

Bubble policy



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In 1970, Congress amended the Clean Air Act to assign the Environmental Protection Agency (EPA) responsibility for the control of air pollution emitted by stationary sources. Stationary sources refer to the industrial plants, factories, and refineries of firms that emit pollutants into the air. The EPA began by requiring each state to develop a plan that indicates the levels of emissions allowed by various types of stationary sources. To meet these emissions standards, the EPA directed firms to adopt and operate the latest, and oftentimes most expensive, air pollution abatement techniques.

This form of regulation, which defines the allowable level of emissions at each source as well as the means by which emissions are to be controlled, is referred to as command-and-control regulation. Because of its stringent requirements, command-and-control regulation does not allow firms to minimize their pollution control costs. Due to the high pollution abatement costs associated with command-and-control, firms placed pressure on the EPA, the states, and Congress to adopt alternative methods to comply with air pollution regulation.

Firms suggested they could meet the emissions standards at lower costs if they were provided more flexibility than the current regulatory system allowed. This led to the development of emissions trading. Based on the concept of marketable pollution permits, emissions trading allows firms to adjust the levels of pollution control at each source of emissions as well as select the type of pollution control techniques to employ. Instead of meeting individual limits at each source of emissions, a firm can make tradeoffs between the sources.

This allows the firm to abate pollution at lower costs. With the adoption of the EPA's Emissions Trading Policy Statement during the 1980's, a firm now can choose to control its emissions using either command-and-control regulation or a system of emissions trading. A specific form of emissions trading, referred to as the bubble policy, is examined in this paper, since " it is the... component of the Emissions Trading Program which most closely resembles the marketable permit concept addressed in the empirical and theoretical work" (Atkinson and Tietenberg 18).

The bubble policy is available for use by stationary sources that were in existence prior to the writing of the Clean Air Act Amendments of 1970. Using a bubble allows a firm to treat all the emissions sources in an entire plant as a single source of emissions. As a result, the firm can control emissions most at the points cheapest to abate, and control emissions least at the points most expensive to abate (Liroff). It is theorized that use of the bubble policy reduces the costs of pollution abatement, which, in turn, increases the value of the firm.

A history of stationary source air pollution regulation an explanation of the bubble policy is provided in this paper. Also discussed is some of the past research comparing the performance of different air pollution control instruments. While emissions trading is hailed as the least-cost method of pollution control, it has not been universally adopted by firms. This observation can be explained by the cross-sectional variation in the benefits received by firms when they change to the bubble policy.

Firms that do not have much to gain from the adoption of a bubble may find it is not worth the costs incurred when making a switch in instruments.

Selected studies that examine the effect of the costs of adopting and using emissions trading are also described here. History of Stationary Source Air Pollution Regulation In 1963, the Clean Air Act was written to commission the states to create their own air pollution policies. The states made use of emissions standards exclusively to limit the acceptable levels of emissions generated by stationary sources within firms.

The federal government possessed no active role in the development and implementation of air pollution policy until the writing of the Air Quality Act in 1967. This act granted power to the federal government to specify the types of abatement technologies firms were required to adopt at their pollution sources, while still permitting the states to create and enforce emissions standards (Liroff). Often, the federal government required the adoption of the most advanced abatement technology available to firms, regardless of cost.

The combination of the federal and states' roles in the reduction of stationary source air pollution resulted in a form of command-and-control regulation. Firms were told not only how much to limit their emissions by, but also which abatement technologies to use for pollution control. To this point, the only option for air pollution control was the command-and-control regulatory system, which was created through a hybrid of federal and state environmental regulation (Liroff). A major change in air pollution control policy came when the EPA was created and the Clean Air Act Amendments of 1970 were written.

Adoption of the amendments established a stronger role for the federal government in the control of stationary source air pollution because these

amendments directed the EPA to set national ambient air quality standards (NAAQS). Since air quality standards specify the acceptable level of air quality instead of the actual levels of emissions allowed, the NAAQS differed from the emissions standards set by the states. The amendments required each state to develop a state implementation plan (SIP) by the middle of 1972.

