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Chapter Seven
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Economic theory has profoundly influenced policy-makers' thinking about the selection of instruments to effectuate environmental policy goals. And this thinking about the economics of instrument choice has powerfully influenced United States climate change policy, leading the United States to strongly support environmental benefit trading as an instrument of climate change policy. This chapter will discuss this influence. It begins with a basic explanation of emissions trading, a form of environmental benefits trading, and a short summary of its history. It then recounts the United States' embrace of unrestrained international environmental benefit trading as a climate change remedy and how this influenced U.S. and international climate change policy. It closes with some analysis of the advantages and disadvantages of the United States' posture in this regard.

Economists have long lamented traditional regulation's inefficiency, referring to it pejoratively as "command and control" regulation (an epithet embraced by many non-economists as well).[1] They have recommended either pollution taxes or emissions trading in order to remedy this inefficiency, with most of them tending to prefer taxes.[2] President Clinton at one point proposed employing an energy tax to address climate change, which would create an

incentive to reduce emissions of carbon dioxide, the principal greenhouse gas. But the rejection of government that Professor Schroeder has described carried with it an extreme aversion to new taxes, and Congress would not support such a tax. Hence, anti-governmental attitudes played a role in limiting even the choices among instruments that economic thought commends.[3]

In the climate change arena economists' second choice environmental instrument, emissions trading, gained much more traction. It fit in reasonably well with the prevailing free market ethos and seemed to some policy-makers to offer an alternative to government regulation. Accordingly, a brief explanation of emissions trading and its history will prove useful.

I. Emissions Trading Described

United States law often relies on uniform performance standards as a means of meeting environmental goals.[4] Such standards require all firms within an industry to reduce emissions by an amount that the government chooses. This leaves firms with some technological flexibility, as polluters may choose any technology that meets the regulatory limit.[5] But it requires each regulated unit within a facility to meet the government-specified target. It is spatially specific regulation.[6]

Economists consider uniform performance standards inefficient. A uniform standard does not produce uniform costs among regulated facilities. Indeed, facilities within an industry commonly encounter widely varying compliance costs when meeting a uniform target. This implies that an industry could meet the same aggregate reduction demanded through a uniform standard more cheaply if facilities facing high marginal control costs made fewer reductions than the uniform standard demands and those facing lower marginal control cost made more reductions than the uniform standard demands. Unfortunately, government officials rarely have sufficient marginal control cost information to fine-tune regulation to match each facility's cost structure. Indeed, governments employ uniform standards precisely because they allow officials to regulate large groups of facilities without having to tailor regulation to each firm's circumstances.

An emissions trading approach allows the owners of regulated facilities themselves to shift around their pollution control obligations to achieve the least cost allocation of emission reductions. An emissions trading scheme begins with a government regulator setting a uniform standard, just as with traditional uniform performance standard. But when the regulator uses trading, she authorizes owners of pollution sources to forego a required reduction if they pay other polluters to make extra reductions in their stead. Given the opportunity to

trade around compliance obligations in this manner, polluters with high local marginal control cost will presumably forego local reductions and pay somebody else for extra reductions instead. Conversely facilities with low marginal control costs will make enough extra reductions to sell them to facilities that would otherwise face high marginal control costs. The polluters themselves rearrange their reduction obligations to achieve the goal the regulator has set for the industry as a whole at lower cost than would happen if each regulated entity met a uniform target. This approach rather ingeniously allows for efficient fine-tuning of regulation without the government having to tailor regulation to each facility's special cost situation.

Trading proponents often claim that emissions trading stimulates innovation more effectively than traditional regulation.[7] Innovation consists of the development and use of a new technique or idea.[8] The idea of newness, an idea at the heart of our concept of innovation, implies that for a technology to be innovative, it must involve a non-obvious departure from prior art. We do not innovate when we employ a pollution control technique that has been used many times before in a new plant or even a new industry (at least if the applicability is obvious). We innovate when we advance the state of technology by doing more than just making obvious incremental refinements. The end of this chapter will examine the claim that emissions trading more effectively

stimulates innovation than traditional regulation. Whatever the claim's merits, it is certainly congruent with market glorification. Indeed, a competitive market's capacity to stimulate innovations bettering our lives constitutes perhaps its most widely admired feature, as evidenced by the laudatory press Apple has received for introducing the iPod. The claim that emissions trading produces superior incentives for innovation helps clothe it with the luster some see in markets generally. This claim is also important to trading's utility in addressing climate change. Scientists now believe that avoiding dangerous climate change will require massive emission reductions, which entails the abandonment of fossil fuels over time.[9] Abandonment of fossil fuels implies a need to innovate to develop cheap and effective substitutes. Innovation can create these substitutes thus making abandonment of fossil fuels technically, economically, and politically feasible. The claim that emissions trading effectively stimulates innovation implies that it stimulates substantial movement in the right direction over time, *i.e*. that it provides a strong impetus to develop technologies capable of substituting for fossil fuels. This claim suggests that emissions trading provides the sorts of economic incentives that will produce a positive economic dynamic. The economic dynamic framework suggests that the suggestion that trading might optimally stimulate innovation is more important than the largely uncontested static efficiency claim for emissions trading.

