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Policy Options for Controlling Greenhouse Gas Emissions: Implications for Agriculture

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Climate Change Legislation Picks Up Speed

The pace of activity around climate change legislation picked up noticeably in 2007. The increased focus brought new legislative proposals to reduce greenhouse gas emissions (GHGs). These bills include cap-and-trade systems, and carbon taxes[1] as well as energy bills that promote energy efficiency or renewables (Table 1). Many also include support for research and development for emission reducing alternatives.

The cap-and-trade bills generally engage agriculture through a credit system. As such, agriculture is not capped, but individual land owners can make the case that they have reduced emissions or increased carbon uptake and thus get credits. Entities under the cap can apply these credits and that creates sales possibilities.

The carbon tax bills generally defer decisions on how to include nonenergy emissions. For example the Larson bill, directs the Secretaries of Treasury and Energy to make recommendations within six months on non-carbon GHGs. We argue below that these activities can be brought into a carbon pricing system similarly to energy related emissions.

Market Based Incentives and Complementary and Competing Approaches

Economists widely favor market based incentives (e.g. carbon taxes or cap and trade systems) as they are generally more economically efficient than regulatory approaches. A carbon tax or the CO2 price that results from a cap and trade control system will raise fossil fuel costs and tip the balance toward less emission intensive fuels like renewables. An incentive-based program lets the market determine whether, when and how much renewable fuel should be used rather than setting a mandatory blending rate, portfolio standard, or production target.

Given that we wish to use a market-based approach, what are the important design features? The first important design issue is whether the system is imposed at upstream or downstream. Upstream refers to coal mines, natural gas, oil wells, refiners or import points for energy. Downstream refers to the end users of fossil fuels. In the case of energy-related CO2 and from an efficiency standpoint it does not, for the most part, matter where the price is imposed. This is simply a consequence of the general principle that the tax wherever it occurs will be passed though to consumers leading them to reduce energy use and, as a result, emissions.

From an administrative and regulatory cost viewpoint, however, it makes a difference where the price is imposed. The United States has roughly 1500 coal mines, 150 oil refineries and 200 natural gas pipeline locations meaning a small number of places the upstream tax would be levied. In contrast, a downstream system would require taxing millions of consumers, raising the administrative costs. Both would provide incentives to reduce energy use and lower associated emissions. For agriculture and land-use, upstream means applying the tax or cap and trade system on the owner of the land.

Second, it is important to make the system comprehensive. This means including as many GHGs and sectors as possible. This calls for agriculture to be included. A number of studies have found that by being comprehensive the cost of an abatement program is sharply reduced.

1. *Carbon taxes can apply to carbon emissions only or to a broader array of greenhouse gases. In this paper, we will use the term "carbon tax" to apply to a tax on some or all greenhouse gases.*

Bill	Primary Policy Instrument	Other Features	Agriculture Related Provisions
Lieberman-Warner December 2007	Cap and Trade	R&D Incentives, Energy Efficiency Standards	• Agriculture's energy-related emissions not covered • Credits for sequestration and other GHGs • Incentives for fuel from cellulosic biomass
Bingaman-Specter	Cap and Trade	R&D Incentives	• Because regulated upstream, covers energy-related emissions from agricultural sector • Credits for sequestration and other GHGs • Incentives for fuel from cellulosic biomass
Kerry-Snowe 2007	Cap and Trade	R&D Incentives, Renewable Portfolio Standards, Energy Efficiency Standards, Motor Vehicle Emission Standards, Gasoline Content Standards	• Breadth of sectoral coverage of the cap and trade left to the executive branch • Credits for sequestration • Renewable fuel required in gasoline • E-85 fuel pump expansion
Sanders-Boxer 2007	Cap and Trade	R&D Incentives, Renewable Portfolio Standards, Energy Efficiency Standards, Motor Vehicle Emission Standards, Gasoline Content Standards, Emission Standards for Electric Generation Units	• Breadth of sectoral coverage of the cap and trade left to the executive branch • Credits for sequestration • Renewable fuel required in gasoline
Waxman 2007	Cap and Trade	R&D Incentives, Renewable Portfolio Standards, Energy Efficiency Standards, Motor Vehicle Emission Standards	• Breadth of sectoral coverage of the cap and trade left to the executive branch •No provisions for agriculture
Udall-Petri 2006	Cap and Trade	R&D Incentives	• Because regulated upstream, covers energy-related emissions from agricultural sector • Credits for sequestration and other GHGs
Larson 2007	Carbon Tax	R&D Incentives	• Increased fuel prices create incentives for reduction of energy-related agricultural emissions • Credits for sequestration and other GHGs
Stark-McDermott 2007	Carbon Tax		• Increased fuel prices create incentives for reduction of energy-related agricultural emissions
Dingell Draft 2007	Carbon Tax + Gasoline Tax	R&D Incentives	• Increased fuel prices create incentives for reduction of energy-related agricultural emissions

Table 1: Congressional Climate Bills Featuring Incentive-based Mitigation Measures

Third, it is important to identify the real losers under any carbon pricing scheme[2]. The SO2 trading system and the EU Emissions Trading Scheme gave permits to the energy sector largely for free. However, the burden falls predominantly on final consumers, especially lower income ones. Revenues from auctioned allowances or a carbon tax can be used to relieve some of that burden.

