

Beyond Kyoto is an updated selection of chapters from *Carbonomics* focusing on a flexible system of global carbon pricing designed to encourage international cooperation.

Praise for *Carbonomics*

"Exposes the hidden side of energy policies ... Stoft is a truly subtle and skilled economist ... makes a very important contribution to the solution of the world's most urgent problem."

—George Akerlof, 2001 Nobel Laureate in Economics

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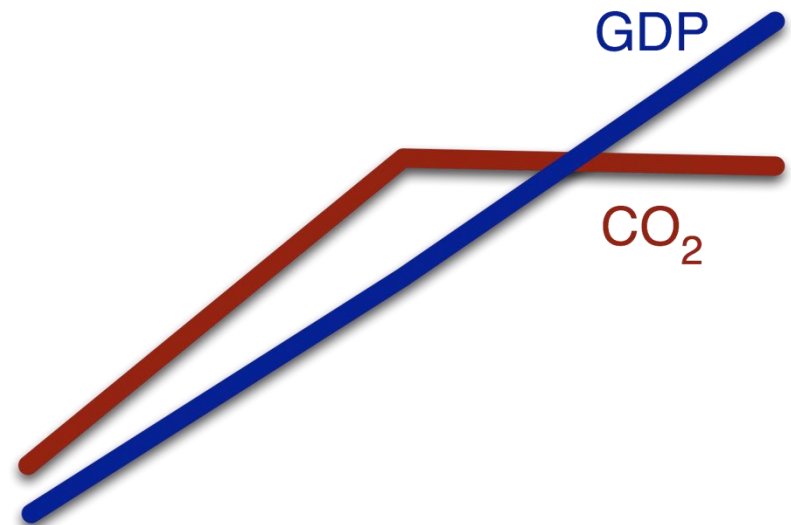
Review in Foreign Affairs

[*Carbonomics*] offers a clear and cogent argument for why a carbon tax—or, rather, a carbon untax—is likely to be greatly superior to a cap-and-trade system.

—Richard N. Cooper, Harvard University

Beyond Kyoto

Flexible Carbon Pricing for Global Cooperation



Steven E. Stoft

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Acknowledgments

When I decided to write *Carbonomics*, the first edition of this book, I asked my friend Dan Kirshner, a lifelong environmentalist, to be my coauthor. He declined, but offered to read and comment. I knew I could count on him to present an environmental perspective that made sense economically. But he also proved to be expert at spotting unclear arguments, and he even wrote a couple of the more memorable passages. In short, the book you see here would not exist had it not been for Dan’s continual guidance.

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This second edition of *Carbonomics*, which has been shortened and tailored to focus on the future of the Kyoto Protocol, would not exist were it not for the vision and dedication of Mathieu Thomas. He initiated the project and selected the chapters as well as doing all of the translation. It has been a pleasure to work with someone so dedicated and enthusiastic.

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chapter 1

Strategies for Cooperation

Perhaps it is time to try another approach: a commitment by each country to raise the price of emissions (whether through a carbon tax or emissions caps) to an agreed level.

—Joseph E. Stiglitz, 2010

BONNIE AND CLYDE HAVE ROBBED A BANK, but the prosecutor has little evidence against them. In prison, they are kept apart. Both know they will get only a one-year sentence for firearms possession if they remain silent, and they will be given seven-year sentences if they both confess. They know exactly what would be best for their small world—to cooperate with each other and remain silent. But they won't. Instead they will betray each other and suffer the consequences, because there is one more rule to this game.

If one confesses and betrays the other, while the other cooperates and remains silent, the silent one—the one who cooperates—will spend life in prison, while the one who betrays will go free immediately. This makes the game a “prisoners’ dilemma,” the most famous game in game theory.

I will soon explain what goes wrong, but the most surprising thing about this game is how frequently it turns up in real life—always in disguise. The most recent, well-known case occurred at the Copenhagen climate summit. Few delegates realized that the countries assembled there were playing a huge multi-player version of the prisoners’ dilemma. As usual, the prisoners did not cooperate.

Good News about Copenhagen

Global warming is a global problem, but not just because the climate is a global system. The source of the climate problem is a global failure of the fossil-fuel market. It fails to take into account the cost of emissions. But, you knew that. What you may not know, is that the only remedy is a global game. That's because there is no global government. Such a government could solve the problem with command and control—emission caps, and it could even combine caps with market forces—by allowing trade.

But without a global government there can be no global cap. So Kyoto's system of national caps and global trade is a much different game than the European Union's Emission Trading System. Few seem to have noticed this enormous difference. Europe has a single cap. The Kyoto Protocol calls for dozens of self-selected "caps," or targets. As a result, Europe's system works (though not as well as the "untax" we will discuss shortly), and the Kyoto system does not work—as was made painfully clear at Copenhagen.

Surprisingly, this is good news. If we had been trying the best approach to global cooperation at Copenhagen and that had failed disastrously, there would be little hope for success in the future. But when the wrong approach fails, there remains an excellent chance that a better approach will work. Part 2 shows such a path.

But how could this wrong approach go unnoticed for fifteen years? It didn't. Nobel economists such as Joseph E. Stiglitz and Thomas C. Schelling have been warning us that the Kyoto approach was doomed for almost a decade. But there's a reason that policy took the wrong path. The problem of cooperation has been largely ignored. This is because, of the three approaches to economics, cooperation is the focus of the newest and least understood approach—behavioral game theory—sometimes called the art of strategy. This book makes use of that approach by focusing on cooperation.

Three Approaches: Control, Efficiency, and Cooperation

The most out-of-date approach to economics is also the simplest. Often called command and control, it is the reason environmentalists like cap and trade. In fact, policy analysts at Canada's federal environmental agency, Environment Canada, have told me that cap and trade is only acceptable because it is a kind of command and control. And of course, environmentalists all love the cap but don't have much faith in the price of carbon that makes the cap effective.

The second approach, market economics, relies only on the price of carbon. The cap is simply one way to make emissions expensive and to raise the price of carbon. But the goal of economics is not pricing and it is not markets. The goal is "efficiency"—saving money, and carbon trading is just one way to save money.

So, this is why cap and trade has been popular. Environmentalists like the control that caps seem to promise, and economists like the efficiency that

comes from trade. And what more could we want than to save money and have complete control?

We should also want cooperation—the focus of the third approach to economic problems.

Control without cooperation means controls will be weak or that the control will fail. And saving money on a weak or broken policy is not very helpful. For example, Canada accepted a tight cap, did almost nothing and then announced, in the middle of the Copenhagen conference, that it no longer likes its cap, so it will not meet it. Global command and control is just an illusion. There is no global governing body with the authority to control.

Without a global authority, we are left with a hundred countries playing a global climate-policy game. Fortunately the basic game is well known and has been studied theoretically and experimentally for many years. It's called the "public-goods" game, which is just the prisoners' dilemma with many prisoners. Unfortunately prisoners in such a dilemma don't often cooperate.

So why won't Bonnie and Clyde cooperate and remain silent? A one-year sentence is far better than the seven years they are going to get when they betray each other. The most powerful concept in game theory is called a "dominant strategy." And, as luck would have it, betraying, not cooperating, is the dominant strategy. The idea is a simple one. If you are playing a game and one strategy is best no matter what your opponent does, that is a dominant strategy.

And if one strategy is best, no matter what, you would be pretty silly not to use that strategy. Pretend you are Bonnie. You only have two strategies: betray Clyde or cooperate with him and remain silent. Which is better if Clyde plays his "betray" strategy? In that case, if you play "cooperate" you get life in prison, while if you play "betray" you get only seven years. You had better betray. Which of your strategies is better if Clyde plays his "cooperate" strategy? If you play "cooperate" you get a year in prison, but if you play "betray" you get set free today. Betray is better, again. (In real life, the game may continue years later, and that may complicate today's strategy. But to understand the dilemma, assume that Bonnie and Clyde will never see each other again.)

So no matter what Clyde does, Bonnie is better off if she betrays Clyde. Worse yet, she knows that Clyde will figure this out, so he will probably betray her. She would be foolish indeed to cooperate knowing this could not help her and that she is risking life in prison. "Betray" is the dominant strategy for each.

Now there's good news and there's bad news. Hundreds of experiments have shown that when two people play a prisoners' dilemma game over and over, they tend to cooperate most of the time. That's because playing it many times changes the game to one with many more strategies. For example, there is the tit-for-tat strategy. If you betray me this time, I will betray you next time, but if you don't, I won't. The climate game goes on and on, so that's a lot like playing it over and over. Perhaps that will help with cooperation.

But now, the bad news. When there are more than three players, this doesn't happen. When the game is played repeatedly, the small amount of cooperation at the beginning—for example at Kyoto—tends to break down. Players become less cooperative over time—as we saw at Copenhagen. This is why cooperation must be the first goal of climate policy.

The No-Treaty Climate Game

Reducing greenhouse gas emissions is a public good. That's not just a value judgment. "Public good" is an economic term that means a good that cannot be sold for private profit. If you drive less, that reduces emissions and helps the climate. Almost all of the benefit goes to others, but there is no way to charge for this service.

Public goods are problematic. They are costly to produce, but no one gets paid for them. If Belgium completely stops using fossil fuel tomorrow, it will reduce world emissions by less than one percent and have almost no impact on its own climate. So what is Belgium's dominant climate strategy? If the rest of the world chooses to cooperate, Belgium will have a good climate whether it cooperates or not, so it should save the cost of abatement and do almost nothing. If the rest of the world chooses to do nothing, Belgium would be foolish to try to fix the climate on its own, so it should do almost nothing. Like Bonnie and Clyde, its dominant strategy is to *not* cooperate.

Every country faces this dilemma. Very large countries have a reason to cooperate a little because they capture more benefit from their own efforts. But even the largest country is still mainly trapped by the dilemma. At least that's the case without any treaty, so I will call this the no-treaty climate game. That was the game before Kyoto.

Strategies for Cooperation

The third economic approach, which has been gaining strength since the 1950's, is game theory. More recently this has taken a welcome turn toward behavioral studies and experiments. One of its central questions is, what features of a game improve cooperation? This is not just a scientific question, but a practical question as well.

One feature of the Kyoto Protocol was that it did not take effect until after 55 percent of emissions were covered by signers that had accepted emission targets. This changes the climate game and favors cooperation. And that's the practical reason for game theory—to help us change the rules and make the game better. Climate treaties and agreements add new rules and change the game. So the point of global climate policy is to invent treaties and agreements that change the rules and change the game so that countries play more cooperatively.

The 55-percent rule did just that, but what about the cap-and-trade rules? Do they help cooperation? Cap and trade, as already noted, was added

because of its command and control features and its ability to reduce costs. But no one ever did a serious analysis of its effect on cooperation. Unfortunately, when that analysis was undertaken in early 2010 at the Global Energy Policy Center,¹ it turned out that adding cap-and-trade rules to the no-treaty climate game harms cooperation. It causes just the sort of polarization seen in Copenhagen.

This means that larger and rich countries, which tend to be most (though not very) cooperative in the no-treaty climate game, become more cooperative when cap-and-trade rules are added. Similarly, countries that put the least effort into emission reductions under the no-treaty climate game, because they are small or poor, become even less cooperative. In theory, cap-and-trade causes small poor countries to set caps higher than their business-as-usual emissions. That's like developing countries selling carbon offsets to Europe and then pretending they would not have done certain renewable projects that they really would have done anyway. The United Nations has been busy preventing such schemes, but there has been a clear tendency for "gaming the rules"—exactly as predicted by game theory.

Now this game-theory result has only been demonstrated for a very simplified model of the world, but it is the only indication we have at present of how cap-and-trade affects cooperation. Some of reasons for this polarization lie beyond the reach of game theory. But when polarization and lack of cooperation have become such critical problems, it seems unwise to adopt cap-and-trade, which only exacerbate the polarization problem. Game theory also predicts that the net result of polarization will be increased emissions.

National and International Cooperation

Part 1, "The Carbon Untax," concerns national policy. But if this chapter has piqued your interest in global issues, you will find no difficulty in skipping directly to Part 2, Flexible Global Carbon Pricing. Although neither part takes a game-theory approach, both parts were guided by a game-theory perspective and emphasize the goal of cooperation.

The "untax" is a national policy designed to achieve national consensus by being obviously inexpensive and obviously fair. It is a carbon tax combined with an equal-per-person refund. All of the money collected is returned, with none spent on any special interest. This way, no one can say the untax will bankrupt the country or take away jobs even when much stronger climate policies are eventually needed. In fact those who choose a carbon footprint even slightly smaller than average will get back more in refunds than they pay in taxes. And those who emit more will pay a net tax only on their excess emissions. Given the high emission rates of the wealthy, with their huge homes

¹ See www.global-energy.org/international/games/cap-price-games.

and private planes, most people will, in fact, use less than average. Most will find that their refund checks more than cover their carbon taxes.

If all this sounds impossible, then you should read Part 1, where the workings of this system are revealed in full. It's not a new idea. In fact, this system is built into every economic model of climate policy, and it is the reason economists believe climate policy can be so affordable. The untax is also one of the fairest systems, and the poor, even if they have some special energy need, such as a long commute, will almost always come out ahead. This is because the untax amounts to giving them the same rights to the atmosphere as the average person already makes use of.

Part 2 presents Flexible Global Carbon Pricing, which was designed specifically to maximize international cooperation. Its flexibility means that China and India can make firm international commitments without committing to the binding caps that they have rejected for fifteen years. This eliminates the greatest barrier to cooperation. At the same time, Europe can continue with its mixture of carbon caps and carbon taxes (including its €300-per-ton-of-carbon gasoline tax). In fact, a commitment to a global carbon price target allows each country to decide whether to use cap and trade or some other pricing method, such as the carbon untax.

Besides this flexibility, using a single global price target means all countries are required to make a proportional effort to reduce their emissions. So the polarization of national efforts caused by cap and trade is simply eliminated. This is also a critical step towards cooperation.

But it is not fair to require poor countries, who have caused almost none of the climate problem, to contribute even a proportional level of effort. To remedy this, a Green Fund is proposed. This will transfer funds from countries with high-emission per capita to those with low emissions per capita. But this transfer is linked to cooperation. To receive its full share of Green Funds, a country must hit the global price target. So, again the rules of the game are designed to promote cooperation. Currently the opposite is true. The Clean Development Mechanism (CDM) of the United Nations was designed to reward countries that avoided commitments. And the countries rewarded believe that they must continue to avoid commitment in order to keep these rewards flowing. The Kyoto Protocol pays developing countries not to cooperate.

Last but not least, consider cost. Cost is the universal barrier to cooperation, and as stronger policies are needed this barrier will only become more problematic. Fortunately the policies presented here are remarkably inexpensive. The results are so striking that they are worth presenting in advance.

These results assume, for illustrative purposes only, the adoption of a €30 per tonne global carbon price (which could be achieved with cap and trade or, better yet, an untax) and a Green-Fund. The remarkable results of such an agreement are shown in the table below.

Table 1. Costs of 30-per-ton Global Carbon Pricing with a Green Fund

	Starting Emissions per Capita (tons/year)	Emission Abatement Cost (cents per person per day)	Green Fund Cost	Total Cost
India	1	0.8 ¢	-1.7 ¢	-0.9 ¢
Average Country	5	4.1 ¢	0.0 ¢	4.1 ¢
United States	20	16.4 ¢	6.6 ¢	23.0 ¢

Note that China is quite close to being an average country in per-capita emissions. Such a policy should cut emissions by at least 20 percent.

As Table 1 shows, this policy is surprisingly cheap. Any country that chooses to implement it with an untax will guarantee fair treatment for its poor and that the policy's low cost is clear to all. Europe's costs would be roughly half those of the United States. India, as can be seen, comes out ahead. China, having now achieved average per-capita emissions, must fund its own climate policy, but it will not need to contribute to the Green Fund. In any case, its cost will be so low that it will only delay its economic growth by about two weeks over the next decade.

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Low cost, flexibility, fairness, a single global target, and the absence of externally imposed national caps—these attributes will lead toward an international agreement. They are not the only helpful rule changes. Others are already known and yet more remain to be invented. But, what matters most at this critical time, after the polarizing events at Copenhagen, is for the world to stop thinking about targets and timetable—and think instead about strategies for cooperation.

Part 1

The Carbon Untax

chapter 2

Cap-and-Trade Politics

Virtually all allowances were handed out for free under the wildly successful sulfur dioxide trading program in the U.S.

Nathaniel Keohane,
Director of Economic Policy and Analysis,
Environmental Defense Fund, 2008

MOST ECONOMISTS, FROM LEFT TO RIGHT, agree that a carbon tax is best. But cap and trade still dominates political discussion. The public wants their emission reductions certain and their taxes hidden. Understand this saying, and you will know the reasoning behind cap and trade.

Under the sulfur dioxide trading program the government hands out 10 million 1-ton emission permits, corresponding to about half as much sulfur as their recipients emitted before the program.² The government gives these permits to coal plant owners in proportion to past pollution and lets them know they can emit what they want, but without a permit they'll be fined \$2,000 a ton. No one emits without a permit, so this rule caps emissions. The outcome is certain, and the tax is hidden.

We'll find the hidden taxes shortly, but this chapter focuses on how such taxes will play out politically when the little \$2-billion-per-year sulfur cap program is scaled up to a \$345-billion-per-year carbon-cap program. The sulfur tax was easy to hide, but a program that taxes a family of four \$4,454 per

² This was the second cap-and-trade program. The first capped CFC emissions by handing out free CFC permits, which resulted in windfall profits. A tax was then imposed partly to recapture the windfall profits.

year—the price of the carbon cap program, according to one estimate—is likely to make headlines. This is especially likely when the tax increases, say, by 50 percent within a single year because of speculation in the carbon permit market.

The chief way to hide the tax revenues, thereby hiding the tax, is to give away valuable carbon emission permits for free. But the European public caught on to this, and word has spread to the United States. Hence, many current proposals call for auctioning most of the permits. Auctions raise visible revenues, so current cap-and-trade bills all have ways of dividing these up, as well as ways of handing out some free permits.

But what if all the permits were auctioned and all the revenues were refunded to consumers? That was essentially President Obama’s plan. That would make the bitter pill of a \$4,454 tax much sweeter. And the cap would still work perfectly. That would make cap and trade very much like the untax described in the previous chapter and described in more detail in the next chapter. But for now we will focus on finding the taxes in cap and trade.

Finding the Taxes

We’ve been paying the sulfur emissions “tax” for eighteen years, and almost no one notices. Of course these charges are not called taxes—better to let people believe the polluters are paying. The government requires expensive sulfur permits, and the coal plants pass on the permit costs to consumers. Just as with an untax, the government keeps no tax revenues, but, in this case, polluters get the “refunds,” not consumers. The government hands out free sulfur permits worth about \$2 billion a year mostly in proportion to past pollution.

Let’s take that one step at a time so we can see the tax more clearly, and let’s consider carbon permits instead of sulfur permits. They work the same. Imagine two identical power plants that both emit about a million tons of carbon dioxide per year. One gets 2 million free 1-ton permits and the other gets none. Will the plant that gets free permits sell power for any less than the plant that has to buy its permits?

The plant with a million extra free permits sells 1 million permits to the other at the market price of \$30 per ton. In reality it’s not so uneven, but a stark example makes the principle clearer.

Now the manager of the plant that buys the permits realizes that every megawatt-hour of power he generates costs him about \$25 for coal plus a \$30 permit, which is \$30 more than it used to cost when he didn’t need permits. So with costs up by \$30 he charges \$30 more for his electricity.

The manager with free permits thinks in a surprisingly similar way: “If I don’t generate a megawatt-hour, I will save \$25 in fuel costs and I will have one more permit to sell for \$30. So generating a megawatt-hour less benefits me by \$55, and generating a megawatt-hour more costs me \$55. So he also

sells his power for \$30 more per megawatt-hour than before the cap. This is not just economic theory, it’s how European utilities have turned free permits into billions of dollars of increased profits.

As a result, consumers pay for every permit both power plants need—the free ones and the purchased ones. The market cost of all permits is passed through in higher electricity costs. It’s exactly as if the government had taxed all the carbon dioxide and the power plants had passed on the tax for consumers to pay.

Consumers pay for all the free permits. So they pay the carbon tax. But they pay it to the power company, not to the government. But who gets to keep the tax? Not the power company that had to buy all its permits. It spent all its “tax receipts” buying permits. But any company that is given free permits is, in effect, given the right to keep tax receipts equal to the value of those permits.

In this example, one power company was given 2 million free permits. It sold half for \$30 million, and charged consumers \$30 in higher electricity prices for the other half even though it got them for free.