II. Experience with Emissions Trading

The United States began experimenting with emissions trading in the late 1970s and President Reagan's Administration greatly amplified this trend. The trading programs introduced greater "flexibility" into implementation of the 1977 Clean Air Act Amendments by allowing facilities to escape various reduction obligations if they provided an alternative reduction, usually from a different unit within the same facility. Thus, one unit would use another unit's reductions to offset its emissions. Air pollution experts refer to these early programs as "bubble" programs, because they treated facilities as if they were encased by a giant bubble.[10]

These programs produced very large cost savings, but often these savings came from evasion of pollution control obligations.[11] The program facilitated evasion of reduction obligations because of two fundamental flaws. First, EPA allowed states to apply the bubble approach to pollutants that could not be well monitored.[12] Second, EPA did not insist that states cap the emissions of the facilities generating credits. Indeed, the law did not cap the emissions of the facilities purchasing credits either, but it did usually subject them to limitations of their emissions rates.[13] Credits excusing compliance with a local emission limit could be realized through just about any pollution reduction project involving

the traded pollutant. The combination of poorly monitored pollution and the lack of caps created enormous complexity that led to lost emission reductions.

The evasions this project-based structure encouraged merit a little explanation, as similar problems may arise in the climate change context. One problem involved giving up an emission reduction at a regulated facility on the basis of a credit reflecting no *additional* pollution reduction. For example, Virginia encouraged siting of a new petroleum refinery within its state by offering it pollution reduction credits that the highway department realized when it switched asphalt formulations. This asphalt switch occurred for economic reasons having nothing to do with pollution control regulations. Without trading, the reduction from the asphalt switch would still have occurred and the refinery would have been required to greatly reduce its emissions and offset the remainder under the Clean Air Act. Because of the trade, the refinery claimed a credit for the asphalt switch and avoided having to reduce its emissions and offset its residual emissions. Thus, the trading caused a loss of emissions reductions that would have occurred had there been no trading for the asphalt credit. Other evasion examples include the "phantom" credits generated by facilities that had shut down; the facilities died but the pollution control credits lived on. Of course shutting down a facility does reduce its emissions. But unless demand slackened, another facility would probably ramp up production and

increase emissions to make up for it. But as no cap existed on the mass of facility emissions, this pollution increase would not be accounted for. Phantom credits justified giving up reductions otherwise required under the Clean Air Act, usually without producing a real net reduction in its stead.

President Reagan embraced emissions trading as a piece of his "regulatory reform" program, promising less government and more reliance on markets. In this context, he was loathe to recognize that the market he established lacked environmental integrity. And his regulatory reform staff put out reports glowingly praising the "cost savings" the bubble programs had produced, while glossing over the loss of emission reductions otherwise provided for under the Clean Air Act.

The acid rain program that followed, however, would prove more successful. By the end of the 1980s, the acid rain problem had achieved the sort of prominence that global warming achieved around 2006. Regulation seemed inevitable. Both the electric utilities and the Bush Administration (the elder Bush) hoped that Congress would employ a flexible cost saving emissions trading approach to regulation of the sulfur dioxide emissions causing acid rain. They won over the more technocratic environmental groups, such as the Natural Resources Defense Council and Environmental Defense (then called the Environmental Defense Fund), by capping the mass of regulated facilities'

emissions at levels that offered a significant environmental improvement and by generally requiring regulated sulfur dioxide emitters to employ continuous emissions monitors. The combination of a cap and air-tight monitoring persuaded technocratic environmentalists that the program would achieve worthwhile goals and ultimately produced the first successful emissions trading program. The program produced the planned reductions quite reliably (indeed early) and significant cost savings. The emission decreases reduced deposition of sulfur dioxide into ecosystems significantly. Reduced deposition, however, did not cure the ecological problem, which had become quite serious during the years when regulators failed to seriously address it. But it is likely that a non-trading program would likewise have failed to completely cure the ecological problem. Only an enormously stringent limit, whether achieved by trading or not, would do that. Overall, the acid rain trading program was a clear success.

III. Trading and the Climate Change Regime

As the acid rain trading program took shape, the United States began to participate in the climate change negotiations that would produce the Framework Convention on Climate Change and ultimately the Kyoto Protocol. President Bush took a stance fully in keeping with free market ideology, opposing caps on emissions, but supporting trading. This stance ignored the

lessons of the acid rain program, which showed that caps are essential to the success of the trading program. And this approach ignored the lessons of the bubble programs, which suggested that project-based trades tended to facilitate evasion of reduction obligations. The United States consistently touted the success of the acid rain program as showing that all emissions trading must be a good idea, thereby ignoring the rather more nuanced and richer lessons a reasonably complete history of emissions trading might offer about program design.

The United States' position on trading during the 1990s and the first years of the 21st century remained basically unchanged. The United States wanted broad international environmental benefit trading, not confined to countries willing to cap their emissions or to activities that could be well monitored. I use the term "environmental benefit trading" here, rather than emissions trading, because of the extreme breadth of the United States position. The United States wanted credits for actions that did not reduce emissions at all, but instead ameliorated climate change by enhancing ecosystems' capacity to act as a carbon sink, absorbing carbon emissions that would otherwise contribute to global warming. For example, the United States wanted credits for tree planting, since trees absorb carbon dioxide. While the acid rain program succeeded in part because it focused on a single pollutant amenable to reliable monitoring, the

United States advocated trades among a basket of greenhouse gases, lumping together those that could be well monitored with those that could not. In this respect, the U.S. in essence took a position that could duplicate the failure of the bubble program, which focused mostly on an entire category of poorly monitored gases, volatile organic compounds.

