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A Better Way to Slow Global Climate Change

Climate and Energy Economics, Climate Change, Energy Security, Environment, Global Environment

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JUNE 1997 — The next major round of international negotiations on controlling global climate change is to be held later this year in Kyoto. The focus of talks to date has been on policies to reduce worldwide carbon dioxide emissions to 1990 levels and hold them there. A proposal by the United States would achieve this by creating a system of internationally tradable emissions permits.

Although the U.S. proposal has attractive features and has been endorsed by a number of prominent economists, it has several serious flaws that would prevent the treaty from being ratified and implemented. First, it focuses exclusively on stabilizing emissions even though a much stronger case can be made for reducing the growth of emissions rather than allowing no growth at all. A second problem is that it would also be very difficult and expensive to monitor and enforce. Third, it would generate such huge transfers of wealth between countries that those generating most of the world's emissions would be unlikely to ratify the treaty. More important, these wealth transfers could cause dramatic changes in exchange rates, trade balances, and international capital flows and would put enormous stress on the world trading system.

A better alternative would be to set up a system of national permits and emissions fees. Each country would be allowed to distribute tradable emissions permits equal to its 1990 emissions. Each government would also agree to sell additional permits at a fee specified in the treaty, say U.S.\$10 a ton of carbon emitted. The effect of the policy would be to encourage firms to reduce emissions whenever they could do so at a cost of \$10 a ton or less. Since this alternative does not focus on stabilization and instead aims at the more modest goal of reducing emissions where it can be done at low cost, and it includes an allowance for 1990 emissions, it is far more likely to be ratified and implemented. It would give firms an incentive to reduce emissions without causing huge international transfers of wealth and would avoid causing havoc in the system of world trade. Because the fee would be uniform throughout the world, the emissions reductions would be accomplished at minimum cost. Finally, the revenue raised by emissions fees would provide an incentive for individual governments to enforce the policy.

POLICY BRIEF #17

International concern about climate change has led to a series of negotiations aimed at producing a binding treaty to control worldwide emissions of carbon dioxide. The next major round of talks, intended to produce a final agreement, will be held in December in Kyoto. Negotiations have focused on measures to roll back emissions to 1990 levels and hold them there. A preliminary proposal advanced by the United States would achieve this by creating a system of internationally tradable emissions permits. The total number of permits would be limited to the amount of emissions in 1990, and they would be distributed among countries by treaty, possibly according to each country's population or its actual 1990 emissions. It would be up to individual governments to decide how to distribute their country's allocation. Once

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distributed, the permits could be bought and sold without restriction on an international market. The system would initially apply to developed countries and would later be extended to developing countries.

The U.S. proposal has generally received favorable reviews from economists and was featured in a widely circulated petition regarding climate change written by five leading economists and signed by thousands of others. (The authors were Kenneth Arrow, Dale Jorgenson, Robert Solow, Paul Krugman, and William Nordhaus.) However, much of the enthusiasm for international permit trading has been based on purely theoretical arguments. Few economists or policymakers seem to be aware that it would create such serious practical problems that a treaty based on international trading would never be ratified and implemented.

If the remaining rounds of negotiations are to produce a useful agreement, it is essential that the focus be shifted to a more pragmatic policy. We propose a system of national permits and emissions fees that would be a significant step toward controlling climate change and would be practical and politically viable.

Why Do Permits Look Good in Theory?

The basic idea behind a tradable permit system is simple: any firm emitting carbon dioxide would be required to own permits equal to the amount of carbon it produces. For example, a firm emitting one hundred tons of carbon would have to own one hundred permits. The permits would be allocated among countries by treaty, and it would be up to each government to decide how to distribute its permits domestically (we will return to this point below). Once distributed, the permits could be bought and sold without restriction on a world market. It would be illegal to burn fossil fuels without having purchased a permit, and it would be up to each government to enforce the treaty within its own borders.

Permit systems have three key features as a method of pollution control. First, they provide a firm upper bound on emissions. In this case, the limit would be the amount of emissions in 1990. This feature of permits makes them attractive to those who believe that decisive action needs to be taken on climate change.

Second, because the permits can be traded, pollution abatement will be done at the minimum possible cost to the economy. Firms that can clean up cheaply will end up doing the abatement: they will be able to make a profit by cutting their emissions and selling their extra permits. Firms that find it very expensive to reduce emissions will buy permits instead.

To make this concrete, consider the following example. Imagine two companies, L and H, are each emitting fifty tons of carbon annually for a total of one hundred tons. Suppose the government wants to reduce total emissions to eighty tons. One approach would be to require each firm to reduce its emissions by ten tons. That would achieve the eighty-ton target, and at first glance it seems like a reasonable policy: both firms contribute equally to the problem so both contribute equally to the solution.