So, in effect, cap and trade is a carbon tax with a tax rate set by the permit market and paid by consumers to the companies that are given free permits. Those are usually the companies that polluted most in the past. This is the system that Nathaniel Keohane, of the Environmental Defense Fund, calls “wildly successful” in this chapter’s opening quote. Its great success was in getting power plant owners to agree to reduce emissions. That was an important achievement, and now you can see why the power plant owners agreed. They are not paying the tax, you are.

Can a Locked-In Cap Hit a Moving Target?

The primary argument for a cap is that it guarantees we will hit our target. This will not likely prove true—laws are easily change, and usually contain loopholes. But, for three reasons, a target enshrined in law may well prove not to be the correct target forty years from now.

First, governments are rarely predictive wizards. Does history provide any examples of government targets set accurately forty years in advance?

Second, scientists have not reached a consensus on what the cap should be. The Intergovernmental Panel on Climate Change (IPCC) takes no position on what emission level makes us safe and must be met. If the IPCC ever does name a target, it will, as it does with all its estimates, state a range of uncertainty around that target. Currently, the scientific consensus is that the uncertainty is too great to allow even an estimate of the right target.

We know enough to be worried and to get moving. We also know we will probably move too slowly, simply because of inertia. But the lack of scientific consensus means that some think the problem will prove worse than current estimates, and some think it will prove less severe.

Until science speaks more clearly, we should surely work hard to reduce climate change. But respect for the diversity of legitimate opinions dictates adopting policies that accommodate good news as well as bad news. This also broadens support for a strong initial policy, but it means admitting that the target will likely change.

Third, if the rest of the world does not buy into cap and trade, then the world has no cap, and a cap on the world is what matters. Only a global cap can provide even theoretical certainty.

In short, the science, economics, and politics of the world are far too complex to attempt to lock in our path forty years in advance. Like it or not, we are shooting at a moving target. We need a policy that recognizes this and builds in flexibility. A rigid cap is not that policy.

Is Safety a Bad Thing?

Almost all cap-and-trade programs come with some form of safety valve. But one corner of the environmental camp believes that safety valves will keep us anything but safe. The Union of Concerned Scientists straightforwardly declares, “A cap-and-trade program should not include a safety valve.” The Environmental Defense Fund, on a Web page titled “Why Safety Valves Are Very Dangerous,” calls them “failure by design.”

A safety valve limits the price of pollution permits—say, to \$100 a ton—by requiring the government to offer an unlimited number of permits at that price. This effectively raises the cap, if and when the permits are selling at the safety valve price. However, when permits sell for less than the safety price, as they have always done in the European carbon market, no one buys extra permits, and the cap is secure.

Some say any safety valve would destroy a cap-and-trade program. But when high permit prices turn the safety valve on, every emitter is still being taxed—forced to buy permits—at this high tax rate. That means the pressure to conserve is greatest when the safety valve is in use. The safety valve does not reduce conservation pressure below what it was before the valve opened; it only limits the pressure to the maximum level deemed economically safe.

Setting a cap determines emissions but not cost, so the point of a safety valve is to provide some cost certainty. Most voters reject the view that cost is no object. Although polling data indicate a large majority of Americans agree that something should be done about global warming, that majority evaporates quickly when the polling questions include moderate costs.

John Whaley, who conducted a survey for the research and strategy firm American Environics in 2007, describes the results as follows: “Telling voters that global warming will lead to environmental disaster did not lead to increased support for action on global warming. In addition, when voters were told that specific proposals would lead to higher energy costs, support for policies to limit carbon dropped dramatically.” In other words, most voters

place severe limits on what they are willing to spend to meet a carbon cap. A majority are opposed to any carbon tax at all.

Even environmentalists who consider such attitudes illegitimate must recognize that they are real and powerful. Although a cap without a safety valve just might become law, if voters are surprised by high costs they can—and may well—simply change the law.

But it is also important to realize that the idea of limiting costs does not indicate an immoral or antisocial attitude. Well-meaning, intelligent people can and do believe that climate risks are uncertain and that, before we go to extremes, it makes sense to learn more. It is more than a tactical error to accuse such people of advocating “failure by design.”

Both camps should recognize the legitimacy of the other’s judgment. If they do, I think there is room to resolve the controversy by considering practical political consequences.

Note that the two positions lead logically to opposite views on a safety valve. Some believe that, because of the danger of climate change, any cost is justified. They logically conclude that “no safety valve” is the best policy. Others place a limit on what they are willing to spend. They conclude that a safety valve helps them achieve what they want—spending what it takes, but only up to a certain cost limit.

Some in the no-limit camp seem unwilling to recognize either the existence or the legitimacy of the cost-limit view. To assert that a safety valve at any level is dangerous is to assert that any attempt by me to limit my cost is dangerous. In other words, no limit that I choose could possibly be legitimate.

The no-limit camp should first recognize that most people, like it or not, do have serious limits on what they are willing to spend. The second step is to realize the consequences of overrunning those limits, which could be either a weak implementation or a backlash that later undermines the cap’s effectiveness.

\$4,454 for a Family of Four

When it comes to cost, political discussions tend to steer clear of hard numbers. Fortunately, the MIT group evaluated the 80-by-2050 cap. They estimate that the initial cost of permits will be \$345 billion per year in 2007 dollars. That comes to \$4,454 for a family of four. This is much more expensive than the current cap-and-trade bills before the U.S. Congress, because those bills, while claiming to achieve 80-by-2050, fall far short of the mark. They “meet” their caps by paying developing countries for emission reductions.

Families will not purchase the permits, but the cost of the permits will be passed through to consumers in the form of higher prices for electricity, gasoline, home heating, and, indeed, every other product. The revenues from these higher costs will flow to those who receive free permits, typically coal mines and refineries, and to the government to the extent that it sells the

permits in an auction. Revenues transferred to coal mines and refineries will typically end up in the hands of wealthier individuals, while revenues collected by the government will often be spent on energy-related programs.

Cap-and-trade programs, unlike carbon taxes, do not generally refund the value of free and auctioned permits in visible ways such as by reducing the payroll tax or sending a check in the mail. Because of this, consumers will perceive most of the \$4,454 as real net costs. For many, the cost will be comparable in size to the income tax, with political implications that need closer attention.

One issue, which many environmentalists have raised, is that a cap-and-trade tax—just like a carbon tax—is regressive. The poor pay the highest percentage rate. Although some bills before Congress include subsidies that would help some poor pay their higher utility bills, this problem has not been adequately addressed.

Moreover, the permit market controls the price of permits, and market prices fluctuate. In fact, studies of permit prices show that they fluctuate more than stock prices and almost as much as oil prices. It is not unheard of for permit prices to double in a year or two. This would double the “tax” from \$4,454 to \$8,580 per family of four. An event like this is likely during the first ten years of the program, and such an event—even if people expect it to be short-lived—would severely jeopardize the integrity of any cap-and-trade program. From a political perspective, a safety valve is needed to keep cap-and-trade programs safe from voter backlash during such speculative permit-price bubbles.

Handing out free permits may help get legislation passed, but in the long run it will prove catastrophic. In the long run, people will see cap and trade as a tax. Any tax of this magnitude is vulnerable, especially when it fluctuates dramatically from year to year.

This raises the fundamental question of the carbon pricing approach. Does a cap-and-trade policy or a carbon tax have to be this expensive? Shouldn’t energy policy be far cheaper?

Is It Cheap or Expensive?

The MIT study found that an 80-by-2050 cap will cost \$345 billion per year right at the start—over 2 percent of gross domestic product—and go up from there. But in Chapter 1, I said carbon pricing is extremely cheap. Only an advanced program that cuts emissions dramatically should get into the 2 percent range. What’s going on?

The permit cost is not the net cost to the country as a whole.

Spend a dollar on a permit, and someone else gets that dollar. Suppose the government auctions all the permits and gives all the proceeds back to consumers. Now it does not cost a family of four \$4,454; all the visible net costs vanish. The total refund equals the total paid. In spite of refunding the

entire cost of the permits, the cap is still a cap and still reduces emissions just as much. This proves a cap can work very cheaply and that the cost of permits is not the cost to the country. There would still be a cost from reducing emissions. That is the actual cost of the cheapest version of cap and trade, and it is much smaller than, and not as visible as, the cost of permits.

Environmentalists are missing this incredibly good news. They could have a cap-and-trade program that refunds all the extra energy costs, and it would work just as well.

The MIT study also estimates the actual cost and comes up with about \$10 billion, rather less than the \$345 billion permit costs. That’s only at the start, but for most of the forty years, actual costs are considerably less than the permit costs.

However, if the government auctions the permits and uses all the revenue to help businesses adjust, to pay for research, and to subsidize alternative energy, then much of the \$345 billion permit cost will become actual costs for less wealthy consumers. This comes on top of the actual cost of reducing emissions.

Unfortunately, cap and permit prices fluctuate, and permit prices tend to start higher than a tax would because businesses buy and hold permits for the future. Consequently, business will vigorously demand compensation—and by the looks of the bills before the U.S. Congress, they will get it. This makes cap and trade more expensive for consumers than a carbon tax.

Should Cap and Trade Fund Alternative Energy?

If the goal is to reduce carbon emissions, shouldn’t we spend the \$345 billion a year on stimulating new energy technology? That would mean auctioning all the permits and devoting the proceeds to alternative energy.

But the whole point of a carbon cap or carbon tax is that a carbon pricing policy is the cheapest policy for reducing carbon emissions. The table below shows the initial years of a carbon cap program under two different revenue assumptions: Either permit revenues are refunded to consumers, or they are spent on government-picked energy projects.

Table 1. *Initial Years under a Cap-and-Trade Program Used to Subsidize Energy Technology*

Goal	Net Cost	Result
Correct the underpricing of carbon	\$10 billion	26% reduction
Subsidize energy technology	\$355 billion	Who knows?

Values are from the MIT group’s analysis of a cap that declines in a straight line until it reaches 80 percent below 1990 carbon emissions in 2050.

Values are from the MIT group's analysis of a cap that declines in a straight line until it reaches 80 percent below 1990 carbon emissions in 2050.

The column labeled Net Cost shows the hidden costs of adapting to lower carbon emissions plus expenditures on energy technology. With subsidized technology, this is no longer a cap-and-trade program; it's a huge subsidy program hidden under a cap-and-trade fig leaf. Though small and cheap, the fig leaf may do more good than the subsidies. If more emission reductions are needed, we should make the cap stronger rather than dumping \$355 billion into subsidies.



Carbon caps impose large and unpredictable taxes that make such policies politically vulnerable. In the long run, they provide far less control than people claim for them, and as I show in Chapter 6 they provide an extraordinarily poor path to international cooperation.

It is better to minimize the real costs of carbon pricing by returning the incentive revenues to consumers. Once this is done, real costs will be surprisingly low. With a full refund, a low-cost carbon pricing policy will be more palatable and more secure. In the next chapter, I explain the nature of the real, but hidden, costs of carbon abatement.

How Caps Stifle Initiative

Let's not forget psychology and moral values. At first blush, caps look psychologically attractive. They seem to say, "Do the right thing, no matter what the cost." But caps are wolves in sheep's clothing.

Their most obvious deception is a false sense of security. They seem to be binding. But let's look ahead. Typically, caps and the emissions they allow decline by the same number of tons each year. At first, cheap opportunities to decrease emissions are available. But each year, the cheapest options are taken, and eventually only the most expensive remain.

On the way to 2050, the cost will likely become higher than anticipated. Then we will see that caps are not at all binding. They are just as easy to change as to install. Pass another bill; the cap goes up and the costs come down.

But a more sinister aspect of cap psychology lies in the control it takes away from individuals. Caps corrode the ethos of the environmental and energy-independence communities.

Hundreds of books, web sites, and groups and millions of individuals now promote ways we can each help save fossil fuel and reduce greenhouse gases. Even hard-nosed people like James Woolsey, a former head of the CIA and leading neoconservative, drives a small car to help fight terrorism. It's not quite rational economics, but it makes sense morally and psychologically. Caps will undermine the moral and psychological rationale for such behavior.

Suppose we have a cap-and-trade system, and you buy a small hybrid car—a little smaller and more expensive than you would like. But you want to help knock down OPEC prices and help the climate.

What have you accomplished? Under a cap, exactly nothing. The cap will be met no matter what you do. When you use less carbon, someone else automatically gets to use more. This works indirectly through the trading of permits, but it does work. More bluntly, after the permits are reshuffled, your squeezing into a small, efficient car just allows someone else to drive a big gas-guzzler. It doesn't help the climate or security one bit. The guys driving the guzzlers will be waving to the Prius owners and saying thanks—or maybe just laughing.

That's what caps do. They take all control of conservation and emissions away from individuals and small groups and give it to the authority that sets the cap. Everyone else can go home. An untax doesn't do that. When you save energy, it still matters.

chapter 3

An Untax on Carbon

U emissions will plummet far faster than in top-down or Manhattan projects.

—James E. Hansen, NASA climate scientist, 2008

“THERE IS A BROAD CONSENSUS in favor of a carbon tax everywhere except on Capitol Hill, where the ‘T word’ is anathema.” So says the conservative American Enterprise Institute. The conflict between the antitax politics and the consensus creates a tension at the heart of energy policy. Capitol Hill politicians have blocked the world’s best energy policy with antitax slogans.

A carbon untax breaks the deadlock by dividing the carbon tax into two steps and correcting the expensive second step. The first step of a carbon tax collects the money, and the second step gives it to the government. The first step, collecting the money, makes the carbon tax work and is the reason for the broad consensus. Collecting the carbon charge discourages fossil-fuel use. The untax does this, but it replaces the second step, “give it to the government,” with “give it back.” That’s so different that I cannot call the untax a tax. The whole point of a tax is to collect money for the government.

The simplicity of the untax hides a number of puzzling subtleties. If consumers pay all the costs and receive all the refunds, why does it work? If it refunds 100 percent of what it collects, isn’t it free? If it’s free, how can it possibly be a powerful method of moving society away from fossil fuels? And if it has hidden costs, won’t it be unfair to the poor? I will explain the basic workings of the carbon untax and then consider these mysteries one by one, though I leave the question of fairness for Chapter 5.

How the Untax Works

A carbon untax (or tax) is simple because it collects revenues from very few players. For example, an oil tax does not charge 200 million drivers every time they buy gas. And it does not tax tens of thousands of gas stations. It simply charges oil refineries for the amount of carbon in the oil they buy. Taxing oil refineries, natural gas producers, and coal mines would cover almost all carbon.

Refinery operators will, of course, complain about being taxed and forget to mention they are passing the tax on to gas stations. Gas station owners will complain and forget to mention they are passing the tax on to consumers. So when you hear their complaints, remember who really pays the carbon charge—it is you and I, the final consumers, and no one else.

When truckers buy gas, they will claim to be consumers because they burn the gas in their trucks: But, in fact, they will pass the cost on in their trucking rates. Anyone who can pass the cost on will pass it on, and if they pass it on they are not a final consumer. When you buy gas for your car, unless you can bill someone else for your gas costs, you are the final consumer. In essence, you pay the carbon tax. #

I do not intend to discourage a carbon tax or untax by pointing this out; rather, I am encouraging self-defense. Even though businesses will pass the cost of the untax right through to us, they will demand a slice of our refund checks in addition to what we pay them in higher prices. In fact, the cap-and-trade laws before Congress, which are basically disguised carbon taxes, include long lists of who gets how much of the tax revenue. In many cases, you pay the tax, and business gets the refund.

It’s important to remember that even though the government collects the money from refineries and coal mines, you and other consumers ultimately pay the full charge. So the refund belongs to you—or at least it should. All 100 percent of it. I hope I am making myself clear on this, because when it comes to big bucks—and we are talking about hundreds of billions here—business is going to fight hard and fight dirty.³

All right, let’s look on the bright side. Say we win that fight and secure the refund for consumers. How does the refund work? It’s simple. I suggest we do as Alaska does. Everyone who has been a legal resident for the past year gets a check in June. How big a check? Count the untax revenues for the last year and divide by the number of checks. Everyone gets the same amount.

³ Of course some businesses will be hurt and some helped by the shift in demand from high-carbon to low-carbon fuels. This is a common occurrence in the market place. And remember, companies relying on fossil fuels have been warned about this change since 1992. Market-driven fossil-fuel price fluctuations have been more severe than any proposed carbon tax, and occur with far less warning. But no one talks of having consumers subsidize airlines when oil prices go up, or of subsidizing gas-fired power plants when natural gas prices double.

Alaska spends less than 1 percent of the money it returns on mailing out the checks. The overhead should stay low because everyone will want to cooperate—if they don't, they don't get their checks. It's a lot easier to find people when you're handing out money than when you're collecting it.

How Big Is the Refund?

A standard guess at how high a carbon tax needs to be, at least for the next decade or so, is \$30 per ton of carbon dioxide, though guesses vary widely. The United States emits about 6.5 billion tons of carbon dioxide per year (22 tons per person). At that rate, the untax would collect about \$195 billion per year. The U.S. population is about 300 million, so that generates a refund of \$650 per person, or \$2,600 per year for a family of four.

An oil price of \$100 per barrel is probably high enough on its own to encourage conservation, so if oil prices are high enough, the untax rate on oil might start out near zero. Coal and natural gas would still be taxed. This would reduce refunds to about \$365 per person, or \$1,460 for a family of four.

On average, everyone pays the same in higher prices as they get back in refunds, so this is not a get-rich-quick scheme. However, as I've mentioned, the very rich use more energy—heating their mansions and flying their private jets, for example—than do most of us. In fact, the rich use so much more carbon than average that they raise the average to a point at which 60 percent of the population uses less than the average. Everyone using less than average gets refunds greater than their additional costs of energy.

Energy Policy Number One: The Carbon Untax

The world is at risk of costly climate change, costly oil-price spikes, and more wars over oil. But contrary to what many believe, scientists do not yet know if a climate-change tipping point exists or where it is if there is one. Terrorist activity and wars are equally hard to predict. Action is clearly warranted, but we cannot pin down just how much to spend.

A simple realization provides the key to sensible action. After thirty-five years of complex and ineffective energy policies, the United States was importing a greater percentage of oil, was facing the highest oil prices ever in 2008, and was emitting more carbon than ever. It would be beneficial to put in place a solid, simple, efficient policy that could be dialed up or dialed down as needed. To achieve this, the policy should start gradually to overcome reasonable (and unreasonable) concerns about cost, but it should be set to ramp up unless it causes problems or we discover a magic energy technology.

The carbon untax is such a policy. It would be gentle and powerful at the same time. Most importantly, it would end thirty-five years of ineffective policies and prepare the country for the challenges ahead. Because the carbon charge part of a carbon tax is the same as the carbon charge part of an untax, we can turn to other experts for opinions on designing the carbon charge.

The most effective action would be a slowly increasing carbon tax.

Climate scientist James E. Hansen, 2006

Taxes on carbon are powerful tools for coordinating policies and slowing climate change [and] are likely to be more effective and more efficient [than] quantity oriented mechanisms like the Kyoto Protocol. ... Carbon prices would rise by between 2 and 4 percent per year.

Economist William Nordhaus, 2005

A carbon tax could be relaxed [or] increased. In either event, such changes could be phased in over time, creating predictability and allowing an ongoing reassessment.

American Enterprise Institute, 2007

James E. Hansen, a NASA scientist, has long been the best-known and most outspoken scientist warning of climate change. William Nordhaus, a Yale economist, has been perhaps the leading energy economist for thirty years. The conservative American Enterprise Institute has been skeptical of global warming though concerned about energy-security issues.

It is remarkable to find such a diverse group not only advocating the same policy, but describing its implementation in similar terms. Only Hansen is advocating an untax, but the others recognize the political difficulties of imposing the new tax they advocate.

A plausible path for the untax rate would be to start at, say, \$10 per ton of carbon dioxide in 2010—or as soon as possible, in any case—and increase by \$2 per year toward \$50 in 2030.⁴ How fast the untax starts will depend on what is politically feasible. We should commit to following the path we adopt for, say, four years at time, and as the American Enterprise Institute report suggests, changes should be phased in over time, not implemented suddenly. A predictable approach will both save billions of dollars and accelerate the impact of the policy by many years.

Here's how a carbon untax could be implemented:

- < Start with a low carbon charge and increase it gradually.
- < Apply the charge to all fossil fuels but collect it at the fewest possible upstream points.
- < Mail checks to consumers in June that refund 100 percent of collected revenues on an equal-per-person basis.
- < Reassess the carbon charge regularly but change it only gradually.

⁴ Notice that we say "carbon" tax, but the dollar values are actually applied to carbon dioxide. A \$12 tax on carbon dioxide is the same as a \$44 tax on carbon.

Because of the slow start, those most concerned about the climate will undoubtedly worry that this is too little too late. But remember two points. First, climate-change advocates have been in a rush for almost two decades, without making any progress on emissions that can be measured in the atmosphere. A slow and steady start on a powerful policy is better than a continued deadlock or throwing money at wasteful policies like solar roofs and ethanol.

