BACKGROUNDER

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Emissions Trading versus CO_2 Taxes

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Overview

Much attention has focused on the design of a trading program for carbon dioxide (CO_2) emissions, but a more fundamental question is whether emissions trading is really the best regulatory model. In particular, are there potential advantages or disadvantages to a CO_2 tax versus a cap-and-trade program? This Backgrounder compares and contrasts the two policy approaches and examines the extent to which the potential advantages of CO_2 taxes might be captured in a hybrid emissions trading program through appropriate design features, such as safety valves and allowance auctioning. We briefly touch on other regulatory options but plan to cover that more thoroughly in a separate document.

Similarities between CO_2 Taxes and Emissions Permits

A CO_2 tax imposed "upstream" in the fossil fuel supply chain (with rates reflecting the amount of CO_2 that will be emitted when the fuel is later combusted in automobiles, during electricity generation, and so on) minimizes the number of entities subject to the tax and therefore has administrative advantages. Roughly speaking, the tax would be passed forward into the price of coal, natural gas, and petroleum products and therefore ultimately into the price of electricity and other energy-intensive goods. These higher energy prices would encourage the adoption of fuel- and energy-saving technologies across the economy and promote switching from carbon-intensive fuels like coal to natural gas and renewable fuels. In these regards, a CO_2 tax closely resembles an upstream emissions trading system, where the price of allowances is passed forward into fuel prices.

Neither policy has to be implemented upstream; CO_2 taxes and emissions trading programs can be implemented anywhere in the chain from fossil fuel production (upstream) to

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ultimate fuel combustion (downstream). However, there is typically greater efficiency—lower cost per ton—associated with upstream programs because they can encompass virtually all emissions sources with minimal administrative burden, thereby maximizing low-cost mitigation opportunities. In contrast, downstream programs necessarily exclude small sources (as does the EU Emissions Trading Scheme, or EU ETS). And either taxes or tradable permits can incorporate incentives for downstream carbon capture and storage at industrial facilities, for forestry expansion on farmland, and for other downstream activities, via offset and crediting programs.

Potential Advantages of a CO_2 Tax

Carbon taxes have several advantages over traditional emissions permit systems, but as discussed later, some of these can be partly captured through modifications to the cap-and-trade approach.

One potentially important advantage of the CO_2 tax is that it fixes the price of CO_2. In contrast, under a cap-and-trade system, CO_2 permit prices can be volatile because the supply of permits is fixed but the demand for permits may vary considerably over time with changes in the demand for energy, spikes in natural gas prices, and so forth. Volatility in permit prices may deter carbon-saving investments in capital or R&D that have high up-front costs: the long-term payoffs to a firm are very uncertain if the future price of CO_2 is unknown.

Moreover, typically it makes economic sense to allow nationwide emissions to vary on a year-to-year basis because prevailing economic conditions affect the costs of emissions abatement. This flexibility occurs under a CO_2 tax because firms can choose to abate less and pay more tax in periods when abatement costs are unusually high, and vice versa in periods when abatement costs are low. Traditional permit systems do not provide similar flexibility because the cap on economywide emissions has to be met, whatever the prevailing abatement cost. Intuitively, imposing strict limits makes economic sense only if (1) we are rapidly approaching a threshold in atmospheric greenhouse gas concentrations beyond which there is a risk of dangerous climate change; and (2) those strict limits are globally enforced. It is worth noting that most trading programs do allow banking—the saving of unused allowances for future periods—and this can provide some flexibility if initial targets are sufficiently generous for a long enough time to allow a bank to emerge. The possibility of borrowing is discussed below.

Another potentially important advantage of CO_2 taxes is that they directly raise revenues for the government, whereas under traditional permit systems, the government gives away free

allowances. For example, a tax of $10 per ton of CO_2 would currently raise about $50 billion of revenue a year for the federal government, or about 7.5 percent of federal personal income taxes. This extra revenue could be used to lower the rates of other taxes, such as those on individual income. (Such a "tax swap" was implemented by the United Kingdom in conjunction with its 2001 climate change levy.) Income taxes cause a variety of distortions in the economy; for example, they can deter educational and other investments that would increase an individual's earning power, since part of the rewards will be taxed away by the government, and they can also lower the incentive for some people to join the workforce. These economic distortions could be reduced, albeit modestly, if CO_2 tax revenues were used to lower individual income taxes. Even if the revenue from a CO_2 tax is not used to cut other taxes, it could still flow to a variety of important uses—including support for energy R&D, adaptation, or assistance to stakeholders and communities adversely affected by the policy. Weighing against this revenue-raising advantage is the risk that government will spend the additional revenue on programs that cost more than the benefits they provide, thereby exacerbating the cost of the program relative to giving allowances away for free.

