RESOURCES

RESOURCES FOR THE FUTURE SPRING 1995, NO. 119

Transaction Costs and Markets for Pollution Control

Robert N. Stavins

Since the early 1980s, government authorities have been experimenting with emission-permit markets as a way to reduce the costs of achieving a given emission-reduction goal. In such markets, a fixed number of permits to emit a given pollutant is issued to polluting firms, who are then free to reduce emissions and sell their unneeded permits or to buy permits rather than reduce emissions, depending on which is cheaper. Although emission-permit trading will probably be less costly than more conventional pollution-control instruments, transaction costs can make a permit approach less cost-effective than promised. Such costs can significantly affect the quantity and pattern of trading and hence the total cost of pollution control when permits are traded. For this reason, choosing between permits and other approaches must be made on a case-by-case basis. And if permit trading is to achieve its cost-effectiveness potential, permit markets must be designed in ways that minimize transaction costs.

For more than two decades, environmental law and regulation have been dominated by command-and-control approaches—typically either mandated pollution-control technologies or inflexible discharge standards on a smokestack-by-smokestack basis. But in the past five years, policymakers increasingly have explored market-based environmental policy instruments—mechanisms that provide economic incentives for firms and individuals to carry out cost-effective pollution control. Marketable emission permits, which can be traded among potential polluters, have been at the center of these efforts in the United States.

The transition from command-and-control approaches to economic-incentive approaches has not been easy. In some cases, environmental policymaking has outrun our basic understanding of the new pollution-control instruments. Consequently, the claims made for the cost-effectiveness of marketable permit systems often have exceeded what can be reasonably anticipated.

Several factors can adversely affect the performance of marketable permit systems: monopoly power by permit holders; non-profit-maximizing behavior, such as attempts to increase sales and staff; the preexisting regulatory environment; and the difficulty of monitoring and enforcing permit-trading rules. One potential problem has received little attention: the effect of transaction costs on the market for permits. Below I discuss the forms and sources of transaction costs, cite evidence of these costs in permit markets, and examine the effects of the costs on the performance of permit markets. I then suggest some implications that these effects have on decisions to use permits as opposed to other pollution-control approaches and on designs for a system of tradable permits.

Forms and sources of transaction costs

In general, *transaction costs*—those costs that arise from the exchange, not the production, of goods and services—are ubiquitous in market economies. They can arise from any exchange: after all, parties to transactions must find, as well as communicate with, one another. These parties may need to inspect and sometimes even measure the goods to be sold. They also may need to draw up contracts, consult with lawyers or other experts, and transfer titles.

Transaction costs can take one of two forms. One form consists of services provided by buyers or sellers; the other is the margin (difference) between the buying and selling price of a commodity in a given market. This margin may be due to the direct financial costs of brokerage services.

Three potential sources of transaction costs exist in tradable permit markets. The first source is the search for a trading partner. A potential buyer of a discharge permit expends time and effort in finding a seller, though—for a fee—brokers can facilitate the process. A second, less obvious, source of transaction costs is bargaining. Once buyers and sellers enter into negotiations, they incur significant resource costs, including fees for brokerage, legal, and insurance services. A third source of transaction costs is monitoring and enforcing permit trades. These costs, which also can be significant, are typically borne by the responsible government authority rather than by trading partners.

Evidence of transaction costs in permit markets

The cost savings that may be realized through marketable permits depend upon active trading. Impediments to active trading can thus limit savings. Abundant anecdotal evidence illustrates both the prevalence of significant transaction costs in tradable permit markets and the impediments to efficiency that can result from *thin* markets—that is, markets in which few trades occur.

Many studies have found fewer trades—and hence lower cost savings—in real-world permit markets than theoretical models predict. In several cases, transaction costs appear to have played a particularly adverse role. For instance, administrative requirements generated transaction costs that essentially eliminated potential gains from trade in the Fox River (Wisconsin) program for buying and selling water-pollution permits. Likewise, transaction costs in the form of brokerage and consultant fees may be having an adverse effect on the emission-permit trading program that the U.S. Environmental Protection Agency (EPA) created for criteria air pollutants.

On the other hand, high levels of trading—and significant cost savings—may result when transaction costs can be kept to a minimum. Such was the case when, in the 1980s, EPA created a market for the use of lead in gasoline as part of the phaseout of leaded gasoline. The success of this market owed much to minimal administrative requirements, as well as to the fact that potential trading partners (oil refineries) already were experienced in striking deals with one another. Minimization of transaction costs also may be responsible for the success of a transferable development-rights program in the New Jersey Pinelands. In this case, the government provided free brokerage services.