At a closer look, however, it is clear that the policy could end up wasting a lot of money. It fails to take into account that it might be much more difficult for one firm to reduce emissions than for the other. Suppose firm L has low abatement costs and can reduce its emissions at a cost of \$100 a ton while firm H has higher costs of \$200 a ton. If each firm eliminates ten tons of carbon, the total cost will be \$3,000. However, it is possible to get the same amount of abatement at far less cost: if firm L cleans up all twenty tons, the cost would only be \$2,000. The equal reduction policy, in other words, costs 50 percent more than necessary and would waste \$1,000.

To avoid this problem, one might imagine a different policy in which firm H was not required to do anything and firm L was required to reduce its emissions by twenty tons. This would get the cleanup at minimum cost, but it would clearly not be regarded as fair by firm L. Firm L would have to pay \$2,000—the total cost of the cleanup—while firm H paid nothing even though both firms are responsible for the problem.

An ideal policy would have firm L do all the abatement but have firm H pay some of the cost. The third key feature of tradable permit systems is that they allow the costs of cleanup to be shared among firms even when the firms do very different amounts of abatement. The reason is that the government can exercise a great deal of control over the equity of the policy by the way it distributes the permits. In fact, a permit system allows the government to spread the cost of the policy across firms any way it wants. To see how this works, suppose the government decides to solve the example problem by setting up a tradable permit system with a total of eighty permits. One way it could distribute the permits would be to give forty to each firm. If no trading occurred, each firm would have to eliminate ten tons of pollution and the costs would be the same as under direct regulation: \$2,000 for firm H and \$1,000 for firm L. However, both firms would have an incentive to trade in the permit market. Firm H would be willing to buy up to ten

permits at any price up to \$200 (the abatement cost avoided for each permit), while firm L would be willing to sell permits for any price above \$100 (the extra abatement cost incurred in order to be able to sell a permit). If the market price turned out to be \$150, the total cost would drop to \$1,500 for firm H (ten permits at \$150 each) and \$500 for firm L (\$2,000 of abatement costs less \$1,500 from selling permits to firm H).

This solution minimizes abatement costs but would probably not be regarded as fair by firm H. However, the government could easily even out the burden by giving H a larger share of the permits. Suppose it gave forty-three permits to H and thirty-seven to L (rather than forty each). Firm H would end up buying seven permits from firm L. At a price of \$150, the total cost to H would be \$1,050 ($7 \times \150) and the total cost to L would be \$950 ($\$2,000 - \$1,050$). The abatement would end up being done entirely by firm L, and at minimum cost, but the overall burden would be shared between the firms. In general, permit systems give the government great flexibility in distributing the burden of abatement. The flexibility could be used to grandfather existing firms or to shift the burden of the policy in other ways that might make it more politically viable.

What Would Go Wrong in Practice?

Permit systems have worked well when used to control domestic problems. The best-known example is the sulfur emissions trading scheme introduced by the 1990 amendments to the Clean Air Act. It has been a tremendous success: electric utilities, the principal industry affected by the program, have been able to reduce the cost of controlling sulfur emissions to one-tenth of the minimum cost projected when the act was adopted. For controlling carbon dioxide emissions in an international context, however, several practical problems arise that ensure that a treaty based on the U.S. proposal would never be ratified and implemented.

The first problem is that the U.S. proposal would force emissions back to 1990 levels and hold them there without regard to the costs and benefits of doing so. However, studies to date suggest that the costs exceed the benefits, perhaps substantially. Estimates of the cost of holding emissions constant range from -0.5 percent (an increase in GDP) to 2 percent of GDP annually; most fall in the range of 1 to 2 percent. Considerably less is known about the benefit of stabilizing emissions. In principle, the benefit of stabilization is simply the sum of the avoided costs of damages that higher temperatures would cause. In practice, these damages are fiendishly difficult to estimate. The link between carbon dioxide emissions and global temperature is slow and indirect and is not very well understood by climatologists. At the same time, little is known about the damages higher temperatures would cause.

Together these problems have proven so daunting that only a handful of studies have been attempted and most have focused on a single scenario: estimating the damages caused by an increase of 2.5 to 3 degrees Celsius in global temperatures. The results vary, but at the upper end of the range the cost of the damages could be as much as 1.3 percent of annual GDP for the United States by the middle of the next century. The benefit of stabilizing global temperatures would be that these damages would be avoided. The benefit of stabilizing global emissions is considerably less. Even at 1990 emissions rates, global concentrations of carbon dioxide, and hence global temperatures, will continue to rise for many years (although at a slower rate than if there were no restrictions on emissions). In fact, stabilizing temperatures would require cutting emissions to about half of 1990 levels. This means that the estimate of 1.3 percent of GDP is not the benefit of stabilizing emissions, but rather (implicitly) the benefit of cutting them to 50 percent below the 1990 level. Holding emissions at 1990 levels would only reduce the rate of warming rather than prevent it entirely, and the damages avoided would be less than 1.3 percent of GDP.