This trading über alles (everywhere) position reflected a triumph of economic ideology over sound regulatory practice. Even during the Clinton Administration this position continued to command the allegiance of the federal government. While President Clinton himself was not an ideologue, his Administration was well aware that the free market ethos remained very influential in Congress. The Administration hoped that its trading über alles position would help it win over Republican Senators who liked markets, but detested regulation.

From a free market perspective, this trading position made perfect sense. The broadest possible market maximizes liquidity and trading's cost savings potential. Thus, this position enjoyed considerable support among both economists and legal academics influenced by the law and economics movement.

From a legal perspective, the position raised considerable concerns. It seemed to ignore the lessons of the bubble experience— that programs reaching poorly monitored activities or relying on project-based credits from noncapped

sources tended to produce evasion of reduction obligations, rather than simple cost effective rearrangements of those obligations.

This position, moreover, troubled delegations from other countries. Representatives of the European Union repeatedly expressed concerns about the environmental integrity of the U.S. approach. They fought hard to limit environmental benefit trading's role in the climate change regime and to build in safeguards to maximize its integrity. Developing countries had even more fundamental concerns about emissions trading. Their representatives tended to view emissions trading as a means of allowing developed countries to escape their moral obligations to address climate change domestically. During climate change negotiations, they frequently noted that developed countries had created this problem, and that they should therefore solve it. And generally, that meant that developed countries should reduce their own emissions. Developing countries' representatives also expressed concerns about trading programs making their future participation in addressing climate change difficult and expensive. Developing countries expected that they eventually would have to deliver emission reductions of their own. If developed countries, who would go first, met their reduction responsibilities by buying up credits in developing countries, the cheap opportunities would be gone when developing countries began their to reduce emissions later in the 21st century. Hence, the trading über

alles position created considerable international tension and greatly complicated ongoing efforts to construct an effective climate change regime.

The United States neoliberal instrument choice position, whatever its technical merits, had an enormous impact on the evolving climate change regime. At the insistence of the United States, the Framework Convention on Climate Change provided that countries could achieve the Convention's aim, stabilization of emissions at 1990 levels, individually or "jointly." The parties to the Convention probably understood this reference to "joint implementation" as authorizing trading, at least among countries agreeing to aim to stabilize emissions. At the United States' request, the Conference of the Parties to the Framework Convention on Climate Change (COP) authorized a series of "pilot projects" designed to test the efficacy of international emissions trading during the years between the enactment of the Framework Convention and the completion of the Kyoto Protocol to that convention. Although these projects yielded no clear results and no meaningful evaluation, the United States, predictably in light of the ideology prevailing in Washington, insisted on building broad environmental benefit trading into the Kyoto Protocol.

The extreme United States position almost caused the negotiations leading up to the Kyoto Protocol to collapse. The combination of a trading über alles position and a refusal to accept meaningful caps infuriated delegates from many

countries. Yet, an agreement seemed impossible without the effective participation of the United States, the world's largest greenhouse gas emitter. Finally, the Clinton Administration sent Al Gore, a long-time supporter of climate change action, with instructions to broker a compromise. Then Vice-President Gore helped broker an agreement that committed the United States to 7 per cent reductions below 1990 levels in exchange for an agreement to very broad environmental benefit trading.

Largely, as a result of the United States position, the Kyoto Protocol contains no less than three emissions trading programs. Only one of these programs limits trades to developed countries with caps. The other two are "project-based mechanisms" that have more in common with the bubble programs than they do with the acid rain program. The first program, Joint Implementation (JI), allows trades with countries (nationals of countries) in Eastern Europe and the former Soviet Union. The second project-based program, the Clean Development Mechanism (CDM), authorizes trades between developed countries (or their nationals) and developing countries. The CDM proposal came from the Brazilian delegation, but its creation and adoption reflect all parties' concern that the United States be brought on board, and the United States strongly supported Brazil's proposal.

The parties to the Kyoto Protocol recognized that these instruments, especially the project-based ones, raised significant problems of monitoring, accounting, environmental integrity, and international coordination. Accordingly, many of the post-Kyoto negotiations have focused on developing governance structures and ground rules for the trading programs. The CDM created the most serious accountability issues, so it generated the most elaborate structures and rules. The COP created a CDM Executive Board consisting of ten country representatives with relevant expertise to oversee CDM implementation. Its duties include approving methodologies for measuring or estimating emission reductions and reviewing individual projects' compliance with ground rules. The CDM also certifies "designated operating authorities," which must estimate the credits a project is supposed to generate and then verify that they actually did produce these credits. In practice, these bodies usually are private consulting firms paid for by project developers. In addition, the host county must approve projects generating credits in its territory. The Kyoto Protocol requires that CDM projects advance sustainable development. The post-Kyoto governance structure assigns the determination of sustainability to host country governments.

One key ground rule, which is stated in the Kyoto Protocol itself, forbids granting credits for projects that do not provide "additional" emission

reductions. This rule clearly aims to avoid some of the abuses that afflicted the bubble programs. But it's not an easy rule to administer properly. The regime also creates a process for expert evaluation of credits for sink protection, which remains extremely controversial, partly because of the difficulties in predicting how much carbon reduction value a particular project will generate. These rules provide examples of the many matters that arose because of environmental integrity concerns stemming from the U.S. position and its acceptance in the Kyoto Protocol.

