CHOICES
The magazine of food, farm, and resource issues

# Market-Based Approaches to CO2 Emissions Reductions

Leigh Raymond and Gerald Shively

*JEL Classification: H00; Q28; Q48*

Numerous proposals have surfaced promoting policies to limit U.S. emissions of gases like Carbon Dioxide (CO2), a primary contributor to climate change. One such proposal is Senate Bill 2191, the Lieberman-Warner Climate Security Act, which was introduced to the 110th Congress on October 18, 2007. Like many proposals to control greenhouse gas emissions, S. 2191 embraces a market-based approach to achieving reductions. It includes provisions for a carbon emissions trading program and also introduces incentives for carbon sequestration in agriculture and forestry. In the recent flurry of political advocacy and activity, a fair amount of ambiguity and confusion have arisen concerning what carbon tax and carbon trading policy options might entail, and how their impacts might differ. Here we briefly describe some of the basic features of these policy options. We return to the issue of how current policy options might relate to agriculture in the final section.

## What Is Cap and Trade?

Cap and trade systems draw on the ideas of economic thinkers like Ronald Coase, who argued that a clear specification of property rights can often improve environmental conditions more effectively than a tax on undesired behavior. A cap and trade system creates a ceiling on total allowable emissions and introduces exchangeable emissions permits (often called "allowances") that grant the right to emit one unit of pollution in a given year. The cap appeals to those seeking environmental protection because it firmly limits total pollution loading regardless of additional economic growth. New facilities seeking to emit the pollutant must obtain sufficient allowances from existing facilities to maintain the total cap.

At the same time, the system appeals to those seeking to limit the overall costs of meeting the environmental target for several reasons. The first is that allowances are tradable among emitters, allowing them to equalize their costs of compliance at the margin, and thereby achieve the environmental goal at least total cost to society. Firms facing larger pollution control costs can continue to emit higher levels of pollution and buy allowances from firms that can reduce emissions more cheaply. A second appeal is that such systems limit the hand of government regulators on the operational decisions of private corporations, making the programs more popular with the private sector while often reducing enforcement costs.

## A Brief History of Cap and Trade Policy Efforts

Cap and trade first emerged as a serious policy alternative in the context of fisheries management. In the 1960s and 1970s economists increasingly promoted cap and trade systems in other policy contexts. Modest cap and trade experiments were undertaken under the Clean Air Act. Experience with a lead trading program among gasoline refineries in the 1980s added to interest. In 1990, Congress created the largest U.S. experiment with emissions trading to date.

Under Title IV of the Clean Air Act Amendments of 1990, Congress created a new cap and trade program for electricity utilities emitting Sulfur Dioxide (SO2). The new law took a phased approach, limiting the emissions of the largest and dirtiest facilities in the first period of compliance and then expanding the program to more than 3,000 electricity generating facilities after the year 2000. Once initiated, the program allowed utilities flexibility in complying with the law. Firms could buy allowances from other utilities, install scrubbers or other pollution control equipment, burn lower sulfur-content coal in their boilers, or combine these and other strategies. The success of the 1990 SO2 program is widely recognized among environmentalists and the business community. SO2 emissions have plunged, trading has been relatively robust, firms have complied in creative and cost-effective ways, and administrative

and enforcement costs have been far lower than in traditional air pollution programs. Perhaps most surprisingly, the law has achieved nearly 100% compliance from affected units, a record virtually unmatched by other air pollution regulations.

Not surprisingly, other governments have emulated the success of the acid rain program. Most prominently, the European Union adopted an extensive multi-nation emissions trading program for Carbon Dioxide in 2005 as part of its efforts to meet its emissions reduction obligations under the Kyoto Protocol. Although this EU Emissions Trading Scheme (ETS) has had a bumpier road than the U.S. acid rain program, with greater price volatility for emissions allowances and other problems, the program remains a prominent example of cap and trade in the climate change area. States in the Northeastern United States are about to embark on another emissions trading experiment through the Regional Greenhouse Gas Initiative (RGGI). A similar regional cap and trade program is also in the works among western states.

## Cap and Trade vs. Carbon Taxes

The other prominent idea frequently mentioned as a market based approach to controlling CO2 emissions is a tax on carbon-based energy use. This idea gets less support from lawmakers, but remains popular among many academics and advocates. It tends to start out at a disadvantage in any political conversation because it invokes the word "tax," but in practice carbon taxes and a cap and trade system share many features. With cap and trade, government establishes the emissions level, and allows the market to determine the emissions price. In contrast, under a carbon tax, the government helps set the emissions price and the market determines the emissions level.

Most importantly, both policies are market-based in the sense that they put a price on a commodity that was formerly free. In this instance, both create scarcity, and price the atmosphere's ability to absorb Carbon Dioxide. A crucial difference hides within this similarity, however. In a cap and trade program, the price of emissions is directly set by the market. The demand and supply of emissions allowances determine what their price will be, and that price fluctuates over time. In the acid rain program, the price of allowances moved from $80 to $200 per ton, until recently jumping much higher due in part to a tightening of supply and in part to revisions in the program rules. In the EU ETS, the price of CO2 allowances for phase I of the program has fluctuated more dramatically, from 20 Euros to less than 1 Euro per ton. The bottom line, however, is that policy makers cannot directly control the price of emissions, and therefore cannot directly control the economic impact of the regulations. Instead, the policymaker sets the cap and then lets the market set the additional price faced by industry.

