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seven

Market-Based Environmental Policies

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It is not a new idea. Using market forces instead of bureaucratic fiat as a tool of environmental policy has been proposed by economists, discussed by policymakers, and implemented on a limited scale for two decades. But the concept of putting a price on pollution has yet to live up to its proponents' promises. Is this simply a breakdown between theory and practice? Has the effort to transform environmental regulations with economic incentives been nothing more than quixotic tilting at windmills? Should we continue to rely on more established—if costly—policy mechanisms? We believe the answer is no.

Market mechanisms can work. In fact, they have worked exceptionally well in a number of areas across the United States.[1] Of course, economic instruments, as they are sometimes called, are not panaceas. We have made less progress than we might have toward getting companies and individuals to pay for environmental harms they cause because of unrealistic expectations, lack of political will, design flaws, limitations in regulators' skills, and, all too often, obstacles thrown up by those who might be affected—in industry, the environmental community, and government. All of this can be addressed. Indeed, policymakers at all levels of government, in partnership with private businesses and nongovernmental organizations, should reinvigorate their efforts to develop and implement a next generation of economic incentives.

Properly designed and implemented, market-based instruments—regulations that encourage appropriate environmental behavior through price signals rather than through explicit instructions—provide incentives for businesses and individuals to act in ways that further not only their own financial goals but also environmental aims such as reducing waste, cleaning up the air, or reducing water pollution. In most cases,

market mechanisms take overall goals of some sort—say, the total reduction of emissions of a specific pollutant—and leave the choice of how to accomplish this up to the individuals or companies concerned.[2]

In contrast, conventional approaches to regulating the environment, so-called command-and-control regulations,[3] typically force everyone to implement the same pollution control strategies, regardless of the relative costs to them of this burden.[4] For example, a regulation might limit the quantity of a pollutant that a company can release into the atmosphere in a given time period or even specify, in effect, that a certain type of pollution control device must be put in place. But holding everyone to the same target or mandating the same abatement equipment can be expensive and, in some circumstances, counterproductive. Thus, although this command approach has often succeeded in limiting emissions, it frequently does so in an unduly expensive way. Inevitably, it fails to tailor the demands imposed to the particular circumstances of each company. There is little or no financial incentive to do better than the law requires or to develop and experiment with new technology and equipment that might lead to even greater improvements in performance. The net result is a drag on productivity and complaints about regulatory inefficiency, both of which undermine commitments to achieving environmental gains.

Market-based instruments align the financial incentives of companies with environmental objectives. They can be cost-effective and can provide a powerful impetus for companies to innovate and to adopt cheaper and better pollution control technologies.[5] This leaves more room for economic growth or for more stringent environmental standards to be adopted.

Types of Market Mechanisms

Market-based instruments used in environmental programs can be divided into six major categories:

Pollution charge systems assess a fee or tax on the amount of pollution that a company or product generates.[6] Such "green fees" should be calibrated to actual emissions rather than simply to pollution-generating activities: for example, a charge per unit of sulfur dioxide released by an electric utility, not a charge per unit of electricity generated. Consequently, it is worthwhile for the utility to reduce pollution up to the point at which the cost of doing this equals what it otherwise would pay in pollution charges or taxes.

How it does this and how much it can reasonably spend until costs exceed the pollution tax will vary enormously among firms due to differences in their production designs, physical configurations, ages of assets, and other factors. The end result will be a substantial savings in the total cost of pollution control, as compared to forcing all firms to reduce pollution to exactly the same level or to employ the same equipment.

Setting the amount of the tax is, of course, not a trivial matter. Policymakers cannot know precisely how firms will respond to a given level of taxation, so it is difficult to know in advance precisely how much cleanup will result from any given charge. Nevertheless, in recent years, tax or green fee programs have been used successfully to phase out production of CFCs and other ozone-layer-harming chemicals and to promote better municipal solid waste management practices by charging people "by the bag" for the garbage they throw out.

