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Cap-and-Trade: The Evolution of an Economic Idea

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Over the past three decades or so, emissions trading has evolved from an idea that was little more than an academic curiosity to its current role as the centerpiece of the U.S. program to control acid rain and international programs to control greenhouse gases. This essay identifies some of the key milestones of this evolution, describes how that evolution was shaped by economic analysis, elicits some of the lessons about the design and effectiveness of emissions trading that have emerged from analysis of that evolution, and points out a few of the barriers that lie in the path of achieving a truly global carbon market.

Key Words: emissions trading, cap-and-trade, climate policy

From its inauspicious beginning as an idea that was little more than an academic curiosity, emissions trading has matured into its current role as the centerpiece of the U.S. program to control acid rain and international programs to control greenhouse gases. What explains this rather remarkable transition? This essay identifies some of the key milestones of this evolution, describes how that evolution was shaped by economic analysis, elicits some of the lessons about the design and effectiveness of emissions trading that have emerged from that evolution, and points out a few of the barriers that lie in the path of achieving a truly global carbon market.

Early History

By the late 1950s both economists and policymakers had formed quite well developed and deeply entrenched visions of how pollution-control policy should be conducted. Unfortunately these two visions were worlds apart.

Economists viewed the world through the eyes of Pigou (1920). Professor A.C. Pigou had argued that in the face of an externality, such as pollution, the appropriate remedy involved imposing a per-unit tax on the emissions from a polluting activity. The tax rate would be set equal to the marginal external social damage caused by the last unit of pollution at the efficient allocation. Faced with this tax rate on emissions, firms would internalize the externality. By minimizing their own costs, firms would simultaneously minimize the costs to society as a whole. According to this view, rational pollution control policy involved putting a price on pollution.

Policymakers, on the other hand, preferred controlling pollution through a series of legal regulations, ranging from controlling the location of polluting activities to the specification of emission ceilings.

The result was a standoff in which policymakers focused on quantity-based policies (Kelman 1981), while economists promoted price-based remedies (Kneese and Schultze 1975). During the standoff, the legal regimes prevailed. Taxes made little headway.

In 1960 Ronald Coase published a remarkable article in which he sowed the seeds for a rather different mindset (Coase 1960). Arguing that Pigou's analysis had an excessively narrow focus, Coase argued that by making property rights explicit and transferable, the market could play a substantial role not only in valuing these rights, but also in ensuring that they gravitated to their best use. To his fellow economists, Coase pointed

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out that a property-rights approach allowed the *market* to value the property rights (as opposed to the *government* in the Pigouvian approach). To policymakers Coase pointed out that the then existing legal regimes provided no incentives for the rights to flow to their highest-valued use.

It remained for this key insight to become embedded in a practical program for controlling pollution. John Dales (1968) pointed out its applicability for water and Tom Crocker (1966) for air.

Theoretical Foundations

The appeal of emissions trading comes from its ability to create incentives that are compatible with achieving a prespecified environmental target at minimum cost even in the absence of any regulator information on control costs. Under this system, permits (authorizations to emit a specific amount, usually one ton, of a specific pollutant) are either auctioned off or distributed among emitters on the basis of some criterion such as historical use. As long as marginal abatement costs differ, incentives for trade exist. High marginal abatement cost firms buy permits from low marginal cost firms until the market clears and the demand for permits equals the fixed supply.

While the general properties of the system had been correctly anticipated by Dales and Crocker, it remained for Baumol and Oates (1971) to demonstrate them formally. Interestingly enough their original paper is not about a marketable permits system, but rather about a charge system designed to meet a predetermined environmental target. Nonetheless, because the mathematics is perfectly equivalent for the two cases, the result derived for a charge system immediately was recognized as relevant for emissions trading.

Baumol and Oates proved that a uniform charge would result in meeting the predetermined environmental target cost-effectively. This was important because it implied that the control authority could promote a cost-effective allocation of control responsibility simply by imposing the same tax rate on all polluters. Since all profit-maximizing firms would equate their marginal control costs to this uniform charge, marginal control costs would necessarily be equalized across emitters, precisely the condition required for a cost-effective allocation.

