

A BETTER WAY TO SLOW GLOBAL CLIMATE CHANGE

Warwick J. McKibbin
The Australian National University and
The Brookings Institution

and

Peter J. Wilcoxon
The University of Texas at Austin and
The Brookings Institution

April 1997

The views expressed in this paper are those of the authors and should not be interpreted as reflecting the views of the trustees, officers or other staff of the Brookings Institution, the Australian National University or the University of Texas.

A BETTER WAY TO SLOW GLOBAL CLIMATE CHANGE

Executive Summary

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 later this year 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 to its actual 1990 emissions. It would be up to individual governments to decide how to distribute their country's allocation. Once distributed, the permits could be bought and sold without restriction on an international market. The system would apply initially to developed countries and would later be extended to developing countries as well.

Although the U.S. proposal has attractive features and has been endorsed by a number of prominent economists, it has several serious flaws that ensure the treaty would never be 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 instead of outright stabilization. A better policy would focus on a more modest, and also more politically viable, goal. 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 it is unlikely the treaty would be ratified by the countries generating most of the world's emissions. More importantly, 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 fee specified in the treaty, say \$10 US dollars per 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 per ton or less. Since the policy 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 since 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 fee provides an incentive for the policy to be enforced by individual governments.

Introduction

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 to its actual 1990 emissions. It would be up to individual governments to decide how to distribute their country's allocation. Once 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 as well.

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 policy makers 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. In the remainder of this paper we discuss the practical problems with an international permit system and explain how our alternative policy would work.

Why Do Permits Look Good in Theory?

The basic idea behind a tradable permit system is simple: any firm emitting the carbon dioxide would be required to own permits equal to the amount of carbon in the carbon dioxide it produces. A firm emitting 100 tons of carbon would have to own 100 permits; one emitting 200 tons would have to own 200 permits; and so on. The permits would be allocated among countries by treaty and would be allocated within each country by that country's government. It would be up to each government to decide how to distribute its permits (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, since the permits can be traded pollution abatement will end up being 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 50 tons of carbon annually for a total of 100 tons. Suppose the government

wants to reduce total emissions to 80 tons. One approach would be to require each firm to reduce its emissions by 10 tons. That would achieve the 80 ton target and on the surface it seems like a reasonable policy: both firms contribute equally to the problem so it seems reasonable for them to contribute equally to the solution.

Beneath the surface, however, 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 per ton while firm H has higher costs and can abate only at a cost of \$200 per ton. If each firm eliminates 10 tons of carbon the total cost will be \$3000. However, it is possible to get the same amount of abatement at far less cost: if firm L cleans up all 20 tons the cost would only be \$2000. The equal reduction policy, in other words, costs fifty percent more than necessary and would waste \$1000.

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 20 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 \$2000 -- 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 can be set up to accomplish precisely this goal: they can allow the costs of cleanup to be shared among firms. 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 80 permits. One way it might distribute the permits would be give 40 to each firm. If no trading occurred, each firm would have to eliminate 10 tons of pollution and the costs would be the same as under direct regulation: \$2000 for firm H and \$1000 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 10 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 of the policy would drop to \$1500 for firm H (10 permits at \$150 each), and \$500 for firm L (\$2000 of abatement costs less \$1500 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 43 permits to H and 37 to L. If so, firm H would end up buying 7 permits from firm L. At a price of \$150, the total cost to H would be \$1050 ($7 \times \150) and the total cost to L would be \$950 ($\$2000 - \1050). The abatement would end up being done entirely by firm L, and would be done 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 around in other ways that might make it more politically viable.

What Would Go Wrong In Practice?

