Is taxation or cap-and-trade the better strategy for reducing greenhouse emissions?

Combating Global Warming

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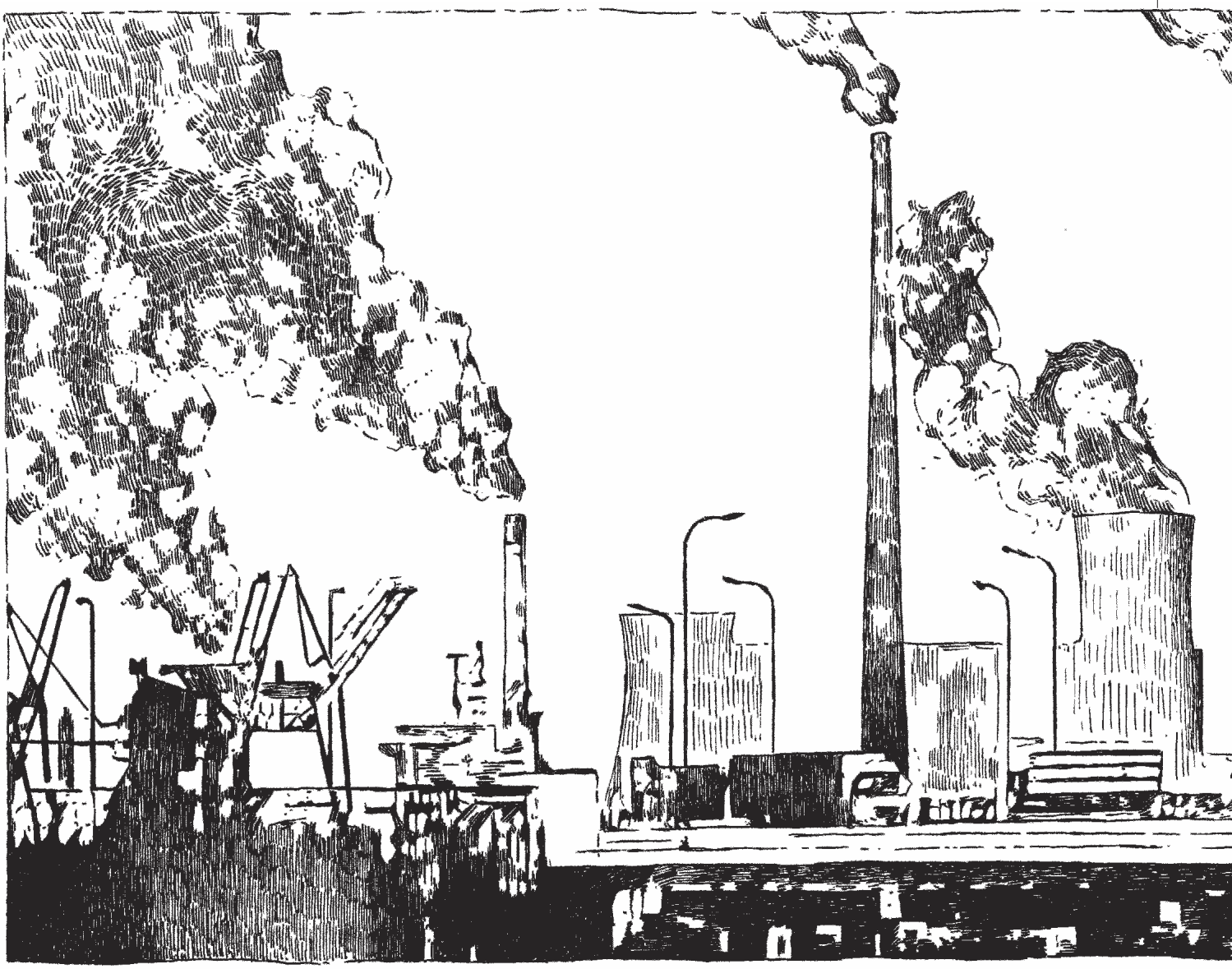
Resources for the Future