This presentation of the CDM regime does not do justice to its complexity, but it suffices to show that the United States' insistence on broad trading has generated a complex set of institutions and rules. Some JI projects require an approval process similar to that governing CDM. Some can undergo a simpler process. Overall, the project-based mechanisms have created vast potential for avoiding emission reductions and with it, a complex set of rules and procedures to try and limit the potential damage.

Even though the international community put in all of these trading programs largely to satisfy the United States (and a few of its allies), the United States did not ratify the Kyoto Protocol. The U.S. failure to ratify the Protocol meant that it could only go into force if another climate skeptic, Russia, ratified it. Russia agreed to ratify the Protocol in exchange for a deal that gave it a lot of

emission credits to sell. These "hot air" credits reflect no actual program to reduce greenhouse gas emissions. Instead, these credits reflect the decline in Russian emissions that accompanied post-1990 economic collapse. If Russia sells these credits, then developed countries purchasing the credits can appear to meet their Kyoto targets without actually reducing emissions.

As we have seen, George W. Bush repudiated the Kyoto Protocol outright, in spite of all of the elaborate provisions seeking to cater to Washington's neoliberalism. In other words, after forcing a shotgun marriage between sustainable development and market liberalism, the United States left the bride at the altar.

But the bride soldiered on. The European Union (EU) had been a skeptic of emissions trading and had spent years trying to craft an effective carbon tax regime in keeping with economists' teachings. Faced with an international architecture favoring emissions trading and doubts about whether it could craft an effective carbon tax regime in light of concerns about competitiveness and free trade, it decided to implement an emissions trading scheme. While most analysts refer to this as a cap and trade regime, that characterization is too simplistic. The scheme does require EU member states to cap the emissions of certain large greenhouse gas emitters, such as coal-fired power plants. But it authorizes the sources of capped emissions to purchase credits from pollution sources that are

not operating under a cap. Indeed, the EU Linking Directive specifically authorizes member states to credit reductions realized through the Kyoto Protocol's project-based mechanisms to the accounts of their regulated facilities. This means, in effect, that this program can lose emission reductions if the project-based mechanisms have integrity problems similar to those that occurred under the project-based bubble programs. The United States trading über alles position ultimately led polities historically quite skeptical of free market extremism to embrace rather broad liberal trading, along with some of the risks to environmental integrity that such a stance implies.

In spite of the Bush Administration's repudiation of the Kyoto Protocol, climate change law has begun to emerge in the United States. Many states have come to the conclusion that they simply must act to ameliorate the dangers that climate change poses for their people. California, for example, has become alarmed about the prospect of droughts and other disturbances that climate change promises, and has begun active planning on how to both manage the disasters it can no longer avoid and to do its part to ameliorate climate change itself. And a number of Congressmen have introduced a variety of bills in Congress to address global warming; only President Bush's likely veto kept a bill from passing in 2007.

Both the major programs in the most important states to address global warming and the bills pending in Congress rely heavily, and often exclusively, on environmental benefit trading to reduce greenhouse gas emissions. These laws (whether enacted or proposed) vary widely in their scope of coverage and the in the amount of emission reductions they demand. But to a remarkable degree, they all contemplate near total reliance on the trading mechanism.

IV. Analysis

Emissions trading does offer an opportunity to cost effectively achieve environmental goals. And the acid rain program has shown that emissions trading, *if properly designed*, can be effective at achieving some environmental goals. Nevertheless, love of free markets has led the United States to overestimate the value of emissions trading, to underestimate the importance of good design, and to a failure to seriously consider more ambitious alternative economic incentives.

A. Efficiency over Efficacy: The Problem of Overly Broad Design

One major problem with free market ideology's influence over U.S. climate policy involves the direction of trading design. Too much market love may push regulators to design programs too broad for effective enforcement. In this

connection, it's helpful to remember that emission trades generally do nothing to advance environmental protection. Decisions about caps by regulators can advance environmental protection. The trades, at best, reallocate the reductions required under a cap in order to reduce their costs. There's nothing wrong with this, rearranging obligations to reduce costs can be desirable. But economists, brokers, and sometimes even regulators sometimes evince confusion on this point. They write about how cap and trade programs "automatically" produce emission reductions and often evaluate programs using a more is better metric; many trades mean a successful program and few trades indicate failure. The notion that trading "automatically" produces emission reductions is utter nonsense. Trading relies on basically the same mechanisms that traditional regulation uses to generate emission reductions, regulatory decisions about the amount of reductions to require and heavy penalties for non-compliance. Thus, the first phase of the European Union's emissions trading scheme failed to produce any real progress, because the caps European regulators set were lax. Most importantly, the amount of trades has no relationship to the environmental success of a trading program. Lots of trades can indicate lots of fraud or lots of cost savings while goals are being achieved. It all depends upon whether the credit generating activities have in fact made extra emission reductions of equal value to those foregone by the sources purchasing the credits. And conversely,

conformance with the cap without trading will meet the program's underlying environmental goal.