The effects of transaction costs on permit-market performance

How much are permit markets affected by transaction costs? To find out, we need to know first how the burden of transaction costs is shared between permit sellers and buyers. Not surprisingly, transaction costs lower the gains from trade for both sellers and buyers. Most of the burden, however, will fall on the trading partner that has less flexibility in controlling its pollution, regardless of who may actually pay brokerage fees or other direct transaction costs.

Transaction costs reduce the overall economic benefits of permit trading by absorbing resources directly and by suppressing exchanges that otherwise would have been mutually and socially beneficial.

In the presence of transaction costs, total expenditures on pollution control generally will exceed those that would be incurred in the absence of transaction costs. Moreover, total pollution-control expenditures in the presence of transaction costs usually will exceed those in the absence of transaction costs by an amount greater than the sum of the transaction costs. This suggests that transaction costs reduce the overall economic benefits of permit trading not only by

continued on page 18

continued from page 10

absorbing resources directly but also by suppressing exchanges that otherwise would have been mutually (indeed socially) beneficial.

If transaction costs suppress mutually beneficial exchanges, we might ask whether in the presence of these costs the initial (free) allocation of permits affects the posttrading allocation of pollution-control responsibility and pollution-control costs. Economists assert that the posttrading allocation of pollution-control responsibility, and hence the aggregate costs of pollution control, are independent of the initial permit allocation. Does this assertion still hold in the presence of transaction costs? The answer is, "It depends."

When incremental transaction costs are independent of the size of individual transactions, the initial allocation of permits has no effect on the posttrading allocation of pollution-control responsibility and aggregate pollution-control costs. But when incremental transaction costs increase with the size of individual trades, the initial allocation *can* affect the posttrading outcome. As a firm's allocation of emission permits increases (that is, its initial pollution-control responsibility decreases), the firm's posttrading level of pollution control will decrease. This process drives up aggregate pollution-control costs.

Economists note that incremental transaction costs are unlikely to be increasing with larger trades, since parties can simply split their transactions into smaller trades in order to economize. But incremental transaction costs can be increasing if they are combined with sufficiently high fixed transaction costs.

On the other hand, incremental transaction costs might decrease with the size of transactions when brokers offer quantity discounts on their services. In this case, if we shift the initial permit allocation *away* from a cost-effective outcome, the posttrading outcome will be *closer* than otherwise to the cost-effective outcome. What explains this apparently counterintuitive result? Decreasing incremental transaction costs mean that there are economies of scale in trading of which firms can take advantage.

In the presence of transaction costs, then, the initial distribution of permits can affect the efficiency of pollution permit markets. For this reason, environmental agencies and legislatures may have less discretion than they believe to allocate permits as they please—in other words, to allocate them in a way that generates support for a tradable permit system. As a result, the political attractiveness and feasibility of such a system may decrease.

Photo courtesy of the Electric Power Research Institute

The 1990 Clean Air Act Amendments called for sulfur dioxide emission-permit trading among electric utilities, which received initial allocations of permits free of charge. The number of permits that each utility received was based on its historic emission level.

Implications for policymaking

Choices between conventional command-and-control approaches and market-based instruments for pollution control ought to reflect the imperfect world in which these instruments are applied. But such choices are not simple.

On the one hand, even if transaction costs prevent significant levels of trade from occurring, aggregate costs of pollution control probably will be less than those of a conventional command-and-control approach. A trading system in which no trades occur is still likely to be less costly than a system that imposes a technology standard—that is, requires specific pollution-control technologies to be used. Moreover, a trading system in which no trades occur is no more costly than a system that imposes a uniform performance standard—that is, requires that all polluters reduce emissions by a specified amount. On the other hand, the total compliance costs (including transaction costs) of a trading system could exceed (depending upon the initial allocation of permits) those of a uniform performance standard that imposed small administrative costs. Thus, case-by-case examinations of alternative instruments are required.

Despite the varying consequences of transaction costs in different circumstances, economists can make some general observations about the effects of these costs. First, transaction costs increase the aggregate costs of pollution control not only directly but also indirectly by reducing total trading volume. Second, this effect tends to be ameliorated in markets with relatively large numbers of potential traders. As the pool of potential trading partners increases,

potential buyers are easier to find, and transaction costs are thereby lowered. In addition, a larger number of firms can mean more frequent transactions and, as a result, more and better information about potential buyers and sellers. These observations suggest that, due to possible transaction-cost effects (and due to the likely effects of market concentration and traders' strategic behavior), we ought to be least confident of relying on tradable permit systems when permit markets are likely to be thin.