In a nutshell, current evidence does not give clear support to a policy of holding emissions constant. The costs and benefits of stabilizing emissions are not known with much precision, but most studies of costs arrive at estimates that are higher than the highest estimates of benefits. Moreover, these costs would have to begin to be paid now in order to avert damages far in the future. Given these considerations, it is difficult to imagine that the U.S. Congress would ratify a treaty based on stabilizing emissions. There is, however, enough evidence to make a clear case for taking steps to slow the growth of emissions. A better policy would focus on this more modest, but also more politically viable, goal.

A second problem with the U.S. proposal is that it would generate large transfers of wealth between countries. Supporters of a permit system regard this as an advantage because it would allow developed countries to compensate developing countries for reducing their emissions. However, the size of the transfers makes it unlikely the treaty would be ratified. Consider the following rough calculation. In 1990 the United States emitted about 1,340 million tons of carbon in the form of carbon dioxide. Carbon emissions are expected to grow over time, so suppose that by 2010 the United States ended up needing to import permits equal to about 20 percent of 1990 emissions, or about 268 million tons. There is enormous uncertainty about what the price of an international carbon permit might be, but \$100 a ton is

well within the range of estimates and some studies have projected prices of \$200 or more. In this scenario, the permit system would add \$27 billion to \$54 billion to the U.S. trade deficit every year.

To put this in context, the entire U.S. trade deficit in 1996 was \$114 billion, so adding permits could increase it by 25 to 50 percent. Where will the money go? If advocates of the policy are correct that emissions reductions will be cheapest in developing countries, developing countries could be large sellers of permits on the international market. The value of permits would dwarf the often-controversial U.S. foreign aid budget, which is now about \$17 billion. Transfers of wealth of this magnitude guarantee the treaty would never be implemented regardless of its economic merits.

A third problem with the plan is that it would put enormous stress on the world trade system. The balance of trade for a developed country importing permits would deteriorate substantially. This would lead to substantial volatility in exchange rates and distortions in the world trade system. Equally serious problems would be created for developing countries. Massive exports of permits would lead to exchange rate appreciation and a decline or collapse in exports other than permits. Also, the permit revenue comes with strings attached: much of it would have to be invested in improved energy technology in order to reduce emissions and free up the permits in the first place. This is unlikely to be an ideal strategy for long-term economic development and would make the policy unattractive to developing countries.

In fact, developing countries have been so unenthusiastic about the policy that the U.S. proposal actually stops short of setting up a worldwide system of permits. Instead it would set up a system of trading among developed countries and the former Soviet Union ("Annex I Countries" in the language of the negotiations). However, this is a compromise that essentially eliminates the main reason for having internationally tradable permits in the first place: the potential gain from trade in emissions rights between industrialized and developing countries. Permit trading would do little to lower abatement costs when the participating countries have fairly similar technology.

Moreover, the U.S. proposal would probably not even achieve the goal of stabilizing emissions. Britain, Germany, and especially Russia are all already below their 1990 emission levels and would be able to sell their unused permits abroad. In that case the permit system would really amount to nothing more than an elaborate accounting mechanism for counting increases in emissions in countries like the United States against the 1990 allocation for Russia. There would be little or no overall reduction. If Russian economic growth begins to recover, the demand for permits within Russia would increase, sharply driving up the world price of permits. This could add an ironic twist to an international permit policy: if Russia were to grow quickly, the United States could soon become the developed world's low-cost emissions abater. In that case the United States would be a net seller of permits, and the rest of the industrial world would end up paying it to reduce its emissions.

Finally, one further problem with the U.S. proposal, acknowledged even by its supporters, is that no individual government would have any incentive to police the agreement. It is easy to see why this is so: monitoring polluters is expensive, and punishing violators imposes costs on domestic residents in exchange for benefits that will accrue largely to foreigners. There would be a strong temptation for governments to look the other way when firms were exceeding their emissions permits. For the treaty to be viable, however, each participating country would need to be confident that all of the other participants were enforcing it. This would require an elaborate and expensive international mechanism for monitoring and enforcement.

All in all, an international permit system aimed at stabilizing emissions would not be politically viable in developed countries, would distort or compromise the world trade system, would be unattractive to developing countries, and would be difficult to monitor and enforce.