The main practical difference between the two approaches, however, was how the "correct" price would be determined. While any price would result in equal marginal costs, only one price would be consistent with meeting the prespecified standard. In a tax and standards system, this price could be found iteratively, through trial and error. In the marketable permits system the price would be established by the interaction of the demand for and supply of permits in the market. In this market not only would the control authority have no direct role in setting the price, but prices would be determined immediately, avoiding a long iterative procedure.

The Baumol and Oates results apply only in a special case—when all emissions from all emitters have the same impact on the environmental target (Tietenberg 1973). When the target involves meeting an ambient concentration standard where location of the emissions does not matter, this case has become known as the "uniformly mixed" case. One prominent example involves greenhouse gases, since a particular emission will have the same impact on the atmosphere regardless of the location from which it is emitted. The Baumol-Oates theorem is also valid when the environmental target is defined in terms of aggregate emissions rather than pollutant concentrations.

In many other cases, however, the location of the emissions does matter. In these cases the contribution of any unit of emissions to the environmental target (say, an ambient standard that sets a concentration limit at a particular location in the air or water) will depend on the location of the emissions. All other things being equal, sources closer to the receptor are likely to have a larger impact than those further away. For these cases neither a single tax rate nor permit price will suffice. Differentiation of rates among sources is necessary.

Montgomery (1972) proved the existence of a cost-effective permit market equilibrium in this more complicated case. In general, those sources having higher marginal impacts on the environmental target need to pay higher prices per unit of emissions, which can be implemented by having separate permits for each receptor location (Tietenberg 1973). When the environmental target is defined in terms of pollutant concentrations in the ambient air (as it is in most countries), the permits can be defined in terms of allowable concentration units. Although the emissions allowed by each permit would degrade the concentration at the associated receptor location by the same amount, each permit would allow differing amounts of emissions depending on the location of the emitter vis-à-vis the receptor. Each permit would authorize fewer emissions for those emitters having a greater impact on the receptor location for each unit of emissions.

The Policy Context

Stripped to its essentials, the U.S. approach to pollution control prior to the adoption of emissions trading, which remains partially intact today, relied upon a *command-and-control* approach to controlling pollution. Ambient standards, which establish the highest allowable concentration of the pollutant in the ambient air or water for each conventional pollutant, represent the targets of this approach. To reach these targets, emission or effluent standards (legal discharge ceilings) are imposed on a large number of specific discharge points such as stacks, vents, outfalls, or storage tanks.

The political acceptability of a cost-effective, quantity-based approach grew as the difficulties with the command-and-control approach became more apparent. Both cost-effectiveness and a quantity-based approach seemed more consistent with, and a less radical departure from, traditional environmental policy. Existing pollution targets could be retained.

The Push for Reform

A pivotal point in the reform movement occurred when empirical cost-effectiveness studies showed that it was possible to reach the predetermined standards at a *much* lower cost than was the case with the traditional command-and-control regime (Tietenberg 2006). This rather consistent finding, produced for a number of different pollutants and geographic settings, offered the politically attractive prospect of either achieving the existing environmental objectives at a much lower cost or of obtaining a much higher level of environmental quality for the same expenditure. While theory showed that command-and-control regulation typically was not cost-effective, empirical work demonstrated that the degree of inefficiency was very large indeed. This work suggested that the gains from reform would be large enough to outweigh the transition costs.

The Evolution of Emissions Trading[1]

The Offset Policy: The Problem Becomes the Solution

The political opportunity to capitalize on these economic insights came in 1976. By then it had become clear that a number of regions, designated "nonattainment" regions by the Clean Air Act, would fail to attain required ambient air quality standards by the deadlines mandated in the Act. Since further economic growth appeared to make the air worse, contrary to the intent of the statute, the U.S. Environmental Protection Agency (EPA) was faced with the unpleasant prospect of prohibiting many new businesses (those which would emit any of the pollutants responsible for nonattainment in that region) from entering these regions until the air quality met the ambient standards.

Prohibiting economic growth as the means of resolving air quality problems was politically unpopular among governors, mayors, and many members of Congress. EPA was facing a potential revolution. At this point, of necessity, EPA considered its options. Was it possible to address the air quality problem while allowing (or even facilitating) further economic growth?

It was possible, as it turns out, and the means for achieving these apparently incompatible objectives involved the creation of an early form of emissions trading. Existing sources of pollution in the nonattainment area were encouraged to voluntarily reduce their emission levels below the current legal requirements. Once the EPA certified these excess reductions as "emission reduction credits," they became transferable to new sources that wished to enter the area.