Second, don't forget look-ahead. A predictable tax or untax rate that will only take effect in, say, ten years starts working as soon as it can be predicted. As an example of how this works, consider a new lending policy adopted by Bank of America. The Wall Street Journal discussed it in February 2008: "Bank of America says it has decided to start factoring a cost of carbon-dioxide emissions into its decisions about whether to underwrite debt for new coal-fired plants. Specifically, the bank says it anticipates a federal cap that would require a utility to pay between \$20 and \$40 for every ton of CO₂ its power plants emit."

Has a new green consciousness seeped into the Bank of America? No, it's still chasing the old-fashioned green. To make safe investments, the bank will assume a carbon permit cost or carbon tax of roughly \$30 per ton, even though no such law has been passed. That's pretty amazing. The law has not even been drafted, and it's already working.

Bank of America is looking ahead at likely trends. If a nonexistent law can have such a strong financial effect in the present, so can the future tax rates of an actual law. Any scheduled increase in the carbon charge will have an impact long before it takes effect. A scheduled tax rate of \$40 in 2025 affects coal plant investment decisions today.

The benefit of starting the tax slowly is that it is gentle in its effect on existing businesses, giving them time to adjust. This means less resistance from businesses and less need for handouts to get their buy-in. Nonetheless, if a quicker scaling-up of the untax rate gains enough popular support to pass, it will not do any significant harm to the economy and would benefit energy security and climate stability.

Why the Untax Works

As I just explained, consumers pay 100 percent of the untax and get it all back in refunds. At first, many people think this makes no sense. But that's because they don't stop to think that, in the untax race, some consumers are winners and some are losers. Use less carbon, and you can be a winner, paying less than you get back in your refund check. Use more carbon than average, and you lose. That's why an untax works. Most people want to be winners.

It's the refunds that cause all the confusion. Sure, the carbon charge makes people want to use less carbon, but won't people spend all of their refund checks on paying the extra carbon charges? They could do that, but

they will quickly learn that it's a waste of good money. Keep in mind, the refund does not change when you spend more or less on carbon. Suppose a family of four gets a \$4,000 refund, no matter what. Suppose that with the new untax, it suddenly becomes possible to save \$800 a year—all costs included—by installing more home insulation. You could say, "Why bother? I've got my refund check to spend; I don't need to save \$800. I can just pay the higher energy bill." A few may say that the first year, but then it will sink in: Why send \$800 of my refund check to my utility company?

In the end, the tables will turn, and most people will decide it makes no sense to treat their refund checks like burnt offerings to their local utility companies or gas stations, just because the money came from charges on carbon. Who cares where the money came from? No need to spend it all on carbon taxes. Consumers will find ways to cut back on fossil fuel and spend the checks on their own needs and desires.

If the Refund is 100 Percent, Is the Untax Free?

The untax works in spite of returning every penny collected. Direct costs—the total paid to the government less the refunds from the government—sum to zero. But does this mean the untax is free on average? No. If the untax works and gets people to do things that reduce emissions, the untax causes indirect costs. Indirect costs—which I also call hidden costs because people often either don't notice them or ignore them—are what people pay to get the job done. Hidden costs don't show up in untax accounting, but they are the real costs of carbon policy.

Buying a hybrid car because of an untax provides one example of hidden costs. Suppose buying the hybrid would cost you \$3,000 extra but would save you \$2,800 in gas cost over the life of the car. The net real cost to you of using the hybrid is \$200, so you don't buy it.

Now suppose we impose an untax, which makes gas more expensive, so buying a hybrid saves \$3,200 on gas. Now it saves us money to buy a hybrid. But, not counting climate or security benefits, there is still a net social cost to buying the hybrid. It still saves only \$2,800 worth of gas, and we only bought it because it also saves \$400 in untax payments. The untax has tricked us and rewarded us into spending \$200 more on a hybrid than we save on gas (not counting the untax savings). This is the real, but hidden, cost of the untax. We don't see it because we're getting rewarded by the untax refunds.

Spending more than the true savings would make no sense, except that there's an extra benefit to using less oil that we're not counting—climate stability and energy security. That's what we get for paying the hidden cost. Carpooling provides another example of a hidden cost—the cost of inconvenience. No dollars change hands over inconvenience. But it's still a real cost.

The true cost picture shows that the hidden costs are real, and the obvious direct costs, which everyone discusses, net out for society as a whole to nothing at all. But the direct costs—the carbon charges—cause people to save carbon. Saving carbon often does cost money, and these hidden costs are hard to keep track of and are usually overlooked. But in one case, when they are zero, they are easy to count. If no one does anything to save carbon, there are no hidden costs and no net cost to society. That’s worth remembering.

∅ If the untax fails to cause any conservation, it’s completely free when averaged over all consumers.

The more good an untax does—the more it reduces fossil-fuel use—the greater the hidden costs. But there’s a limit. In the hybrid example, people saved \$400 on gas costs because of the untax. That tells us something about the hidden cost. It cannot be more than \$400 per person, because people are smart. If the hidden cost of switching to a hybrid was \$2,000, they would not do it to save \$400. This puts a strict limit on the hidden costs.

∅ If the untax works, the maximum possible hidden cost is the amount of carbon charge (tax or untax) avoided.

This just tells us the maximum possible cost in the most extreme case. Typically, the hidden costs are much less. People conserve in the least expensive, least inconvenient ways first. In fact, the first bit of conservation is typically almost free. Economics shows that hidden costs are typically only half the maximum possible value.

∅ The typical hidden cost of an untax is half the amount of carbon charge avoided.

Using these standard results, I have calculated the approximate hidden costs of an untax with various carbon charges and various levels of effectiveness (see Table 1).

Table 1 contains good news and is, in fact, much of the reason that economists favor a carbon tax. It says that imposing a \$30 carbon tax, which has a direct cost of \$528 per person per year, would only have a real cost that averaged \$66 per person per year if it cut carbon emissions 20 percent. The direct costs, which receive all the publicity, come to \$528 per person, but net to zero counting refunds. The real net costs are eight times less. That’s why checking the economics is so important.

The table is based on a simple, commonly-used approximation. In fact, it is used by the U.S. Environmental Protection Agency. I checked it against the results of the complex economic model of cap-and-trade costs used by researchers at the Massachusetts Institute of Technology. Except for the first few years of their model runs, the results were quite similar. In all cases the

simple approximation indicated higher costs than the more rigorous MIT model.⁵

Of course, the untax cannot be designed to save 80 percent with a carbon charge of only \$4 per ton. Only the carbon charge can be set, and then an abatement level will occur on its own. A 20 percent abatement in response to a carbon charge of \$30 per ton is quite plausible, but only time will tell. The \$66 real cost of such a policy is roughly the cost of one tank of gas per year. This is why a good energy policy simply cannot wreck the economy.

Table 1. Average Total (Hidden) Cost per Person per Year

Charge per ton CO ₂	Percent CO ₂ Abatement Caused by Untax			
	10%	20%	40%	80%
\$4	\$4	\$9	\$18	\$35
\$10	\$11	\$22	\$44	\$88
\$30	\$33	\$66	\$132	\$264
\$60	\$66	\$132	\$264	\$528

Based on emissions of 22 tons of CO₂ per person per year before the untax.

Even in a relatively extreme case, which we would not encounter for decades, the \$520 cost per person per year is barely over 1 percent of gross domestic product (GDP). Of course, decades from now, GDP will be higher, and energy use per GDP will have fallen considerably.

Impact on the Poor. A cost of \$66 per year is more difficult for the poor. But this is the average cost, and a person with a very low income is unlikely to be an average user of fossil fuel. The poor don’t own private planes, don’t fly very much, and don’t heat big homes, swimming pools, or hot tubs. If they used just 20 percent less energy than the average user, and did not bother to conserve at all, they would come out ahead on refunds by \$104 per person per year. They would come out ahead by more if they took any energy-saving action that they found worth the money.

Impact on Oil Prices. One more thing to remember is that all energy policies that cause a reduction in oil use will lower the world price of oil. The effect on oil prices will be doubled or tripled if such policies become the basis of the next international climate policy. That would save the United States a lot of money. In fact, it could save enough to cover the entire real cost of the untax by, in effect, charging it to OPEC.

⁵ Since writing this, I have found that the U.S. Environmental Protection Agency uses the same approximation.



The untax is the silver bullet of energy policies. It's simple, fair, and efficient. Most of the best policy experts advocate it, and most politicians fight it. The trouble is the T word. But, as the smartest conservatives are saying, we need to be free to discuss taxes. Demonizing the word tax wins votes but forces the country into more costly policies. Ironically, the likely alternative—cap and trade—is simply a cleverly disguised carbon tax ultimately paid by consumers but largely refunded to polluters.

The untax is administratively simple and cheap because it collects the carbon charge at the fewest possible points, and all refunds are equal. It is fair because it rewards those who do less harm than average—about 60 percent of all families—and places a net charge on those who do more than their share of harm. Yet it is not dictatorial. Everyone is free to burn as much carbon as they can afford. But almost everyone will choose to burn less.

The untax is powerful and efficient because it is a true market mechanism. It simply raises the price of carbon to the level it would be if the market worked perfectly and included the costs of all side effects. It reaches into every corner of the economy that uses carbon and provides an incentive to use less. It is powerful for exactly the same reason that OPEC's energy experiment from 1973 to 1985 permanently transformed the world's use of fossil fuel and saved a hundred times more carbon than any other policy before or since.

chapter 4

Untaxing Questions

*It seems to me a bit like buying indulgences from the ancient church.
@
check.*

Former Arkansas Governor Mike Huckabee, 2007

THE CLIMATE IS CHANGING. The terrorists are coming. We've got to do something now. Grow more corn. Make hydrogen. Build nuclear reactors. Build solar roofs. Cap greenhouse gasses. Invent fusion reactors, zero-emission vehicles, nanotech this, and biotech that.

These ideas all sound so concrete and effective. But sound is about all we get. Ethanol makes things worse, the hydrogen bubble has burst, and zero-emission vehicles zeroed out. Still, there will always be new energy fads.

Carbon taxes and untaxes, on the other hand, are not fads. But it's hard to put your finger on just what they do. They quash the fads and accelerate ordinary, but effective, conservation and give wings to real breakthroughs. But I can't predict the breakthroughs, so it's hard to make an untax seem sexy. Still, perhaps I can at least rebut a few of the baseless criticisms that will surely hinder its acceptance

Indulgences from the Ancient Church?

Both carbon emission permits and a carbon untax let polluters buy their way out of the energy policy. If you have the money, you can emit as much as you want—or even more just to be spiteful. This strikes many people as immoral, so they dismiss market-based policies. As Huckabee, a conservative

Presidential candidate in 2008, puts it in this chapter's opening quote, "I can waste all the energy I want and then justify it by writing a check."

Although as an economist I should probably not admit this, I feel much the same way. I dislike seeing the rich abuse the environment for selfish reasons. In spite of this, I favor policies that let them do just that. My motive is practical. I have taken a close look at every way I can think of—more ways than I discuss here—to curb rich polluters, treat the poor fairly, and still make large cuts in oil use and carbon emissions.

I see no way to do all three. This requires a choice, and my choice is to curb carbon emissions and treat the poor fairly. The rich are beyond our control, so I say we should at least sell them indulgences. But let's not give the money to the ancient church—or to the modern government either.

But why can't we force the rich to do their part? If we imposed a 30 percent cut in carbon use on everyone—no exceptions—the rich could not wriggle out of that. It does seem unfair to the poor, who are already getting by with very little. But the real problem is that it can't be done. How could we count up everyone's carbon every year? Heating, driving, flying, boating, lighting—how could we count all that for every person? It's just impossible. If you can't count it, you can't cut it 30 percent. The same problem applies if you require everyone to reduce their carbon use by the same number of tons. Plus, it would devastate the poor and not make much difference at all to the rich.

Since we can't keep track of everyone's carbon use, perhaps we should keep track of everything else. We could require that all cars get at least 30 miles per gallon. We could ban through-the-door ice makers on refrigerators, because they waste a lot of energy. We could restrict carbon use for heating and cooling to 1 ton of carbon per year per house. Or, if we don't like this one-size-fits-all approach, we could set a different limit for each size of house in each part of the country. But how many miles of plane travel and driving should we allow? Obviously, this approach is a nightmare of regulation.

It is possible, though not a good idea, to use command-and-control regulation on large industries, but when it comes to individuals it really does not make sense. The problem is that energy use reaches into every corner of our lives. Controlling the rich would require the government to check every corner. No one thinks that's right, and fortunately, it's completely unnecessary. We can actually do something that's fair to both the rich and the poor—and that's the untax. It lets the rich write checks, and when the refunds are given out equally the poor get back more than they pay. I explain, in the next chapter, why this is exactly fair.

Do Consumers Care about Price?

A related objection to the untax is that it won't be only the rich who ignore it; everyone else will as well. Everyone is so addicted to fossil fuel, the thinking goes, that they will pay whatever it takes to get their fix. This is the pop-

psychology approach to economics. Economists go a bit overboard assuming people are rational, while pop psychology sees people as irrational—but predictable. I’m as skeptical of predictable irrationality as I am of rationality. It’s best to take an experimental approach to human behavior. Fortunately, the experiment has been done.

Looking back at the OPEC crisis, we find that OPEC had its effect on the world entirely by means of price. (OPEC didn’t cause the lines at the gas stations, by the way. Misguided regulation in the United States did that.) Yes, OPEC pumped less oil, but the world oil market did what markets do and made sure that anyone could buy as much oil as they wanted—provided they paid the price. Think about this for a minute. OPEC supplied less oil, but that did not stop anyone from buying more oil. In every case, it was the price that stopped people from buying more. Prices tripled then doubled on top of that. Price changed behavior, and the change was enormous.

Figure 1. Dick Cheney’s Graph of OPEC-Induced U.S. Energy Conservation⁶

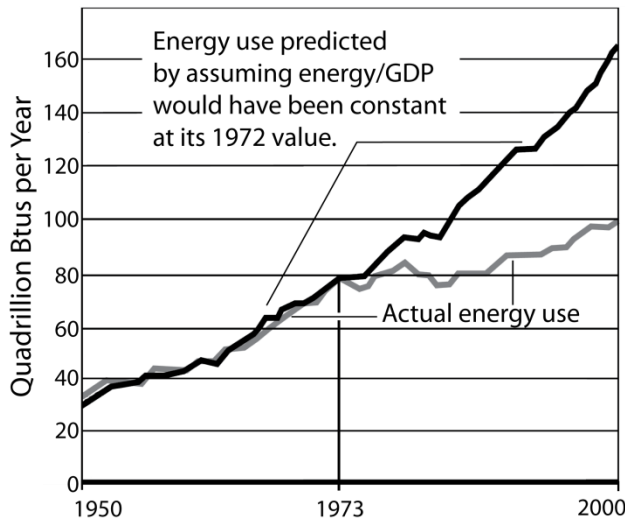


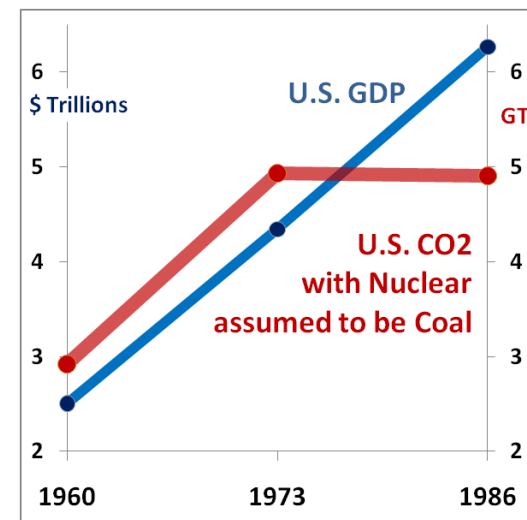
Figure 1 shows total U.S. energy use before and after the OPEC crisis. The figure is not a product of green conservationists, but of Dick Cheney’s

⁶ This graph is Figure 8.1 from the 2001 report by Dick Cheney’s National Energy Policy Development Group. It shows OPEC’s enormous and enduring influence on conservation. From 1950 through 1973, energy use is almost perfectly predicted by GDP. But starting in 1974, the first full year of the OPEC crisis, actual oil use falls increasingly behind the historical trend. The difference between the two lines is due to conservation.

National Energy Policy Development Group—an organization dominated by energy supply companies. If the OPEC crisis had not occurred, the United States would have used something like 165 quads of energy in 2000, according to Cheney’s group. Instead, the United States used 100 quads that year—a savings of 65 quads. (A quad—short for quadrillion British thermal units—is a huge amount of energy.) The data includes energy from all sources—fossil, nuclear, and alternative. So this graph shows just one thing—the effect of high prices on total energy use. The total energy saved is equivalent to almost two decades of oil use at the 2007 rate. In 2007, the United States used only 40 quads of oil.

Some will argue that this enormous impact is due to fuel-efficiency standards and other government programs. But consider two points. These programs would never have happened without the OPEC price hikes, and the government programs do not account for the bulk of the effect. In fact, when the Department of Energy checked energy impacts in 1980, it found that government programs had had almost no net impact on energy conservation but that price had been effective in encouraging energy savings (see “Energy Policy: Mostly Sound and Fury” in Chapter 7 in *Carbonomics*). The high prices imposed by OPEC saved vastly more energy than any other policy before or since.

Figure 2. The effect of oil price on CO₂ emissions



But not only energy was conserved. After increasing by a total of 2 gigatons per year over the 13 years prior to 1973, CO₂ emissions actually decrease slightly during the 13 years after 1973. In fact the decrease was noticeably more than shown in Figure 2. It is common to claim that high oil prices had very little beneficial impact on emissions and that the improvement

during this period was due almost entirely to the introduction of nuclear power. But, I have re-calculated the emissions under the assumption that all nuclear power plants burn coal and graphed this increased level of CO₂. It is also clear from this graph that emissions did not decrease because of a reduction in GDP.

The effects that contributed to the success shown in Figure 2 are diverse. The price of oil caused society to react in many different ways. It brought some of our best energy experts into the field. It made it possible to pass appliance and fuel-efficiency standards. It caused people to buy more fuel-efficient cars and insulate their houses. And, it led to a general awareness of the need for energy efficiency.

But would this work again with an untax? The untax could be set to mimic OPEC's price increase. The difference would be the refund checks. When OPEC raises the price and sends no refund checks, we have two reasons to use less oil. The price of gas is higher, and we end up poorer as a nation because of all the money we give to OPEC. If we do it ourselves, with an untax, the high price has the same effect, but since the untax revenues are all refunded, the country doesn't get poorer.

Which effect is more powerful, the high prices or becoming poorer? When OPEC raises the price of oil from \$25 to \$125, that's a 400 percent increase. But that makes us only about 5 percent poorer as a nation. As can be seen in Figure 2, this is very little compared with growth over 20 years. Not surprisingly, Figure 2 shows that the price effect is much larger than the income effect. Since the main effect is from price, the untax works almost as well as having OPEC raise the price. Of course if we wanted the untax to work just as well as OPEC, we could make it a tax and then give all the revenue to some other country. That would make us poorer, and we would buy less fossil fuel. Not a great idea. In fact making ourselves poor to conserve on energy is probably the worst possible energy policy—and that's the only advantage that OPEC's tax has over an untax.

Because the United States is wealthier now, high carbon prices will probably have less effect than they did thirty years ago. But being wealthier is not a bad thing. On balance, it helps more than it hurts and will make the transition to alternative fuels easier than it would have been in the past.

‡ h Untax?

The objection that everyone will ignore the untax because they are addicted to fossil fuel—that the untax is too small to matter—is based on a view of people that lumps them into a few types, sometimes even just two types. For example, some people like SUVs and some like small cars. The SUV owners won't switch to small cars, and the small-car owners already have small cars, so a carbon tax won't do much good—or so the thinking goes.

People—and even cars—are far more complicated. There are a hundred types of cars and a hundred million types of people. Think about an election with two candidates. The polls tell us that 40 percent of voters favor Sue Spender and 50 percent favor Tom Taxer, with 10 percent undecided. Will one bad headline for Taxer have no effect, because people are either for him or against him? That's probably true for 70 percent of the voters. Their minds are made up, and it would take a lot to change them.

But election strategies are all about shifting the fence-sitters, and, invariably, about 10 percent of voters are on the fence—undecided—or extremely close to the fence. For them, little things can make the difference. And notice that once the bad headline shifts the fence-sitters to one side, a new group of fence-sitters climbs on. A new poll might say that 45 percent favor Spender and 45 percent favor Taxer, and there are still 10 percent on the fence.