Given this, what about the choice between cap and trade and a tax? Both have similar desirable characteristics in terms of economic efficiency in a certain world but differ under uncertainty. Under a cap and trade system the price is uncertain and variable whereas in the tax system the price is specified but the emissions reduction level is uncertain. Research shows that for greenhouse gas control eliminating uncertainty in the price has an economic advantage, tending to favor the tax approach. So-called hybrid systems where a cap and trade system is specified and then a price ceiling (safety valve) or price floor have been proposed to limit price variability, matching some of the properties of tax. While the difference between a cap and trade and a tax system has spurred a vigorous economics debate, the primary concern should be to undertake an incentive system that addresses the three issues above and is not cluttered with other measures that undermine its efficiency.

Many bills have a host of other provisions and the question is do these contribute to efficiency or undermine it? Some of these measures are complementary and some competitive. The complementary ones include information and labeling, research and development funding and reconsideration of public infrastructure funding such as for transportation. However, while experience with these approaches has shown some emissions reduction benefit, alone they are insufficient to significantly reduce emissions growth.

Competing programs are those that create mandates like fuel blending standards, renewable portfolio standards, or mandated efficiency standards. It may turn out that they are completely redundant as in the

2. *We set aside here the distributional implications of climate change itself.*

case of older lower renewable fuel standard that has been far surpassed by the market. However, if they are binding they lead to inflexibility in responding to a carbon price and thereby forcing more costly abatement options.

Agriculture in a Carbon Pricing System

With regard to agriculture and land use, a worrisome aspect of the proposed legislation is the unwillingness to cover land use emissions and other GHG emissions from agriculture on the same basis as other emissions. Economic agents causing greenhouse gas emissions should face a price for those emissions. Crediting systems in proposed legislation, while a step in the right direction, do not bring agricultural emissions fully into a cap and trade or tax system on the same basis as other emitting activities. They allow land owners to receive credits if they demonstrate abatement but if they simply choose to continue emitting they face no penalty.

Agricultural Emissions

Agriculture includes emissions from energy—that will be covered with an energy focused cap and trade system—but also a methane from livestock and rice and nitrous oxide resulting from fertilizer use. How should agriculture be treated? Bringing all or at least large sources under a cap and trade system would treat these symmetrically with energy related emissions.

Methane emissions from enteric fermentation, for example, contributed 112 million metric tons of CO2-equivalent emissions in 2005 or about 20 percent of total agriculture emissions. Large beef and dairy operations generate the bulk of these emissions. Treatment similar to that of energy suggests there should be a tax per head of cattle based on average emissions. Alterations of the animals' diets can change emissions. The government could give credits for diet induced reductions. The burden of proof of dietary change would be on the cattle feeders wishing to avoid the tax or to receive credits applicable to its cap.

Land Use

Land use and management of land can lead it to be either a source or a sink for greenhouse gases but approaches similar to those for other emissions can be applied to land-use with the land owner required to inventory carbon stock changes in order to sell the credits into the market, although such a program may be limited to land owners above a threshold to capture uses such as major forest operations with others allowed to opt in to the cap to avoid excessive management and monitoring costs associated with small sources. Such an approach is consistent with that proposed to deal with carbon capture and sequestration from power plants—where it is presumed that coal combustion leads to emissions unless CCS is demonstrated, and would thus provides similar treatment of emissions across sectors. Similarly, nitrous oxide presumed to be released from use of nitrogen fertilizer could be place under an upstream cap, with the presumed emissions depending on the form of nitrogen applied or where good practice demonstrated lower emissions a credit could be issued. Just as all carbon contained in fossil fuels is presumed to be released into the atmosphere (and thus priced) unless otherwise proven, agricultural emissions are presumed based on standard agricultural practices unless otherwise proven.

Ways Forward

It is desirable to implement incentive-based systems so as to stimulate industry to reduce emissions and innovate in reduction technology. Attention is also needed with regard to where to place regulation (upstream or downstream), comprehensiveness of treatment, and burden distribution. We reject the view that has been dominant in the literature to date that agriculture and land-use activities are somehow special and must be treated differently under a carbon pricing regime. Agricultural emissions should be fully included and activities that reduce emissions should be eligible for credits. Comprehensive inclusion is central to a viable, cost-effective, and efficient carbon pricing program.

For More Information

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