Recent events suggest that it may only be a matter of time before the federal government enacts a nationwide program to reduce emissions of carbon dioxide (CO_2) and other greenhouse gases. First, several bills to control emissions have recently been introduced in Congress. Second, state action on a variety of fronts is threatening a patchwork approach to greenhouse emissions regulation that would be cumbersome for business. Third, a recent Supreme Court case has indicated that the Environmental Protection Agency already has the authority to regulate greenhouse gas emissions — meaning that if Congress does not act, the president can. Meanwhile, recent polls show a new and rising concern among ordinary Americans about climate change, as more CO_2 accumulates in the atmosphere and the earth continues to warm (see Figure 1).

The favored federal policy to address climate change is a domestic cap-and-trade system that, in time, would naturally link to the emissions trading system recently established in Europe. However, just as the momentum for emissions trading seemed unstoppable, a vocal minority, including Sen. Chris Dodd (D-Conn.) and former vice president Al Gore, as well as Congressmen John Larsen (D-Conn.) and Pete Stark (D-Calif.), have begun arguing in favor of a CO_2 tax. And on close inspection, CO_2 taxes seem particularly attractive both for fiscal reasons and because they provide certainty over the price of emissions. So does this mean that policymakers should give up on emissions trading, or are there ways permit systems might be designed to capture the potential advantages of CO_2 taxes?

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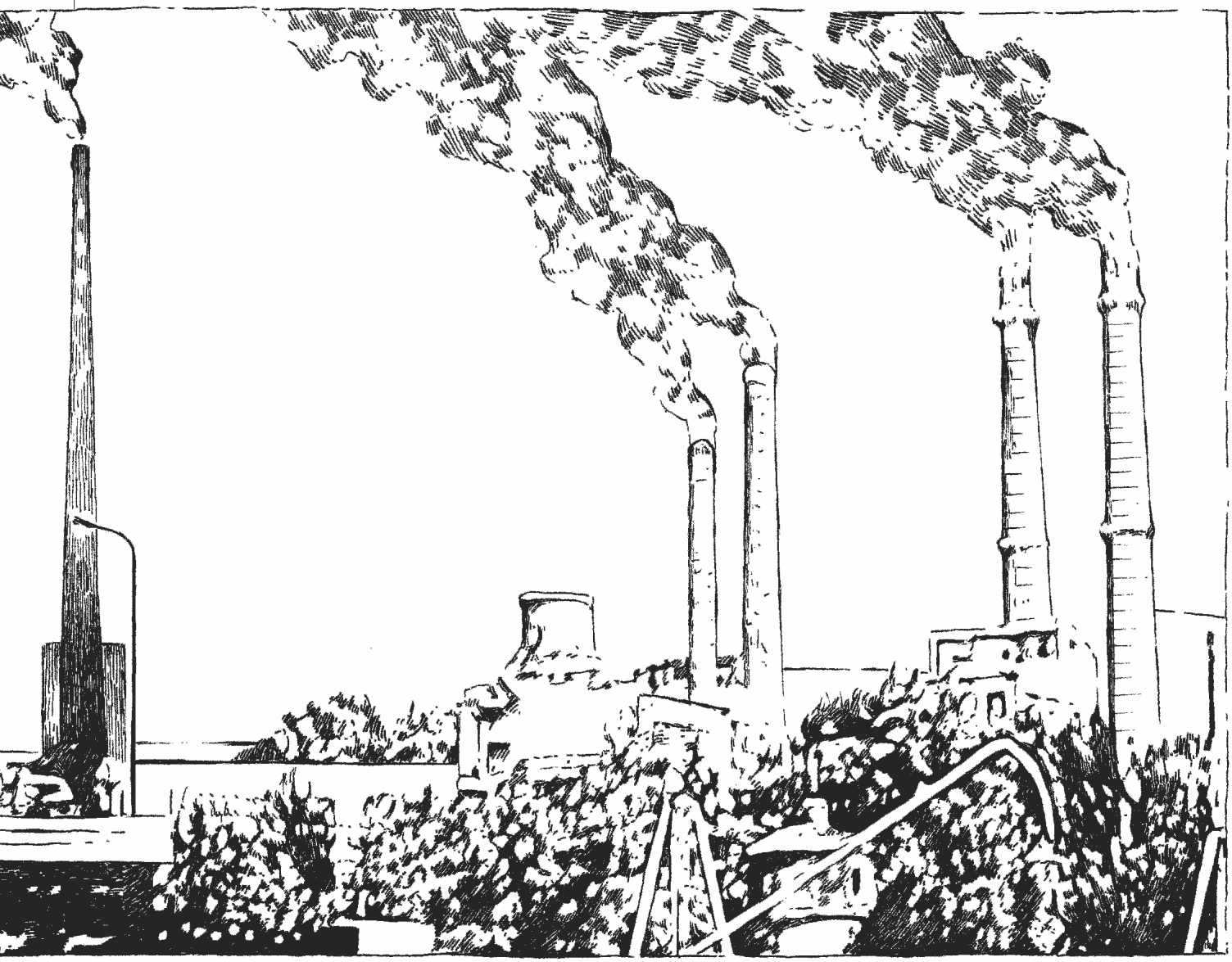
TAX DESIGN