Tradable permits get much the same results as pollution charges, but avoid the problem of trying to predict the results.[7] Under this system, policymakers first set a target of how much pollution will be allowed for an industry, an area, or a nation. Companies generating the pollution then receive (through free distribution or auction) permits allowing them a share of the total. Firms that keep their emission levels below the allotted levels can sell their surplus permits to other firms or use the allotment for one of their facilities to offset excess emissions in another one of their plants. Firms that run out of allowances must buy them from other companies or face legal penalties. In either case, it is in the financial interest of the participating firms to reduce emissions as much as they efficiently can.

There are now in place a number of successful applications of trading programs. In the 1980s, the EPA developed a lead credit program that allowed gasoline refiners greater flexibility in meeting emission standards at a time when the lead content of gasoline was being reduced to 10 percent of its previous level.[8] If refiners produced gasoline with a lower lead content than was required during any time period, they earned lead credits that could be either banked for the future or traded immediately with competitors. The EPA estimated that, compared to alternative programs, the lead banking and trading program saved the industry (and consumers) about $250 million per year and accelerated the phase-down of lead in gasoline.

A tradable permit system is the centerpiece of the acid rain provisions of

the Clean Air Act Amendments of 1990. The law sets a goal of reducing emissions of sulfur dioxide (SO_2) and nitrogen oxides (NOx) by ten million tons and two million tons, respectively, from 1980 levels.[9] As discussed in more detail in chapter 14, electric utility companies annually receive tradable allowances that allow them to emit a specific amount of sulfur dioxide. Those that reduce their emissions below the level of their allowances can sell their excess permits. A robust market for the permits has emerged with savings estimated to be on the order of $1 billion annually compared to command-and-control regulatory alternatives.[10]

In another case, more than 350 companies in southern California are now participating in a tradable permit program intended to reduce nitrogen oxides and sulfur dioxide emissions in the Los Angeles area. The Regional Clean Air Incentives Market (RECLAIM) program operates through the issuance of tradable permits that specify and authorize decreasing levels of pollution over time. As of mid-1996, participants had traded more than 100,000 tons of NOx and SO_2 emissions with a permit value of more than $10 million.[11] Authorities are now considering expanding the program to allow trading between stationary sources (facilities) and mobile sources (cars and trucks).

Deposit-refund systems are familiar to many consumers because of the nine state "bottle bills" that have been implemented to reduce waste from beverage containers. Consumers pay a surcharge when purchasing potentially polluting products and get it back when the product is returned for recycling or proper disposal.[12] Although beverage-container deposits are the most common application, a few states have initiated deposit-refund systems for lead-acid batteries and other items.

Reducing market barriers can also help curb pollution. Measures that make it easier to exchange water rights, for example, promote more efficient allocation and use of scarce water supplies.[13] California, in particular, has achieved considerable improvements in water allocation by creating a market in water rights.

Eliminating government subsidies can promote more efficient and environmentally sound resource consumption and economic development. Below-cost timber sales, for instance, encourage overlogging. Similarly, federal water projects that provide below-market-cost water for farmers in California's Central Valley encourage wasteful irrigation practices and discourage

water conservation. In these cases, market prices would deter waste and promote better environmental practices.

Finally, *providing public information* can improve environmental performance by allowing consumers to make more informed purchasing decisions and creating incentives for environmental care among companies. The Toxic Release Inventory, revealing emissions to air, water, and land of a large number of waste products, has emerged as a powerful tool for encouraging companies to reduce their emissions.[14] And the "dolphin-safe" label on cans of tuna fish virtually eliminated from the U.S. market tuna caught with methods that resulted in incidental, but significant, dolphin mortality.[15]

Barriers to Implementation

Notwithstanding considerable success in implementing specific programs, economic instruments represent only a small share of new regulation and a trivial portion of existing regulation. We must ask why market mechanisms seem to have achieved so little penetration. The most obvious reason is that there has not been a great deal of new environmental regulation. The Clean Air Act and Safe Drinking Water Act are the only major environmental regulations that have been reauthorized since 1990. And even when Congress has been willing to consider market-based instruments for creating *new* regulation, it has not been willing to substitute the technique for the *existing* regulations that now cover 14,310 pages of the Code of Federal Regulations. At the same time, most EPA employees were hired to oversee traditional command-and-control programs and some may be hesitant to switch courses. Traditional regulatory programs require regulators with a technical or legal-based skill-set. Market-based instruments require an economics orientation.