A Better Approach: National Permits and Emissions Fees

The international permit system is an impractical policy focused on achieving the unrealistic goal of stabilizing emissions. A better approach would be an international agreement setting up a system that combines emissions permits and fees at the national level. As in the U.S. proposal, each country would be allowed to distribute emissions permits equal to its 1990 emissions. The permits could be given away, auctioned, or distributed in any other way the government of each country saw fit. Unlike in the U.S. proposal, each government would also agree to sell additional permits for a specified fee, say U.S. \$10. Firms within a country would be required to have emissions permits equal to the amount of emissions they produce. They could buy the permits from other firms or from the government for the stated fee.

Under this system firms would have an incentive to reduce emissions whenever they could do so for less than \$10 a ton. Because the total supply of permits would not be fixed, the policy would not guarantee precisely how much abatement will be done. However, it would ensure that any abatement would be

done at minimum cost. Moreover, firms would always have an incentive to reduce further, either to avoid having to pay the fee or to be able to sell excess permits. Because the government could give the base block of 1990 permits away for free, the permit and fee policy is politically quite different from a simple tax on carbon emissions, an alternative policy that has often been proposed. The exemption for 1990 emissions would lower the cost of the policy to industry by well over \$10 billion a year relative to a carbon tax of the same size. To see this, recall that in 1990 U.S. carbon emissions were about 1,340 million tons. Under a flat \$10 carbon tax, firms would have to pay \$13.4 billion in taxes each year on their 1990 emissions, plus an additional \$10 for each ton of emissions above 1990 levels. Under the permit and fee scheme, the fee would apply only above 1990 levels. Firms would save \$13.4 billion a year yet have an equally strong incentive to reduce emissions at the margin. This would make the policy much more palatable to industry.

A national permit and fee policy would be a modest but concrete step forward in protecting the environment from excessive climate change. It would not necessarily stabilize world carbon emissions, but it would certainly reduce them below the level that would exist without any policy or with a stronger but unimplemented policy. It would also provide valuable information about how much abatement can be done at low cost and how expensive it would really be to stabilize emissions. There is much debate about how easily emissions might be reduced: many economists believe that it will be quite costly, but others argue that emissions can be reduced substantially at low cost. A modest emissions fee would do a lot to show which group is right.

The permit and fee policy would also give governments a built-in incentive to monitor and enforce the treaty. The revenue raised through fees would be available for a variety of purposes: to reduce budget deficits, lower personal income taxes, or shore up social insurance programs. This would give governments enough incentive to enforce the policy that little or no international monitoring would be needed.

Finally, the permit and fee system would be flexible. The fee could be adjusted as needed when better information became available on the seriousness of climate change and the cost of reducing emissions. Equally important, it would be easy to add countries to the system over time: those interested in joining would only have to adopt the policy domestically and no international negotiations would be required. This flexibility is crucial because negotiations to date suggest that only a small subset of countries would agree to be initial participants in a climate change treaty. Among the countries not expected to participate are China and India, both of which are growing rapidly and will soon account for large shares of world carbon dioxide emissions. A treaty that cannot easily be extended to allow these countries to participate will do little to control long-term emissions.

In fact, many of the permit and fee system's practical advantages arise because it is really an internationally coordinated system of domestic policies rather than an international policy in the usual sense. The U.S. proposal is much less flexible because any change in the number of permits or the countries participating in the agreement would require international negotiation.

Conclusion

The U.S. proposal to stabilize carbon dioxide emissions using an international system of tradable permits is attractive in theory but fatally flawed in practice. It has several major problems, each of which would make the treaty difficult to ratify. First, it focuses exclusively on stabilizing emissions even though a better case can be made for reducing the rate of emissions growth. Second, it would involve large international transfers of wealth. Third, it would lead to major changes in exchange rates and the pattern of international trade. Fourth, it would be difficult to monitor and enforce. Together these problems mean that a treaty based on the U.S. proposal will have little effect on carbon emissions because it will never be implemented.

A system of national permits and emissions fees would be a better policy. It would slow the growth of emissions and would do so without creating large international capital flows or disrupting the world trade system. It would also be easier to monitor and enforce. These advantages arise from the fact that the permit and fee policy is really an internationally coordinated system of domestic policies rather than an international policy in the usual sense. Because of this, it demands less surrender of national sovereignty and is a more practical way to achieve international goals.

Some may object to the permit and fee system because it would not guarantee a sharp reduction in emissions. However, the real choice is not between a sharp reduction and a more modest policy; it is between a modest policy and no policy at all. The U.S. proposal, even though its goal is to stabilize emissions, will do nothing to control global warming because it has no real chance of ratification. The permit and fee system is a practical policy that would be a significant step toward addressing the problem

of climate change.

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