To maximize opportunities for cheap emissions reductions, a CO_2 tax would be imposed upstream in the fossil fuel supply chain, as this encompasses all possible sources of emissions when fuels are later combusted. Limiting the tax to a relatively small number of fossil fuel producers eases administrative burdens on the government. The tax, which would be levied in proportion to a fuel's carbon content, would be passed forward into the price of coal, natural gas, and petroleum products, and therefore ultimately into the price of electricity and other



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energy-intensive products. 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 less carbon-intensive natural gas and to carbon-free fuels such as nuclear and renewables.

In these regards, a CO_2 tax closely resembles an upstream emissions-trading system where firms require permits to cover the carbon content of fuels they mine or process and the market price of permits is passed forward into fuel prices. Moreover, through tax credits or emissions offset provisions, both approaches can incorporate incentives for downstream activities that partly offset emissions releases, such as carbon capture and storage at power plants and industrial facilities, forestry expansion on farmland, and other fugitive emissions reductions. And from a standpoint of reducing emissions at the lowest possible cost, market-based instruments like CO_2 taxes and emissions permit systems are typically superior to "command and control" approaches (e.g., vehicle fuel economy requirements, emissions standards for electricity generation, energy efficiency requirements for household appliances). By raising fossil fuel prices, market-based instruments encourage all options for low-cost emissions reductions across the economy; in contrast, command-and-control approaches tend to overly burden specific sectors, firms, or abatement activities, while failing to take advantage of abatement opportunities elsewhere in the economy.

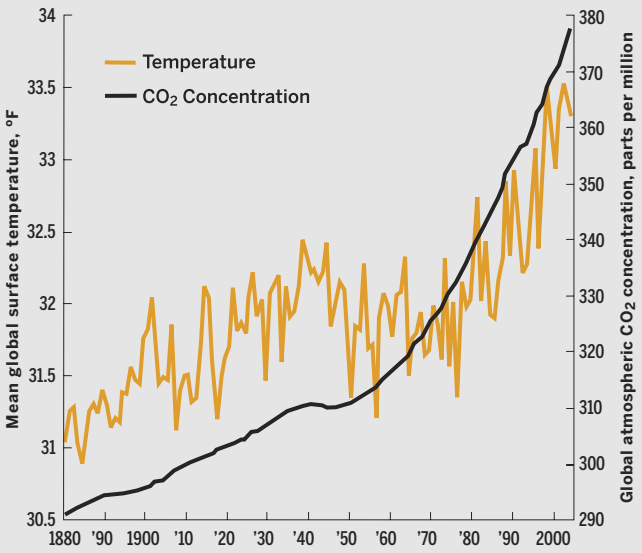
PRICE According to standard economic theory, the appropriate CO_2 tax, or permit price under emissions trading, should reflect the world consequences from the future global warming potential per ton of current CO_2 emissions. Those consequences encompass damages to agriculture, the impacts of rising sea levels and increased storm intensity, health effects from the spread of tropical disease, the risks of major disruptions to world output from more extreme climate scenarios, and so on (though account should be taken of our ability to adapt through, for example, improving farming practices or constructing levees). Predicting and estimating the impacts is extremely challenging and controversial, not least because of the difficulty of valuing very long-term damages given that the atmospheric lifespan of today's emissions is around 100 years. Most mainstream economic assessments value the damages from today's emissions at around $5 to $15 per ton of CO_2. Obviously, damages could be much greater if, as many argue, more weight should be given to ecological effects, the well-being of future generations, or the risk of abrupt climate change.