The same is true for consumers. On every energy decision—whether to buy a smaller car or a better furnace—most people are firmly in one camp or the other. They already have a smaller car, or they definitely don't want one. But it's wrong to think of people as coming in just two types. Even if a lot are in one camp and a lot in the other, you always find a good number sitting on the fence. These are the people who respond to the first small change in fuel price. And once they respond and move off the fence to the low-energy camp, a group of people who use more energy move onto the fence, ready for the next price increase to shift them.

Because we face thousands of energy choices, most of us end up on the fence for at least some choices. And if I'm not on the fence now, I may well be in five years, when I need a new car anyway.

Should I drive to the store or walk? It depends on the weather, which is sometimes borderline, so I'm on the fence. Should I turn off more lights or buy more compact fluorescents or check the air pressure in my tires? With higher energy prices, I will think about all this a bit more and make some of these choices differently. Human psychology is not often black or white; in fact, it's tremendously variable. Changing the price of carbon shifts the weights on every decision, and choices that are at a tipping point will tip away from carbon.

The power of the untax is that it shifts the weight on so many billions of choices that it gets maximum bang for the buck. The beauty of the untax is that it shifts only fence-sitters or those close by. These are the people who are bothered least by making a change. So a carbon untax (or a carbon tax) makes all the changes that bother people the least. Those who really don't want to change don't have to.

Is the Untax Good for Alternative Energy?

As the OPEC crisis demonstrated, the main response to higher oil prices is conservation. Because of the crisis, non-OPEC supply increased a bit, but demand dropped by about ten times as much. The point to understand about the untax, or any type of energy price increase, is that it is not aimed solely at conservation. It induces more conservation only when conservation is easier and cheaper than the alternatives.

The untax targets all nonfossil fuels just as strongly as it targets conservation. In fact, it also targets all innovations and inventions for new types of conservation and new sources of alternative energy. No regulatory policy could do that. So even if you don't believe conservation is possible, the untax still does the job. This is important, because in the long run, the world needs new technology. The untax will encourage all possible new technologies equally and make sure we get the cheapest ones.



An untax rewards not only conservation, but also alternative energy production and all types of innovation. In fact, it creates a level playing field for all alternatives, present and future, to fossil fuel. But only the cheapest approaches will win out.

A carbon tax derives its power from its breadth. It puts a little extra pressure to use less on every fossil-energy decision, something no other policy can accomplish. It doesn't alter most energy choices. It just changes decisions, near a tipping point, that are sensitive to a change in cost. That's how a small push has a large effect.

Some say that taxes and untaxes are so weak that people will ignore them. Considering that "no new taxes" is the most potent of all political slogans, it seems odd to think that people would ignore taxes, and in fact history shows they do not. OPEC's "tax" caused great outcry, and, unsurprisingly, the historical record shows a massive and permanent change in the world's use of fossil fuel. Never underestimate the power of tax avoidance.

chapter 5

Why Untaxing Is Fair

The guys with money will still be able to afford as much gas as they want. Only the little guys will suffer.

—Rita Gibson, Boston delicatessen owner, 1977,
quoted in Time magazine

“SLAP A 5¢-PER-GALLON TAX ON GASOLINE each year if conservation goals are not met.” That’s how Time magazine described President Jimmy Carter’s proposed gas tax shortly after he took office and declared the energy crisis to be the “moral equivalent of war.” But people had adjusted to OPEC’s tripled price and were getting complacent. No one foresaw that the Iranian revolution would soon trigger a doubling of the already high price of oil.

Intense lobbying by the oil and gas industries derailed Carter’s proposals, but America’s sense of fairness also played a role. Carter saw that, higher though they were, oil prices were not yet high enough. And he proposed several corrections, one of which was the five-cent gas tax. That’s similar to the carbon tax I’ve been discussing. Taxes are never popular, but the gas tax struck people as particularly unfair, and they were right.

According to the Congressional Budget Office, a carbon tax would cost the poorest one-fifth of families twice as much in terms of percentage as those in the upper fifth. The low-income group emits only a third as much carbon as the high-income group but suffers more under a carbon tax. Rita Gibson was right: “Only the little guys will suffer.”

Many economists recognize the fairness issue and attempt to solve it with some form of tax relief. Harvard economist N. Gregory Mankiw, for example, advocates a “rebate of the federal payroll tax on the first \$3,660 of

earnings for each worker.” Such a tax rebate would distribute the carbon tax revenues in a way similar to the untax refund. But as I will show, his carbon tax with payroll tax reduction is not quite as fair as the untax. And as the headline of an op-ed he wrote for the *New York Times* proclaims, it’s “a new tax”—a huge new tax that will never fly.

Mankiw’s op-ed captures the economist’s dilemma perfectly. It’s about the extreme difficulty of passing a carbon tax, simply because it’s a tax. But the headline emphasizes only this problematic quality. Why is Mankiw beating his head against this wall? Why not suggest refunding the tax revenues, turning his new tax into an untax? Is the untax so novel an idea? Hardly. Economists habitually model a carbon tax as an untax. It’s an old and venerable idea. So why avoid it? Because economists think they have an even better idea.

Most economists believe that using the carbon-tax revenues in place of regular tax revenues is better, because it is the most efficient approach. They say this approach provides a double dividend: we use less carbon, and carbon taxes are “more efficient.” So politics be damned. These economists want to recommend the best approach—even though they know it is political suicide. I admire this insistence on doing things efficiently, and for twenty-five years I bought the standard analysis that using the carbon-tax revenues in place of other tax revenues is a great idea. But this chapter shows it’s not, and that’s a great relief. There’s no need to keep banging our heads on the no-new-taxes wall.

But could most economists really have missed this point for so many years? Yes, and for a reason. According to economics, we should judge a carbon tax or untax on two counts: efficiency and fairness. Efficiency just means cost-effectiveness. Fairness concerns taking money from one group and giving it to another. Unfortunately, fairness is usually difficult to assess, so economists usually ignore that issue and focus instead on efficiency. Economists have done just that with the carbon tax, proving that Mankiw’s approach is a bit more efficient than an untax. Efficiency is the sole reason Mankiw and other economists favor a carbon tax instead of an untax.

But a complete comparison between a carbon tax and a carbon untax requires considering fairness as well as efficiency. I have never seen anyone attempt this, but I will in this chapter. By a stroke of good luck, it turns out to be possible. I say good luck because I know of only one other policy that economists agree is wrong because it is unfair, even though it improves efficiency. Let’s call it policy X. Surprisingly, policy X is exactly the difference between a carbon tax and a carbon untax.

In a nutshell, this chapter shows that an untax is completely fair and that a carbon tax is just an untax plus policy X. Since economists agree that policy X is wrong, they should agree that using the completely fair untax plus policy X is worse than using just the untax.

The Gold Standard of Fairness

The problem of global pollution resembles an old economics puzzle called the “tragedy of the commons.” Of several possible solutions to this puzzle, one stands out as the most obviously fair. The tragedy of the commons refers to the story, with some basis in reality, of an English town’s common pasture for grazing animals; let’s call them sheep. Everyone can graze as many sheep as they like on the commons at no cost. The tragedy is that everyone takes advantage of this free resource, overusing it. Overgrazing kills the grass, and the commons becomes nearly worthless.

Global warming parallels this story in several ways. People can dispose of their carbon dioxide in the atmosphere for free, but the carbon dioxide reduces the value of this common resource. Economics suggests a solution to this problem—a solution that is widely agreed to be fair, although impractical on a global level. I will show that the untax is a practical way of getting this same fair result. But first, let’s look at the standard fair solution.

To avoid the tragedy fairly, the town determines how many sheep the commons can sustainably support and divides this number by the number of townspeople. Say it comes to two sheep per person. The town grants each person the legal right to graze two sheep. That’s fair, and it prevents overgrazing. To an economist, this is also an efficient solution because it maximizes the value of the commons. Any more sheep, and they would damage the commons. Any fewer, and the town would not fully utilize its commons.

If, however, the blacksmith does not want to graze sheep, a fair solution allows him to give away his rights, trade them, or sell them. After all, these are his rights.

In a large town, a market for rights to the commons develops. It likely just consists of a bulletin board with notices. But soon a typical price develops for, say, the right to graze one sheep for a month. That becomes the market price of sheep permits. In this way, the blacksmith can sell his right at fair market value, and neither buyer nor seller takes advantage of the other.

Notice that we have just reinvented, probably for the millionth time, the system we call cap and trade. The town caps the number of sheep at the sustainable limit of the commons and gives all the townspeople permits, which they are allowed to trade.

This system provides a fair and efficient solution to the tragedy of the commons. Giving out rights equally makes the system fair, because no one has any special claim to extra rights. Giving out a sustainable number of rights and allowing trade makes the system efficient.

Conceptually, this system provides a fair way of solving the problem of climate change. Unfortunately, while fair in principle, giving people such rights and enforcing them on a global scale would be impossible.

The Untax, A Twin of Equal Rights

A fair solution to the global commons problem requires a special cap-and-trade system. Typically, carbon cap-and-trade systems work by distributing rights not on an equal-per-person basis, but in proportion to how much damage each person was causing on some past date. The big polluters get the rights, and as Gibson predicted, the little guys suffer.

That’s not a fair cap-and-trade system. The only fair system for handing out rights is to give them out on an equal-per-person basis. I will call this particular cap-and-trade system equitable cap and trade.

This system should sound familiar. The untax gives refunds on an equal-per-person basis. The untax and equitable cap and trade are twins—provided they are adjusted to give the same carbon price. These prices are the same if permit prices under the cap are the same as the tax rate under the untax. Emitting carbon has the same cost in the two systems, so people reduce emissions by the same amount. The free permits, given out equitably, benefit low carbon consumers exactly as do untax refunds. (This is explained in detail in *Carbonomics*.)

The two systems differ in only one way: The market sets the price of permits, so their cost fluctuates unpredictably. Still, on average, costs, revenues, and emissions all come out the same, so the two systems must be equally fair. This makes the untax a twin gold standard of fairness. It treats people as if they had equal rights to the climate, but without keeping track of 6 billion individual climate rights.

Enter the Economists

The untax is as fair a system as anyone can devise without getting into person-by-person calculations. Because such calculations add enormous complexity and are difficult to make fair, they should remain outside the untax system.

In spite of the fact that the untax is the fairest system for correcting the underpricing of carbon, many economists recommend against the untax. Princeton economist, New York Times columnist, and Nobel Laureate Paul Krugman says that “any new tax on carbon could and should be offset by tax cuts elsewhere.” Mankiw would use the carbon tax to pay off some of the federal payroll tax.

Economists reason that taxes cause us to do less of what is taxed. Income taxes cause some to work a little less; taxes on capital cause people to invest a little less. Working and investing are beneficial and increase the gross domestic product (GDP), so taxes reduce the GDP. Even a carbon tax reduces GDP a bit, but economic calculations indicate that taxing carbon reduces GDP less than taxing labor or capital.

This means that replacing part of the tax on labor or capital with revenues from the carbon tax would increase GDP. That’s a good thing, but how big is the effect? Dale W. Jorgenson, probably the top statistical economist working on energy policy issues, has answered this question. He

estimates that swapping a carbon tax for taxes on labor would increase GDP by 1 percent and that swapping a carbon tax for taxes on capital would increase it almost 3 percent. These results apply to a carbon tax that cuts emissions by 30 percent.

So the effect of using carbon-tax revenues to pay off other taxes is beneficial, but not too impressive. Consider the 3 percent gain from reducing the tax on capital. GDP grows by about 3 percent every year, so after twenty years with compound growth we might be 83 percent richer instead of 80 percent, if economists got to swap the carbon-tax for a tax on capital.

So the economists have a point. If they don't let us have the refund and they instead use the \$300 billion or so per year of revenues to reduce taxes on capital, we will end up a bit richer on average. That's why economists want to make the carbon tax a new tax—to replace an old tax.

Reenter Fairness

But richer on average doesn't say what happens to you or me individually. Perhaps you will lose 10 percent and I will gain 16 percent, and so we will be better off by 3 percent on average. A lot of good that does you.

Economists know that they should take fairness into account, and, strictly speaking, if something is better only on average, economists should not say the situation is better. But they get frustrated when they can see that a policy improves GDP, and they don't know how fair the policy will be. So they decide to bet on the part they understand and cross our fingers that the other part—the fairness part that they don't understand—doesn't cause too much trouble. That's not a bad rule of thumb.

But in the case of an untax, it's possible to evaluate fairness conclusively, although economists have overlooked this fact. Let's take a look. In particular, let's look at the idea of using carbon-tax revenues to reduce some other tax, which I'll call tax T. Is reducing tax T a good idea?

To answer this question, we must consider the deplorable policy X that I mentioned at the beginning of this chapter. Policy X is known to economists as a poll tax, which is an old English term, or as a capitation tax, which means a tax on heads. That's a tax that charges everyone the same amount, no matter what. For example, the poorest person is taxed \$1,000, and the richest person is taxed \$1,000. No one I know approves of such taxes anymore, and I have never heard of an economist recommending that a capitation tax be used to raise revenues to reduce taxes on labor, capital, or anything else.

But economists agree that replacing other taxes with a capitation tax would increase economic efficiency and increase the GDP.⁷ So rejecting the

⁷ The economic argument is that normal taxes discourage what is taxed, which means the taxes can end up discouraging something good. But a poll tax discourages nothing and so causes no good thing to be avoided. One cannot reasonably avoid having a head.

capitation tax means they believe that the unfairness of such a tax overwhelms its benefits. That's a judgment I think we all share. Replacing current tax revenues with a capitation tax is simply too unfair and should be rejected.

Now consider three policies, each of which collects and distributes an average of \$100 per person:

- #1. A carbon tax used to reduce tax T.
- #2. An untax with an equal-per-person refund.
- #3. A capitation tax used to reduce tax T.

Could number one, the economists' new carbon tax, be better than number two, the untax? To answer this question, consider an easier question, which turns out to be the same question in disguise. If we had policy number two, a \$100-per-person untax, would it be a good idea to add to it policy number three, a \$100 capitation tax used to reduce tax T?

Is policy #2 + policy #3 a good idea?

No, because we have already seen that using a capitation tax is so unfair that everyone rejects it even though it increases efficiency. There is no reason to change our minds and start liking capitation taxes just because we have implemented an untax—the fairest form of carbon tax.

But an untax plus a capitation tax—number two plus number three—is exactly the same as number one, a carbon tax used to reduce tax T.

Policy #2 + policy #3 = policy #1.

Here's why: Start with policy #2, the \$100 untax. It's just a carbon tax with an equal-per-person refund of \$100. Now add policy #3, a \$100 capitation tax. That takes away everyone's \$100 refund. So we are back to a regular carbon tax with no refund. That's policy #1.

Because policies #2 and #3 together are a bad idea, and together they are the same as policy #1, then policy #1 must be a bad idea. And that's my point. The economists propose policy #1, a carbon tax used to reduce another tax. Compared with an untax, it's a bad idea.

The only way out of this logic would be proof that a capitation tax would cancel out some unfairness in the untax. But since the untax is one of the twin gold standards for carbon fairness, that way out doesn't make sense.

This conclusion is important because it removes a stumbling block that causes economists to advocate a new tax. They can control carbon emissions just as efficiently with an untax as with a carbon tax. And by turning the carbon tax into a carbon untax, they avoid the political pitfall of the T word. That should be comforting as well as familiar, because the untax has been showing up in economic models for years.

From Theory to Dollars

In 2000, the Congressional Budget Office (CBO) ran some numbers on the fairness issue. It considered a cap-and-trade system in which the government auctions off all the permits and uses the revenue to provide “each household with an identical lump sum.” This is exactly the equitable cap-and-trade approach just discussed, except that it works per family instead of per person. But since equitable cap and trade is the twin of the untax, the CBO report can also serve as an analysis of the untax.

The CBO also considered a cap-and-trade policy in which all the permit revenues go to reduce corporate income taxes. This is just like a carbon tax whose revenues are used to reduce the corporate income tax. Table 1 shows the CBO’s results.

Table 1. *The Congressional Budget Office Compared Two Ways of Using Permit Revenues or Carbon-Tax Revenues*

Use of Carbon Revenues	Change in Real Annual Income	
	Lowest 20%	Highest 20%
Decrease in Corporate Taxes (Efficient but Unfair)	-\$510	+\$1,510
Equal-per-Person Refund (The Untax Approach)	+\$310	-\$940

The table shows that when carbon taxes or permit revenues are used to reduce corporate taxes, the poorest 20 percent of households experience a net cost of \$510, while the wealthiest 20 percent gain \$1,510—in spite of producing more carbon emissions. With an equitable cap-and-trade program or an untax, poor families gain \$310, and wealthy families experience a net cost of \$940 per year because of their extra carbon emissions. These estimates apply to a policy that is intended to reduce emissions by 15 percent.

When the government reduces corporate income taxes with carbon-tax revenues, the poor, who emit less, get poorer, and the rich, who emit more, get richer. Gibson is right again.

Mike Huckabee complains, “I can waste all the energy I want and then justify it by writing a check.” An untax allows such waste and check writing, but the checks written by the rich provide the poor with a small net gain to compensate them for climate rights they are not using and that, in effect, the rich are using. The cost of this compensation is enough that it will change the behavior of the rich without the government having to interfere with the details of their lives. Of course, everyone has the same incentive to emit less; no one is singled out.

Some of the rich will ignore the cost, and some will reduce their emissions significantly. All are free to choose their own strategy, but those using more than their share must compensate those using less than their share. If I were poor, I would rather the government charge the rich and send me some of the proceeds than heavy-handedly force the rich to cut back and give me nothing.



The untax, a carbon tax combined with an equal-per-person refund, has the same economic effect as giving everyone an equal right to emit carbon and allowing them to use or sell their rights. Although it may sound antisocial to “privatize the climate,” the current system already privatizes the climate by allowing everyone to claim any amount of the atmosphere for their own private use without compensating anyone.

Redirecting untax refunds to reduce other taxes would increase economic efficiency a little. Reducing corporate taxes increases efficiency the most but is the most unfair. Any use of untax refunds to replace tax revenues turns the untax into a tax and is as unfair as implementing a capitation tax to reduce other taxes—a policy that almost everyone has rejected consistently for over a century.

The untax can protect the atmosphere to any desired degree simply by setting the appropriate tax rate. It allows us to choose how much to emit, but those who choose not to do their part must fairly compensate those who do more than their share.

Part 2

Flexible Global Carbon Pricing

chapter 6

Kyoto: What Went Wrong?

Clearly, more work is needed [on the Kyoto Protocol]. In particular we will continue to press for meaningful participation by key developing nations.

—Al Gore, *New York Times*, 1997

NINETY-FIVE U.S. SENATORS rejected a Kyoto type of treaty in July 1997, five months before 150 nations completed the text of the Kyoto Protocol—the actual rules for curbing emissions. The senators said they would not sign a treaty based on the protocol unless it imposed commitments on developing countries. They took a reasonable position, but one that closed the lid on a box the United States had built around the Kyoto process. No one conspired to build this box; it was just the result of unintended consequences.

Ironically, a great environmental victory in the early 1990s was the first step in constructing the box. Environmentalists and then-President George Bush ended a multiyear stalemate over acid rain by getting coal-fired power plants to accept emission caps imposed under a cap-and-trade policy. That success earned cap and trade the title of most successful market-oriented approach to emissions control. So when the U.S. team went to Kyoto, that was its proposal—to cap and trade greenhouse gas emissions. In the abstract, it made a lot of sense. But the countries of the world proved to be more complicated than coal-fired power plants.

Countries vary enormously in their levels of greenhouse gas emissions, so it's impossible to cap them all at the same level, and no one suggested that. Instead, the treaty gave every country its own cap. That caused a lot of squabbling and naturally enough led to no caps for countries with low levels of

per capita emissions—the poor countries. In effect, China, India, Brazil, and others argued that just because the rich countries started polluting first, they should not get to emit ten times more than poor countries, which have done less damage.

They have a point. But this leaves the Kyoto Protocol with an impossible contradiction. It's unfair to give poor countries caps that are five, ten, or even twenty times lower, on a per-person basis, than those of rich countries. But without such caps, poor countries have no obligation at all, and unfortunately, developing countries have the fastest-growing levels of emissions. China by itself emits more carbon dioxide than any other country, although its per-person emissions are low. Cap and trade sets up a clash between fairness and effectiveness. What is fair doesn't work, and what works is not fair. This is the box that the United States has built around the Kyoto Protocol.

This part of the book explains how to break out of the cap-and-trade box safely and effectively. In this chapter, I explain why we must abandon cap and trade as a global system before the world can solve the problems of climate change and energy security.