Many environmental organizations have also been hesitant to move regulation toward market-based instruments. Some groups worry that increased flexibility in environmental regulation will lower the overall level of environmental protection. Others believe that market mechanisms condone the "right to pollute" and that conventional government mandates thus have superior moral virtue. Finally, some environmental professionals, like their government counterparts, are simply resisting the dissipation of *their* experience and existing skills in dealing with command-and-control programs.

The ambivalence of government officials and environmentalists is mirrored by the regulated community. Many industries and companies have applauded market-based instruments in an abstract sense because of their promise of flexibility and cost-effectiveness.[16] As a practical matter, however, the vast majority of businesses have not enthusiastically lobbied for the implementation of these instruments. Much of the hesitation stems from reluctance to promote any regulation, no matter how flexible or cost-effective. Perhaps seasoned by experience, businesses fear that implementation might not prove as cost-effective as promised or that the ground rules could change after programs get under way.

From a political economy perspective,[17] private firms are likely to prefer command-and-control standards to (auctioned) permits or taxes because standards produce economic rents,[18] which can be sustainable if coupled with sufficiently more stringent requirements for new sources. In contrast, auctioned permits and taxes require firms to pay not only abatement costs to reduce pollution to a specified level but also costs of polluting up to that level. Command-and-control standards are also likely to be preferred by legislators for several reasons: the training and experience of legislators may make them more comfortable with a direct standards approach than with market-based approaches; the time needed to learn about market-based instruments may represent significant opportunity costs; standards tend to hide the costs of pollution control while emphasizing the benefits; and standards may offer greater opportunities for symbolic politics.

Moreover, those who would differentially be affected may be expected to press for changes. For instance, several high-sulfur-coal-producing states attempted to skew the acid rain trading program by forcing companies to install high-cost scrubbers instead of shifting to more economical low-sulfur coal from other states. At the same time several midwestern coal-burning utilities demanded—and received—"bonus" allowances. Additionally, for companies that have invested tens of millions of dollars in meeting existing pollution control requirements, any change in policy might entail more expense or the writing off of capital stock now in place. Indeed, for businesses to optimize their environmental investments, regulations have to be not only flexible but also predictable over time.

Coupling concerns about consistency with the antiregulatory climate pervading the country, many corporations have concluded that it is better to

argue against *any* regulation rather than for better regulation. Several environmentally sensitive industries now argue in favor of voluntary industry programs rather than compulsory regulations. The chemical industry, for example, has developed Responsible Care codes that it says obviate the need for intensive regulation. The petroleum and paper industries have similar initiatives. The energy being directed toward these programs has diverted attention away from economic incentive approaches.

Part of the problem with market mechanisms is that the benefits they bring are often invisible to consumers, while the costs they impose as fees or taxes are all too plain. It is not obvious, for example, that gasoline and electricity prices are lower than they might otherwise have been because we successfully used market-based programs rather than command-and-control mandates to phase out lead and to reduce acid rain. On the other hand, long-distance drivers will pay more with higher gas taxes—and they know it. It is difficult to generate enthusiasm for economic instruments among those for whom it clearly means money out of their pockets.

Companies, moreover, often do not have internal incentive systems in place to reward managers who take advantage of market-based instruments. In many corporations, environmental costs are not fully measured and are not charged back to the business units from which they are derived. Moreover, the focus of many corporate environmental officers has been primarily on problem avoidance and risk management rather than on the creation of opportunities to benefit competitively from environmental decisions. Until corporate culture changes, the full potential of market mechanisms' cost-effectiveness and improved incentives for technological change will not be realized.

Next-generation market mechanisms. The limited use of economic incentives to date should not cause us to abandon or deemphasize market-based instruments as a next-generation policy option. Rather, we should make price signals a central part of the environmental policy toolkit. With more than $140 billion being spent annually in the U.S. on pollution control and cleanup, environmental policymakers need to seek more effective tools to maintain and improve environmental quality in a cost-conscious manner. This need dictates that we not lose the opportunity of using programs that can reduce costs and stimulate the development of new, more efficient technologies. In the long term, public support for environmental programs depends on confidence that the money invested is delivering good returns.