New sources were allowed to enter nonattainment regions providing they acquired sufficient emission reduction credits from existing facilities in the region so that total regional emissions were *lower* (not just the same!) after entry than before. (This was accomplished by requiring new sources

[1] Due to limitations of space, only a small sampling of the operating programs can be mentioned here. Emissions trading has been used in many other contexts including the RECLAIM program in the greater Los Angles area (Hall and Walton 1996), the program to phase out lead in gasoline (Nussbaum 1992), the NOx Budget program in the Northeast (Farrell 2001), emissions averaging of industrial toxics (Anderson 2001), and controlling particulates in Santiago, Chile (O'Ryan 1996, Montero, Sanchez, and Katz 2002).

to secure credits for 120 percent of the emissions they would add; the additional 20 percent would be "retired" as an improvement in air quality.) Known as the "offset policy," this approach not only allowed economic growth while improving air quality—the original objective—it made economic growth the vehicle for improving the air. It turned the problem on its head and made the problem part of the solution.

It wasn't long before the federal government began to expand the scope of the program by allowing credits to be banked and permitting existing sources to trade with other existing sources. In this program not only was the government required to certify each reduction before it qualified for credit, but credit trades were generally approved by the control authority on a case-by-case basis. Not surprisingly the huge transaction costs associated with this level of government involvement limited the effectiveness of the program, leading one pair of commentators to subtitle an article about this program "Why Is This Thoroughbred Hobbled?" (Dudek and Palmisano 1988).

Tackling Acid Rain: The Sulfur Allowance Program

The most successful version of emissions trading to date has been its use in the United States for controlling electric utility emissions contributing to acid rain. Under this innovative approach, allowances to emit sulfur oxides were allocated to individual plants, with the number of authorized emissions being reduced in two phases so as to ensure a reduction of 10 million tons in emissions from 1980 levels by the year 2010.

Perhaps the most interesting political aspect of this program was the role of trading in the passage of the acid rain bill. Although reductions of acid rain precursors had been sought with a succession of bills over the first two decades of Clean Air Act legislation, none made it into law. With the inclusion of an emissions trading program for sulfur in the bill, the compliance cost was reduced sufficiently to make passage politically possible.

Sulfur allowances form the heart of this tradable permit program. The allowances are allocated to specified utilities on the basis of an allocation formula. Each allowance, which provides a limited authorization to emit one ton of sulfur, is defined for a specific calendar year, but unused allowances can be carried forward into future years. They are fully transferable not only among the affected sources, but even to individuals who may wish to "retire" the allowances, thereby denying their use to authorize emissions.

Emissions in this controlled sector cannot legally exceed the levels permitted by the allowances (allocated plus acquired). An annual year-end audit balances emissions with allowances. Utilities that emit more than is authorized by their holdings of allowances face a substantial per-ton penalty and must forfeit allowances worth an equivalent number of tons in the following year. This general approach of enforcing a predefined cap on emissions with transferable allowances that are matched against actual emissions at the end of the year has become known as "cap-and-trade."

The sulfur allowance program has several innovative features that were influenced by analysis, but in the interest of brevity I will mention only one—ensuring the availability of allowances by instituting an auction market. Although allowances can be transferred either by private sale or in the annual auction, historically the problem with the private sale route was that prices were confidential so transactors operated in the dark. Due to an absence of knowledge not only about potential buyers and sellers, but also about prices, transaction costs were high; the lack of price transparency inhibited effective emissions trading.

EPA facilitated this market by instituting an auction market run by the Chicago Board of Trade. During the negotiations, utilities fought the idea of an auction because they knew it would raise their costs significantly. Whereas under the traditional means of distributing allowances utilities would be given the allowances free of charge, under a conventional auction they would have had to buy these allowances at the full market price, a potentially significant additional financial burden.

To gain the advantages an auction offers for improving the efficiency of the market, while not imposing a large financial burden on utilities, EPA established what has become known as a *zero revenue* auction (Hahn and Noll 1982). Each year the EPA withholds from its allocation to utilities somewhat less than 3 percent of the allocations, and auctions these off. In the auction these allowances are allocated to the highest bidders, with successful buyers paying their actual bid price (not a common market-clearing price). The proceeds from the sale of these allowances are refunded on a proportional basis to the utilities from which the allowances were withheld. Although this auction design is not efficient because it provides incentives for inefficient strategic behavior (Hausker 1992, Cason 1993), the degree of inefficiency is apparently small (Ellerman et al. 2000).