Aside from the possible differences in economic efficiency, revenue to the government (and its potential uses) has different distributional consequences for various people and firms in the economy. A free distribution of allowances benefits those who receive the allowances for free—perhaps businesses and their shareholders. Revenue to the government could be spread more broadly across the population, if used to lower tax rates for all income groups. A critical question, therefore, is the degree to which the burden of a market-based CO_2 program is broadly spread across society or, conversely, concentrated among a particular group of businesses—as well as how the government could and would spend any revenue.

Finally, emissions trading systems require new institutions to function effectively; that is, they require the establishment of smoothly running markets where firms can buy and sell permits and obtain information about permit prices now and in the future. Experience has shown that these institutions arise quickly and largely inexpensively; the U.S. SO_2 trading program is one example. However, some emissions trading markets have witnessed exceptional volatility during their inception. For example, the U.S. NO_x budget program saw prices skyrocket in the wake of uncertainty about whether Maryland, a net supplier, would enter the program on time, and the EU ETS saw a spectacular crash in prices as data revealed an excess of CO_2 permits rather than the expected shortage.

Hybrid Trading Schemes That Blur the Distinctions

The problem of permit price volatility under a cap-and-trade system can be partly addressed by providing a "safety valve" and allowing firms to bank unused allowances. With a safety valve, firms can buy additional permits from the government in periods when the permit price reaches a trigger level; this keeps a cap on permit prices when the demand for them is high because of high abatement costs. And with permit banking, in periods when the demand for permits is slack because abatement costs are low, firms have an incentive to hold over some allowances for use in future periods when they expect higher permit prices; this mechanism helps create a floor under permit prices.

An alternative to a safety valve has recently been introduced in the U.S. policy debate—namely, permit borrowing. The most recent proposal, by Senators McCain and Lieberman in the 110th Congress, allows firms to borrow up to 25% of their obligation in a given year for up to five years (paying 10% interest annually). Coupled with somewhat clear expectations about future prices, this mechanism could provide flexibility similar to a tax. Without clear expectations about future prices, however, it would tend to dampen short-term volatility while leaving the market open to fluctuations based on longer-term expectations about the cap and prices.

The second potential advantage of a tax, the raising of revenues versus the free allocation of permits, can also be captured by a cap-and-trade program if the government auctions allowances (or conversely, a CO_2 tax could include rebates or exemptions). Although 100% auctions would mimic the revenue advantages of a CO_2 tax, partial auctions – or as suggested by the recent U.S. Climate Action Partnership proposal, a gradual transition to auctions – offer a full spectrum of possibilities.

Potential Disadvantages of a CO_2 Tax

CO_2 taxes raise several practical concerns. One is simply the current political resistance to new taxes; for example, despite a major effort, the first Clinton administration failed to enact a major new energy tax motivated on environmental grounds. Nonetheless, the CO_2 tax should not be ruled out entirely on this basis, since it is always difficult to predict what policies may or may not be politically feasible down the road with different political leadership and likely greater public awareness of, and concern about, both global warming and fiscal constraints.

Another concern (noted earlier) is that revenues from a CO_2 tax (or auctioned permits) might end up being wasted; for example, if the revenue could go toward special interests, rather

than substituting for other taxes or addressing important social needs. Again, this hinges on whether the political will is there; in principle, legislation accompanying a CO_2 tax could specify how the new revenue must be used, thereby avoiding the risk that it will be dissipated among competing special interest groups. This highlights a related issue: a fiscally focused climate policy will tend to shift the focus (at least partially) from the environment to revenue and fiscal policy, perhaps in terms of jurisdiction of agencies and committees, but almost certainly in terms of the policy debate. At first blush, such a shift would seem to be disadvantageous for the environment.

Another issue is that policymakers may wish to compensate the industries most affected by the carbon regime or ease the transition for firms and workers facing adjustments. Compensation is fairly straightforward to provide under an emissions trading regime, by granting free allowances to particular firms or groups based on their historical activities. Compensation could also be provided under a CO_2 tax regime, although legislatively, this is more complex.

Finally, and perhaps most importantly, policymakers may have goals for progressively cutting back nationwide greenhouse gas emissions each year, perhaps because atmospheric CO_2 concentrations are already judged to be dangerously high, or because steady progress on emissions reductions more effectively communicates America's seriousness about tackling climate change to the international community. A traditional cap-and-trade system with no safety valve is best tailored to this direct target for emissions reductions; in contrast, progress on emissions reductions is uncertain under a CO_2 tax because emissions vary from year to year with economic conditions. Cap and trade with a safety valve may provide an interesting compromise: the safety valve limits permit prices and emissions abatement costs, but the trigger price can be steadily increased over time, providing more certainty about emissions levels over the longer term.