Like choices between command-and-control approaches and market-based approaches for pollution control, choices among market-based approaches should be made with care. Consider the choice between tradable permit markets and pollution taxes. Economists usually emphasize the symmetry between these two instruments, but they are not symmetrical under conditions of uncertainty, in the presence of transaction costs, or under other special conditions. Studies comparing taxes and permits have assumed that permit markets entail no transaction costs. This assumption is troubling, given evidence that these costs are common in permit markets. Of course, systems of pollution taxes can involve substantial administrative costs, both fixed (per firm) and variable. Hence, these instruments should only be compared on a case-by-case basis.

Implications for designing policy instruments

Where a system of tradable permits is the instrument of choice for controlling pollution, three sets of design issues stand out.

The first set relates to the point in the product cycle at which pollution ought to be regulated. The simplest pollution-control systems (whether they involve tradable permits or other instruments) focus on inputs to production processes—say, the lead content of gasoline or the carbon content of fossil fuels. When the focus shifts away from inputs, pollution-control systems may become more sophisticated and, as a result, potentially more costly. For example, trading in permits for emissions (an output) represents substantially greater administrative complexity and transaction costs than trading in inputs. Further along this path of increasing complexity are ambient-pollution permit trading, exposure trading, and finally risk trading. Each system along this path may come closer to a theoretical ideal but also may entail greater public costs because of increased monitoring and enforcement and increased private transaction costs. Indeed, these practical considerations may explain why—contrary to economists' models—public authorities have adopted input and emissions trading but not ambient-pollution, exposure, or risk trading.

A second set of design issues centers on how trading programs can be designed to provide information needed by potential traders. Government authorities can take actions that directly reduce traders' uncertainty about market variables, as well as reduce barriers to private brokerage services and make allowance for the development of futures markets. At a minimum, government authorities can avoid creating regulatory barriers (such as requiring government approval of trades before the trades take place) that drive up transaction costs and discourage trading. More actively, they can try to reduce market uncertainty by taking on a brokerage role. That is, they could help potential traders identify one another by supplying information about potential buyers and sellers.

Private brokerage services can also play an important role in supplying information. In the national sulfur dioxide permit-trading program created under the 1990 amendments to the Clean Air Act, commercial brokers provide forecasting services for electric utilities by using computer models to predict the supply and demand for permits. In local programs, such as EPA's Emissions Trading Program, commercial brokers may conduct the air-quality modeling that is required for some permit trades.

While commercial brokers receive fees and therefore contribute to transaction costs, their basic service—bringing together buyers and sellers by matching buy orders and sell orders—can reduce transaction costs below what they would otherwise be. In general, brokers can contribute to social welfare by helping parties to economize on transaction costs. In addition, brokers can play the role of consultants, adding value to their basic function as intermediaries by understanding the regulatory process and by maintaining information about prospective buyers and sellers. Finally, brokers may assume risk by buying, holding, and selling permits.

Government authorities can take actions that directly reduce traders' uncertainty about transaction costs. One way to do this would be to take on a brokerage role.

A third set of design issues concerns the initial allocation of permits, which—as noted above—gains significance in the presence of transaction costs. This single aspect of design can establish or destroy the political feasibility of any tradable-permit system. Because government authorities need to establish a constituency for a proposed permit market, they usually choose to distribute permits free of charge. This politically attractive choice enables them to devise all sorts of initial allocations that will win support for an emission-trading program.

Typically, economists assume that these alternative initial allocations have only distributional implications, since they also assume that initial allocations do not affect aggregate abatement costs. But initial allocations may have more than distributional effects when transaction costs are present. Thus, a successful attempt to establish a politically viable

emission-trading program through specific permit allocations can actually result in a program that will be far more costly than promised.

Such a result may argue for the economist's favorite permit-allocation mechanism: auctions. This approach becomes even more attractive in the presence of transaction costs. But political barriers to permit auctions and political incentives in favor of all sorts of free distributions are likely to remain in place for the foreseeable future.

What, then, is the general message for public policy? With transaction costs present in markets for tradable permits, the "devil is in the details." And while the existence of transaction costs may make the choice between ambient-pollution permits and emission permits more obvious, it may well make the choice between conventional approaches and permits more difficult because of the ambiguities that transaction costs introduce. Likewise, the supposed symmetry of taxes and permits becomes questionable, and the need to compare these instruments on a case-by-case basis becomes more compelling. Finally, transaction costs require government agencies to pay greater attention to the details of designing specific tradable-permit systems. Doing so will lessen the risk of overselling these systems and increase the chance that well-designed systems will be implemented successfully.

Robert N. Stavins is a university fellow at Resources for the Future and an associate professor of public policy at the John F. Kennedy School of Government at Harvard University. A detailed investigation of the topics explored in this article is forthcoming in the Journal of Environmental Economics and Management *and in a discussion paper available from the author. A preliminary analysis is found in RFF discussion paper QE93–16.*