Permit systems have worked well in practice when used to control domestic problems. The most well-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 focuses exclusively on stabilizing emissions even though too little is known about the costs and benefits to make a clear case for stabilization. Studies to date suggest that the damage caused by higher temperatures might be as much as 1.3% of annual GDP for the United States by the middle of the next century. The benefits of stabilizing emissions at 1990 levels are considerably smaller than this, however. At 1990 emissions rates, global concentrations of carbon dioxide, and hence global temperatures, will continue to rise for many years, albeit at a slower rate than in the absence of control. (Stabilizing temperatures would require cutting emissions to about half of the 1990 level.) Since holding emissions at 1990 levels would only reduce the rate of warming, rather than prevent it entirely, it would generate less than the 1.3% benefit of stabilizing temperature. On the other hand, estimates of the cost of stabilization range from -0.5% (that is, that restricting carbon emissions would increase GDP) up to 2% of GDP annually. Given this uncertainty, and the fact that costs would have to be paid now to avert damages far in the future, it seems unlikely that the U.S. Congress would accept a policy of stabilization. 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 a more modest, and 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 make it unlikely the treaty would be ratified. Consider the following rough calculation. In 1990 the United States emitted about 1340 million tons of carbon in the form of carbon dioxide. Carbon emissions are expected to grow over time and suppose that by 2010 the U.S. ended up needing to import permits equal to about 20 percent of 1990 emissions, or about 238 million tons. There is enormous uncertainty about what the price of an international carbon permit might be but \$100 per 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 \$24 billion to \$48 billion dollars 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 on the order of 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. A developed country importing permits would see its balance of trade deteriorate substantially. This would lead to substantial volatility in exchange rates and would create

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 traditional exports. 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 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 U.S. 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, driving up the world price of permits sharply. This could add an ironic twist to an international permit policy: if Russia were to grow quickly, the U.S. could soon become the developed world's low-cost emissions abater. In that case the U.S. would be a net

seller of permits and the rest of the industrial world would end up paying the U.S. to reduce its emissions.

Finally, one further problem with the U.S. proposal, already 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. An elaborate and expensive international mechanism for monitoring and enforcement would be required.

All in all, an international permit system aimed at stabilizing emissions is not 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 combining emissions permits and fees at the national level. 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. Each government would also agree to sell additional permits for a specified fee, say \$10 U.S. dollars. Firms within a country would have 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 per ton. Because the total supply of permits is not fixed, the policy does not guarantee precisely how much abatement will be done. However, it does insure that whatever abatement is done will be done at minimum cost. Moreover, firms always have an incentive to reduce further, either to avoid having to pay the fee or in order to be able to sell excess permits.

Because the government can give the base block of 1990 permits away for free, the permit/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 ten billion dollars relative to a carbon tax of the same magnitude. To see this, recall that in 1990 US carbon emissions were about 1340 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/fee scheme, the fee would only apply above 1990 levels and firms would save \$13.4 billion a year while having an equally strong incentive to reduce emissions at the margin. This would make the policy much more palatable to industry.

A national permit/fee policy would be a modest but concrete step forward in protecting the environment from excessive climate change. It will not necessarily stabilize world carbon emissions but it will certainly reduce them below where they would be in the absence of any policy, or in the presence of 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/fee policy also gives 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/fee system is flexible. The fee can be adjusted as needed when better information becomes available on the seriousness of climate change and the cost of reducing emissions. Also, it would be easy to add countries to the system over time: those interested in joining would only have to adopt the policy domestically; no international negotiations would be required. In fact, many of the permit/fee system's practical advantages stem arise because it is really more like an internationally-coordinated system of domestic policies than an international policy in the usual sense. The U.S. proposal is much less flexible. Any change in the number of permits outstanding or the countries participating in the agreement would require international negotiation.

Conclusion

The U.S. proposal to stabilize carbon dioxide emissions using an international permit trading system is attractive in theory but fatally flawed in practice. A treaty based on it will have little effect on carbon emissions because it will never be implemented. A combined permit/fee system such as we propose, on the other hand, is far more likely to be politically viable and would

reduce emissions. Those who are most concerned about climate change may oppose the permit/fee policy because it does not guarantee a sharp reduction in emissions. They should keep in mind, however, that the alternative to getting modest reductions is likely to be getting no reductions at all.