When Caps Are Unfair

Caps on emissions are a burden, and the tighter the cap, the bigger the burden. On the other hand, getting a high cap can be worth a lot of money. That's because each country issues carbon permits up to its cap and can sell extra permits to companies in other countries for hard cash. In Europe people call this "selling hot air," and some Eastern European countries, including Russia, have lots of it to sell.

Russia gained a lot of its hot air by holding out and not signing the treaty until the country received an extra helping of free permits—that is, a higher cap. Because the United States would not sign the treaty, it could not go into effect without Russia's signature, which gave Russia a lot of leverage. This was a double win for Russia—the extra permits are valuable and they loosen the overall cap. As the world's number-two oil producer, Russia will be hurt by a tight overall cap, which inevitably reduces world oil use and the price of oil.

The architects of the Kyoto Protocol may have issued permits unfairly, but this does not mean caps can't be fixed. Let's consider some specifics.

The Kyoto Protocol sets emission caps relative to a country's emissions in 1990. In that year, the Chinese were emitting about 2.5 tons of carbon dioxide per person per year, and Americans were emitting about 23.4 tons per person. Even in 2008, India emits only 1.1 tons per person. I'm not criticizing Americans or complimenting the Chinese. This is just the situation we're in. It happens to make it impossible to set caps fairly and effectively. To be effective, caps must be set low, near 1990 emission levels. That is possible, but how would such caps be adjusted? If India's and China's caps adjust down, they will forever be stuck a century or so behind us on carbon emissions. That's unfair.

Not the "You First Principle"

The International Herald Tribune called it the "You First principle" in June 2008 but says it's been the main reason for the Kyoto deadlock from the start. Developing countries say "You first," and we reply, "No, you first."

Some say that's why the United States should pass one of the cap-and-trade bills before Congress. The problem seems easy to solve. We go first, and a year later they go. If they don't go, we have time to back out. Could such a little problem really explain a fifteen-year deadlock?

You would think that if You First is the problem, someone would say, "If you go first, then I'll follow." No one is saying that, particularly not the developing countries. They're saying, "You go, and we won't go." That's a problem that could cause a fifteen-year deadlock—or a fifty-year deadlock.

In June 2007, China published its National Climate Change Programme, which says China will follow the U.N.'s principle of "common but differentiated responsibilities."

China spelled out "differentiated responsibilities" for the Bali Climate Change Conference in December 2007: "The developed countries, whose emissions of GHGs [greenhouse gases] are the main cause of climate change, should have the primary responsibility to cut their high GHG emissions and to channel adequate financial resources and to transfer low-carbon technologies to developing countries. ... On the other hand, the developing countries, who are innocent in terms of responsibility for causing the problem, are by far the biggest victims."

That's it for developing-country responsibility. We "have the primary responsibility," and they "are innocent in terms of responsibility." That certainly is differentiated. But in case it's still not quite clear, Ma Kai, head of China's powerful economic-planning agency, explained it to the New York Times: "Our general stance is that China will not commit to any quantified emissions reduction targets."

This does not mean developing countries will not assume responsibilities. It just means they will not accept emission caps. Caps are out. They've been telling us for fifteen years, and they have good reasons. They are not going to change their minds just because we cap ourselves.

But I cut Ma Kai off in midsentence. He went on to say, "But that does not mean we will not assume responsibilities in responding to climate change." In fact, China is probably doing more than the United States is doing. It has adopted stricter fuel-efficiency standards, a more aggressive reforestation program, and a tougher energy-intensity reduction goal than George W. Bush's.

But according to that same Tribune article in June 2008, developing countries still won't "accept binding national emission caps." The trouble is not the You First principle. The trouble is caps.

So their caps must be able to adjust up. But no one has figured out how to do that fairly and effectively.

Perhaps some mathematical trick would help us set fair caps. China could be capped relative to what it “would have emitted” if it had not been capped. The cap could be set farther below that would-have-emitted level each year—2 percent less, then 4 percent, then 6 percent, and so on. Unfortunately, as time goes on, we know less and less about what would have happened if China’s emissions had not been capped. China might argue that, without a cap, it would have been emitting 127 percent more in 2010 than in 2000, as the DOE predicts. But environmentalists might argue that China would have been emitting only 27 percent more. That was China’s emissions increase between 1990 and 2000. So China and the environmentalists might disagree by 100 percent on how tight a cap should be. Who is to decide?

If the cap is set 50 percent too high, it will have no effect. If it’s set 50 percent too low and enforced, it will curb China’s growth drastically. The latter outcome is unfair, and the former is ineffective. Caps based on predictions break down quickly. Besides, developing countries have been rejecting caps consistently and vigorously for fifteen years.

Caps Here and No Caps There

Without any way to cap developing countries fairly, the Kyoto Protocol takes another approach. It allows them to sell certified emission reductions, or CERs, to companies in capped countries. As the name implies, this is a certification that the uncapped country is making emission reductions that it would not otherwise make. I will call these CERs carbon credits.⁸ A business in a country with a cap can buy carbon credits to help meet its permit requirement under its national cap-and-trade system. Each credit, like each permit, allows the emission of greenhouse gases equivalent to a ton of carbon dioxide.

Reducing emissions in China is cheaper than reducing them in Germany, for example, so carbon credits save money and seem to be an excellent idea. And sometimes they work. However, no matter how well intentioned, credits will eventually run into two serious problems. First, they will cost a lot, and second, they will be gamed or cheated on.

Paying Others Is Expensive. To see how buying foreign carbon credits gets expensive, consider how things are going. In twenty-five years China will be emitting twice as much as the United States, Europe, and Japan combined. So if we do our part to buy China back down to our level, we will have to buy credits from China equal in amount to our own emissions. At \$30 a ton, that would cost about \$200 billion. I can’t see us sending China that much money every year. That’s more than \$2,500 paid by a family of four.

⁸ Similar certificates in other schemes are often called offsets.

Gaming with Carbon Credits. Gaming poses an equally intractable problem. And there is no way around it—it’s just in the topsy-turvy nature of paying people *not* to do bad things.

For example, the operators of a coal-fired power plant in South Africa said they would keep using dirty coal unless they got carbon credits to buy some natural gas instead. But then someone found out that they had signed a gas contract before the CER policy went into effect. That is, they had already planned to cut their carbon dioxide emissions. They were simply hoping to defraud the United Nations, which administers the CER program.

Though someone detected the fraud in this case, eventually it will become impossible to know what the company would have done, because, with a carbon credit policy now already in place, the firm’s operators have time to cover their tracks. If they plan to buy natural gas, they won’t tell anyone until they lock in the credits.

This is why few markets sell negatives. People do plenty of annoying things, but rarely do we pay them \$20 not to do this or \$50 not to do that. Blackmail and protection rackets are two unpleasant exceptions.

In the long run, markets for not doing things just naturally end up in disarray. Say the city paid people for not parking too long in downtown parking spaces. You pull up to the curb, and the meter maid says, “If you leave in less than an hour, I’ll give you \$2.” So you do, and she does. But when you get home, you tell your teenager about this, and the wheels start turning. Pretty soon your kid parks downtown, leaves his parking space after ten minutes, and collects \$2. He then parks two blocks away and collects \$2 more, and so on. Pretty soon downtown has turned into a game of musical cars for teenagers. The payments are for leaving parking spaces, but the result is parking spaces mobbed by teenagers.

Perhaps you still think people wouldn’t do things like that or that we could catch them. But consider this example: Certain chemical plants around the world emit just about the worst greenhouse gas imaginable. The refrigerant HFC-23 is 11,700 times worse than carbon dioxide. But a European company can pay a chemical plant in China to stop emitting HFC-23. The Chinese plant puts the gas through an incinerator to avoid emitting it into

Billions Wasted

A working paper from two senior Stanford University academics, David G. Victor and Michael W. Wara, examined the U.N.’s Clean Development Mechanism (CDM) market for CERs (Certified Emission Reductions), which are international carbon credits issued by the U.N. The quantity of new CERs tripled in 2007 to a value of 12 billion euros. They found that “much of the current CDM market does not reflect actual reductions in emissions, and that trend is poised to get worse.” Moreover, investors paid roughly 4.7 euros for Chinese CERs corresponding to emission abatements that cost fifty times less.

Victor said, “It looks like between one and two thirds of all the total CDM offsets do not represent actual emission cuts,” according to the Guardian, May 26, 2008.

the atmosphere. Incineration is a cheap process, and for every ton a plant burns it earns 11,700 tons of carbon credits, which the European company purchases. In early 2008, international carbon credits were worth about \$25 per ton. So incinerating a ton of HFC-23 was worth close to \$300,000, while incineration cost only about \$5,000. Most of the credits granted in the first few years of the CER program have been for HFC-23 incineration.

So how is this story like the one about the teenagers parking downtown so the city can pay them not to? There are rumors that Chinese companies have built chemical plants mainly to cash in on carbon credits.

But even if no one intends to misbehave, the CERs encourage it. Whoever takes most advantage of them makes the most profit and can sell their product for less and undercut their competition. Businessmen fear their competitor will employ such a strategy, and so, in self-defense, they feel they must employ it themselves. Paying for negatives—giving out carbon credits for not emitting—can corrupt honest people.

In fact, the United Nations has known of the CER problem from the beginning and terms it “additionality.” That is, the United Nations requires projects to be “additional” reductions to emissions. Now my copy editor asks “additional to what,” and that is exactly the question the United Nations did not, and can never, answer clearly. The answer will always be, “additional to some hypothetical future world.” The idea of enforcing an “additionality” requirement is just wishful thinking.

Just for comparison, consider what would happen if instead of the United Nations giving China carbon credits, China had agreed to put a tiny \$1-per-ton tax on greenhouse gas emissions. That would mean \$1 per ton of carbon dioxide and \$11,700 per ton of HFC-23 emissions. That’s more than it costs to incinerate HFC-23, so chemical plants would incinerate and pay no tax at all. In fact, many developing countries—and, to some extent, the United States as well—subsidize fossil fuel. A requirement to stop subsidizing greenhouse gas emissions and to impose even a small tax would be a huge step in the right direction—not least because developed countries would then have to meet their caps by cutting emissions at home.

Charging people who park too long is a better idea than paying them to leave sooner. Every city in the world has figured this out. The same principle holds for taxing emissions instead of paying people not to emit. Sooner or later, this will become all too apparent.

Avoid Global Emission Caps Require Equal Effort

Capping emissions country by country boxes us in. It’s unfair to cap poor, rapidly growing countries. But paying them not to emit is too expensive for the rich countries because of waste and overpayment. We need a fair and effective way to include the developing nations. Since caps don’t work, the obvious alternative is carbon pricing. In fact, that should have been the first choice.

Instead of a requirement that every country stay under a certain cap, the rule would be that every country must put a certain price on carbon. Countries could achieve that price with a cap, a tax, or an untax. Each country would be free to choose. Global carbon pricing is inherently more fair because it requires a level of effort instead of a specific cut in emissions.

If your family is weeding the garden, a requirement that each person pull 30 pounds of weeds may be next to impossible for the little kids. But a requirement that everyone pull weeds for thirty minutes may be reasonable. In any case, it has a better chance of being fair.

A carbon price of \$30 per ton scales automatically to a country’s carbon level. In a country where people use 1 ton per person per year, the average cost will be \$30 per person per year. In a country where people use 20 tons, the cost will be \$600 per person per year. Of course, the money stays in the country, so this is not a cost to the country. The government can, if it wishes, give it all back—via an untax or another method—as long as it does not reward those who emit more carbon. If a nation adopts an untax, it helps the poorest people in that country.

This approach ensures that carbon control does not limit economic growth. With a carbon price of \$30 per ton, nothing stops India from becoming richer than the United States. But if India’s emissions are capped at their present level, it makes it almost impossible for India to catch up economically.

At this point, some people will conclude that carbon pricing seems more fair simply because it’s weaker. But that is not the case. As I explained in Chapter 5, a cap that causes a \$30 carbon price has exactly the same effect as a \$30-a-ton carbon tax. Both a cap and a tax put a price on carbon, and the price—and nothing else—does the work. A cap is only stronger if it tricks the world into accepting a higher carbon price. But the opposite is more likely. People are afraid a cap might push carbon permit prices too high, so they set caps cautiously and build in loopholes. In any case, if caps push carbon prices to \$100 while the world is only willing to accept \$50 carbon prices, the world will change the cap and not the other way around.



It would make little sense to suggest such a radical new course—global carbon pricing—if the old system of national carbon caps were viable or needed only minor adjustment. But an international system of capping is not an option. That does not mean individual nations need to stop using cap-and-trade systems. Nations can still choose any method they want to raise their national carbon price to the global-carbon-pricing target.

For good reasons, developing countries will not accept internationally set caps. Paying them to curb emissions will prove too expensive, especially because payments not to emit are ineffective and inevitably lead to gaming and fraud. Fortunately, a global carbon price can provide a fair and effective standard, and it is the best hope for international cooperation.

chapter 7

Global Carbon Pricing

We have everything we need to get started, save perhaps political will, but political will is a renewable resource.

—Al Gore, Nobel lecture, 2007

HALF THE WORLD will not accept carbon caps but might accept a carbon price requirement. Such a requirement would not put a lid on growth in developing countries. Poor countries, would be compensated by international payments from a Green Fund. Individual countries could choose caps, taxes, or untaxes at the national level.

Countries that are particularly dependent on oil would be free to target carbon from oil. Targeting oil would decrease political resistance and increase the policy's effectiveness at reducing oil prices. As Al Gore says, the world may not yet have the political will to get started. But that could change if people begin to see the benefit of cooler global temperatures combined with the benefit of lower oil prices. Political will is most effectively renewed with a dollop of financial self-interest.

Switching from Kyoto's caps to a new, global-carbon-pricing policy will require a major reorientation of the Kyoto Protocol. In this chapter, I describe a basic design that, because of its flexibility, requires only minor adjustments to existing national carbon control policies. I present a simplified version of the design in this chapter, adding modifications for fairness and enforceability in Chapters 9 and 10.

The Price of Carbon

Global-carbon-pricing policy sets a target global carbon price and then makes sure the world achieves it on average. To make the policy flexible at the national level, the global carbon price must be defined to work with any type of national carbon policy—cap and trade, gas tax, untax, or any other method of making carbon expensive. To achieve this flexibility, global-carbon-pricing policy defines the national carbon price as the average carbon price over all fossil fuels and does not apply the requirement to every individual purchase of fossil fuel.

Price is just revenue divided by quantity sold. Collect \$100 from selling ten items, and we know the average price is \$10 per item. The national average price of carbon is total annual revenues from carbon charges divided by total carbon emissions during a year. So if the United States collects \$60 billion in carbon charges in a year and emits 6 billion tons of greenhouse gases, our national price of carbon is \$10 a ton. That's all there is to it.

Well, not quite. Suppose a nation's carbon cap-and-trade program gives away all its permits to coal-fired power plants—not a good idea, but just suppose. How should a global-carbon-pricing policy give that country's program credit for carbon pricing? The global policy must work with any national carbon policy to avoid giving any country an excuse to opt out.

Because free permits given to coal plants collect no carbon charges for the government, it seems as if they should not contribute to the national carbon price. But if permits given out for free cost \$20 a ton in the private market, they put just as much pressure on companies that need them as a \$20 carbon tax. So these permits should get just as much carbon pricing credit. This is fair and easy to arrange. Carbon permits receive carbon pricing credit equal to their value at the time they are retired to cover emissions. If a million permits are retired in May and the average price in May is \$30 per permit, the country receives credit for \$30 million of carbon pricing revenues.

Carbon or Greenhouse Gas?

Fossil fuel accounts for about 70 percent of greenhouse gas emissions. However, we should not ignore the other 30 percent. Carbon dioxide is the greenhouse gas emitted when people burn fossil fuel. Since this book is about energy policy, I'm most concerned with carbon.

But sometimes people use carbon to refer to all greenhouse gases. For example, Europe's greenhouse gas markets are called carbon markets. In that tradition, when I speak of carbon, in most cases I mean all greenhouse gases.

Carbon taxes, gas taxes, and untaxes all collect revenues that are easy to count. Subsidies for ethanol and wind will be unnecessary once fossil fuel costs more. However, if countries still offer such subsidies, they should not be counted, because the track record of subsidies around the world, including in the United States, is dismal. In fact, an enormous benefit of global carbon

pricing is that it dramatically shrinks wasteful energy programs.

Appliance and fuel standards should continue, but to be counted they would need to be converted to a system of fees and rebates. Under such a system, low-efficiency appliances or cars are charged a fee for their above-average carbon use and high-efficiency appliances or cars receive a rebate. This will improve their performance and reduce their vulnerability to bureaucratic foot-dragging.

Each country would have to count total emissions and total revenues to determine its national carbon price. And greenhouse gases come in many types and from many sources. In the United States, the Environmental Protection Agency and the Department of Energy keep track of these, but would this be

‡ 8
Global carbon pricing goes by several names and has probably been outlined a hundred times. Several of its advocates stand out because they have written about it as a solution to the Kyoto difficulties.
These include William Nordhaus of Yale, Richard N. Cooper of Harvard, Nobel Prize winner Joseph E. Stiglitz, and the recent chairman of the president's Council of Economic Advisers, N. Gregory Mankiw.
I describe a specific approach to global carbon pricing in this book, but whenever I say someone else favors global carbon pricing, I only mean they favor the generic concept, not my specific proposal.

possible in most other countries? What about Estonia, Slovenia, and Romania? As it happens, by May 2008, these and thirty-six other countries had already filed their national greenhouse gas inventories with the United Nations under the Kyoto Protocol. This information is necessary under any climate-change protocol. So the difficulties with measuring emissions appear surmountable and, in any case, cannot possibly be an argument against switching to a global-carbon-pricing policy.

In fact, permit prices under cap and trade are more sensitive than is carbon pricing to errors made in counting emissions. The European Union miscounted by a few percent during the trial carbon-cap period before 2008 and issued a few too many permits. The result was that the price of carbon crashed from about \$30 a ton to under \$1 a ton. Under a global-carbon-pricing policy, such a small mistake would cause only a small problem. A similar-size error might cause a country's carbon price to be miscounted as \$30 per ton instead of \$29.

The World Bank tracks most countries' finances closely. So keeping track of carbon price revenues should not be difficult. Moreover, low-emission countries will want the Green Fund payments discussed in Chapter 9, so they have reason to cooperate.

To sum things up, a nation's carbon price is its total carbon pricing revenue divided by its total greenhouse gas emissions. Revenues are not hard to count, and countries must count their carbon emissions under any system that works.

Flexibility Global Carbon Pricing

Flexible global carbon pricing, as I will call this proposal, does not require that all carbon be priced the same. The price can vary from one type of fuel to another. That provides flexibility in the design of national policies

Countries can, if they like, tax oil carbon at a high rate and other carbon at a low rate, just as long as they collect enough total revenue. Because taxing oil reduces its use, it also helps to lower the world price of oil. Large oil-consuming nations can have enough of an impact to save a significant amount of money with this approach. Europe already does this, and it makes sense for the United States as well.

But when one country uses less oil, all consuming countries benefit, which argues for cooperation. A global-carbon-pricing policy makes it easier to price oil high and thus encourages cooperation among oil-consuming nations. Since a global-carbon-pricing policy requires countries to collect a certain amount of revenue from pricing carbon, why not focus much of the revenue collection on oil? That has the fringe benefit of reducing oil prices.

In effect, flexible global carbon pricing encourages the formation of a large international consumers' cartel. As I will discuss in more detail later, this is not just good for energy security. The benefits of such a cartel would also provide much of the glue that will hold together an international climate agreement. And of course, a consumers' cartel would reduce consumption of oil. That's the only way it can work.

The Clean Development Incentive

Although a country with one-tenth the income of a rich country would pay about one-tenth the carbon charges if its carbon prices were the same, this is probably not fair. Generally, poor people find it harder to give up a certain fraction of their income than richer people do. Moreover, they have caused much less of the problem, whether we consider climate or energy security.

Fair carbon capping requires taking into account a host of considerations, and even then we end up with a stalemate. Fair carbon pricing is simpler and is best achieved with Clean Development Incentive (CDI) payments. The CDI serves the same purpose as the United Nations' Clean Development mechanism (CDM), discussed in Chapter 6. But the CDI has none

of the gaming and corruption problems associated with paying countries not to emit what they might have emitted were it not for CDM. The CDI pays countries for collecting carbon revenues by pricing carbon one way or another. This is measurable, and does not involve any assumptions about what might have been. It also encourages the single most effective climate policy—carbon pricing.

A fair formula for the CDI can be based on just one factor, emissions per capita. This avoids all the bickering over individual caps. In Chapter 10, I provide a specific design, which, in effect, implements a Green Fund of the type proposed by Mexico and others, and which provides an extra incentive for reducing emissions per capita.

