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Economic incentives for environmental protection

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Public concern over environmental issues has risen dramatically over the last two decades. There has been increasing pressure on the governments of industrialized countries to develop a reasoned response to a variety of problems, such as acid rain, stratospheric ozone depletion, and the cleanup of toxic waste dumps. Partly in response to the growing pressures to address environmental issues, regulators have begun to explore new approaches for addressing environmental problems that use "economic" incentives instead of "command-and-control" regulation.

Under command-and-control regulation, the regulator sets a technical standard or a performance standard for sources that pollute the environment. Command-and-control regulation has been criticized by economists because it does not leave firms and individuals with much choice in how they achieve an environmental target. For example, a law may require that a power plant use a scrubber to reduce air pollution, regardless of whether another technology or group of technologies might be more effective in achieving the same level of air quality.

Economists have argued that many pollution problems can be addressed more effectively through the introduction of economic incentives. The idea behind using economic incentives is to save society resources while achieving a particular environmental goal. For example, in 1990, Congress adopted an economic-incentive approach for limiting acid rain that could save society as much as $1 billion annually in comparison to a conventional command-and-control approach that required the largest polluters to install scrubbers.

There are many different kinds of economic-incentive approaches. They include the use of subsidies, taxes, deposit-refund schemes, marketable permits, and the removal of institutional barriers that lead to price distortions. In the interest of brevity, we focus on taxes and marketable permits, which have received the greatest attention in the academic literature.

Pollution Charges

Charge systems impose a fee, or tax, on pollution. For example, a chemical manufacturer would be charged for every unit of pollutant that it discharged into a river. Pollution charges, by themselves, do not restrict the amount of pollutants that may be emitted; rather, they tax emissions. Such fees ensure that a firm will take pollution costs directly into account in its business decisions. A firm has many options. It might decide that it is in its interest to pay the fee, completely eliminate the discharge, or partially reduce the emission.

Several European nations, including France, the Netherlands, and Germany, currently use water-pollution charge systems. Another potential application discussed frequently is a tax on carbon dioxide production to help address global climate change.

The advantage of the fee system is that all firms face the same incentive to limit pollution at the margin. A firm will control pollution up to the point where the marginal cost of control just equals the fee. The result is that the total costs of pollution control are minimized, as compared with other methods of allocating the pollution-control burden across firms. Charges, like other market-based mechanisms, also provide ongoing incentives for firms to develop and adopt newer, better pollution-control technologies.

One problem with emission charge systems is that governments do not know in advance what level of cleanup will result from any given charge. This problem stems from a lack of knowledge about how firms will respond to a given level of taxation. Governments do not have the information to determine either an individual firm's pollution-control costs or the distribution of costs across firms. This inability to specify a target level of pollution that will be achieved does not, however, alter the reality that charges have the potential to achieve emission reductions at substantially lower cost than command-and-control regulation.

Marketable Permit Systems

Marketable or tradable permits can achieve the same cost-minimizing allocation of the pollution-control burden as a charge scheme, while also avoiding the problem of uncertain responses by firms. Under a tradable permit system, the allowable overall level of pollution is established and then allotted to firms in the form of tradable permits. Firms that keep emission levels below the allotted level may sell or lease their surplus permits to other firms, or use them to offset excess emissions in other parts of their own facilities.

As with a charge system, the marginal cost of control is identical across firms, and thus the total cost of control is minimized for any given level of total pollution control. In the case of local air pollution control, for example, this approach could be substantially more efficient than current regulatory methods, both because its inherent flexibility takes advantage of differences in control costs and because it allows individual firms to decide where and how to make desired emission reductions.

In the event that overall emission targets are viewed as too strict, the government may choose to increase the supply of permits. Likewise, in order to reduce allowable emissions, regulators could take the opposite stance and reduce the supply of permits.

Permit systems have been used primarily in the United States. Examples include the Environmental Protection Agency's Emissions Trading Program; the nationwide lead phasedown in gasoline, which allowed fuel refiners to trade reductions in lead content; and the gradual phaseout of chlorofluorocarbons in the United States, where businesses are allowed to trade the right to produce or import limited quantities of these chemicals. Congress passed legislation calling for a marketable permit system for controlling acid rain. Permit systems might also be applied in other areas, such as local air pollution, point and nonpoint source water pollution, and the control of global climate change through international trading in greenhouse gas permits.

How Charges and Marketable Permit Systems Behave in Practice

An examination of existing charge and marketable permit schemes reveals that they are rarely, if ever, introduced in their textbook form. Virtually all environmental regulatory systems using charges and marketable permits rely on the existing permitting system. This result should not be terribly surprising, since most of these approaches were not implemented from scratch. Rather, they were grafted onto regulatory systems in which permits and standards play a dominant role.

As a result of the way actual charge and marketable permit systems are implemented, the level of cost savings resulting from these approaches is generally far below their theoretical potential. Cost savings can be defined in terms of the savings that would result from meeting a prescribed environmental objective in a less costly manner. Most of the charge systems implemented to date have not had a major incentive effect. We can infer from this that polluters have not been induced to search for a lower-cost mix of meeting environmental objectives as a result of the implementation of charge schemes. Thus, it seems unlikely that charges have performed very well on narrow efficiency grounds. The experience with marketable permits is similar. Only in the case of the lead phasedown do permits appear to perform as well as the theoretical ideal would suggest. In general, different charge and marketable permit systems exhibit wide variation in their effect on cost savings.

While charge systems and marketable permit systems rarely perform near their theoretical potential, it is important to recognize that they have performed as well as, if not better than, command-and-control systems in most cases. In general, the direct effect of both charges and marketable permits on environmental quality appears to be neutral or slightly positive.

The performance of charge systems and marketable permit systems has been broadly consistent with economic theory. For example, where barriers to trading are low, more trading is likely to occur. Where charges are high and more directly related to individual actions, they are more likely to affect the behavior of firms or consumers.

The Future Use of Economic Incentives

Despite the fact that practical political considerations will continue to limit the design and implementation of environmental policy instruments, economic-incentive mechanisms will receive a warmer reception in the years to come. Proponents of incentive-based environmental policies should be guardedly optimistic, precisely because the demand for environmental protection is high and other proposed solutions might result in severe economic dislocation.

The next steps in introducing these approaches will involve the design of market mechanisms that are politically acceptable. Potentially important applications include such diverse problems as global climate change, critical habitat loss, and hazardous waste generation and disposal. While improved policy design and understanding will not necessarily lead to widespread application of economic-incentive approaches, these approaches are destined to remain only a theoretical curiosity without it.

References

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(*See also* Energy costs; Pollution abatement costs; Subsidies)