An implementation plan specifies the procedures, timetables, and emissions standards existing pollution sources are subject to so that a state can meet the NAAQS by mid-1975 (Doniger). Because command-and-control regulation requires firms to adopt relatively expensive pollution control technology and to reduce pollution at each source where emissions are released, the costs of air pollution control soared. Firms began to lobby for the adoption of cheaper alternatives by which to meet the emissions standards and eventually, this led to the consideration of marketable pollution permits and emissions trading.

A pollution permit market still requires firms to meet an overall emissions standard, but it allows them to select the type of abatement technology to use in its control of emissions. It also allows them to decide the sources at which to abate pollution. These choices provide firms with an opportunity to reduce the costs of meeting emissions limits. The concept of emissions trading had been discussed in the past, but until this point, such a system had not been put into practice (Baumol and Oates). The Emissions Trading Policy Statement eventually adopted by the EPA includes four types of emissions trading.

One of these is referred to as the bubble policy. An imaginary bubble is placed over the relevant emissions sources of the firm so that the total quantity of emissions the firm is permitted to emit is the sum of the allowable emissions from each source covered by the bubble. Under the bubble, the firm can then choose to over-control the sources that are cheapest to abate and under-control the sources that are most expensive to abate. It can make these tradeoffs in the control of air pollution as long as the amount of pollution released does not exceed the total emissions allowed (Atkinson and Tietenberg).

In addition, a firm using a bubble is not required to adopt specific air pollution control technology or equipment. The bubble policy allows the firm to reduce its costs of air pollution control by providing it with the opportunity to equate the marginal costs of abatement across all of its points of emissions. Various estimates of the cost savings from the use of the bubble policy have been produced (Atkinson and Tietenberg). For example, Levin estimates that the cost savings from the use of bubbles totals \$800 million over the first six years of the policy's existence.

Comparisons of Air Pollution Control Instruments When the command-and-control regulatory system was developed to reduce the pollution emitted by stationary sources, a number of studies emerged comparing its performance to alternative pollution control instruments. Most of these studies examine highly theoretical forms of pollution control instruments rather than the systems used in practice. Comparisons are made between standards, such as limits on the quantity of emissions, and incentive-based instruments, such as marketable pollution permits.

This literature, as Tietenberg, concludes that the use of permits to allocate pollution rights reduces the same amount of emissions at a lower cost than does command-and-control regulation (Tietenberg). Hahn develops a representative study that compares the effectiveness of command-and-control regulation to a marketable permits system. When a firm complies with command-and-control regulation, it reduces the excess emissions released from each emissions point in order to meet the state and EPA regulated standards for each source.

The marketable permits system, on the other hand, specifies an overall ceiling on the total amount of emissions allowed while allowing firms to buy and sell rights to pollute as needed. In the process, firms can choose to operate the least-cost abatement technologies to reduce their emissions at fewer sources. This study makes comparisons between environmental control instruments under conditions of perfectly enforceable standards. When standards are perfectly enforceable, firms find it prohibitively costly to produce more pollution than allowed by state and EPA regulation.

When standards are not perfectly enforceable, firms weigh in the possibility of violating the emissions standards into their production decisions. Tietenberg has made a comparison of ten empirical studies measuring the potential cost savings of using a least-cost air pollution control instrument instead of command-and-control. To compare the cost savings across studies, Tietenberg calculates the potential cost savings as a ratio of command-and-control costs to the lowest possible cost of meeting the same air pollution target.

Alternatively stated, the command-and-control allocation of pollution control is two to twenty-two times more expensive than the least-cost allocation. According to Tietenberg, the large range of the potential cost savings across studies exists because they examine the control of different pollutants. Also, the emissions standards firms are required to meet differ across studies. A theoretical model comparing the wealth effects of emissions standards, emissions taxes, and marketable pollution permits on the shareholders of firms is formulated by Dewees.

