



# Market-Based Approaches to Environmental Policy

A “REFRESHER” COURSE

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Upon hearing the term “market-based approaches to (or economic incentives for) environmental protection,” some people assume this means letting unfettered competition between unregulated private firms determine how clean our air or water will be, how much open space we will have, or how many fish stocks will be driven to collapse.

Nothing of the sort is intended. In fact, market-based approaches to environmental protection are a clever form of government regulation. They are premised on the recognition that while competitive markets are a wonderfully efficient means of deciding what types and quantities of consumer goods should be produced, they generally fail with respect to environmental quality, the provision of “public goods” like open space and common-property resources like fisheries. Every undergraduate and graduate economics textbook discusses this notion of “market failure,” and the environment is always the first illustration that is used.

Given the very necessary government role in protecting the environment, the real question becomes how best to do this. Market-based approaches to environmental protection are premised on the idea that it is possible to confront private firms, individuals, and even other levels of government with the same kinds of incentives they face in markets for labor, capital, and raw materials—that is, prices that force them to economize. The rationale for market-based approaches, in other words, is to try to put the powerful advantages of markets to work in service to the environment.

## *Command-and-Control Era*

To paint a quick picture of traditional regulation, consider the case of air and water pollution control. Prior to the early 1970s, the regulation of air and water pollution was almost exclusively the responsibility of state and local governments. In fact, the Clean Air Act amendments of 1970 and the Federal Water Pollution Control Act Amendments of 1972 marked the first really substantial federal involvement in environmental protection.

Under the Clean Air Act, the federal government (in the form of the then-new U.S. Environmental Protection Agency, or EPA) began specifying the pollution-control equipment that any new plant had to embody. In addition, EPA required local areas to formulate plans to reduce pollution from existing sources so that the air quality standards that EPA began issuing would be met. These plans typically required large, privately owned industrial facilities to reduce their pollution the most, and often required other sources to roll back their pollution by uniform amounts. Both new and old facil-





ities had to apply for and receive operating permits from EPA that specified allowable emissions. In addition, the federal government also began limiting for the first time the tailpipe emissions of new cars rolling off the assembly lines of both domestic and foreign manufacturers. While the emerging water pollution regulations differed somewhat, at their heart, too, were a series of technological requirements for both newly constructed and existing plants, coupled with mandatory permits that specified allowable emissions.

Despite protests to the contrary, both programs have had significant successes, most notably in the case of the Clean Air Act. Since 1970, air quality around the United States has improved dramatically in almost every metropolitan area and for almost every air pollutant. For one notable example, airborne concentrations of lead, an especially insidious threat to health, were 93% lower in 2000 than they were in 1980. Success under the Clean Water Act has been less dramatic, though quite obvious in many places. Rivers that 30 years ago had almost ceased to support aquatic life have seen fish strongly rebound (even if it is still inadvisable to eat the fish one catches in some places).

Despite these successes, by the late 1980s dissatisfaction with the technology-based standards approach had become rampant. First, by requiring sources of air and water pollution control to meet emissions standards keyed to a particular type of technology, many regulations had effectively

“frozen” pollution control technology in place. No one had an incentive to invent a more effective and/or less expensive pollution control technology as long as some other technology had received EPA’s blessing. Second, by requiring regulated firms to have specific types of pollution control in place, they were denied the flexibility to modify their production process or reformulate their product(s) in such a way as to reduce their emissions because they would still be required to use whatever technology was applicable. Finally, it was becoming clear that the technology-based command-and-control system was overly expensive. Study after study showed that it would be possible to meet the same environmental goals—either in terms of ambient air quality or in terms of emissions from affected sources—for much less money than the current approach was costing.

### *Cap and Trade vs. Pollution Taxes*

There are two principal market-based approaches to environmental protection, both of which owe much of their popularity today to a small group of economists, most notably the late Allen Kneese of RFF. While mirror images of one another in many important respects, one market-based approach looks not unlike the current regulatory system while the other appears to be a more radical departure. The more familiar-looking approach to air or water pollution control

would still be based on a system of required emissions permits. Under this approach—generally referred to as a “cap-and-trade” system—each pollution source is given an initial emissions limitation. It can elect to meet this limit any way it sees fit: rather than being required to install specific types of control technology, the source can reduce its pollution through energy conservation, product or process reformulation (including substitution of cleaner fuels), end-of-pipe pollution control, or any other means. Importantly, and not surprisingly, each source will elect to reduce its pollution using the least expensive approach available to it.

More surprisingly, a source has one additional option under the cap-and-trade system: it can elect to discharge *more* than it is required so long as it buys at least equivalent emissions reductions from one or more of the other sources of that pollutant. All that matters is that the total amount of emissions reductions that take place from all sources are equal to the initial cap established by EPA (or another regulatory authority). Those sources that will elect to make significant emissions reductions under this system are precisely those that can do so inexpensively; likewise, those that elect to buy emissions reductions from other sources rather than cut back themselves will be those that find it very expensive to reduce. (This is the analogue to Adam Smith’s famous “invisible hand” that steers producers and consumers to the most efficient allocation of resources.) Moreover, all sources have a continuing incentive to reduce their pollution—the more a source’s emissions fall short of its limitation, the more emissions permits it will have to sell to other sources.