Suppose, for the sake of argument, that CO_2 emissions were priced at $10 per ton over the next few years, either through a tax or permit policy. This would reduce nationwide emissions by perhaps 5 percent relative to forecast levels in the near term, which may sound fairly modest. However, ideally the emissions price would be ramped up each year in coordination with other countries, implying a progressively larger reduction in emissions below levels that would occur without the CO_2 price.

Figure 1

Emissions and Temperature

Mean global temperature and atmospheric CO_2 concentration, 1880–2004



SOURCES: NOAA, Law Dome ice cores historical records, Mauna Loa Observatory

FISCAL ISSUES

One important way in which CO_2 taxes differ from "traditional" permit systems (where all allowances are given away free to firms) is that taxes raise revenue for the government. For example, a $10 CO_2 tax would raise about $60 billion in revenue per year (or more, as emissions rise in the future and if other greenhouse gases are also taxed).

One way of using this revenue would be to finance a reduction in individual federal income taxes of around 6 percent, which would (moderately) alleviate various tax distortions in the economy. For example, by taxing away some of the returns to working and saving, income taxes deter some people from joining the labor force and encourage others to consume too much of their income. Income taxes also induce a bias away from ordinary spending, toward items that are deductible or exempt from taxes (e.g., owner-occupied housing, employer-provided medical insurance). Although subject to some dispute, we would put the economic efficiency benefits from using revenues from a $10 CO_2 tax to offset income taxes at around $20 billion a year (almost 0.2 percent of current GDP); this represents a substantial gain that would not be possible under a traditional permit system.

Does this benefit of CO_2 taxes imply that their overall costs are negative (i.e., that they both reduce emissions and benefit the overall economy)? That is, does a "green tax swap," reducing income taxes and raising a CO_2 tax, improve the efficiency of the tax system, distinct from the environmental benefit of reducing emissions? CO_2 taxes, like emissions permits, do impose economic costs. For example, they induce costly investments throughout the economy to conserve energy and they cause industry to use cleaner, but more expensive, fuels than they otherwise would. Moreover, by driving up

economy-wide energy costs, CO_2 taxes can also have harmful effects on the overall level of economic activity and employment, which exacerbates some of the distortions created by income taxes. Those costs must be compared to the above costs of income taxes. While there has been some controversy on this issue, the most recent research suggests that the overall costs of imposing a CO_2 tax of around $5 to $15 per ton, with the revenues used to reduce income taxes, are small and perhaps even negative. Although there may be concerns about distribution, there is little basis for holding up a moderate, revenue-neutral CO_2 tax on the grounds that it harms the economy.

But what if the revenues from CO_2 taxes are used for other purposes? Clearly, if the revenues simply end up paying for dubious pork barrel spending projects, the fiscal argument for CO_2 taxes is reversed. A further possibility is to use revenues to partly offset looming pressure on the federal deficit from entitlement spending, which would lower the burden on future, rather than current, taxpayers. However, when new revenue sources accrue to the Treasury, rather than being offset by automatic tax reductions elsewhere, there is a risk that some of the extra revenue will ultimately finance more public spending, which may not have the same social value as cutting distortionary taxes. Although some revenue might be earmarked for clean technology programs, legislating reductions in other taxes is probably the best use of most of the revenue from CO_2 taxes, from the standpoint of the overall economy.

