House, among the most active and influential enthusiasts of market-based environmental instruments were: Counsel Boyden Gray and his Deputy John Schmitz, Domestic Policy Adviser Roger Porter, Council of Economic Advisers (CEA) Member Richard Schmalensee, CEA Senior Staff Economist Robert Hahn, and Office of Management and Budget Associate Director Robert Grady. At EPA, Administrator William Reilly — a "card-carrying environmentalist" — enjoyed valuable credibility with environmental advocacy groups; and Deputy Administrator Henry Habicht and Assistant Administrator for Air and Radiation William Rosenberg were key, early supporters of market-based instruments. In the Congress, Senators Timothy Wirth and John Heinz provided high-profile, bi-partisan support for the SO_2 allowance trading system and, more broadly, for a wide variety of market-based instruments for environmental problems through their "Project 88" (Stavins 1988). And, finally, in the environmental community, EDF Executive Director Fred Krupp, Senior Economist Daniel Dudek, and Staff Attorney Joseph Goffman worked closely with the White House to develop the initial allowance trading proposal.

[17]There continues to be more rhetoric than understanding about what is really entailed in an economic perspective of environmental problems. For a response to the "straw men" frequently set up and attacked by those hostile towards an economic viewpoint, see: Fullerton and Stavins (1998).

[18]Although such ethical objections to the use of market-based environmental strategies have greatly diminished, they have by no means disappeared (Sandel 1997).

TABLE 1: COSTS OF SELECTED ENVIRONMENTAL, HEALTH, AND SAFETY REGULATIONS THAT REDUCE MORTALITY RISKS

Regulation	Year Issued	Agency	Cost per Statistical Life Saved (Millions of 2002 Dollars)[a]
Logging operations	1994	OSHA	0.1
Unvented space haters	1980	CPSC	0.2
Trihalomethane drinking water standards	1979	EPA	0.3
Food Labeling	1993	FDA	0.4
Passive restraints/belts	1984	NHTSA	0.5
Alcohol and drug control	1985	FRA	0.9
Seat cushion flammability	1984	FAA	1.0
Side-impact standards for autos	1990	NHTSA	1.1
Low-altitude windshear equipment and training standards	1988	FAA	1.8
Children's sleepwear flammability ban	1973	CPSC	2.2
Benzene/fugitive emissions	1984	EPA	3.7
Ethylene dibromide drinking water standard	1991	EPA	6.0
NO_x SIP Call	1998	EPA	6.0
Radionuclides/uranium mines	1984	EPA	6.9
Grain dust	1988	OSHA	11
Methylene chloride	1997	OSHA	13
Arsenic emissions standards for glass plants	1986	EPA	19
Arsenic emissions standards for copper smelters	1986	EPA	27
Hazardous waste listing for petroleum refining sludge	1990	EPA	29
Coke ovens	1976	OSHA	51
Uranium mill tailings (active sites)	1983	EPA	53
Asbestos/construction	1994	OSHA	71
Asbestos ban	1989	EPA	78
Hazardous waste management/wood products	1990	EPA	140
Sewage sludge disposal	1993	EPA	530
Land disposal restrictions/phase II	1994	EPA	2,600
Drinking water/phase II	1992	EPA	19,000
Formaldehyde occupational exposure limit	1987	OSHA	78,000
Solid waste disposal facility criteria	1991	EPA	100,000

[a]Source is Morrall (2003). Only final rules are included. Estimates are from respective agencies. Non-mortality and non-health benefits were subtracted from the annual cost (numerator) to generate *net cost*. For each entry, the denominator is the estimated number of statistical lives saved by the regulation annually. Agency abbreviations are as follows. CPSC: Consumer Product Safety Commission; EPA: Environmental Protection Agency; NHTSA: National Highway Traffic Safety Administration; FAA: Federal Aviation Administration; FRA: Federal Railroad Administration; OSHA: Occupational Safety and Health Administration.

TABLE 2: MAJOR U.S. TRADEABLE PERMIT SYSTEMS

Program	Traded Commodity	Period of Operation	Environmental and Economic Effects
Emissions Trading Program	Criteria air pollutants under the Clean Air Act	1974-Present	Environmental performance unaffected; total savings of $5-12 billion
Leaded Gasoline Phasedown	Rights for lead in gasoline among refineries	1982-1987	More rapid phaseout of leaded gasoline; $250 million annual savings
Water Quality Trading	Point-nonpoint sources of nitrogen & phosphorous	1984-1986	No trading occurred, because ambient standards not binding
CFC Trading for Ozone Protection	Production rights for some CFCs, based on depletion potential	1987-Present	Environmental targets achieved ahead of schedule; effect of TP system unclear
Heavy Duty Engine Trading	Averaging, banking, and trading of credits for NO_x and particulate emissions	1992- Present	Standards achieved; cost savings unknown
Acid Rain Reduction	SO_2 emission allowances; mainly among electric utilities	1995-Present	SO_2 reductions achieved ahead of schedule; annual savings of $1 billion per year
RECLAIM Program	SO_2 and NO_x emissions by large stationary sources	1994-Present	Unknown
Northeast Ozone Transport	Primarily NO_x emissions by large stationary sources	1999-Present	Unknown

SOURCE: Stavins (2003).