The flip side of this approach is one in which *no* limits are placed on each ton of pollution that a source emits, but in which each ton is taxed. Pollution taxes are paid to the government, which is then free to use the revenues as it sees fit—to reduce other taxes, spend on pollution control R&D, reduce the national debt, etc. While appearing very different from the cap-and-trade approach, this system creates the very same set of incentives. That is, the firms that can reduce their pollution inexpensively will invest in doing so because each unit of pollution reduced is that much less paid in pollution taxes. Firms that find it very expensive to reduce their pollution will continue to discharge and pay the taxes; note, however, the strong and continuing incentive the latter have to find ways to cut their emissions—and the higher the taxes on

pollution, the stronger that incentive. Also, both a cap-and-trade system and a pollution tax create the same incentive to reduce pollution that the wage rate creates for firms to minimize the amount of labor they use or that the interest rate has in disciplining firms’ borrowing.

The cap-and-trade approach began to be implemented in a small-scale way in the late 1970s and early 1980s in both Democratic and Republican administrations. But the first really large-scale application of cap-and-trade—which resulted in the most significant environmental policy success since 1970—came in the 1990 amendments to the Clean Air Act.

In order to reduce emissions of sulfur dioxide by 50% in the eastern half of the United States, an ambitious cap-and-trade system was created under which more than 100 large coal-fired power plants were given initial emissions reductions. These plants could meet their emissions reductions targets themselves, through any means they selected, including shifting from high- to low-sulfur coal. However, the affected plants were also given the ability to purchase excess emissions reductions generated by other plants that found it easy to reduce their sulfur dioxide.

This approach has resulted in reductions in sulfur dioxide emissions that have been both larger and faster than required by the law. Moreover, the annual savings to electricity ratepayers nationally (compared to the previous command-and-control approach) range from 50–80% and these savings amount to \$1–6 billion annually, depending on whose estimates one wants to use. As a result of this success, cap-and-trade approaches are now being proposed for additional reductions of sulfur dioxide, nitrogen oxides, and mercury under the Bush administration’s Clear Skies Initiative. They have also been put forward by former EPA Administrator Christie Todd Whitman for reducing water pollution in certain watersheds, by state and local governments seeking smog reductions, and by foreign governments exploring lower-cost approaches to a variety of environmental problems. The European Union has just announced that it will use a cap-and-trade system to control carbon dioxide as it struggles to comply with the terms of the Kyoto Protocol, which is still alive in Europe.

### *Uncertainties Created by Each System*

Large-scale experiments with pollution taxes are harder to find in the United States. Under the 1987 Montreal Protocol

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to phase out worldwide use of chlorofluorocarbons (CFCs) and other ozone-depleting substances, a tax was levied on CFC production during the time mandatory phase-out was taking place, although this is clearly a hybrid system under which command-and-control regulation was augmented by a pollution tax. The evidence to date suggests that this hybrid approach is working well—CFC emissions have fallen and early evidence is that the stratospheric ozone “hole” has stopped growing.

Interestingly, perhaps the most ambitious application of pollution taxes is occurring not at the federal or even state level of government, but at the local level. Hundreds of communities around the United States have adopted “pay-as-you-throw” systems for household garbage collection. Rather than charge every household the same amount for refuse collection, these communities are charging households a fixed amount per bag of garbage collected at curbside. This has had the effect of reducing the amount of yard wastes that end up in municipal landfills (households are composting more) and possibly even changing households’ purchasing decisions toward products which come with less packaging.

Why have cap-and-trade policies flourished in comparison to pollution taxes in the United States? Perhaps most obviously, a system in which discharge permits are issued, but made saleable, looks rather like the regulatory system currently in place in the United States, with the added twist of marketability. Another reason has to do with the uncertainty each system creates. Specifically, under a cap-and-trade system, the total amount of pollution is firmly fixed—that is the purpose of the cap. What is uncertain are exactly where the emissions will occur (this depends upon who trades with whom), and how much an emissions permit (the right to emit one ton in a given year, say) will cost—the latter is determined in a competitive market.

Under a pollution tax, sources are allowed to discharge as much as they want, as long as they pay the per unit charge for each ton emitted. Thus, there is uncertainty about the total amount of pollution discharged (though we can be sure that the higher the tax, the lower the amount of pollution discharged). There is no uncertainty under the latter system about the maximum amount it will cost to reduce a ton of pollution, though, because that will not exceed the per-ton tax. The total amount of revenue raised by such a system is not

predictable, because if sources can reduce their emissions less expensively than is believed to be the case, they will discharge less to avoid the tax. In years past, environmentalists objected to pollution taxes on the grounds that sources faced no pollution limits at all and could continue to pollute as long as they paid the corresponding taxes. Note, however, that this approach makes sources pay for every single unit of pollution that they discharge—unlike the command-and-control system in which firms are given considerable amounts of “free” emissions in the form of any discharges they may make so long as they are beneath their permitted levels.

The choice between cap-and-trade systems and pollution taxes rests in part on the pollutant in question. For pollutants like sulfur dioxide, CFCs, or carbon dioxide that mix equally in the atmosphere and that pose few or no local health effects, cap-and-trade works well because we are unconcerned about where emissions take place. On the other hand, if we are concerned that limiting emissions might impose too big a burden on the economy, the pollution tax approach is best because sources know that they will never have to pay more for a ton of pollution discharged than the tax. Effluent charges also raise revenue—not a trivial issue in many places, including developing countries.

One thing is for sure. Market-based approaches to environmental protection have become the default option in much of modern environmental policy, both in the United States and abroad. But it would be a mistake to claim that command-and-control regulation is dead. First, there are some cases where market-like solutions won’t do the job. If an imminent, serious hazard to human health and the environment is discovered, an outright ban is likely to be the appropriate policy response. Second, some still prefer that companies be punished for their emissions by making them pay as much as possible to alleviate them. But this is premised on the misguided notion that firms pollute because they are malevolent, rather than because pollution is one consequence of making things that society demands. Moreover, such an approach really only punishes the customers, employees and shareholders of the firm, for they are the ones who will end up bearing the costs. ■

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