PRICE CERTAINTY Another potentially important advantage of the CO_2 tax is that it fixes the price of CO_2. In contrast, under a pure 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 from year to year with changes in the demand for energy, spikes in natural gas prices, and so forth. Volatility in permit prices may deter adoption of carbon-saving technologies (e.g., carbon capture and storage) or major research and development programs (e.g., hydrogen-powered or plug-in hybrid vehicles), as the long-term payoffs from those investments are uncertain if the future price of CO_2 is unknown. This volatility may also dampen society's appetite for progressively stricter emissions caps over time, as volatility imposes additional costs to risk-averse individuals.

Moreover, ideally the marginal costs of reducing emissions should be equated from year to year to the value of expected discounted marginal damages. While sensitive to particular assumptions about damages, this equality is roughly achieved under a CO_2 tax that rises at a rate of 2–5 percent over time. However, it is not achieved under a cap-and-trade system because of uncertainty in permit demand. For example, in years when the demand for energy is strong, the marginal costs of meeting the cap may be very high, implying that the cap is too tight. In contrast, when the demand for energy is slack, marginal costs of meeting the cap may be very low, implying that the cap is too lax. For those reasons, some studies suggest that the net benefits over time (climate change benefits less emissions abatement costs) under a traditional permit system might be only a small fraction of the net benefits under an appropriately scaled CO_2 tax.

HYBRID PERMIT SYSTEMS

So the fiscal and price stability advantages seem to imply an open-and-shut case for CO_2 taxes over emissions trading, right? Actually no, because this argument assumes that the only viable permit system is the traditional one. It is also critical to consider various "hybrid" permit systems that can capture some, and perhaps even all, of the economic advantages of CO_2 taxes, implying that the distinction between tax- and permit-based approaches might be more apparent than real.

First of all, the government does not have to give away allowances to firms for free. It could auction off the allowances and retain the revenue. (See "Auctioning Pollution Rights," Winter 2004.) Indeed, all of the emissions trading proposals in the 110th Congress as of May 2007 propose auctioning some portion of the allowances. For example, the government might solicit bids for permits from fossil fuel producers and then sell permits to the highest bidders until the quota for that year has been exhausted; second-round trading of allowances among firms would then establish the prevailing market price of permits. On average, annual revenues accruing to the government under this type of auction would be roughly the same as the revenue that would be collected under the equivalently scaled CO_2 tax; if revenues would be recycled in the same manner under either policy, the fiscal difference between the two instruments more or less disappears.

Second, the problem of permit price volatility can be addressed through provisions like "safety valves" and, to a lesser extent, permit banking and permit borrowing. With a safety valve, firms can buy additional permits from the government in periods when the permit price reaches a specified trigger level. This effectively relaxes the permit cap in that period, thereby keeping a ceiling on permit prices when permits would otherwise have been in excessive demand. Coupling a very tight cap with a safety valve would almost completely stabilize prices. Alternatively, transitory permit price spikes might be ironed out by allowing firms to borrow permits from the government during periods of high permit prices and pay them back through more stringent emissions control in some future period. Similarly, permit banking helps to create a floor under permit prices; under this mechanism, in periods when the demand for permits is slack because abatement costs are low, firms have an incentive to abate more in order to hold over some allowances for use in future periods when they expect higher permit prices. While still subject to fluctuations driven by longer-term price expectations, these mechanisms at least remove short-term volatility. Although arrangements for banking and borrowing permits strengthen the need for new financial institutions, such institutions would probably develop quickly and at relatively low cost.

In short, the key distinction is not really between CO_2 taxes and emissions trading systems per se. Rather, it is between policies that raise revenues — and use revenues wisely — and have limited price variability (i.e., CO_2 taxes or auctioned permits

with safety valves and emissions trading over time), versus non-revenue-raising instruments with no provisions to limit price variability (i.e., traditional permit systems).