Free market ideology's view of markets as spontaneously generating benefits, tends to obscure the relationship between credit generation and environmental quality in an emissions trading program. In a properly functioning emissions trading market, every time a polluter makes an extra reduction to sell into the market, a purchasing polluter raises its emissions above the amount otherwise required. Polluters, unfortunately, have an economic incentive to exaggerate the value of credits and to understate the value of debits—the amount of under-compliance they financed with a credit purchase. Environmental goals can be realized with few trades or lots of trades. The key question from a regulatory perspective is not whether a lot trades occurred, but whether the credits traded really were at least as valuable as the debits.

Increasingly, evidence suggests that the broad trading approach the United States has lobbied for has produced lost emission reductions.[14] Emission reduction losses arise when projects lack "additionality" – when credit is awarded for projects that would have reduced emissions even if no polluter had paid for the credit. There is some evidence that the CDM Executive Board has approved projects that differ little from the asphalt project we described above. In one case, it approved a solar energy project for credit, even though the

financing was in place long before the possibility of CDM credits existed. The problem is that as long as those purchasing the credits pay some money for them, and a tiny portion of that money reaches those developing the solar project, the project developers can claim that the money was essential to the project's completion. These claims should be regarded as correct when the money earned for the credits account for a very high percentage of the project cost. But such claims appear dubious when the credit revenue accounts for a very low percentage of the project cost, which has been the case with respect to many projects.[15] Renewable energy presents a political problem for the CDM Executive Board. If the CMD Executive Board applied a strict additionality test to relatively expensive projects like many renewable energy projects, it's possible that no renewables projects would generate credits.[16] To appreciate that this should not be seen as a problem one must view the trading mechanism analytically, not as magic. If the board disapproves of credits when credit purchases account for a small portion of project revenue, there's a good chance that the project will be built without credit, and therefore without an increase in emissions in the country purchasing the credits. Thus, denial of credits will not cause a loss of renewable energy or other environmental benefit. Under the CDM Executive Board's current approach, we often give up reductions in Europe

because of reductions elsewhere that would have occurred even if there had been no credit purchased.

All of these problems arise because of the project-based design. A true cap and trade program would produce good overall results in spite of effects like these. But in a project-based program, these sorts of issues can result in lost emission reductions. Hence, the U.S. approach has increased the risk that the emission reductions countries have committed to making will not, in fact, be realized.

B. International Political and Institutional Problems

The potential shortfall in emission reductions could directly worsen climate change, but it also poses a more potent indirect risk. As we have seen, countries like China and India have so far refused to agree to emission reductions. While they accept the Framework Convention's principle of common but differentiated responsibilities, they believe that developed countries should clean up before they are asked to do so. In future climate change negotiations, they will prove more amenable to reduction commitments if it's clear that developed countries have met their responsibilities under the Kyoto Protocol. The Kyoto Protocol's embrace of virtual compliance—compliance based not on physically achieving targets within the country assuming the target, but upon claims about reductions

realized elsewhere—may make claimed compliance non-credible. This could add to the larger problem that the United States has created by not trying to comply at all. If the largest emitter did not comply and developing countries have doubts about whether the climate leaders in Europe really complied as well, it may be hard to reach effective agreements to reduce worldwide emissions.

On the other hand, the assumption of these risks has led to the development of governance institutions designed to contain them. Indeed, creation of expert bodies addressing some of the emissions trading issues under the Kyoto Protocol represents an advance over both of the institutional structure governing the bubbles and most, if not all, international environmental law regimes, which often contain weak monitoring and enforcement mechanisms or none at all. While advances in institutional structure have continued, so far they do not seem to have made up for the deficiencies of such a large complicated system.

Ample reasons exist for some measured skepticism. The CDM Executive Board has disapproved some projects and reduced the credits claimed for others, so there is evidence that it is willing to counteract some inflated credit claims from project developers. Yet, it may find application of a very strict additionality test politically difficult, as such a test leave popular measures like solar energy out of the CDM, thereby improving its integrity, but diminishing its luster.

Project developers generally pay the designated operating authorities to evaluate project, so notwithstanding the CDM board's accreditation procedures, conflicts of interest may lead designated operating authorities to exaggerate credits or seek certification of dubious projects. And developing country national governments have largely played little role in overseeing CDM projects, which is what resource restraints would lead one to expect.

In spite of all of this, there are some forces limiting the damage potentially coming from Kyoto's overly broad trading schemes. Russia has not undermined the scheme by selling lots of hot air credits to date. This may reflect decisions on its part that it may profit more by waiting, but it also may reflect a widespread perception that the public in Europe would not accept the use of such credits to undermine Kyoto compliance.

Economic thought has been the driver for assuming these sorts of risk through overly broad trading programs. For economic thought has helped lead the United States to a position seeking the broadest possible trading in order to make sure that private polluters could use the cheapest possible credits for compliance purposes. The possibility that the cheapest credits might prove problematic or fraudulent has had only a minor influence on federal policy, although it has influenced some of the emerging state law more seriously. The Northeastern states, for example, have crafted a Regional Greenhouse Gas

Initiative, which features some numerical and qualitative restraints on project-based credits in order to minimize bubble-like problems. In general, love of markets and a lack of serious concern for effective government have led the United States to focus far too much attention on efficient use of private sector resources, and not nearly enough on cost effective use of very limited government resources. Broad trading programs can exhaust government resources by multiplying the number and types of transactions that government must monitor in order to assure the legitimacy of any one claimed emission reduction.