In his analysis, he assumes that no pollution control policy is anticipated by the stock market. He concludes that the wealth of shareholders in existing firms is relatively higher when emissions standards are adopted over taxes and permits. Standards lead to less plant closures than incentive-based instruments, a result which has a smaller negative impact on shareholder wealth than taxes and pollution permits (Dewees). In fact, in some cases, shareholders may prefer emissions standards to no control policy at all. A firm's potential preference for emissions standards over no air pollution regulation is explained Buchanan and Tullock.

They compare the effect of an emission tax and an emission quota on firm profits, concluding that existing firms may benefit from a quota on pollution. If the quota is only available to existing firms, barriers to entry are created. This allows firms in the industry to earn excess profits in the short-run. " In effect, regulation in this sense is the directional equivalent of cartel formation... " (Buchanan and Tullock 142). When taxes are instead adopted, firms incur short-run losses until a new market equilibrium is reached.

Existing sources support the adoption of emission quotas over taxes if an air pollution control policy is to be adopted. Maloney and McCormick formulate a theoretical model and empirically test the hypotheses they derive to determine whether or not the imposition of emissions standards increases producer wealth. They argue, as did Buchanan and Tullock, that air pollution regulation can create entry restrictions to polluting industries. One way that air pollution regulation creates entry limitations is by placing differential pollution control requirements on newer firms.

" For example, the 1970 Clean Air Act and its amendments imposed standards on existing pollution sources as a function of the ambient air quality, while new firms had to meet the strictest standards regardless of local air quality. Moreover, the ambient air standards have been the tightest in the cleanest air regions, further restricting the entry of rivals" (Maloney and McCormick 101). The authors conduct an event study to examine the effect of the OSHA cotton-dust standards on firm value, as these standards are more stringent for newer firms.

Consistent with their expectations, older firms within the cotton industry increased in value when the regulation was adopted. While no specific entry barriers are written into the cotton-dust standards, Maloney and McCormick (1982) theorize that the effect of the law may be an intra-industry wealth redistribution. Emissions Trading in Practice The performance of emissions trading has resulted in significant economic gains for firms due to the reduced costs of compliance, but according to Hahn and Hester (1989b), the impact on air quality has been negligible.

They report estimates of the cost savings and the impact on environmental quality from the use of two types of bubbles: EPA bubbles and state bubbles. State bubbles refer to those approved under state generic bubble rules. These rules allow states to approve bubble applications without having to forward them to the federal EPA for final approval. A majority of states do not have generic bubble rules, however, which means that the bubble applications these states process go through both the state air pollution agency and the EPA to gain full approval.

Hahn and Hester estimate the cost savings from state bubbles at \$300 million and from EPA approved bubbles, the savings are \$135 million over the years 1981 through 1986. The larger savings from state approved bubbles arise because a larger number of bubbles have been approved using state generic bubble rules. In fact, through 1989, there had been ninety bubbles approved under state generic bubble rules and only forty-two approved through the traditional EPA bubble application process. This could be because the bubble approval process under the generic rule is less bureaucratic and time consuming.

Although fewer in number, there are studies that disagree about the magnitude of the cost savings received by firms from emissions trading (Stavins). In an empirical study by Atkinson and Tietenberg, the effectiveness of external bubble trading is explored through a simulation of the sequential and bilateral emissions trading activity of firms. External bubble trading refers to the trading of emission permits created through the adoption of a bubble. If a firm utilizes a bubble to decrease its emissions, it

essentially creates emission permits equal to the quantity of emissions reduced.