PRACTICAL ISSUES

But still, what would be the point of developing an elaborate emissions trading system if its main purpose is simply to mimic the effects of a CO_2 tax?

One possibility is that policymakers may prefer the certainty of progressive emissions reductions over time provided under cap-and-trade, perhaps because (in conjunction with other countries) their objective is to stabilize atmospheric CO_2 concentrations at some level deemed "safe" by scientists, rather than basing policy on a contentious balancing of the benefits and costs of slowing global warming. But this is no reason to reject the CO_2 tax out of hand, as the tax rate could always be raised in the future if targets for emissions reductions are not being met, perhaps because of unexpectedly rapid economic growth. Similarly, although a domestic emissions trading system might ultimately be linked to similar systems in other countries to create a global regime for emissions control, nothing prohibits a global tax-based system from emerging where taxes are eventually harmonized and set jointly.

Another possibility is that policymakers may wish to provide temporary compensation for affected industries. These would include some downstream industries outside of the formal carbon regime that suffer from higher fuel input prices, particularly industries like steel that face fierce international competition. Under a cap-and-trade system, granting some free allowances to particular firms that they could then sell to others provides an easy and natural mechanism for such compensation, though it erodes, for the near-term, some of the potential for revenue-recycling benefits. This compensation also reduces the temptation to exempt some industries from the emissions control regime, which would be the worst outcome from an economic perspective as some of the benefits from including the widest possible range of mitigation options under the program are forgone. However, it is unclear whether such efforts to provide temporary compensation to affected industries reflect a genuine need for transitional assistance or just an unnecessary opportunity for rent seeking and mischief.

Finally, many may worry that however well-intentioned a CO_2 tax may appear, the revenues will be squandered on wasteful government spending. In a nutshell, this is the worst of three mischievous outcomes. The least mischievous is allowance rent seeking; rather than collecting the rents and using them to cut taxes, with attendant efficiency gains, they are simply redistributed. The next-worst possibility would be exemptions, where some industries facing significant competition — or engaging in aggressive lobbying — would escape regulation. Here, the efficiency of an economy-wide program incentivizing the least expensive emissions reductions, wherever they exist, is threatened. Because taxes remove the opportunity for easy redistribution, they may increase the risk that politically favored industries will be exempt from the emissions control regime. Finally, the aforementioned "worst" outcome would be the collection of revenue that, rather than being used to cut other taxes or simply redistributed, is actually wasted on low-value pork barrel spending. Not only do we face the cost of emissions abatement, we also face the drag of additional wasteful government spending. Viewed this way, taxes threaten the worst two of three bad outcomes.

MOVING FORWARD

Broad-based federal action to begin a progressive transition away from a greenhouse gas–intensive economy is to be welcomed. But achieving that with the best climate policy is also important, not only for minimizing the costs of the transition, but also for increasing the likelihood that the policy will be effective and will stand the test of time.

So how likely is it that the "best" climate policy for the economy — that is, one with price stability and that raises revenues to cut other taxes — is likely to emerge? As regards price stability, there are reasonable grounds for optimism. Some CO_2 tax proposals have recently emerged, and some of the proposals for cap-and-trade systems (such as the McCain-Lieberman and Bingaman-Specter approaches) include safety valves and mechanisms for borrowing over time. However, even though many cap-and-trade proposals envision auctioning a rising share of allowances over time, near-term revenues in these proposals, and also in the tax-based counterparts, are not offset by other tax cuts but are typically earmarked, for example, in technology and transitional assistance programs. Whether those earmarks, which might be a necessary part of the political deal to get climate legislation off the ground, and which are likely valuable at some initial level, would sunset or continue indefinitely is difficult to judge at this stage. We can only hope that policymakers will come to appreciate fully the potential for reaping a large dividend with more judicious use of revenues over the longer term. R

Readings

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