Even Pricing at Zero Would Be a Step Forward

As I mentioned earlier in this chapter, one of the greatest benefits of a carbon pricing policy is that it reduces wasteful energy programs around the world. And the most wasteful of all such programs are fossil-fuel subsidies. These cost governments more than the benefits they provide, besides hastening global warming and decreasing energy security. Subsidizing ordinary goods wastes money, because it causes people to overuse the subsidized goods. Subsidize wool, and people will wear wool instead of cotton, even though wool costs more to produce and even in cases where cotton works just as well.

When countries subsidize fossil fuel, they waste money, damage the climate, and decrease energy security. That's a lose-lose-lose policy. Global carbon pricing puts a stop to such policies worldwide, saving the world hundreds of billions of dollars a year. With a carbon pricing requirement, subsidies count as negative pricing. So to achieve the required price, a country must abandon carbon subsidies or apply an extra-heavy carbon tax that counteracts the subsidy.

Fossil subsidies also cause problems on a global scale. In mid-June 2008, China raised its domestic price of gasoline, and the *New York Times* reported that: "The price of light crude fell \$4.02 to \$132.66 a barrel following [China's 16 percent] fuel price increase announcement. ... After the hikes, prices [in China] rose to about \$3 a gallon. ... In 2007, China's subsidy of gasoline alone was \$22 billion, close to 1 percent of its gross national product." If reducing the subsidy cut world oil prices, then the subsidy itself has been raising them.

This little report speaks volumes about Kyoto and the need for a global-carbon-pricing policy. Under Kyoto, China is spending a good fraction of what an effective anti-global-warming program would cost on subsidies that exacerbate global warming. Along with many positive programs, China is also helping to damage the climate and helping OPEC charge the world more.

The market's reaction to China's price hike gives us some idea of the past cost of its subsidy policy, but only a hint, because China's price hike will take years to fully reduce Chinese oil consumption. China cut its gas subsidy by

about forty-five cents a gallon, and that immediately saved the world \$4 per barrel. That comes to about \$100 million a day saved on OPEC's exports, which is \$36.5 billion a year. And, of course, you can triple that if you want to add in all the other oil companies—including Exxon and the Russian companies.

China's domestic oil price increase does not likely indicate a phaseout of gasoline subsidies. Rather, it's an indication that the country's subsidies had gotten out of hand. The Kyoto Protocol has handed China hugely profitable carbon credits. At the same time, the protocol allows the Chinese to turn around and increase their damage to the climate by subsidizing oil imports—imports that increased 25 percent in the year ending May 2008. A global-carbon-pricing policy, on the other hand, requires all countries—including the United States, China, Saudi Arabia, and Iran—to stop subsidizing fossil fuels and start taxing them.



Global carbon pricing allows flexibility in the design of national policies. The only requirement is that the combined policies of a country collect enough revenues from carbon pricing to meet the global pricing target.

This flexibility encourages countries that import a lot of oil to cooperate in setting a high price on oil carbon, which helps reduce world oil prices. This makes global carbon pricing the best policy for energy security as well as climate stability. The synergy between these goals provides a strong incentive for international cooperation, as I discuss in Chapter 12.

chapter 8

Does the World Need a Cap?

The Intergovernmental Panel on Climate Change says we must reduce carbon emissions 80 percent by 2050.

—Environmental urban legend

ENVIRONMENTALISTS OF A CERTAIN STRIPE are saying there's a scientific consensus that we must reduce carbon emissions 80 percent by 2050. But the Intergovernmental Panel on Climate Change (IPCC)—the U.N.'s climate science group—has said nothing of the kind. The IPCC does predict the global, but not national, emission levels that would hold greenhouse gas concentrations down to 450, 550, or 650 parts per million. But they haven't said which target we must shoot for. The current carbon dioxide level has already reached 385 parts per million from a historic starting level of 280.

The legend contains a nugget of truth, reflecting a popular environmentalist choice of 450 parts per million as a target. Some reports, which the IPCC has summarized but not endorsed, say that the developed countries must push their emission levels down to 80 percent below 1990 levels by 2050 to make up for what the rest of the world is likely to do—if we want to stabilize greenhouse gas concentrations at 450 parts per million. Of course, many environmentalists now advocate a period of negative emissions to bring the world back 350 parts per million.

In truth, the best target for 2050 depends on highly uncertain climate dynamics, ice-sheet dynamics, biological sensitivities, technical breakthroughs and economic costs. Fortunately, we have no need to know the best target for 2050, we only need to know enough to act wisely for the next few years, at which time we will know a little more. The task at hand is not to predict the distant future and pretend we can control it, but to build institutions that are

capable of taking and sustaining the strong actions that will likely be necessary. We have now spent 15 years failing to do that, largely because we have been focused on numerical goals for the distant future. Agreement on a number for the world in 2050 provides little guidance concerning who should do how much at present and who should pay for it.

When Is a Cap Not a Cap?

Cap and trade is supposed to work by setting one big cap for all emitters combined. With a national cap-and-trade program, individual companies don't have caps. With a global cap-and-trade program, you'd think individual nations would not have caps. You'd think the whole world would just have one big cap.

But we don't have a world cap. Instead, we have lots of caps for individual countries. What's going on? Under the Kyoto Protocol, it's a bit mysterious, with some countries capped and others not. But suppose every country had a cap. Would that make a world cap? It would, and the sum of all the country caps would be the world cap. But what is the effect of the "national caps"? Do they do more than just add up to determine the total? If that were all they did, countries would not worry about their particular cap, but here's why they worry.

"Capped" countries are allowed to trade carbon permits. This saves money because countries for whom it's expensive to reduce emissions pay companies in other countries to reduce their emissions. That generally saves money, and it's a good thing. It's already happening, and more of it will happen in the future.

But international trading means the national caps are not actually caps at all. Any country can emit more than its cap just by purchasing some permits. It's exactly like a cap-and-trade system on U.S. companies. None of them get individual caps; any company can buy extra permits if it needs them.

When a company buys extra permits, it's because it does not have as many as it needs. When a nation buys extra permits, it's for the same reason.

What people call national "caps" actually function as allocations of free permits. But no one calls them that, because giving out free permits to emit greenhouse gases just doesn't sound right.

If Germany's cap is 1 billion tons, that means the Germans have permission to emit up to 1 billion tons without paying for extra permits. That's exactly the same as if Germany were given free permits to emit 1 billion tons and needed permits for all their emissions. So a national cap does not cap a nation; it tells the nation how much it can emit for free before it has to start buying permits from other countries. In effect, national caps are just allocations of free permits. That's why countries care a lot about where their cap is set.

If the United States adopts a cap that slides down to 80 percent of 1990 emissions by 2050, we will almost surely join the world trade in carbon

Easy to Agree On. A global-carbon-pricing policy requires a single target price for carbon. Compromise is required to reach agreement, but the simplicity of global carbon pricing makes this easier. Also, carbon pricing is designed to offer the carrot of lower world oil prices as an inducement for nations to cooperate.

With individual caps, every country has an incentive to fight hard for a lenient cap. Remember that national caps are really free carbon permits, and carbon permits are worth a lot of money on the worldwide permit market. In hammering out the Kyoto Protocol, countries have constantly struggled over individual caps. Handing out trillions of dollars to 180 countries on the basis of negotiation, as opposed to a rule, is one of the best ways to cause endless bickering.

Simple to Adjust. When the carbon price needs adjustment—and it will—only global price target needs changing. The Clean Development Incentive, described in Chapter 10, is can also be adjusted by changing a single value. The policy leaves no room to bicker for individual advantage.

When nations negotiate a global price, everyone is in the same boat. If the price goes up, it costs everyone more, but it also improves climate stability and energy security for everyone. Countries will still have disagreements, but no country can get the benefit of a stronger policy without contributing its share.

7 Different people think in different ways. Environmentalists think the environment is a top priority. So they think first of emission limits and give little weight to the cost of meeting them. They are not frightened by the cost uncertainty of caps.

Most people, even rich Americans who tell pollsters the environment is important, are not yet willing to put much money on the table. When pollsters ask if they will accept higher gasoline prices, they say no, often rejecting increases that would cost just a few dollars per year. In poor countries, this is even more true.

I'm not concerned with who is right but about the importance of cost. But the project of turning most of the world into dedicated environmentalists will not succeed in time to stop global warming. Instead, we must work with the situation at hand.

The points I make in Chapter 2 about concerns with the cost of caps carry even more weight when it comes to developing countries. For the vast majority of the world's citizens, immediate costs come first and long-term benefits second. These people are willing to spend something, but they do not want to lock into a cap with little idea of what it will cost them. Capping fossil-energy use at levels equivalent to those found in the United States in the late 1800s can be a frightening prospect. I personally think we can achieve such reductions at a surprisingly low cost. But it has never been done, and people are frightened to commit to such an experiment, especially when they are poor.

This is roughly how many people look at the problem:

You want me to reduce my fossil-fuel use to the level Americans used in the nineteenth century? Some say that will be cheap, and others say we must sacrifice a great deal for the environment. But no one really knows what's necessary. I'm willing to start. But don't ask me to lock into a plan when I don't know either the cost or what is necessary for the environment.

The bottom line is that caps frighten most people once they take a close look at them, because no one knows what caps will cost. If people are forced to accept a cap with an unknown cost, they will fight for a weak cap. In the end, people will accept a stronger policy, even if it costs more, to avoid one that's cheaper but risky.

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Although caps appear to provide certainty, locking in a goal regardless of cost makes the policy's cost highly uncertain. For most of the world's citizens, unknowable short-run costs are more troubling than uncertainty in the distant future.

So the world is not about to cap emissions, and without a worldwide cap, national caps are simply a way of dividing up costs. They shift income from tightly capped countries to countries with looser caps or no caps. This turns a cap into a punishment, and a lack of a cap into a reward, and reinforces the resistance to caps.

A global carbon price has the opposite effect. It puts all countries in the same boat. Raising the price of carbon costs all countries proportionally and increases climate stability and energy security. A country cannot use the system to help itself at the expense of other countries. All nations rise or fall together. This way lies cooperation.

chapter 9

International Enforcement

What you cannot enforce, do not command.

—Sophocles (496 B.C. to 406 B.C.)

WHY DO PEOPLE DRIVE ABOUT 70 MILES AN HOUR on the freeway? Because the speed limit is 65. Actually, that's not exactly why, and the little 5-mile-an-hour discrepancy gives us a clue. It's the police and the courts that keep most of us from speeding, not the limit itself. The police don't usually ticket you till you are driving about 10 miles an hour over the limit. That, and a bit of caution, explains the 5-mile-an-hour discrepancy.

This may seem obvious, and it is. But people constantly forget about it in discussions of international policy. The authors of the Kyoto Protocol set speed limits—caps—but forgot about the police and the courts. This works to some degree with a small group of cooperative players, such as about half the nations of the European Union. But bring an outlaw nation such as Canada into the mix, and speed limits without police are a joke.

OK, Canada is hardly an outlaw nation, and that's my point. Canada is one of the most cooperative nations in the world, and a liberal, pro-Kyoto government was in power during the crucial period when nations were hammering out the protocol. But the country is still exceeding its Kyoto limit by something like 20 percent. Think what will happen once we include a lot of countries that are less cooperative and enthusiastic than Canada and when the requirements get tighter.

Keeping 180 nations in line requires an effective enforcement mechanism. Doing without one is completely irresponsible. But enforcement need not be heavy-handed. In fact, the poorest countries can be paid to comply by implementing a Clean Development Incentive and a Green Fund to

encourage compliance. And, when penalties are used, they only need to be strong enough to compel an average level of compliance, because only average emissions and average oil consumption matter for global climate change and energy security. In this chapter, I show how to enforce a global carbon price effectively but with the lightest possible touch.

Before we discuss how to enforce a global “speed limit,” though, we need a clear picture of exactly what a carbon speed limit looks like. The global carbon price target determines the “speed limit” for each nation. If that target is \$20, and a country emits 1 billion tons of carbon dioxide per year, its annual target revenue is \$20 billion dollars. That's all that must be enforced on average for all nations—their target revenues.

Light but Effective

The first principle of gentle enforcement is that it's OK for a country not to achieve the target price. However, in that case, the country must pay a fine. In other words, countries can buy their way out. Some people will prefer a more moralistic approach, but as we saw in Chapter 4, this benefits no one and complicates the system. A carrot-and-stick approach of fines and rewards will make the system more popular with both those buying their way out and those getting rewards. And this flexibility will not hurt the outcome at all.

The second principle of gentle enforcement requires that fines exactly pay for rewards. Revenue from fines should not be used to pay for other projects, because this will prove costly and cause resentment. You will hear this approach, with fines equal to rewards, called a revenue-neutral mechanism. It's a popular design because it works so well and so simply; it causes no fights over where the money comes from or who should get it.

Enforcement as a Race

Fines and rewards make up the carbon-pricing incentive that enforces the global carbon price target. But it may help to think of this as a race instead of enforcement. It's a race to higher carbon prices. The winners get prizes, and the losers pay for the prizes, so everyone is motivated. In this race, each country's score is its actual revenue collection minus its target revenue collection—that is, actual carbon revenues minus what the country would collect if it set its carbon price equal to the global target carbon price. Collecting too little revenue gives a country a negative score.

We also need a simple rule for handing out prizes. Remember that negative prizes—fines—pay for the real prizes. First, we set a prize rate, Z , which might be, say, 10 percent. Then, if a country collects an extra \$500 in carbon revenues, its prize is \$50. If it collects \$500 too little, it pays a fine of \$50.

If Z is too high, countries will over-comply to earn the big prizes. And if Z is too low, many nations will under-comply because the penalty is too small to

worry about. So we can attain average compliance—which is all we need—by choosing the right prize rate, Z .

That's a simple idea, but what if most countries do better than required or if most countries do worse? Then either the fines would not pay for the prizes or we would collect more fines than we need. Even with a good system for choosing Z , this can happen. Keeping revenue neutral requires adjusting the fines and the rewards when, at first, they don't balance each other out.

If we collect too much in fines we can just refund the extra proportionally to all countries. If we collect too little, it works a bit differently. We simply divide the fines among the winners in proportion to their scores.⁹ In either case, the fines exactly pay for the prizes.

Adjusting the Carbon-Pricing Incentive Rate, Z

The enforcement system I just described works fine provided the incentive rate, Z , is strong enough but not too strong. Economists should be able to make a reasonable first guess at Z . After that, administrators will have to adjust the rate. However, a simple rule can determine how to adjust Z . If the weighted global average carbon price is only half as high as it should be, then the next year double Z to provide twice the incentive. If the average carbon price is 30 percent above target levels, then reduce Z by 30 percent.

That's all it takes. Enforcement won't be perfect. Some years the carbon price will be a bit high, and some years it will be a bit low. But, on average, it will equal the global carbon price target. This means that the global carbon price will be accurately enforced—on average. Global warming is a slow process, and there is no need to be right every year.

How Big a Fine?

Would a government collect \$10 billion with a carbon tax to avoid \$9 billion in fines? Wouldn't the fine need to be \$10 billion—100 percent of the tax collected—to get reluctant countries to comply? Not at all. If a country collects \$10 billion in revenue, it can refund all of it to its citizens while a \$9 billion fine payment leaves the country. So the fines do not need to be so high. Even a \$1 billion fine or less may well encourage a government to collect and refund \$10 billion with a carbon tax, untax, or a cap-and-trade system.

So a low prize-and-fine rate, even 10 percent or less of revenue collected, is likely to motivate compliance. This is good, because big fines are unpopular, even when countries deserve them. Of course, any country can

⁹ This small change in the case when fines don't cover the prizes assures that any nation that sets exactly the global carbon price will never have to help pay for prizes. This is done to prevent any perception of unfairness. A more complete description of this rule is available at global-energy.org.

avoid a fine simply by setting its carbon price to the global target level—or a little higher to get a reward.

Enforcing the Enforcement

The police enforce the speed limit by handing out tickets—little slips of paper that you can just tear up and throw out the window. So obviously the police are not enforcing the speed limit at all. Well ... actually they play a crucial role, but without backup their tickets would do no good. To get people to drive slowly, we need three layers: the speed limit, the police, and backup enforcement with real muscle—prison or wage garnishment.¹⁰

Few people get their wages garnished for speeding. But garnishing is still part of the system. It's the threat of garnishment that does the job, and because it's a credible threat the government almost never needs to follow through. But without some real threat, the whole enforcement system is a joke.

The same holds for an international climate agreement. Without a real threat, countries will miss their targets and be issued tickets and throw them out the window, so to speak. More likely they will agree to pay, but they will never get around to it. After a while, some countries will see they don't have to pay the fines, and they'll start missing targets regularly, but not by too much.

But then the leaders of other countries will think, "If they are going to miss their target by 20 percent, we are going to miss ours by 20 percent." And eventually the whole system falls apart.

I cannot prove this will happen. But an organization with members who cooperate for mutual economic benefit is basically a cartel. And economists have studied cartels for a long time, and the main thing they've learned is that cartels tend to fall apart. And the bigger they are, the faster they fall apart. Once a cartel has more than a hundred members, it's likely to fall apart before it ever gets organized. The trouble is that standard cartels can make their own rules (speed limits), but the only real enforcement they have is this: If one member cheats, the others can shut the cartel down and punish everyone.

That doesn't work too well for cartels, and it won't work at all for an international climate organization. As an aside, the Organization of Petroleum Exporting Countries (OPEC) has (fortunately) had a huge amount of trouble with discipline, and so Saudi Arabia has to do almost all the work. We need to do a lot better than OPEC, and we can.

I see three reasons for optimism beyond the collective benefits of climate stability and energy security. First, the Clean Development Incentive that I describe in the next chapter will reward poor countries enough that they

¹⁰ Even the threat of taking away a license won't work, without backup enforcement for that penalty—something with real muscle.

will find it cheap to participate, and the poorest will even find it profitable. This eliminates many enforcement problems. Second, quite a few of the wealthier countries, who will have the most reason to cheat, seem to be cooperatively inclined. Third, the world has an ultimate enforcement lever that can do the job.

Sea Turtles and Ultimate Enforcement

As Joseph E. Stiglitz explains in his recent book, *Making Globalization Work*, the law we can use as the ultimate enforcement of the international climate agreement has already been tested—on sea turtles. We will get to them shortly, but first recall that countries should rarely be subject to the ultimate enforcement. People pay their speeding tickets rather than chance wage garnishment or prison. That’s what we want for the international climate agreement—something that’s strong and consequently almost never used.

Sea turtle populations exist around the globe. Several of the eight species are endangered, and one species faces likely extinction. The United States passed a law forbidding importation of shrimp caught in nets without U.S.-style turtle-excluder devices, but the World Trade Organization (WTO) struck down this law as arbitrarily and unjustifiably discriminatory. The United States lost the case because it provided technical and financial assistance to countries in the Western Hemisphere, but not to four Asian countries. They filed the complaint.

The United States then spent five years working with the complaining nations, except for Malaysia, which refused to cooperate. Next, the United States reinstated its turtle-protection policy, and Malaysia again filed a complaint with the WTO stating that the United States was not entitled to impose any prohibition in the absence of an international agreement allowing it to do so. This time the WTO sided with the United States.

The WTO made this significant statement in its initial decision: “We have not decided that sovereign states should not act together bilaterally, plurilaterally or multilaterally, either within the WTO or in other international fora, to protect endangered species or to otherwise protect the environment. Clearly, they should and do.” The WTO also noted that, under WTO rules, countries have the right to take trade action to protect the environment and exhaustible resources, and the WTO does not have to “allow” them this right. These decisions declare that countries can impose trade restrictions—even stopping unwanted imports entirely—to enforce their own global environmental policy. This means it’s legal for countries to enforce a global pricing policy using trade sanctions.

The WTO’s ruling allows for the ultimate enforcement of a global pricing policy. Trade sanctions have real teeth. They are just what we need.

The idea of enforcing a climate agreement with trade sanctions is not new. Harvard professors Richard N. Cooper and Jeffrey Frankel have written

about the idea (Cooper in 2000 and Frankel in 2004). And Nobel Prize—winner Joseph E. Stiglitz explains the idea in his book *Making Globalization Work* (2007). Although enforcement based on trade policy would be equally useful with a system of national caps or a system of global carbon pricing, Cooper and Stiglitz recommend coupling it with global carbon pricing.

Frankel says, “Trade sanctions are perhaps the most powerful multilateral inducement that can be applied to shirkers, short of military force.” Because they are such a strong measure, we should use trade sanctions cautiously. But they should be part of the system. We should use them to enforce fines, and they might induce holdouts to join the world climate agreement. But remember, this part of the enforcement system is focused more on high-emission countries, while the Clean Development Incentive and the Green Fund are focused more on low-emission countries.