Emissions Trading in the Kyoto Protocol on Climate Change

In December 1997, industrial countries and countries with economies in transition (primarily the former Soviet Republics) agreed to legally binding emission targets for greenhouse gases at the Kyoto Conference. The Kyoto Protocol became effective in February 2005.

The Kyoto Protocol authorizes three cooperative implementation mechanisms that involve tradable permits—Emissions Trading, Joint Implementation, and the Clean Development Mechanism.

- "Emissions Trading" (ET) allows trading of "assigned amounts" (the national quotas established by the Kyoto Protocol) among countries listed in Annex B of the Protocol, primarily the industrialized nations and the economies in transition.
- Under "Joint Implementation" (JI), Annex B parties can receive emissions reduction credit when they help to finance specific projects that reduce net emissions in another Annex B party country. This "project-based" program is designed to exploit opportunities in Annex B countries that have not yet become fully eligible to engage in the ET program described above.
- The "Clean Development Mechanism" (CDM) enables Annex B parties to finance emission-reduction projects in non Annex B parties (primarily developing countries) and to receive certified emission reductions (CERs) for doing so. These CERs could then be used along with in-country reductions to fulfill "assigned amount" obligations.

The European Union Emissions Trading System

The largest emissions trading program to date for climate change has been developed by the European Union to facilitate implementation of the Kyoto Protocol (Kruger and Pizer 2004). The EU program covers 25 countries, including the 10 "accession" countries, most of which are former members of the Soviet bloc. Its first three years, from 2005 through 2007, constituted a trial phase. The second phase coincides with the first Kyoto commitment period, beginning in 2008 and continuing through 2012. Subsequent negotiations will specify future details.

Initially, the program covers only carbon dioxide (CO_2) emissions from four broad sectors: iron and steel, minerals, energy, and pulp and paper. All European installations in these sectors larger than established thresholds, some 12,000 in all, are included in the program.

The Regional Greenhouse Gas Initiative

In some ways the most important of the U.S. regional programs, in part because it was first, is the Regional Greenhouse Gas Initiative (RGGI). I have chosen to focus a bit on this program, not only because it is of special geographic relevance to the members of this Association, but also because I think some important lessons can be derived from it.

First, the basics. RGGI is a cooperative effort by 10 Northeastern and Mid-Atlantic states to implement a regional cap-and-trade program initially covering CO_2 emissions from power plants in the region. When RGGI came into effect in 2009, it capped regional CO_2 emissions at 2009 levels through 2014, and then requires emissions to be reduced 10 percent by 2019.

RGGI was set up as an interstate Memorandum of Understanding (MOU), followed by legislation in each of the member states to fill in the details, while being faithful to the structure and parameters established by the MOU. Importantly the majority of allowances are auctioned, not gifted, and many RGGI states, including Maine, are using a 100 percent auction with revenues used to promote energy efficiency and renewable energy.

In Maine this led to an interesting dynamic. Support for RGGI came from many sectors including a rather stable coalition of environmental groups and large industries. While the environmentalists were attracted by the fact that carbon would be capped, the industrial groups, even including some that would be forced to buy allowances, were attracted by their ability to apply for grants to use the RGGI money for energy efficiency investments. The industries could see the handwriting on the wall and they at least wanted to make sure they had a structure in place to reduce the costs of compliance. Maine has high electricity prices relative to the national norm, so efficiency investments in Maine have a higher relative payoff; the avoided cost is higher.

In Maine the widespread support for RGGI not only was influential in getting the legislation enacted, but it has been crucial in protecting the funds from being swept away either by legislators looking for funds to reduce looming budget deficits or by sectors seeking to reserve some portion of the funds for their exclusive use. It has, in effect, created a constituency for maintaining the program, which is rather remarkable, when you think about it, for a program to control carbon.