The first step toward better acceptance of market mechanisms is to improve the design of the programs. This must be done to counter the resistance of private firms, to calm fears of environmental groups and others about back-sliding on results, and to ensure that the actual cost savings come closer to, if not match, predictions. Accomplishing this means recognizing that market-based instruments are not a solution to all environmental problems. Rather, they are a useful element in what should be a portfolio of policy instruments. Indeed, some environmental problems will continue to require command-and-control solutions. On the other hand, market forces acting alone or voluntary industry initiatives may be sufficient to address other problems. But when regulation is called for, getting price signals to reflect environmental harms should be the first option considered.

An overarching design goal should be to make regulatory programs based on economic instruments more predictable. This requires stable rules, careful calibration of pollution control targets, and credible commitments to keeping programs in place for the long term. In addition, market-based instruments should be designed to deliver the greatest cost savings possible. Transaction and administrative costs must be reduced. Rights bestowed under these programs must be protected. Competitive market conditions must be maintained. The incentives for participation must be clear. When knowledge about environmental harms changes or new political pressures necessitate revisions to a market-based program, the transition should be made in a manner that does not detract from the program's efficiency.

In addition to design changes, the use of market-based instruments should evolve beyond Washington to the state and local levels. Although federal spending for environmental control continues to outpace state spending (in 1991, federal spending was about $18.2 billion for environmental and natural resource programs, compared to state spending of $9.6 billion), the gap is closing.

One of the most exciting uses of market-based incentives on the state and local level has been in an area not usually regarded as environmental: the general permitting process. A great challenge for state and local governments—and a source of frustration for new and growing companies—is the time required to issue permits for activities such as zoning, construction, and pollution discharge. Some states have developed programs that incorporate incentives into the existing framework for permits and inspections. For example,

expedited evaluations of permit applications are often completed for firms that choose to participate in new pollution prevention programs. Although not a market-based instrument in the strict sense, such initiatives embody the spirit of what is called for in next-generation environmental policy: a relatively simple way to give firms incentives to meet environmental goals.

Market-based instruments can also be used to address the environmental issues at which most state and local initiatives are directed: waste management, land use, and air quality improvement. At the core of most municipal solid-waste problems, for example, are price signals that fail to convey to consumers and producers the true costs of waste collection and disposal. In fact, these costs are frequently embedded in property or other taxes. Some municipalities do highlight a charge for waste collection in their semiannual property tax assessments. However, since such charges are usually flat fees that do not vary with the quantity of waste generated by individuals, there is no incentive for users to reduce the waste they create. Unit pricing corrects this. By charging households for waste collection services in proportion to the amount of refuse they leave at the curbside, unit pricing ties household charges to the real costs of collection and disposal. Households thus have an incentive to reduce the amount of waste they generate either by changing what they buy, reusing products or containers, or composting yard and garden material. Moreover, if municipalities charge extra for unseparated refuse, they can also give residents an incentive to separate the recyclable components of their trash.

Unit charges will not solve all solid-waste management problems. They are difficult to apply to apartment units. Some form of "lifeline" pricing is required for low-income families so that these households do not pay a disproportionate amount of income for trash collection. And illegal dumping can be a problem if the programs are not organized properly.[19] However, this approach combines cost-effectiveness with minimum inconvenience. The number of these programs has mushroomed from one hundred in 1989 to some three thousand today.[20]

Market-based instruments can also help balance local economic growth with environmental protection of the land. As economic and population growth continues, a larger share of environmental problems will be associated with tensions over land use. Land-oriented tradable permit programs have already been adopted in several states, including New Jersey, Florida,

and California. Florida established a wetlands-mitigation banking program in 1993 that allows the state and five local water management districts to license owners of wetlands property as "mitigation bankers."[21] Private developers are asked to offset the potential environmental damage arising from a proposed development by purchasing a "credit" from the bankers, who in turn agree to preserve and often improve their wetlands. Thus, those who diminish the amount of wetlands through development provide the resources to expand wetlands elsewhere in the ecosystem. Even before the program was formally established, a group of entrepreneurs set up Florida Wetlandsbank, which sells mitigation credits for forty-five thousand dollars per acre and uses part of the proceeds to improve degraded wetlands.