These permits can now be sold to another firm that releases emissions exceeding the standards. Atkinson and Tietenberg conclude that the bubble policy "has not even approximately achieved a cost-effective allocation of the control responsibility. The cost savings have been smaller and the number of trades fewer than might have been expected at the outset of the program" (Atkinson and Tietenberg 1988). The reason their results show a significant divergence between the actual and potential cost savings is because their study is confined to external bubble policy emission trades.

In actuality, a majority of the emissions trading activity involving the bubble policy is carried out as an internal trade within a firm. Their findings do not, therefore, universally apply to all instances in which the bubble policy is adopted. Although many claims have been made about the cost savings resulting from emission trading markets, little consideration has been given to the transactions costs of emissions trading. These are the costs of negotiating and enforcing trades of emission permits between firms.

The few studies that do mention these transactions costs do not explicitly include them in models of tradable permit markets (Hahn and Hester). One theoretical model that does examine the effect of these costs on tradable emissions markets is developed by Stavins (1995). His model shows the costs of engaging and enforcing emissions trades across firms unambiguously decrease the volume of trading, regardless of the specific functional forms taken by marginal control costs and transactions costs (so long as they are non-decreasing over the relevant ranges).

As the costs of participating in a marketable permit market increases, the price paid by permit buyers is driven upwards while the price received by the sellers is reduced. The burden of the costs of emissions trading falls most heavily on the firms with higher costs of pollution control. When the costs of negotiating and enforcing emissions trading are present, the outcome is also affected by the initial allocation of permits. This result contradicts Montgomery's finding that the equilibrium allocation of pollution control over firms is independent of the initial permit allocation.

An empirical study performed by Gangadharan (1997) evaluates the performance of the Regional Clean Air Incentives Program (RECLAIM) for nitrogen oxides and sulfur oxides in the Los Angeles area to determine the impact of transactions costs on the participation of firms in the tradable pollution rights market. She hypothesizes that transactions costs limit the benefits of emissions trading, thereby reducing the number of firms participating in the tradable pollution rights market.

By including search and information cost data in her hedonic price regressions for nitrogen oxide and sulfur oxide emission permits, Gangadharan determines that these costs are responsible for a significant number of firms opting not to enter the tradable pollution rights market. Another obstacle to achieving the benefits of emissions trading arises from regulatory constraints on emissions trades. Hahn states that while the use of emissions trading has led to millions of dollars in savings for polluters engaging in emissions trades, the potential savings are much larger if the regulatory constraints on emissions trading were relaxed.

He investigates how regulatory constraints on the new bubble policy, detailed in the 1986 Final Emissions Trading Policy Statement, affect a firm's choice between individual emissions source control and trading under the new bubble rule. In order to make an emissions trade under the new bubble rule, a firm must make an additional reduction of 20% of the emissions standards. Each firm decides whether or not to meet the source-specific standards by trading emission credits across sources or by reducing emissions at the source itself.

" If it trades emission rights across sources, the firm incurs a penalty (in terms of aggregate emissions requirements) relative to the choice of meeting emission requirements through internal adjustments of each source.... Assuming the firm tries to comply with the regulation, it will weigh the increased costs associated with the emissions penalty against the potential cost savings resulting from lower pollution control costs" (Hahn 154). Summary In summary, firms generally benefit from the adoption of emissions trading.

Although a multitude of studies perform empirical tests to compare the costs of pollution control alternatives and an even larger number develop theoretical models of the benefits of emissions trading, the magnitude of emissions trading benefits are affected by firm specific factors. This paper reviewed theoretical models of the factors that enhance the air pollution control and influence the benefits of adopting the bubble policy. The firm's decision is affected by the how much it can save when it controls its emissions using the bubble policy.

The magnitude of these savings are affected by a number of factors such as the firm's costs of pollution abatement, the stringency of the regulatory emissions standards, and the uncontrolled levels of emissions generated during the production of output. Past research provides evidence of the cost savings when firms operate under an emissions trading regime rather than command-and-control, but this literature fails to identify the factors influencing the size of the gains received from switching pollution control instruments. Bibliography

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