C. Tradeoffs Between Static Efficiency and Long-Term Innovation

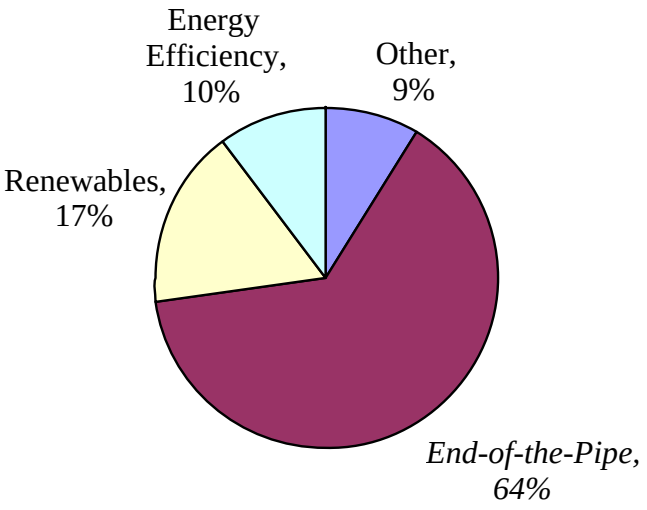
Advocates of trading programs under the Kyoto Protocol have predicted that it would create incentives to maximize deployment of renewable energy and energy efficiency. These claims amount to an assertion that emissions trading creates the right economic dynamic.

So far, however, the data from the CDM indicate that emissions trading under the Kyoto Protocol has mostly stimulated end-of-the-pipe controls, not fundamental changes in energy infrastructure. At first glance, this data suggest that emissions trading has stimulated renewable energy and energy efficiency, as most of the projects involve these sorts of measures. But a more careful analysis

suggests much more emphasis on end-of-the-pipe approaches than on renewable energy or energy efficiency. End-of-the-pipe approaches have generated the lion's share of credits available in the market.[17] And the number of credits generated provides a more reliable measure of how most reductions get generated. Indeed, HFC control projects alone, which have the potential to stimulate emission increases, generated almost half of the total Clean Development Mechanism (CDM) credits generated so far.[18]

The graph below reflects the distribution of credits sold thus far under the Kyoto Protocol's CDM.[19]It shows end-of-the-pipe controls' predominance with a relatively small percentage of credits produced by renewable energy and energy efficiency.[20]

Distribution of Total CDM Credits Issued Through July 18, 2007



If one examines somewhat less reliable numbers for projects "in the pipeline" (i.e. not yet fully-approved) for CDM only, renewable energy credits rise to about 25% by 2012.[21]

Trading also has done absolutely nothing to stimulate nuclear power, which, while controversial, some see as a necessary element of a future largely free of dangerous climate change. The European Union does not allow its polluters to use nuclear power credits to satisfy their obligations under its emissions trading scheme. But even without this prohibition in place, nuclear power is too expensive to finance with revenues derived from those seeking low cost abatement.

These results reflect only the early experience with emissions trading under the Kyoto Protocol. The European Union has just completed phase one of a two phase emissions trading scheme that will produce much of the demand for CDM credits. The second phase will be stricter and could change this picture somewhat, but the credits generated so far reflect the market's anticipation of phase two to some degree.

The experience with broad emissions trading contrasts strikingly with the experience with narrower approaches. Most European countries and several states in the United States have adopted programs aimed specifically at stimulating renewable energy. The most successful programs employ a type of subsidy called a "feed-in tariff" that guarantees renewable energy providers a high price for the energy they produce. In the United States, as we have seen, renewable portfolio standards are more common. Both have been far more effective in stimulating renewable energy than broad-based emissions trading. There is little evidence that maximizing short term efficiency through adoption of the broadest possible emissions trading program stimulates innovation more effectively than a narrower approach aimed directly at the innovation objective.

The evidence that emissions trading stimulated great reliance on conventional approaches and little fundamental change is consistent with the experience in the United States acid rain program. That program produced no

renewable energy. Instead, utilities complied predominantly through reliance on two of the oldest best understood methods for reducing sulfur dioxide emissions, scrubber installation and use of low sulfur coal. To be sure, the program did stimulate *some* innovation. It stimulated some advances in scrubber design that won patents, which suggests some innovation. And some analysts described utilities use of dispatch orders to maximize use of cleaner units as an innovation. But the most thorough review to date of innovation under the acid rain program and its non-trading predecessors addressing the same pollutant from the same sources found that emissions trading produced *less* innovation than traditional regulation. And we have already seen that the bubbles produced a lot more evasion of pollution control obligations than innovation.

A program we have not yet examined, the lead trading program, did produce fundamental change. But this program required that small refiners phase out lead entirely. It's quite clear that the same phaseout requirement without trading would have produced the same fundamental change. Indeed, the lead banking program delayed the phaseout somewhat.

Furthermore, the economics literature on trading increasingly expresses skepticism about trading proponents' assertion that lead provides better incentives for innovation than a performance standard of identical scope and

stringency. Certainly, it does not reflect the unanimity that prevails with respect to assertions about trading's static efficiency.