Although RGGI auction prices have been low, due to a relatively permissive cap coupled with a recession, the auctions have gone very well. Post-market reviews detected no price manipulation, prices fell within expected ranges, given the recession, and considerable revenue was raised for energy efficiency projects in the states.[2]

In my opinion this experience with auctions has had an impact on the national debate. Rather than start with the historical presumption that allowances would be gifted, the burden of proof has now shifted to those seeking gifted allowances to make a case as to why gifting would be a better use of the revenue than competing uses such as energy efficiency or ameliorating the burden of higher energy prices on lower income groups. To be sure, in some current bills before Congress a number of sectors have received gifted allowances, but I think it is significant that over the long run, even in those bills, *all* gifted allocations are scheduled to be phased out in favor of auctions.

The enabling statute in Maine specified that the funds be placed in the Energy & Carbon Saving Trust, known popularly as the RGGI Trust, and allocated on a competitive bid process to those who would use the public funds to complement private funds for energy efficiency investments. The bids are required to be ranked on the basis of the amount of energy savings per Trust dollar invested.

One desirable attribute of this approach is that it counteracts the natural tendency for bidders to want as much public money as possible. This allocation method provides an incentive for bidders to put as much private money into the proposed project as possible to increase their likelihood of being funded. It also allows the state to get the "biggest bang for the buck" from the available funds.

Finally let me close this section by sharing some data on the effects of Maine's attempts to cut carbon emissions. These effects are *not* due to RGGI because they predate RGGI. I am sharing them because, rather, they demonstrate what a difference energy efficiency and fuel substitution can make in lowering carbon emissions, and RGGI will no doubt intensify these effects by adding an additional source of revenue.

Maine experienced a 16.2 percent drop in total greenhouse gas emissions from 2005 to 2008 (Maine Department of Environmental Protection 2010). To put that into context, the national cap-and-trade legislation seeks to achieve a 17–20 percent reduction from 2005 by 2020. Maine has almost hit that target 12 years early.

About 90 percent of gross greenhouse gas emissions in Maine are from energy consumption, and 97 percent of those emissions are estimated to be from fossil fuel combustion. A decomposition of the sources of the 12.48 percent decline in fossil fuel emissions from 2005 to 2007 (the latest year permitted by the availability of state BTU data) reveals that for that period *none* of it is explained by declines in economic activity. About two-thirds of it is explained by energy efficiency/conservation, and the remaining third by fuel substitution (Tietenberg 2010).

Lessons about Program Effectiveness[3]

Economic principles have been used to design the programs, and economic analysis has helped to

[2] These reports can be found at http://www.rggi.org/co2-auctions/market_monitor.

[3] This section is drawn from a much more detailed (and more intensively documented) summary in Tietenberg (2006).

shape the evolution of these programs and to assess their success. Two types of studies have been used to evaluate cost savings and air quality impacts: *ex ante* analyses that depend on computer simulations, and *ex post* analyses that examine the actual implementation experience.

The vast majority, though not all, of the large number of *ex ante* studies have found command-and-control outcomes to be significantly more costly than the least-cost alternative (Tietenberg 2006).

Although detailed *ex post* analyses are relatively rare, two detailed evaluations of the sulfur allowance program (Carlson et al. 2000, Ellerman et al. 2000) found that considerable cost savings had been achieved in meeting the air quality goals following implementation of the program.

Whereas conventional wisdom holds that cap-and-trade programs lower costs, but have no effect on air quality, that seems to be an oversimplification. In retrospect we now know that the feasibility, level, and enforcement of an emissions cap can all be positively affected by the introduction of emissions trading. In addition, emissions trading may trigger environmental effects from pollutants that are not covered by the limit. While most of these external effects are desirable, some are detrimental.

In general, air quality has improved substantially under emissions trading. For some programs the degree to which credit for these improvements can be attributed solely to emissions trading (as opposed to exogenous factors or complementary policies) is not completely clear.

For early credit programs, such as the offset policy, the magnitude of the positive air quality increases and cost savings have been smaller and the achievements have come more slowly than anticipated by the original proponents. Constraints imposed on early credit programs by an excessively cautious bureaucracy took their toll. Fortunately the number and intensity of these constraints have tended to diminish over time as familiarity with this approach increases bureaucratic comfort with it.

Looking Ahead: Transitioning to a Global Carbon Market

In principle, moving from domestic pollution control systems to global markets is not difficult, but in practice it is far from easy. In the limited space here it would be impossible to be even approximately comprehensive, but a few examples should be sufficient to convey a flavor of some of the issues that must be confronted.