The oil-exporting countries, which often subsidize carbon use—for example, Iran and Venezuela subsidize gasoline—will be the toughest challenge. It is to their economic advantage to undermine the agreement and to thwart all efforts to conserve oil and gas. However, their gains from keeping the price low domestically are relatively small. Selling oil cheaply at home when they could sell it for a high price abroad cancels most of the advantage they get from subsidized consumption. Because of this, trade penalties might just do the trick and get them to cooperate—albeit grudgingly.



Cooperation never comes easily, and when anyone can quit and still get 90 percent of the benefit, many will choose to not to honor their commitments. Two levels of enforcement are necessary to secure cooperation. The first is a simple and immediate penalty schedule for noncompliance. The second is a real threat that backs up the penalties. Trade sanctions can serve as the threat and are strong enough to rarely need using.

Primary enforcement of global carbon pricing is simply a modest set of rewards for countries that exceed the target and fines for those that fall short. Some countries will choose the reward, and others will choose to buy their way out of full compliance. This freedom to choose will make global carbon pricing more popular than it would be with heavy-handed enforcement.

chapter 10

The Green Fund

It is reasonable that everyone who asks justice should do justice.

—Thomas Jefferson

ABOUT ONE-QUARTER OF THE EARTH'S POPULATION has no access to electricity and uses fossil fuel only indirectly. It seems presumptuous to ask them to share, even in proportion to their small incomes, in solving problems that they have played no role in causing.

The Kyoto Protocol imposes no obligations on developing countries but allows them to sell carbon credits to developed countries with cap and trade. This addresses fairness, but it goes too far, as the U.S. Senate agreed when, in 1997, it passed a resolution by 95-to-0 opposing any treaty lacking obligations for developing countries. Also, as I explain in Chapter 6, selling credits for *not emitting* leads to gaming. This makes the Kyoto Protocol ineffective and expensive.

Global carbon pricing is more fair to begin with than emission caps are, but it too will need adjustment. Poor countries should not have to tax their low rates of carbon emissions at the same rate as wealthy countries tax their high rates of emissions, unless we give the poor countries some financial assistance. Since the enforcement mechanism of the previous chapter tends to equalize international prices, assistance is in order in the form of a Clean Development Incentive (CDI).

CDI payments are based on the twin “gold standards” of fairness described in Chapter 5. One is the untax and the other is equitable cap and

trade. In principle, either of these could be applied to the world, and ignoring administrative problems, they would produce exactly the same results if they were set at levels of equally strength. In both cases, high emitters would pay low emitters, and the payments would be the same.

This policy has the strongest claim to fairness because it treats everyone in the world equally. Neither the rich nor those who pollute the most are given any special right to pollute. But this system transfers a great deal of money from high-emission nations, such as the United States, to low emission nations such as India. In fact, a \$20 global carbon untax would result in a family of four in the United States paying about \$1,200 per year to poor countries. This is not politically feasible.

This is why Part 2 recommends primarily that countries impose their own carbon taxes and keep their revenues. However by adding a relatively small Clean Development Incentive that works like a global untax and like the equitable cap-and-trade system, we can improve fairness, encourage cooperation by low-emission countries, and provide every country with an additional incentive to reduce emissions. Such a CDI can use an incentive rate that is much lower than the global carbon price and still satisfy the U.N.'s requirement that the developed and developing countries have different responsibilities. This is because the CDI generates flows of funds between countries while global carbon pricing does not.

How the Green Fund Works

Although the CDI is almost identical in its effects to both a global untax and to a global and equitable cap-and-trade system, it is different in one respect. It applies to countries and not to individuals. But it is still calculated on the basis of per-capita emissions.

To see how it works, first consider a country with average emissions per capita. Under a global untax, the residents of such a country would pay the average amount of tax in total and each resident would receive a refund equal to the average amount of tax. So the country as a whole would see no net flow of funds. Similarly, under a global, equitable cap-and-trade system, a country with average emissions would not end up buying or selling any emission rights to other countries.

If, however, a country emits more than average it would pay more carbon tax than it would get back with a global untax, or it would need to buy rights from a low-emission country under an equitable cap-and-trade policy.

From this we see that the CDI should transfer funds from countries with above average emissions to countries with below average emissions. This is exactly what a Green Fund does. Conveniently, once an incentive rate is chosen for the CDI, all payments to and from the Green Fund are determined without further negotiating or bickering. Like the global pricing target used

under flexible global carbon pricing, the Clean Development Incentive rate that generates the Green Fund must be set by negotiation at a climate summit.

As an example of how the complete system might work, consider a global pricing target, 1 ton, and a Green Fund incentive rate of \$2/ton. In order to calculate the abatement cost of the \$30 carbon price, we must assume an amount of carbon reduction, so take this to be 20 percent. These values can be used to construct Table 1.

Table 1. Example: Clean Development Incentive with Global Carbon Pricing

	Starting Emissions per person	Internal carbon revenue	Abatement cost of carbon tax	Green Fund income	Total cost
	1	2	3	4	5
India	1 ton	\$24	\$3	\$6	-\$3
Average Country	5 tons	\$120	\$15	\$0	\$15
United States	20 tons	\$480	\$60	-\$24	\$84

Dollar values mean dollars per person per year. Assumptions: the global carbon price target is \$30/ton, the Clean Development Incentive rate is \$2/ton, and the reduction in emissions is 20 percent.

This example shows that quite a strong carbon policy, implemented with flexible global carbon pricing and the CDI, would be quite cheap. Even in the United States it would cost only \$84 per person per year or \$0.23 per person per day. Of course that is the average cost per person, and if countries use an untax as their method of carbon pricing, it will be much cheaper than that for the poor.

In the first column, the values for annual emissions per person are roughly right, but have been rounded to make the calculations easier.

The second column shows internal carbon revenues based on \$30/ton. These are in gray, because these revenues are not a social cost. All of the tax collected stays in the country and can be spent, used to reduce some other tax, or preferably, returned with an untax refund.

Column three reports the abatement costs of emission reductions caused by pricing carbon (for example, with a carbon tax). This calculation is explained in Chapter 3 and illustrated in Table 1 of that chapter. If the percent emission reduction is ER , then the formula for abatement costs is:

Abatement costs

This is the same formula used by the U.S. Environmental Protection Agency. Division by two is required because the most anyone will pay to save carbon (because of carbon pricing) is the price of carbon, P , but cheaper methods will be implemented first. Note that this cost, is just something that happens as people and businesses adapt, and it is not an explicit part of the system.

Column four shows Green-Fund payments. Note that for a country with average emissions per capita, this value is zero. For other countries, it is calculated from three values, the Green-Fund incentive rate G , the country's per-capita emissions E shown in column one, and the global average emission rate A of 5 tons per person. The formula is:

Green Fund incentive payment

A negative value, such as -\$30 per person per year for the United State indicates a payment to the green fund. Note that this payment has nothing to do with the flexible-carbon-pricing rules, except that it helps compensate poor countries for the burden of pricing carbon.

Column five is the abatement cost minus payments from the Green Fund, or for high-emission countries, abatement cost plus payments to the Green Fund.

Note that all countries are assumed to meet the global carbon pricing target of \$30/ton. If some country under-collects carbon revenue by, says, \$10 per person per year, and the pricing incentive rate, Z , is 10 percent (see Chapter 9), then that country would be required to pay an extra \$1 per person, which would be distributed to countries that over-collect carbon revenue. This would not affect the Green Fund, but the country would have slightly lower abatement costs plus the additional cost of paying the pricing incentive.¹¹

For completeness, here is the formula for the pricing incentive.

Pricing incentive payment

The variable r denotes the country's per-capita carbon-pricing revenue. If the formula gives a negative value then the country must pay, otherwise it is paid. Together the two incentive formulas plus the rule for adjusting Z and a restriction on Green-Fund payments, described below, are the entire proposed international system. Of course G and Z must be chosen by negotiation.¹²

China appears to have emissions slightly above average, but in fact a significant part of its emissions are actually exported in the form of steel, aluminum, glass and other energy-intensive exports. Taking this into account, China would probably be slightly below average in its emissions, so it will receive only a very small amount from the Green Fund. But compared with the United State, it would have only a quarter of the burden from internal carbon pricing, and it would not be required to make any payments to the Green Fund.

¹¹ As presented here, (but unlike in *Carbonomics*) the Green Fund incentive rate, G , and the pricing incentive rate, Z , are unrelated. However, there is a technical reason that G should not be too weak compared to Z . This is explained in "Flexible Global Carbon Pricing: A Backward Compatible Upgrade For The Kyoto Protocol" (available on global-energy.org and from the European University Institute).

¹² Although these formulas fully explain the basic system, slight modifications are needed for special cases. These are fully explained on global-energy.org.

The Two Clean Development Incentives

The CDI actually provides two completely different incentives, an incentive to comply with flexible global carbon pricing, and an extra incentive to reduce emissions. The incentive to comply only works for countries with below-average emissions—countries that receive Green-Fund payments. If these countries do not price carbon at the global target price, their Green-Fund payments are scaled back in proportion to their under-compliance. If they don't price carbon at all, they receive no Green-Fund payments. If they price carbon at \$10 when the global target is \$20, they receive only half their Green-Fund payments. This is a strong but gentle form of compliance incentive for countries receiving substantial Green Fund payments. That includes all countries with emissions significantly below the world average per-capita emission level.

The second incentive is the result of the Green-Fund formula being based on emissions per capita. Because of this, any country that reduces its emission per capita either saves money by reducing its payments into the Green Fund if it is a high emission country, or gains larger payments from the Green Fund if it is a low-emission country.

So CDI payments reward a country for reducing its per-person emissions. But what useful actions will this new incentive encourage that the carbon price incentive does not already encourage? This incentive might encourage the government to research the country's geology to find the best places for carbon sequestration. If this leads to more carbon sequestration, the country will be rewarded with a lower payments to the Green Fund, or higher payments from the Green Fund.. Or a country might conduct an advertising campaign to change attitudes and inform people how to save fuel more cheaply. Carbon pricing does not reward such actions, even though they would reduce the country's carbon emissions. But CDI payments reward all emission reductions.

What Is the Advantage for Developing Countries?

Altogether, half the world's emissions come from countries with below-average emissions—the countries that will receive Green-Fund payments. These countries will likely contribute more than half the emissions in the coming years and more than half the increased demand for oil. Green-Fund payments will help bring these countries into full compliance with the global-carbon-pricing policy.

India, for example, emits far less per person than the global average but has the world's fastest-growing population, which is expected to surpass China's by 2050. It is also growing economically at a tremendous rate. Bringing countries like India into full compliance will stop their subsidization of fossil fuel and cause them to increase its price instead. This will have a huge impact on the way their fossil-fuel use develops—much greater than the impact of

paying them for specific products under the U.N.'s Clean Development Mechanism. And paying them to join the world effort will prove far cheaper.

Also, participation in global carbon pricing will bring these countries into the global oil consumers' cartel, helping reduce world oil prices more than the U.N.'s clean development projects ever will. As developing nations join the effort to reduce oil use rather than subsidize it, the resulting reduction in the world price of oil may well cover the entire cost of Green-Fund payments.

In short, Green-Fund payments are probably the most cost-effective measure we can take to curb global warming. Developing countries have other, more pressing problems, and without these payments, they will simply feel it is unfair for them to clean up the mess we got rich making—even though we intended no harm. Without today's low-emission countries, we cannot solve the global problems of climate change and energy security.

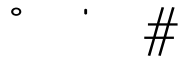


A uniform carbon price across all countries is the most cost-effective way to curb emissions. But a carbon price is a burden. The burden on a poor country is proportionally less than the burden on a rich country, because the poor country generally has less carbon to tax. But even this system treats the very poorest countries unfairly.

A Clean Development Incentive, based on emissions per capita, can correct the problem, and the resulting flows of funds are, in essence, the workings of a Green Fund of the type proposed by Mexico and other nations. Payments into and out of the Green Fund (CDI payments) should not be based on income, or on past emissions because, these payments constitute an important and potentially valuable incentive. If the payments depend on income then they provide a perverse incentive for countries not to develop and grow. If they are based on past emissions, then they provide a meaningless incentive for countries to change their past. Only by linking the CDI to emissions per capita can we take full advantage of the incentive value of Green-Fund payments.

Most important, the Clean Development Incentive can unite the world in a campaign for energy security and climate stability. Only with such a globally unified campaign will the world overcome its global challenges.

chapter 11



Cartel

*Foreign oil is costing us \$500 billion a year. In 10 years, \$5 trillion
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from one area to another in the history of the world.*

—Oilman T. Boone Pickens, 2008

THE TWO GREAT ENERGY CHALLENGES—climate change and energy security—are converging in the political arena. Oil addiction is now seen as central to both challenges, and many other energy questions are now seen to overlap. But only one broad approach can meet both challenges at once. The world must reduce its use of fossil fuel. And by historical standards, it must do so with unprecedented speed.

Without deliberate action, change will come too slowly to meet the climate challenge and too dangerously to meet the challenge of energy security. Without deliberate action, we will unnecessarily transfer trillions of dollars to the exporting nations, which, by blind luck, own the majority of the world's oil and gas.

Both challenges are global, and to solve both requires an international organization. Such an organization is inevitably an oil consumers' cartel. It is also a gas and coal consumers' cartel.

Any organization of producers aimed at reducing supply is a producers' cartel. Any organization aimed at reducing demand is a consumers' cartel. A consumers' cartel brings precisely the changes we seek. By definition, it reduces consumption, just as fixing the climate requires. And as the law of supply and demand predicts, it reduces the market price—the world price—of

oil, gas, and even coal.¹³ Reducing imports and lowering the price of oil lead to energy security.

To succeed we have no choice but to form a consumers' cartel. We can remain blind to this fact or we can embrace it. We can let the Organization of Petroleum Exporting Countries (OPEC) intimidate us into not saying “the dread words,”—consumers' cartel—as the *New York Times* called them in 1980. Or we can take full advantage of a cartel's benefits to unite the constituencies who most want to meet these two challenges—energy security and climate stability. So I say them again: Form a consumers' cartel. Learn to love those words and stop fearing OPEC. Protect our wealth and protect the climate.

Which Cartel Is Right?

OPEC has been a proud cartel from the start. Its purpose: to gouge the world, rich and poor alike. Moreover, at best its members make poor use of their spoils. *New York Times* columnist, and author of *Hot, Flat and Crowded*, Thomas L. Friedman has pithily described the result with what he calls the First Law of Petropolitics: “The price of oil and the pace of freedom always move in opposite directions in oil-rich ... states.”

The purpose of an oil consumers' cartel would be to stop the gouging and save the climate. Between OPEC and a consumers' cartel, there is no question which one is right. Yet the policy of the United States for thirty years, ever since Henry Kissinger gave up on the idea, has been “Don't bother OPEC, and no, no, no, we must never even mention the idea of having our own countercartel—a consumers' cartel.”

Are we idiots?

Or is some powerful anticonsumer force actively influencing policy from behind the scenes—some force that would lose tens of billions of dollars a year if the price of oil returned to a conscionable level? I'm not one for conspiracy theories, but I have a hard time swallowing the idea that politicians and the public keep going so far wrong without a lot of “help.”¹⁴

Is It OPEC, or Is It Nature?

The Saudis, in 1979, cut back on their plans to increase oil production, and they have not increased their production since. But perhaps the Saudis have less oil than they claim to have. They are secretive, so we don't know how much of

¹³ International coal shipments have been increasing rapidly and are now affecting the domestic price for coal.

¹⁴ It may be of interest that the National Petroleum Council, funded by the fossil-energy industry, is an advisory committee inside the U.S. government. It is part of the Department of Energy (DOE), brought in at the DOE's inception in 1977.

their oil remains. It can only hurt them if we decide to prepare for a shortage of oil, so they would not want to warn us.

OPEC's power may be spent. Perhaps we are up against nature instead of OPEC; peak oil could be the real problem. Does that mean a consumers' cartel is a waste of time? Just the opposite. Cartels are typically used to manipulate a market in which the other side is free and competitive. It's harder to go up against an opposing cartel. The International Energy Agency now estimates that if supply and demand get much tighter, we are in for extravagant price increases. If nature prevents a supply increase, it will work just as well to limit demand with a consumers' cartel.

It matters not at all whether OPEC constrains supply or nature constrains supply. Absent a consumers' cartel, the price goes up just as high, and the trillions still flow to OPEC and the oil companies. With a consumers' cartel, the price comes down.

Opportunity Knocks

In 2008, soaring oil prices again sparked outrage. But unlike twenty-five years ago, we have reason to hope for an international response. The Kyoto process and its successor have begun to organize the world as never before.

In fact, the world is practically begging for a consumers' cartel; people just haven't understood it. They simply know they want an agreement to use less oil. Because a consumers' cartel would lower prices and save countries such as the United States, China, India, Germany, France, and Japan tens of billions of dollars per year, a cartel motivates cooperation. It also provides the tangible benefits needed to quiet the acrimony of the international climate process.

It may seem a marvelous coincidence that one policy fix will take care of two energy challenges—energy security and climate stability. However, two extraordinary barriers stand in our way: the oil industry and environmentalists—strange bedfellows indeed. No, they have not joined forces or found a common cause. The oil industry blocks our path in order to protect its astronomical profits. Environmentalists, on the other hand—or at least many I've talked with—are simply confused about what a cartel does. A consumers' cartel would reduce oil prices, and lower oil prices will encourage oil consumption, and more consumption means more, not less, carbon emissions and global warming, or so many environmentalists seem to think.

Every step of this logic is correct in isolation, but here's the catch: A cartel does lower the oil price—the world price. But it's not the world price that drives consumption. Domestic oil prices drive consumption. A consumers' cartel must separate world and domestic prices, and we can do this by means of an oil tax or, better, an untax. So the real logic is this: A consumers' cartel would reduce *world* oil prices, but *domestic* oil prices will stay high to discourage oil consumption, and less consumption means fewer carbon

emissions and less global warming. One thing is certain about a consumers' cartel.

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I lowers the world price of oil,

I can only guess at who has blotted this old idea out of the collective consciousness, but I suspect those with the most to lose from a tax on oil. I can't prove it, but it looks like the oil companies have brainwashed us all into believing that taxing oil would not work or is impossible. OPEC at least is completely open about this and issues a new anti-gasoline tax report almost every year.¹⁵

But a cartel would work, and that's why the oil companies and OPEC hate the idea. And it would be possible if we opened our eyes. And it would make us richer, not poorer.

Tax oil and give all the revenues to consumers. That's dirt cheap. Consumers consume less oil. Demand for oil falls, and so does its price. America pays exporting nations less. We are richer. Consumers pay extra for gasoline but get it all back—100 percent—with an untax. The United States, acting alone, could have a significant effect. But a consumers' cartel that organized most of the world could send the world price of oil tumbling—but only by keeping the domestic price of oil high.

It should surprise no one, least of all environmentalists, to find that since OPEC and the oil industry hate a consumers' cartel, environmentalists should love one. Opportunity is knocking, but it is up to all of us to understand what the oil companies hope will remain confusing.

How It Works

The international policies that I have described in Part 2 of this book are the policies of a consumers' cartel. But as I explain in Chapter 1, cartels fall apart when they cannot agree on caps and cannot enforce them. Historically, this has happened with production caps, because most cartels are producers' cartels. But the same holds for consumers' cartels.

Both history and economics tell us that cartel members will fight over caps and cheat on them. The Kyoto Protocol tried caps, and look what happened. Most of the cartel members fought for and gained exemptions from caps. Others, such as the United States, agreed on a cap and then quit the cartel. Some bargained for a loose cap as the price of joining. Others joined with good intentions and then "forgot" to comply. Not only was all this totally predictable, Henry Kissinger's team foresaw it and discovered the remedy back in 1974. They called it a "floor price" for domestic oil.

¹⁵ see www.opec.org/library/SpecialPublications/Whogetswhat2008.htm

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When OPEC raises its price, consumers eventually use less oil. This is one factor limiting OPEC's market power.

With a domestic floor price for oil, OPEC can raise the world price to that level without consumers seeing any change in the price they pay. So OPEC knows consumers will not reduce consumption if OPEC sets its price to the floor price.

Several factors make it difficult for OPEC to play this game, but a more dynamic floor price might curb OPEC's market power even more.

This is an advanced design topic that is discussed in more depth on global-energy.org.

The proposals I have put forth in Part 2 of this book apply the essence of Kissinger's remedy from 1974. Ironically, he also first tried national caps oil usage only to find that the nations of his consumers' cartel, the International Energy Agency, could not agree on caps. Subsequently, they agreed on an international floor price for oil—in essence an international tax on oil carbon.