Market worshipping policy-makers just assume that trading must stimulate innovation better than traditional regulation of identical stringency and scope. But this assumption rests upon a fallacy. It assumes that only emissions trading creates markets, and that traditional regulation does not. This assumption is not correct. A traditional performance standard requires reductions in emissions. Once such a standard is established, companies pay contractors, vendors, and/or employees to evaluate pollution control methods and to purchase and operate pollution control technologies. A performance standard makes pollution expensive. Once one is promulgated, continuing to pollute at current levels can lead to heavy fines. It therefore creates economic incentives to clean-up and a market in technologies capable of assisting in that process. This does not necessarily mean that traditional regulation does a great job at stimulating innovation either. Indeed, while traditional regulation has, at times, stimulated significant technological innovation, it often has not done so. Unfortunately, our knowledge traditional regulation's stimulation of innovation remains woefully incomplete, because of a dearth of post-compliance studies. But the presence of some innovation both in trading and non-trading contexts means that the question of whether emissions trading stimulates significant

innovation more effectively than performance standards do is a lot more complicated than many of its proponents have assumed. The tendency to glorify markets has led many in the neoliberal era to treat emissions trading as a panacea with respect to innovation.

A subsequent chapter will address the question of whether we can do better, and if so, how. Emissions trading's poor track record in stimulating innovation does not necessarily mean that competing mechanisms do better. It does, however, mean that the question of whether we get more innovation by either redesigning emissions trading programs or making use of alternatives merits more discussion than was possible when the neoliberal view dominated.

Conclusion

Glorification of markets has led the United States to favor broad environmental benefit trading. This position led to a climate change regime largely based on this model. The neoliberal instrument choice and design model, however, creates risks of losing planned emission reductions, various institutional failures, and inadequate stimulation of innovation.

None of this means that emissions trading is a poor idea. Indeed, emissions trading constitutes one of the more useful contributions of economic thought to environmental policy, since a well-designed program can cost

effectively reduce emissions. But the assumption that just because emissions trading lowers short-term costs, broad environmental benefit trading must be the answer to the climate change problem merits further analysis, which I will provide in a subsequent chapter.

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[1] See Nathaniel O. Keohane, Richard L. Revesz, and Robert N. Stavins, "The Choice of Regulatory Instruments in Environmental Policy," *Harvard Environmental Law Review* 22 (1998): 313-67, 313-14 (noting economists "consistent endorsement" of market-based instruments over "command-and-control" instruments and then explaining the former's cost effectiveness advantages).
[2] Jonathan Baert Wiener, "Global Environmental Regulation: Instrument Choice in Legal Context," *Yale Law Journal* 108 (1999): 677-800, 727-35 (explaining why standard economic analysis tends to favor pollution taxes).
[3] Cf. Keohane, Revesz, and Stavins, "Choice of Regulatory Instruments," 348 (pointing out that firms will usually prefer grandfathered trading programs to pollution taxes, because only the latter taxes residual emissions).
[4] See Bruce A. Ackerman and Richard B. Stewart, Comment, "Reforming Environmental Law," *Stanford Law Review* 37 (1985): 1333-1365.
[5] See David M. Driesen, "Is Emissions Trading an Economic Incentive Program?: Replacing the Command and Control/Economic Incentive Dichotomy," *Washington and Lee Law Review* 55 (1998): 289-350, 297-98; Robert W. Hahn and Robert N. Stavins, "Incentive-Based Environmental Regulation: A New Era for an Old Idea?" *Ecology Law Quarterly* 18 (1991): 1-42, 5-6; Louis Tornatzky, Mitchell Fleischer, and Alok K. Chakrabarti, *The Processes of Technological Innovation* (Lexington, MA: Lexington Books, 1990), 101; Richard Stewart, "Regulation, Innovation, and Administrative Law: A Conceptual Framework," *California Law Review* 69, no. 5 (1981): 1256-1377, 1268; cf. Richard B. Stewart, "Controlling Environmental Risks Through Economic Incentives," *Columbia Journal of Environmental Law* 13, no. 2 (1988): 153-69, 158.
[6] See Driesen, "Is Emissions Trading an Economic Incentive Program?" 303.
[7] See Stewart, "Controlling Environmental Risks," 160; Keohane, Revesz, and Stavins, "Choice of Regulatory Instruments," 314.

[8] See David Driesen, "Design, Trading, and Innovation" in *Moving to Markets in Environmental Regulation: Lessons from Twenty Years of Experience*, ed. Jody

Freeman and Charles Kolstad (Oxford: Oxford University Press, 2007), 437-438; see generally Adam B. Jaffe, Richard G. Newell, and Robert N. Stavins, "Technological Change and the Environment" in *Handbook of Environmental Economics*, ed. Karl-Goran Maler and Jeffrey Vincent (Amsterdam: Elsevier, 2003), 1:464-67 (discussing the economists' distinction between "innovation" and "diffusion").

[9] *See, e.g.*, H. Damon Matthews & Ken Caldeira, "Stabilizing Climate Requires Near Zero Emissions," Geophysical Research Letters, *Geophysical Research Letters* 35 (2008): L04705.

[10] See Chevron v. Natural Resources Defense Council, 467 U.S. 837, 840 (1984).

[11] See Larry Lohman, *Carbon Trading: A Critical Conversation on Climate Change, Privatisation, and Power* (Uppsala, Sweden: Dag Hammarkjöld Foundation, 2006), 150-51; Driesen, "Is Emissions Trading an Economic Incentive Program," 314-16; California Air Resources Board and United States Environmental Protection Agency, *Phase III Rule Effectiveness Study of the Aerospace Coating Industry* (1990) 4; Richard A. Liroff, *Reforming Air Pollution Regulation: The Toil and Trouble of EPA's Bubble* (Washington DC: Conservation Foundation, 1986); David Doniger, "The Dark Side of the Bubble" *Environmental Forum* 4 (1985): 33-, 34-35; Richard A. Liroff, *Air Pollution Offsets: Trading, Selling, and Banking* (Washington DC: Conservation Foundation, 1980).