Linking Existing Markets

Most initial concepts of a global carbon market assumed that it would be designed and implemented as a single unit. In practice, of course, that has not happened. We now have a series of regional carbon markets, each with somewhat different rules and targets, and discussions are now ongoing about the possibilities of forming a single market by linking them. Several practical barriers exist to the achievement of that objective (Jaffe and Stavins 2008).

Generally, systems are politically harder to link if their associated caps have very different stringencies. Since different cap stringencies normally lead to different prices, entities in the more stringent system end up buying allowances from entities in the least stringent system, potentially transferring a considerable amount of money in the process. Politically this is difficult to sell to the participants in the program with the stringent cap, because it seems that the monetary transfers arise simply from the lack of political willpower in the market with the less stringent cap. This consideration is currently hindering negotiations between the United States and Europe because U.S. proposals typically require less emissions reduction by the 2020 period than their European counterparts.

Another barrier arises because current U.S. proposals envision a much larger role for offsets than European proposals. Offsets are important for at least two reasons:

(i) a significant influx of offsets, by increasing the supply, can lower the price considerably. A lower price can delay the replacement of existing carbon-intensive capital stock with low carbon alternatives; and
(ii) offsets present more challenges than allowances to the environmental integrity of the program as the validity of the reductions is more difficult to verify. Differences in polices among countries as to how many offsets they allow, what kinds

of offsets they allow, and the strictness of the verification procedures will matter in the negotiations about linking. Countries that limit particular types of offsets in their own programs could see them entering though the back door in a linked system.

Including the Developing Countries

Including developing countries as full participants in a global carbon market makes sense from both economic and environmental points of view, but it is easier said than done. While their reluctance to accept national caps, lest those caps inhibit development, is a major barrier, simply continuing developing countries as partial participants through the Clean Development Mechanism (CDM) under the Kyoto Protocol presents its own set of problems. In the absence of a firm cap under the Protocol, defining the baseline so as to ensure that the CDM reductions are "additional" (and not merely reductions that would have happened anyway) is crucial. Yet as the historical experience with the CDM demonstrates, the difficulties associated with defining additionality opens the door to inflated claims of emission reductions (Wara 2007).

One possibility that is receiving increasing attention would involve an initial step of introducing sectoral caps (Hamdi-Cherif, Guivarch, and Quirion 2009, Hall et al. 2008). For example, a cap could be put on the electrical power sector, a sector that would be an attractive starting point both because it is relatively (compared to other sectors) easier to monitor and enforce and its inclusion would normally, by itself, bring a disproportionate share of the country's emissions under control.

Presumably allowance trading under a sectoral cap would result in greater total capital flows than the CDM, because transaction costs would be lower. Once a cap was established in order to participate in trading, a country would simply need to develop an accurate emissions inventory and then compare actual emissions to the emissions budget. To the extent that actual emissions come in under the budget, the country could sell allowances. Issues such as additionality and the development of appropriate project emission baselines, which tend to limit the incentive to invest in CDM projects, would be less of an issue in a sector with a cap.

Concluding Comments

Emissions trading provides a good example of the "pendulum" theory of public policy. In the early 1970s, emissions trading was considered an academically intriguing, but ultimately impractical, idea. It had trouble getting on the national agenda. Reformers had few successes.

However, that changed once the expectations created by the economic analysis had been confirmed on the ground by the sulfur allowance program. It demonstrated not only the feasibility of the approach, but also its effectiveness. Emboldened by success, expectations and enthusiasm started to outrun reality.

In the final stage, the one I believe we are now in, reality once again is beginning to reassert itself. My sense is that both policymakers and academics are beginning to realize not only that emissions trading has achieved a considerable measure of success, but also that it has specific weaknesses. It has also been interesting to observe the growing prominence of auctioned permits, moving the whole enterprise much closer to the economic point of view that emphasized prices that prevailed at the outset.

Economic analysis has helped us to understand that not all emissions trading programs are equal. Some designs are better than others. Furthermore, one size does not fit all. Emissions trading programs can (and should) be tailored to each specific application.

The evidence suggests that while emissions trading is no panacea, well-designed programs, which are targeted at pollution problems amenable to this form of control, are beginning to occupy an important and durable niche in the evolving menu of environmental policies. This economic idea has come of age.

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