While working to incorporate the use of market-based instruments on the state and local level, policymakers should also work toward adopting new incentive programs on the federal level. In the hazardous waste area, deposit-refund programs could provide incentives not only to reduce the amount of waste but also to change disposal systems. The amount of lead, mostly from batteries, that enters landfills and incinerators may still be a significant hazard, despite EPA regulation of landfill construction and incinerator operation. The number of such batteries recycled each year has been declining. More than twenty million enter the waste stream annually, and this number could increase by some 30 percent by 2000. Under a deposit-refund system, a deposit would be collected by the administering agency at the time manufacturers sell batteries to distributors or manufacturers, who would pass on the charge to vehicle purchasers.[22] In time, the used batteries would be returned to redemption centers that would refund the deposit and then be compensated by the agency. Although some states have launched these programs, federal action is preferable when a national market or scale economies argue for a single system.

Market mechanisms may also be useful at the global level, especially in response to problems arising from diffuse sources. If, for example, the United States decides to participate in a binding international agreement to reduce worldwide greenhouse gas emissions, a carbon tax may be the most effective and least costly way to meet any emissions reduction targets. By altering price signals through charges based on the carbon content of fuels and tax credits for those establishing new carbon "sinks," a market-based regulatory system would internalize the potential costs of climate change. Higher prices would

reduce demand for fossil fuels, thereby reducing emissions of carbon dioxide, and would stimulate the development of new technologies that are less carbon-intensive. Moreover, a properly designed revenue-neutral tax policy, under which carbon charges are offset by the reduction or elimination of payroll or other taxes, could help to protect the environment, reduce distortions associated with other taxes, promote economic growth, and render the program of greenhouse gas emissions controls more politically palatable.

By shifting organizational mindsets, developing new and needed skills, and overcoming the resistance of sometimes competing interest groups, we can make market-based instruments work for our collective benefit and bring environmental policy into the twenty-first century. If cost-effective regulation is a serious priority for environmental policymakers—and it must be in our world of tight budgets, both private and public—we cannot afford to overlook the opportunity to deliver more bang for the buck by harnessing market forces to protect the environment.

Notes

1. Janet Milne and Susan Hasson, *Environmental Taxes in New England: An Inventory of Environmental Tax and Fee Mechanisms Enacted by the New England States and New York* (South Royalton: Environmental Law Center at Vermont Law School, 1996).

2. See, for example, Robert Stavins, ed., *Project 88-Round II Incentives for Action: Designing Market-Based Environmental Strategies* (Washington, D.C.: Government Printing Office, May 1991); and Robert Stavins, ed., *Project 88: Harnessing Market Forces to Protect Our Environment* (Washington, D.C., December 1988). Both studies were sponsored by Sen. Timothy E. Wirth, Colorado, and Sen. John Heinz, Pennsylvania.

3. There is something of a continuum from a pure market-based instrument to a pure command-and-control instrument, with many hybrids falling between. Nevertheless, for ease of exposition, it is convenient to consider these two fundamental categories. See Robert Hahn and Robert Stavins, "Incentive-Based Environmental Regulation: A New Era from an Old Idea?" *Ecology Law Quarterly* 18 (1991): 1–42.

4. For a detailed case-by-case description of the use of command-and-control instruments, see P. R. Portney, ed., *Public Policies for Environmental Protection* (Washington, D.C.: Resources for the Future, 1990).

5. For an empirical analysis of the dynamic incentives for technological change under different policy instruments, see Adam B. Jaffe and Robert Stavins, "Dynamic Incentives of Environmental Regulations: The Effects of Alternative Policy Instruments on Technology Diffusion," *Journal of Environmental Economics and Management* 29 (1995): S43–S63. This paper develops a general approach for comparing the impact of policies on

technology diffusion and applies it to the most frequently considered policy instruments for global climate change.

6. A. C. Pigou is generally credited with developing the idea of a corrective tax to discourage activities that generate externalities, such as environmental pollution. See A. C. Pigou, *The Economics of Welfare,* 4th ed. (London: Macmillan, 1938). For a modern discussion of the concept and a number of case examples, see Robert Repetto et al., *Green Fees: How a Tax Shift Can Work for the Environment and the Economy* (Washington, D.C.: World Resources Institute, 1993).