[12] Daniel H. Cole and Peter Z. Grossman, "When is Command and Control Efficient? Institutions, Technology, and the Comparative Efficiency of Alternative Regulatory Regimes for Environmental Protection," *Wisconsin Law Review* 1999:887-938, 918-925 (describing how the bubbles of the late 1970s and early 1980s were introduced at a time when pollution could not be monitored).

[13] See Byron Swift, "Command Without Control: Why Cap-and-Trade Should Replace Rate Standards for Regional Pollutants," *Environmental Law Reporter* 31 (March 2001): 10330-10341.

[14] See, e.g., Lambert Schneider, *Is the CDM Fulfilling its Environmental and Sustainable Development Objectives? An Evaluation of the CDM and Options for Improvement* (Berlin: Oko-Institut, 2007), available at http://www.panda.org/about wwf/where_we_work/Europe/news/index.cfm?uNewsID=118260; Michael W. Wara, *Measuring the Clean Development Mechanism's Performance and Potential* (January 20, 2008), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1086242.

[15] See Schneider, *Is the CDM Fulfilling its Environmental*, 42 (showing that CER revenue was a very small part of the projected internal rate of return for 546 of the first 803 projects).

[16] See ibid. (showing that CER revenue was generally a very small part of the projected internal rate of return for renewable energy projects).
[17] See Kevin A. Baumert, Note, "Participation of Developing Countries in the International Climate Change Regime: Lessons for the Future," *George Washington International Law Review* 38 (2006): 365-407, 386 (noting that gas capture/destruction projects account for 66 percent of expected emission reduction credits); Michael Wara, "Is the Global Carbon Market Working?" *Nature* 445 (7 February 2007): 595-596, 596 (showing that waste gas projects account for the majority of credits claimed for projects "in the pipeline").
[18] Joergen Fenhann, "UNEP Risoe CDM/JI Pipeline Analysis and Database, CDM Pipeline Grouped in Types," http://cdmpipeline.org/cdm-projects-type.htm (showing that HFC projects generated 49% of the credits).
[19] See ibid.; see also Joergen Fenhann, "Guidance to the CDM/JI Pipeline" (Denmark: Capacity Development for the CDM, 2006), 1, http://cdmpipeline.org/publications/GuidanceCDMpipeline.pdf [hereinafter *CDM/JI Guide*] (explaining that data comes from UNFCC homepage located at http://cdm.unfccc.int/index.html including Project Design Documents also available there).
[20] I have derived this graph from table 10 of the CDM Pipeline Overview spreadsheet of the UNEP Risoe CDM/JI Pipeline Analysis and Database. See Joergen Fenhann, CDM Pipeline Overview, http://cdmpipeline.org/publications/CDMpipeline.xls (Table 10 in an Excel spreadsheet of CDM pipeline data; accessed March 12, 2008) (providing analysis of all CDM/JI projects in the pipeline). The "other" category in this chart and the subsequent JI chart denotes technologies that are not known to involve end-of-the-pipe, renewable efficiency, or energy efficiency technologies. The "other" category includes some projects that might be properly viewed as "end-of-the-pipe" projects, so that the percentage of end-of-the-pipe credits may be understated. The finding that renewables projects generate only a modest percentage of the total credits is broadly consistent with other analysts' conclusions. See, e.g., Wara, "Measuring the Clean Development," 26 (stating that renewables have generated 18% of the total credits).
[21] See Fenhann, CDM Pipeline Overview (Table 10) (showing that projected renewable energy credits will reach 25% in 2012). Furthermore, renewables project developers may face greater risks than developers of cheaper projects of having their projects' emission credits disapproved or reduced. See Lucy Mortimer, "An Uncertain Path,"*Carbon Finance* 3 (20 April 2006): 14-?, http://www.carbon-financeonline.com (noting that many projects may not make it through the registration process because of financial problems, methodological

problems, and uncertainty about the post-2012 carbon market); Ben Pearson, "Market Failure: Why the Clean Development Mechanism Won't Promote Clean Development," *Journal of Cleaner Production* 15, no. 2 (2007): 247-52, 248 (noting that many renewables projects may not meet the Kyoto Protocol's "additionality" criterion). Similarly, the smaller joint implementation mechanism pipeline's renewable energy credits constitute about 19% of total projected credits. See Joergen Fenhann, JI Pipeline Overview, http://cdmpipeline.org/publications/JIpipeline.xls (Excel spreadsheet of JI pipeline data; accessed March 12, 2008), 1. Conversely, analysts expect end-of-the-pipe control's share of future project credits to decline to about 40% of the total. See Jane Ellis and Sami Kamel, *Overcoming Barriers to Clean Development Mechanism Projects* (Paris: OECD, 2007), 10, http://www.oecd.org/dataoecd/51/14/38684304.pdf; Karan Capoor and Philippe Ambrosi, *State and Trends of the Carbon Market 2007* (Washington, DC: World Bank, 2007), 28, http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:21319781~pagePK:64257043~piPK:437376~theSitePK:4607,00.html.