A carbon tax reverses this relationship by raising the cost of all carbon-based fuels by an increment set by government decision makers. Thus, in one important sense a carbon tax offers something a cap and trade system does not: relative cost certainty. If a policy maker is more concerned about ensuring that the economic costs of a new climate change regulation do not get too large, then a fixed carbon tax actually offers a simpler and easier mechanism for ensuring that cost certainty than a cap and trade system. To deal with this cost uncertainty under cap and trade, some proposals incorporate "safety valve" features that raise the cap when price exceeds a certain level.

Another vital difference between the two approaches relates to revenue. With a carbon tax the government obtains a potentially significant new source of revenue that could fund the general treasury or additional environmental programs designed to mitigate the potential impacts of climate change. Cap and trade, by contrast, has traditionally relied on giving emissions allowances away for free to current users of the resource. The 1990 SO2 program took this approach, as have most countries for most allowances under the more recent EU ETS. Recently, however, greater interest has emerged for alternative methods for distributing allowances, including allocation based on pollution efficiency benchmarks, economic efficiency, or relative population sizes. In addition, interest has grown in allocating allowances via auction, an idea that is embraced by S. 2191 and is also being used in RGGI. This makes cap and trade a bit more like a carbon tax, in that it offers government a revenue stream. In theory, the regressive nature of a cap and trade policy can then be substantially offset by redistributing auction revenues to citizens, either through lower taxes or a direct dividend.

## Key Choices and Issues

Cap and trade systems and carbon taxes create several additional choices and issues for policymakers. The first is who should pay the tax or require the permits: whether the market should be implemented "upstream," forcing a relatively small number of affected businesses (e.g., energy importers, extractors and refiners) to pay the tax or obtain allowances, or "downstream," putting that burden more directly on end users, including citizens. In addition, there is the question of setting the right cap for allowances or the right price for a carbon tax. In theory, one can find a tax level that leads to the same emissions outcome as established by a given emissions cap, but in practice the information required for doing so is often lacking. Additionally, critics argue that pricing carbon will reduce trade competitiveness, for example if U.S. businesses move operations to unregulated countries in order to avoid domestic costs of burning carbon-based fuels. While

this "pollution haven" hypothesis is a valid concern, recent research on the effect of other environmental regulations on global capital flows suggests that environmental regulations are rarely a precipitating factor in a firm's decision to move operations overseas—instead, the strongest influence by far is the lower cost of labor in other nations. Thus, concerns about "reduced competitiveness" for U.S. firms under a carbon tax or cap and trade system may be exaggerated.

## What about Agriculture?

A prominent feature of climate change legislation currently under consideration in the U.S. Congress is a clearly articulated role for agriculture. The first instance of this is that S. 2191 specifies that up to 15%of all required emission allocations from covered industrial and power sources (such as electricity generating plants) can be provided in the form of "offsets" arising from domestic agricultural and forestry sources. This means, for example, that emitting firms could replace required greenhouse gas reductions with verifiable efforts to either reduce greenhouse gas emissions in agricultural settings or to directly sequester carbon (say through changes in cropping practices or afforestation). Some farmers already take advantage of a less lucrative voluntary offset market today, selling credits through private brokers like the Chicago Climate Exchange (CCX). Binding caps on carbon emissions would, of course, seem likely to raise the value of such offsets substantially.

A second important provision of the proposed legislation is that 10% of emission allocations will be allocated directly to the Secretary of Agriculture. Five percent of these allocations are intended to be distributed to the agricultural sector to reward the carbon reduction and sequestration efforts of agricultural producers. An additional 5% are intended to be allocated to National Forests and National Grasslands, also for carbon reduction and sequestration efforts. In all instances, the legislation specifies that primary consideration in these efforts should be directed toward use of native plant species. Not surprisingly, the exact details of what agricultural and forestry activities might qualify under the law remain unclear in the legislation. Opportunities will be defined by the interpretation, implementation, verification and review of any new laws. These will be the responsibilities of newly created implementing agencies.

## For More Information


*Emissions Trading: Principles and Practice,* by Tom Tietenberg (RFF Press, 2006).

*The Paparazzi Take a Look at a Living Legend: The SO2 Cap-and-Trade Program for Power Plants in the United States,* by Dallas Burtraw and Karen Palmer, Resources for the Future Discussion Paper 03-15 (2003), available at http://www.rff.org/Documents/RFF-DP-03-15.pdf

*Allocation in the European Emissions Trading Scheme: Rights, Rents and Fairness,* edited by A. Denny Ellerman, Barbara K. Buchner, and Carlo Carraro (Cambridge Univ. Press, 2007).

*Markets for Clean Air: The U.S. Acid Rain Program,* by A. Denny Ellerman, Paul L. Joskow, Richard Schmalensee, and Juan-Pablo Montero (Cambridge Univ. Press, 2005).

*Who Owns the Sky?* by Peter Barnes (Island Press, 2001).

*The EU Emissions Trading Directive: Opportunities and Potential Pitfalls* by Joseph Kruger and William Pizer, available at http://www.rff.org/documents/RFF-DP-04-24.pdf.

The Emissions Trading Education Initiative (http://www.etei.org/links.htm)



*Leigh Raymond is associate professor in the Department of Political Science at Purdue University, West Lafayette, IN. Gerald Shively is professor in the Department of Agricultural Economics at Purdue. Both authors are members of the Purdue Climate Change Research Center. They can be contacted at leigh@purdue.edu and shivelyg@purdue.edu.*