7. See Robert Hahn and Roger Noll, "Designing a Market for Tradeable Permits," in *Reform of Environmental Regulation,* ed. W. Magat (Cambridge, Mass.: Ballinger, 1982). Much of the literature on tradable permits can actually be traced to Coase's treatment of negotiated solutions to externality problems. See generally Ronald Coase, "The Problem of Social Cost," *Journal of Law and Economics* 3 (1960): 1–44.

8. In each year of the program, more than 60 percent of the lead added to gasoline was associated with traded lead credits. See Robert Hahn and Gordon L. Hester, "Marketable Permits: Lessons for Theory and Practice," *Ecology Law Quarterly* 16 (1989): 361–406.

9. For a description of the legislation, see Brian L. Ferrall, "The Clean Air Act Amendments of 1990 and the Use of Market Forces to Control Sulfur Dioxide Emissions," *Harvard Journal on Legislation* 28 (1991): 235–52.

10. See Dallas Burtraw, "Cost Savings sans Allowance Trades? Evaluating the SO_2 Emission Trading Program to Date," Discussion Paper 95-130 (Washington, D.C.: Resources for the Future, September 1995); and Elizabeth M. Bailey, "Allowance Trading Activity and State Regulatory Rulings: Evidence from the U.S. Acid Rain Program," MIT-PAPER 96-002 WP (Cambridge: Center for Energy and Environmental Policy Research, MIT, 1996).

11. For a detailed case study of the evolution of the use of economic incentives in the SCAQMD, see NAPA, *The Environment Goes to Market: The Implementation of Economic Incentives for Pollution Control* (Washington, D.C.: NAPA, July 1994), chap. 2. Recent implementation problems with the RECLAIM program, however, illustrate a point we emphasize throughout the chapter: for a host of reasons, actual applications of market-based instruments tend not to perform up to the standards that the simplest analysis might anticipate.

12. See P. Bohm, *Deposit-Refund Systems: Theory and Applications to Environmental, Conservation, and Consumer Policy* (Baltimore: Published for Resources for the Future, in the Johns Hopkins University Press, 1981). Peter S. Menell, "Beyond the Throwaway Society: An Incentive Approach to Regulating Municipal Solid Waste," *Ecology Law Quarterly* 17, no. 4 (1990): 655–739.

13. See W. R. Z. Willey and Thomas J. Graff, "Federal Water Policy in the United States—An Agenda for Economic and Environmental Reform," *Columbia Journal of Environmental Law* 1988: 349–51.

14. See James T. Hamilton, "Pollution as News: Media and Stock Market Reactions

to the Toxics Release Inventory Data," *Journal of Environmental Economics and Management* 28 (1995): 98–113; and EPA, *1994 Toxic Release Inventory: Public Data Release* (Washington, D.C.:EPA, January 1996).

15. See Daniel C. Esty, *Greening the GATT* (Washington, D.C.: Institute for International Economics, 1994).

16. There have been some genuine enthusiasts for market mechanisms. See Stephan Schmidheiny with the Business Council for Sustainable Development, *Changing Course: A Global Business Perspective on Development and the Environment* (Cambridge: MIT Press, 1992).

17. See Nathaniel O. Keohane, Richard L. Revesz, and Robert Stavins, "The Positive Political Economy of Instrument Choice in Environmental Policy," paper presented at the Allied Social Science Associations meeting, New Orleans, Jan. 4–6, 1997.

18. "Economic rent" is that part of an indvidual's or firm's income which is in excess of the minimum amount necessary to keep that person or firm in its given occupation. It is sometimes thought of as above-normal profits, such as those that accrue to a monopolist or the owner of a scarce resource.

19. See Don Fullerton and Thomas C. Kinnaman, "Household Responses to Pricing Garbage by the Bag," *American Economic Review* 86 (1996): 971–84.

20. See Lisa A. Skumatz, "Beyond Case Studies: Quantitative Effects of Recycling and Variable Rates Programs," *Resource Recycling*, September 1996: 62–68.

21. See William Fulton, "The Big Green Bazaar," *Governing Magazine* (June 1996): 38.

22. See Hilary A. Sigman, "A Comparison of Policies for Lead Recycling," *RAND Journal of Economics* 26 (1995): 452–78.