REFERENCES

Arrow, Kenneth, Maureen Cropper, George Eads, Robert Hahn, Lester Lave, Roger Noll, Paul Portney, Milton Russell, Richard Schmalensee, Kerry Smith, and Robert Stavins. "Is There a Role for Benefit-Cost Analysis in Environmental, Health, and Safety Regulation?" *Science* 272:221-222, 1996.

Coase, Ronald H. "The Problem of Social Cost." *Journal of Law and Economics* 3(1):1-44, 1960.

Cropper, Maureen L., William N. Evans, Stephen J. Berardi, Maria M. Ducla-Soares, and Paul R. Portney. "The Determinants of Pesticide Regulation : A Statistical Analysis of EPA Decisionmaking." *Journal of Political Economy* 100:175-198, 1992.

Fullerton, Don, and Robert Stavins. "How Economists See the Environment." *Nature* 395(October):433-434, 1998.

Graham, John and Kristin Loevzel. "Regulatory Reform: Moving Forward in the States." *Risk in Perspective*, volume 5, number 2, Harvard Center for Risk Analysis, February 1997.

Hahn, Robert W., Sheila M. Olmstead, and Robert N. Stavins. "Environmental Regulation in the 1990s: A Retrospective Analysis." *Harvard Environmental Law Review* 27(2):377-415, 2003.

Hahn, Robert W. and Robert N. Stavins. "Incentive-Based Environmental Regulation: A New Era From An Old Idea." *Ecology Law Quarterly* 18:1-42, 1991.

Jaffe, Adam B., Steven R. Peterson, Paul R. Portney, and Robert N. Stavins. "Environmental Regulation and the Competitiveness of U.S. Manufacturing: What Does the Evidence Tell Us?" *Journal of Economic Literature* 33:132-163, 1995.

Kelman, Steven P. *What Price Incentives?* Boston: Auburn House, 1981.

Keohane, Nathaniel O., Richard L. Revesz, and Robert N. Stavins. "The Choice of Regulatory Instruments in Environmental Policy." *Harvard Environmental Law Review*, volume 22, number 2, pp. 313-367, 1998.

Lowry, Robert C. "The Political Economy of Environmental Citizen Groups." Unpublished Ph.D. thesis, Harvard University, 1993.

Morrall, John F. III. "Saving Lives: A Review of the Record." *Journal of Risk and Uncertainty*, volume 27, number 3, forthcoming, 2003.

Revesz, Richard L. "Federalism and Environmental Regulation: A Normative Critique." *Federalism: Can the States be Trusted?*, eds. John Ferejohn and Barry Weingast. Stanford, California: Hoover Institution, 1997.

Sandel, Michael J. "It's Immoral to Buy the Right to Pollute." *New York Times*, December 15, 1997, p. A29.

Seligman, David A. *Air Pollution Emissions Trading: Opportunity or Scam? A Guide for Activists* San Francisco: Sierra Club, 1994.

Stavins, Robert N. "Experience with Market-Based Environmental Policy Instruments." *Handbook of Environmental Economics*, Volume I, eds. Karl-Göran Mäler and Jeffrey Vincent, pp. 355-435. Amsterdam: Elsevier Science, 2003.

Stavins, Robert N. "What Have We Learned from the Grand Policy Experiment: Lessons from SO_2 Allowance Trading." *Journal of Economic Perspectives* 12(3):69-88, 1998.

Stavins, Robert N. "Policy Instruments for Climate Change: How Can National Governments Address a Global Problem?" *The University of Chicago Legal Forum* (1997):293-329.

Stavins, Robert N., ed. *Project 88 - Harnessing Market Forces to Protect Our Environment: Initiatives for the New President*. A Public Policy Study sponsored by Senator Timothy E. Wirth, Colorado, and Senator John Heinz, Pennsylvania. Washington, D.C., 1988.

U.S. Environmental Protection Agency. *Environmental Investments: The Cost of a Clean Environment*. Washington, D.C.: U.S. Environmental Protection Agency, 1990.