Is There Any Role for Performance Standards?

From a cost-effectiveness standpoint (e.g., lowest cost per ton reduced), market-based instruments like CO_2 taxes and emissions permit systems, applied to all emissions sources, are typically superior to performance standards, such as limits on emissions per kilowatt hour of electricity generation, fuel economy requirements imposed on new vehicles, or energy efficiency requirements for household appliances. Under market-based policies, the marginal cost of abatement is equated across all sectors of the economy, across all firms within a sector, and across all possibilities for abatement, particularly substitution from carbon-intensive fuels to

other fuels, adoption of energy-efficient technologies, and conservation at the household level, such as driving less and saving on residential heating and cooling.

Unlike market-based instruments, performance standards typically do not impose an economywide carbon price and therefore fail to meet these conditions for efficiently distributing the burden of emissions reductions across different firms, households, and mitigation options. Tradable performance standards offer some ability to equalize marginal costs but often overlap coverage in some areas, exclude coverage in other areas, and always fail to properly incentivize conservation. For example, performance standards for the power sector and appliances would overlap, as would a fuel economy standard for cars and a renewable or carbon-based fuel standard for gasoline. Industrial use of fossil fuels, where output is not easily defined on a consistent basis, would be difficult to include. Finally, performance standards have a weaker impact on conservation than market-based instruments because, while lowering emissions per unit of output or use, they do not raise the cost of output or use to reflect resulting emissions.

On the other hand, performance standards might usefully supplement a market-based carbon regime because of additional market failures or the failure to fully price CO_2 mitigation at its full value to society. In particular, market failures include the possibility that consumers may undervalue more energy-efficient vehicles or appliances, and that the incentives to adopt relatively new, more expensive technologies involve substantial benefits in the form of new knowledge. The failure to price CO_2 mitigation appropriately may arise from understandable opposition to higher energy prices and/or concerns about the international competitiveness of energy-dependent industries.

Summary

Significant differences exist in how emissions taxes and trading programs have traditionally been implemented. In particular, taxes have typically generated government revenues and fixed prices, whereas trading programs have distributed allowances freely and fixed emissions. However, recent proposals for emissions trading programs with auctions and safety valves suggest that the beneficial features of a CO_2 tax can be partly included in a trading program. The same is not true for a tax: it is not possible to create emissions limits without resorting to emissions permits. And whereas revenues can be redistributed, the frequent response to proposed CO_2 taxes from many concerned industries has been to seek exemptions or voluntary agreements in lieu of taxes, a very different outcome from seeking various allowance allocations. Many other features—such as the point of regulation and inclusion of offsets and crediting

programs—have always been interchangeable between emissions taxes and tradable permit programs.

What remains, then, as fundamental differences? Emissions trading programs do require additional institutions: markets, brokers, and information tools to manage risk. These institutions tend to arise quickly and inexpensively but often with some initial periods of excess volatility. And a tax approach does tend to reframe a traditional environmental issue as, at least partially, a revenue issue, with attendant political, jurisdictional, and institutional consequences, something that might arguably arise with revenue-generating allowance auctions. All this suggests that the apparently dichotomous choice of taxes versus tradable permits is more a choice of features along a continuum.

Table 1. Comparison of Policy Instruments

	CO_2 tax	*Cap and trade*
Certainty over CO_2 price?	Yes. The tax fixes the price.	No. But price volatility can be limited by design features, such as safety valves or borrowing.
Certainty over emissions?	No. Emissions vary with prevailing energy demand and fuel prices.	Yes, in its traditional form.
Efficient encouragement of least-cost emissions reductions?	Yes.	Yes.
Ability to raise revenue?	Yes. Typical design leads to maximal revenue generation.	Traditionally, no. But increasing interest in auctions provides opportunity to raise at least some revenue now and possibly transition to maximal revenue in the future.
Incentives for R&D in clean technologies?	Yes. Stable CO_2 price is needed to encourage induced innovation.	Yes. However, uncertainty over permit prices could weaken innovation incentives.
Harm to competitiveness?	Yes, though if other taxes are reduced through revenue recycling, competitiveness of the broader economy is improved.	Yes (as with a tax), if energy-intensive firms facing foreign competition must buy allowances. But giving firms free allowances offsets harmful effect on profitability.
Practical obstacles to implementation?	Yes. New taxes have been unpopular.	Yes. Identifying a reasonable allocation and target is difficult.
New institutional requirements?	Minimal.	Yes, but typically, markets (for trading permits and providing information across firms and time periods) arise quickly and inexpensively.