Part 2 proposes a uniform price on carbon for all members of the consumers' cartel. This avoids the disagreements caused by caps. Countries would be free to put a domestic floor price on oil as part of their compliance with the global carbon price. For strategic reasons, having to do with OPEC's market power, minor modifications of this approach would likely be beneficial.

One hundred fifty national caps will lead to nothing but chaos and failure. One simple carbon pricing rule will do the job right. It would even work for a producers' cartel if it could monitor the price. But producers can easily keep the prices they sell at secret, so they must rely on quantity caps, which are easier to check on but cause disputes. Consuming nations have an advantage because the prices at gas stations and for other retail transactions are public knowledge. So two things make price the instrument of choice for organizing a consumers' cartel. Price is both easy to agree on and easy to monitor.

Once a consumers' cartel is organized and functioning, how does it benefit individual countries? Any country can reduce the world price of oil simply by implementing an untax on oil. If the United States alone puts an untax on oil that is strong enough to reduce the world price by \$10 a barrel, this benefit accrues to every oil-importing nation. If two additional nations each used as much oil as the United States and put in the same effort—set the same tax rate, that would reduce the world price by \$30, and this triple benefit would accrue to all oil-importing countries. A cartel multiplies our benefits without increasing our effort. The benefits of a cartel are proportionally greater for smaller countries because they contribute less to price reduction but still receive the full benefit of a lower world oil price.

Organizing

Cartels fall apart. OPEC is the exception, but only because Saudi Arabia shoulders almost all the cost of accepting a low production cap. So how can a consumers' cartel bring about international cooperation?

The cartel idea consists of two parts, obligations and benefits. Members of a consumers' cartel are obligated to consume less than they would like, but they benefit from a lower world price. Cartels fall apart because quitting the cartel avoids the obligation but retains the benefit—in this case, a low world price and a better climate—which is the same for members and nonmembers.

Of course, this cartel problem is exactly the issue faced by an international climate organization—which is a cartel in disguise. Members are obligated to cut consumption of fossil fuel. But countries would rather take a free ride, consuming as they like while enjoying the climate benefits secured by the cutbacks of others.

Recognizing we have an oil consumers' cartel adds no new obligations; it only reveals new benefits. Obligations tear cooperative organizations apart, while benefits glue them together. Counting the benefit of lower world oil prices helps strengthen the bonds of cooperation.

But does recognition of the cartel concept—including a recognition that it would reduce the world oil price—really change anything? Yes and no. No one benefits directly from understanding the concept. But currently, no one is counting the benefits of lower world oil prices, so those benefits are not acting as glue. In fact, well over half the available glue for an international climate organization is likely being wasted. The oil price effect is uncertain, but it is large by most estimates (see Chapter 13 in *Carbonomics*). More importantly, lower world oil prices occur sooner than climate stabilization and are more tangible to most people. Especially in poor countries, the benefits of a better climate fifty or a hundred years hence pale in comparison with the benefits of cheaper heat and transportation in five or ten years. (Remember, this means cheaper for the country, but it means high oil prices plus refunds for individuals—that's why they will use less.)

Recognizing the benefits of a cartel also leads to a more effective international design as well as more-effective national policies. For example, the global-carbon-pricing policy recommended here, unlike cap and trade, allows countries to emphasize oil over coal. Oil-importing countries will likely take advantage of this to tax oil carbon more heavily than coal carbon, increasing the impact of the cartel on oil prices. That, in turn, will make the program more popular in countries like China and the United States, because it will help unite those concerned with energy security and those concerned with climate change.

The most difficult single step toward organizing the next stage of the Kyoto process will be to bring China and the United States into alignment. Together, they count for nearly half the fossil-fuel problem. For these two,

climate change is more of a divisive issue than a unifying issue. China notes that we have caused far more of the problem, and we note that China is now ahead of us on emissions and that its rate of emissions is rising faster than ours.

Rather than blaming each other, the two countries should focus on an external problems instead? The problem of sending trillions of dollars to oil exporters is something we have in common. And it is a huge problem for both countries. The United States is running out of oil. We've gone from 40 percent dependent on foreign oil in 1974, when Nixon resolved to kick the habit by 1980, to about 60 percent dependent now. China is less dependent now but is expected to be 80 percent dependent by 2030. We have much in common and much to gain from cooperation.

The strategy of tamping down demand for oil by organizing a cartel will provide relatively quick mutual benefits. Reducing our own demand for oil will help us and help China. If China reduces its demand as well, that also helps both countries. Both nations will soon realize that the more they enlist the help of others, the more we all benefit.

Understanding that we can fight high gas prices and energy dependence with the same organization that helps us fight global warming will change the game completely. The new game brings immediate rewards that hit home. Since we are building a consumers' cartel anyway, why not do it right, making use of its full benefits and taking credit for them?



Like it or not, an effective international climate authority will act as an oil consumers' cartel. We should like it, and we should take advantage of it. It requires no additional effort. Acknowledging and advertising a cartel's advantages for oil-importing nations, such as the United States and China, would induce cooperation better than the threat of global climate change.

The price advantage, which people currently ignore, is no small matter. When a research team at the Massachusetts Institute of Technology studied carbon caps set for an 80 percent emissions reduction by 2050, the researchers estimated that the world price of oil would be cut by 47 percent in 2050. That could save the next generation hundreds of billions of dollars per year. Now the oil crisis looks worse, and the benefits of a consumers' cartel look even greater.

Fortunately, this shift to the cartel perspective is purely win-win. A cartel, though it lowers the world oil price, can only do so by reducing consumption and emissions. Unlike fossil-fuel supply policies, such as subsidizing synfuels, and drilling for oil, a cartel is 100 percent climate friendly.

Charge It to OPEC: By the Numbers

Eventually, when we are all driving electric cars, reducing the price of oil will save us no money. But for the next few decades, it could save us a great deal. This calculation shows that, at least up to a 30 percent reduction in CO₂, a global climate policy is likely to be essentially free to the United States—paid for, in effect, by reduced payments to foreign oil companies.

This simplified example of a global climate-change program uses round numbers, which roughly reflect U.S. emissions and oil use in 2008 and 2009.

Initial Assumptions:

Pre-program CO₂ emissions are 6 billion tons per year.

The untax rate is \$50 per ton of CO₂.

The program results in a 30 percent reduction in each type of fossil fuel.

A 10% reduction in world oil use reduces the world price by 15%.*

The climate-change program covers three-quarters of the world's oil use.

The world price of oil is \$75 per barrel (bbl).

The United States uses 20 million bbl/day and imports 12 million bbl/day.

Calculation of the social cost of the program to society:

Social cost = $\frac{1}{2} \times \$50/\text{ton} \times 30\% \times 6 \text{ billion tons} = \45 billion/year .

Calculation of the savings from the reduced cost of oil imports:

World oil use decreases by $\frac{3}{4}$ of 30% = 23%.

The world price of oil decreases by $1.5 \times 23\% = 34\%$.

Savings per barrel imported is 34% of \$75 = \$25.

A 30% reduction would cut oil use (and imports) by 6 million bbl/day.

Savings on the remaining 6 million bbl/day of imports would be:

$\$25 \times 6 \text{ million} \times 365 / 1000 = \$55 \text{ billion per year}$.

How do consumers save \$55B/year without paying less for gasoline—which would make them use more oil and harm the climate? The carbon untax will raise the domestic price of oil more than it reduces the world price. Suppose it raises the domestic price by \$45 above the world price but reduces the world price by \$25. Consumers pay an extra \$20/barrel for oil, but they get, on-average, a \$45/barrel untax refund. In addition to the \$55B, consumers will save on oil purchased from domestic oil companies (not counted here because it is not a savings to the United States as a whole).

*This crucial value is documented in *Carbonomics*, Chapter 13. It is the smallest value found in seven studies that document the world oil price effect (including two from US DOE and two from IEA).

chapter 12

Conclusion

Both the common tax and the targets approach can achieve the so much in the development of the targets approach, it is understandable that there will be reluctance to abandon it. Yet there is not even a glimmer of an idea at the moment of how targets can be set that will be acceptable both to the United States and to the developing countries.

—Joseph E. Stiglitz, *Making Globalization Work*, 2007

STOPPING CLIMATE CHANGE requires a unprecedented shift in our use of technology and it requires global cooperation. Switching technologies gets all the attention, but that's the easy part. The switch is unprecedented only because it requires economic incentives from outside the market. The world has made similar market-driven shifts many times, and the pace of technological change has only quickened.

If we do cooperate, if we place a global tax on carbon, require more energy efficiency and subsidized research, the world will make the switch. And it would cost only about two percent of world GDP in 2050—when the world will be almost three times richer than it is now.

But global cooperation on a project of this scale has never even been attempted, and the differences between countries' responsibilities and capabilities make them naturally suspicious of each other. Even nature has conspired against cooperation. You receive only a billionth—or probably much less—of any benefit to the climate that you cause by your own actions. And even when a country the size of France takes action, it receives only about a

hundredth of the benefit it contributes to the world. Because of this, any country that shirks its responsibility will gain, at no cost to itself, almost as much benefit, from all those who cooperate, as if it did nothing at all.

To compensate for these barriers to cooperation, the world must invent a system that rewards cooperation and discourages countries from avoiding responsibility. But before that system can function, each country's responsibility must be agreed upon. This book focuses on these two essential problems—assigning responsibility and cooperating on that basis. These are the two most crucial problems of climate policy, perhaps because they have been almost completely neglected.

But the problem of assigning responsibility has also gained importance because the main proposal, mandatory emission caps, has proved to be one of the worst possible approaches to assigning responsibility. Of course caps were not proposed because they seemed to lead toward cooperation but because they were thought by some to be necessary. Nobel economist Joseph E. Stiglitz, in his book *Making Globalization Work*, has best explained the difficulties posed by caps for international cooperation.

“The principal difficulty with Kyoto is agreeing by how much each country should reduce its emissions. ... There is no set of *generally accepted principles* for allocating rights to usage. Setting target levels is so contentious because allowing a country high emission levels is tantamount to giving it money—a fact that has become more obvious with the advent of carbon trading [emphasis added].

He also tells us that “Under the common [global carbon] tax proposal, all of these issues are avoided.” This is because a carbon tax comes with a “set of generally accepted principles” for assigning responsibility, while caps do not. The lack of such generally accepted principles for caps is universally recognized, which is why each cap must be individually negotiated.

Stiglitz explains the central issue raised by developing countries about caps by paraphrasing their critical question. “By what right are the developed countries entitled to pollute more than we are, simply because they polluted more in the past?” The United States, he tells us “has not provided any coherent defense of why it should be entitled to pollute more than others.”

The solution to this dilemma—carbon pricing—has been proposed by many, but considering the absolute refusal of the American climate negotiating team to discuss a carbon tax, three names deserve mention. The first, of course, is Stiglitz, but beside him stand William D. Nordhaus, the most prominent U.S. energy-and-climate economist for at least the past thirty years, and James E. Hansen, the climate scientist most respected by environmentalists. All three of these top climate experts consider caps to be a disastrous approach to cooperation and a carbon tax to be the desirable and necessary alternative.

This preference is not due to the efficiency advantage that a carbon tax has over a cap but rather to the problems with cooperation caused by caps and the opportunity they present for subversion and corruption.

Flexible Global Carbon Pricing

Mandatory national carbon caps have stalled the Kyoto process for 15 years, but that does not mean cap-and-trade needs to be abandoned. We simply need to allow countries the choice of committing to a carbon tax instead. Flexibility is the key to agreement and cooperation. It does not matter whether a country requires carbon permits costing \$30 a ton or imposes a carbon tax of \$30 a ton.

Flexible global carbon pricing sets a global target price for carbon and lets countries price carbon with either a cap or a tax. Like cap-and-trade, it lets countries underachieve and pay others to reduce emissions for them (similar to buying carbon permits from other countries). And it pays countries a bonus for overachievement. By adjusting the rate of payment for over- and under-achieving, it equalizes these two behaviors, and that causes the global average carbon price to equal the global target.

When countries impose a carbon tax, they keep all the revenue they collect, which makes the policy very inexpensive. Consequently, countries will not like paying others to meet their requirements—that sends money out of their country. Because of this, a rather low price for under and over-achieving will keep the global carbon price on target.

While equality of tax rates is a generally accepted principle of taxing, another principle is needed as well. Generally the poor should receive some help if they are to be taxed at the same rate as the rich. In this case, poor countries have caused much less of the climate problem, so there is an extra reason to apply this principle. For this reason and to respect the U.N.'s principle of "differentiated responsibilities," a Clean Development Incentive is added to Flexible Carbon Pricing.

This incentive collects revenues from countries with above-average emissions and transfers them to those with below-average emissions. In this way it implements the concept of a Green Fund. In the process, these transfers create two beneficial incentives. First, because they are based solely on emissions per capita, they provide a strong incentive for emission reductions. Second, because distributions from the Green Fund are curtailed to the extent a country does not hit the global carbon pricing target, the Clean Development Incentive provides a strong motive for cooperation.

Reduce Cost to Encourage Cooperation

The biggest impediments to cooperation are actual costs and the fear of unknown costs. Caps amplify this fear because no one knows what it will cost to meet a cap. The best way to minimize both cost and the fear of

unpredictable costs is to implement an untax, as described in Chapter 3. The tax part of the policy is predictable—unlike cap-and-trade costs. And the "untax" refunds to consumers all the money collected by the tax. This proves to everyone that the tax is low cost. Also as Chapter 3 explains, the untax works just as well as a carbon tax to reduce emissions.

It works because the refund is the same for everyone and does not depend on how much carbon they use. If you reduce your carbon use, you pay less tax, but you get the same refund. Because it works, the untax is not free. It causes people to spend money or change behavior to avoid emitting greenhouse gases and to reduce their carbon tax payments. The only net cost to society comes from actually reducing emissions. Unlike subsidies, which allow people or businesses to spend other people's money, emission reductions under an untax result from people spending their own money. There is no better way to control costs.

If the carbon tax is \$20 per ton, no one will spend more money or effort (valued in dollars) than \$20 per ton to reduce emissions. This puts a lid on cost. At most, emission reductions will cost \$20 per ton under such a tax. And on average, reductions will cost about half that much, because there are some very inexpensive ways to reduce emissions and, of course, these will be done first. Using this insight, Chapter 10 evaluates one possible implementation of flexible global carbon pricing.

Suppose that the global target price for carbon is \$30 a ton, and the Clean Development Incentive (CDI) uses an incentive rate of \$2 a ton. Suppose that together these cause a 20 percent reduction in emissions. In this case, because of the Green Fund, as implemented with the CDI, India and similar low-emission countries would actually come out ahead. At one ton of emissions per person per year, the net cost to India of imposing a carbon tax would be about \$3 per person per year and it would receive about \$8 per person per year from the Green Fund.

A country with average per-capita emissions would have a cost of about \$15 per person per year, and would receive no payments from the Green Fund. The United States would spend about \$60 per person per year adapting to the carbon tax and about \$30 per person per year in payments to the Green Fund. This comes to just 25 cents per person per day.

Now even \$15 per person per year for an average emitter like China may sound like a lot for the poor in China. But remember, China can choose to implement its carbon tax as an untax. In this case the poor would receive a refund of \$15 per person per day and they would pay far less in carbon tax. So China's poor would clearly benefit from such a policy.

In summary, flexible global carbon pricing with a Clean Development Incentive avoids the risks and divisiveness of carbon caps with no loss in effectiveness. And if implemented with something like an untax, it will be transparently inexpensive, and will benefit the world's poor.

appendix

Carbon Pricing: What Counts?

Taxpayers are being asked to provide huge subsidies to oil companies to produce oil

—Massachusetts Congressman Edward J. Markey, 2006
(Cosponsor of the cap-and-trade bill that passed the U.S. House)

NO ONE LIKES TO PAY FULL PRICE. And nations are no different when it comes to carbon. That's why we need a global policy. Because leaders don't like pricing carbon (or capping carbon), they will look for the easiest way that still counts to comply with global policy. So it matters what counts. If taxing vodka counts—alcohol does contain carbon—then countries will tax liquor more and gasoline a little less. That won't help the climate, because vodka, though a fuel of sorts, is not a fossil fuel, it's a biofuel.

For the most part, deciding what counts is about as simple as not counting the vodka tax. But a few subtler questions remain. In this chapter, I show how to resolve some of them.

Subsidies

Subsidizing oil is the reverse of taxing it. So in calculations to determine a nation's carbon price, fossil-fuel subsidies reduce the carbon price. A sensible carbon pricing policy deducts fossil-fuel subsidies from carbon revenues. Because of this, as I explain in Chapter 7, global carbon pricing takes a big step beyond the Kyoto Protocol, even if the global target price is zero.

Energy subsidies are common in developing countries, especially in those rich in fossil fuel. China spent over \$20 billion in 2007 subsidizing gasoline. That means it has put a negative carbon price on gasoline. But even

the United States still subsidizes fossil fuels, and pressure is mounting to extend even larger subsidies to fossil synfuels.

Counting subsidies properly—that is, negatively—shines a spotlight on them and removes most of the political incentive to provide them. For every dollar of subsidy, the government would need to collect a dollar of carbon tax. Why bother?

Cap-and-Trade Permits

Cap-and-trade permits sell at a positive price even when governments give them out for free. I discussed this in Chapter 2, but it is worth revisiting. What matters with permits is their market price, even when companies get them for free. If the owner of a coal plant needs 1,000 permits and gets 1,010 for free, it might seem as if the company would not have any incentive to use its coal more efficiently. But, in fact, the coal plant has exactly the same incentive as it would if it had to buy all its permits at the market price. Suppose the market price is \$30 for a 1-ton permit. First, the company sells its 10 extra permits for \$300. Then the plant manager thinks, "If I could save 100 tons of carbon, I would need 100 fewer permits and could sell them for \$3,000."

So the motivation to save carbon depends on the market price of permits and nothing else. A \$30 carbon tax provides the same incentive as requiring permits with a market value of \$30. Coal plants save the same amount of carbon under either scheme, so both plans should count the same under a global-carbon-pricing policy.

Even if a company receives free permits, when it forfeits those permits to cover its carbon emissions, it is like paying a carbon tax. So administrators of a global-carbon-pricing system can check the market price of permits each month to estimate the value of permits forfeited. This value counts as carbon pricing revenue, just the same as carbon-tax revenue does.

Existing Carbon Pricing

What if a nation already has an oil tax or a cap-and-trade system in place when a carbon pricing system starts up? Is that counted? There is no need to punish good habits started in the past, so all carbon charges are counted, new or old.

Caps tend to punish past good behavior and reward past bad behavior. The better a country has done in the past, the more reasonable it seems to assign it a tighter cap—which is, in effect, a punishment. The same holds true when a program resets caps. If a country has "not been able to" meet its cap, that is an argument for a less aggressive cap in the future. A major problem with individually negotiated caps is that the system often punishes good behavior with a tighter cap and rewards bad behavior with a looser cap. We should not make this mistake with global carbon pricing.

Taxing Gasoline for Roads

What about a tax that a government places on gasoline for the purpose of paying for new roads? This is more difficult, because the tax may, in effect, be a tax on road usage and not on carbon. Sorting this out would be impossible in practice, so the architects of a global-carbon-pricing system should make an arbitrary decision and apply it uniformly across countries. Perhaps the simplest rule is to count all taxes on gasoline as carbon taxes.

Deception

Another problem is the possibility of deception. A country could tax gasoline at the pump but secretly subsidize oil refineries on a per-gallon basis. We must take this possibility seriously because, if it is easy to get away with, the international agreement would collapse. Fortunately, it is difficult to keep secret a multibillion-dollar subsidy.

Because the price of oil and the cost of refining oil are well known, it is not too hard to predict what gasoline should be selling for. If a country places a fifty-cents-per-gallon tax on gasoline but the price doesn't go up by fifty cents per gallon, it's pretty obvious something is fishy.

If a country is caught deliberately failing to report a carbon subsidy, the unreported amount should be tripled and subtracted from the country's carbon revenues. Because the enforcement mechanism that I describe in Chapter 9 is self-funding, any country that cheats is harming other countries. Those countries not engaging in dishonest practices will have good reason to demand that deception be dealt with effectively.



As with any financial incentive or regulation, it's important to define carefully the rules for compliance and rewards. In this respect, global carbon pricing does not appear to present any unusually difficult hurdles.

Carbon subsidies are like negative carbon pricing and must be counted as such. Tax subsidies may be complex, but Congress keeps track of tax expenditures on a regular basis, so this is not a new problem. Permits must be valued at their market price. Existing carbon taxes should all count, and administrators of the program should detect and punish cheating.

None of this is particularly difficult, and two aspects of the proposal give reason for optimism. First, countries with low emissions will likely gain a net benefit due to fairness payments. They will want to remain in good standing. Second, most countries stand to gain from the success of global carbon pricing.