

Tradable Permits in Pollution Markets

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Public awareness of the actual and potential threat to the natural environment has grown rapidly in the last few years. Concerns about deteriorating quality of air and water, natural resource depletion and the contraction of bio-diversity have raised fears that irreparable damage is being done to the environment. This has resulted in severe pressure on governments in both industrialised and non-industrialised countries to develop policies to address environmental degradation.

Pollution Reduction Policy Instruments

The historical approach to pollution control has been one of command and control. Under this mechanism, the regulator specifies the technology that must be used to comply with regulations. The first step is to establish ambient air or water quality standards. These standards set legal ceilings on the allowable concentration of each of the pollutants. The second step is to ensure that these standards are met and this is done by making particular forms of behaviour or specific technological choices mandatory. Tietenberg (1996) among others shows that command and control policies are not cost effective. He calculates the ratio of the command and control allocation costs to the lowest cost of meeting the same objective for each study. He finds that these policies cost at least 78% more than the least cost policies. Difficulty in obtaining information about abatement costs of individual polluters and the lack of flexibility in choosing the technology to decrease emissions increases the cost of regulation in this case.

Dissatisfaction with the cost-effectiveness of the command and control approach led economists and policy makers to design another way of enforcing the same environmental standard: through market based incentives. These regulatory mechanisms use different ways to stimulate the market. One of them is by changing the price of the polluting input, technology or the product. If coal combustion causes acid rain and green house effects, then the price of coal in the free market definitely does not reflect the use that coal combustion makes of environmental services supplied by the atmosphere. The price of coal can be altered by imposing a tax on it according to its sulphur and carbon content. These taxes (also called emission charges) are price instruments.

Issuing tradable permits is another kind of market-based mechanism. These permits allow pollution up to the level of the pre-determined standard. As the name suggests, these permits can be traded between the polluters. So polluters whose abatement costs are relatively high have an incentive to bid for the permits. Permit buyers therefore tend to pollute more than permit sellers, yet overall environmental standards remain unaltered because just enough permits are issued to achieve the standard in aggregate. Trading permits between polluters thus minimises the cost of complying with the standard. Marketable permits are generally thought of as quantity instruments because they ration a fixed supply of a commodity, in this case pollution.

This article focuses on the tradable permit mechanism and in particular discusses a tradable permit market currently running in Los Angeles.

Tradable Permits

Most of the tradable permit programs have been initiated in the United States. Some of the important ones include the Environmental Protection Agency's Emissions Trading Program for the regulation of clean air, the Wisconsin system of tradable discharge permits for the management of water quality, the Lead Permits program launched to decrease the lead content in gasoline, and the Acid rain program to reduce sulphur dioxide emissions. Some of these programs have been very successful, like the Lead reduction program where the market was allowed to function free of heavy restrictions and thus resulted in vigorous trading with substantial cost savings. In contrast the Emissions Trading Program had stringent restrictions on trading and this led to significant transactions costs and uncertainty and therefore hampered the realisation of potential cost savings.

Some of the new tradable permit schemes have arisen from state initiatives. Faced with the need to reduce ozone concentrations so as to come into compliance with the environmental standards, states have chosen to use trading programs as a means of facilitating rather drastic reductions in pollutants. The Regional Clean Air Incentives Market (RECLAIM) is one of the most ambitious of these regional programs and is targeted at the South Coast Basin based in Los Angeles. This program was launched in January 1994 and aims to improve air quality in the most polluted city in the United States. All facilities that emit 4 tons or more (annually) of nitrogen oxide or sulphur oxide are included in RECLAIM.¹ About 350 facilities are currently in the nitrogen market and 41 in the sulphur market. Each of these facilities is allocated permits and this allocation decreases by a certain percentage each year for the next decade. The allocation depends on peak activity level for each piece of equipment between 1989 and 1992. New facilities in the region must buy permits to cover their emissions.

RECLAIM is supposed to provide great flexibility to firms in meeting the emission requirements and in the process it is supposed to initiate technological innovation in pollution abatement technology. Hence most pre-program estimates have been projecting enormous cost savings. However, the actual savings will depend on the trading structure and the associated transactions costs. Transactions costs can arise at various stages of

trading. Prior to entering the market, the firm has to learn the rules of the market, work out its optimal production plan and decide whether it will trade or not, and if it does decide to trade, whether it will be a buyer or seller of permits. Once the information about the market is obtained, it searches for a trading partner. Unlike other permit markets (like the acid rain market), the traders in RECLAIM are expected to find trading partners without the help of centralised auction mechanisms. The firms included in RECLAIM are heterogeneous in nature and often do not participate in similar input or output markets, hence searching for a trading partner in the permit market can be very time consuming and costly.

Transaction Costs

Research on the transactions costs in RECLAIM (Gangadharan, 1998) has shown that these costs can be significant in the initial years of the program. In 1995, only 95 facilities out of a total of 350 traded in the nitrogen market. Transaction costs seem to explain why some firms do not trade in the market. The transaction costs variables have been defined to include information costs and search costs. As the information cost and search cost incurred by the firm increases, the probability that it will trade in the market falls. Transaction costs are seen to reduce trading probabilities by approximately 40 percent in the early years of RECLAIM.

Hence even though emission trading programs are seen to be cost effective as compared to the command and control methods, the implementation of these programs can lead to some costs, which are not accounted for in most models. If firms decide not to trade in these untested markets then the potential cost savings will not be realised for the economy. The theoretical literature on environmental regulation has discussed permit programs for a few decades now, however the empirical literature has lagged far behind. Empirical research in this area is important to understand the functioning of permit markets and the implications of different trading rules on the environment and the economy.

The Future

In 1990, the U.S. EPA estimated that more than \$100 billion was spent annually to comply with Federal environmental laws and regulations and this amount is expected to increase in the future. As expenditures rise, policymakers search for more effective tools so as to maintain and improve environmental quality in a cost-effective manner. Market based instruments like tradable permits have potentially an important role to play in this discussion. New tradable permit programs are being initiated all around the world and an emission trading scheme is likely to be adopted to meet the greenhouse gas targets established under the 1997 Kyoto Protocol.

Given the interest in these market-based programs and the history of transactions costs incurred by firms, do we need to initiate policies to encourage participation in the permit market? Some of the ways of encouraging participation would be to increase information dissemination using electronic mediums like the internet, sponsor the development of

electronic bulletin board systems that reduce the search costs incurred by firms and have a well designed centralised trading mechanism. The regulatory authority could play a more active role in these markets to reduce information costs by analysing the transactions data monthly and circulating the summary statistics to participants. The initial years of the program would be the toughest for the firms and some help from the regulatory authority could go a long way towards creating an efficient pollution market.

References:

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¹A firm can have multiple facilities or branches. Environmental regulation is targeted at the facility level.

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