After Kyoto: A Global Scramble for Advantage

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The 1997 Kyoto Protocol is generally viewed as having set carbon emission reduction goals for the developed world for the purpose of avoiding global warming, a tragedy of the commons.[1] But instead of avoiding the plaguing free-rider problem that works in favor of tragedy, the protocol allows uncontrolled growth in carbon emissions from the developing world, which will more than offset reductions elsewhere. Strictly speaking, the Kyoto Protocol is not about avoiding a tragedy of the commons. It involves much more than that.

Apart from expectations that meeting the terms of the protocol will not reduce future emissions, the scientific basis for Kyoto's massive and costly undertaking is far from settled (Singer 1999). Competing models that seek to link human behavior to climate change yield mixed results, which is to say that temperature changes may be caused by solar activity, clouds, or ocean temperature changes. There is also contradictory evidence on temperature change itself. It is not a foregone conclusion that temperatures, though increasing in the last few years, are rising systematically. Nor is it clear that human activity contributes to the current temperature increases.

Putting the scientific questions to one side and viewing the protocol on its own terms, there is serious question whether it is primarily about carbon emission reductions and global warming or about something else. An analysis of the agreement and of the post-Kyoto strategizing suggests that control of global warming is largely symbolic, which does not gainsay its vital importance to environmental groups. The real effects of the protocol relate to cartelization and efforts by interest groups and

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countries to gain competitive advantage in a globally competitive world. Global warming may be just the right wrapping for a major rent-seeking package (Yandle 1998).

To support this assertion, or to refute the null hypothesis, it is necessary to (1) provide evidence from the agreement itself that cartelization is a real possibility and that differential effects across countries, industries, and firms offer significant incentives for political agents to raise rivals' costs; (2) show that the resource costs of meeting the terms of the protocol are large enough and the opportunities for gaining markets or protecting existing ones fruitful enough to justify the cost of cartelization; and (3) provide clear evidence that countries, firms, and industries are indeed behaving strategically in efforts to use Kyoto as a rent-seeking endeavor. To accomplish these three tasks, I first discuss the global commons problem and provide background information on the Kyoto agreement that shows differential effects across countries. I then survey research on the costs of Kyoto, showing that the resource costs and transfers involved are massive and identifying potential winners and losers in particular product and geographic markets. I provide anecdotal and statistical evidence regarding the behavior of energy firms, trade associations, and countries to demonstrate the crucial importance of Kyoto's environmental symbolism in achieving cartelization goals. Finally, I offer some thoughts on Kyoto and alternate policies.

The Global Commons and the Kyoto "Solution"

The Commons Problem

Most environmental problems begin with a commons, an unrationed resource that tends to be overexploited. Steps taken to ration activity on the commons are justified as being necessary to avoid the tragedy of the commons (Hardin 1968; Anderson and Leal 1991). Garrett Hardin and others remind us that property rights and other rationing institutions can emerge, converting a tragedy to triumph. But the Buchanan-Tullock analysis of political instruments chosen for accomplishing this feat warns us that rent-seeking actions taken to define regulatory strategies can earn a high private return (Buchanan and Tullock 1975). In their story, special interest groups and the politicians who "solve" the commons problem can share monopoly rents if the appropriate regulatory remedy is applied.

Appealing to the commons problem when considering global warming is both logical and politically useful. Although its scarcity is still not well established, the upper atmosphere is clearly an unrationed resource. Any steps taken to alter this nonproperty arrangement will require global political action. Yet the commons imperative is by its nature a centralizing force at any level of human activity. Decentralized spheres of private action and exclusive private rights—what might be termed

1. For a lay summary of the protocol, see Sparber and O'Rourke 1998. For the complete text, see United Nations Framework Convention on Climate Change 1998.

individual or local sovereignty—are reduced as collective action expands. In addition, as the scope of action expands, special-interest groups seek to have wealth redistributed in favorable ways. Of course, successful steps taken to avoid real tragedies can generate social gains by precluding the destruction of valuable assets. But as institutions form, there are trade-offs to consider. Rent-seeking costs may be larger or smaller than the gains from avoiding a tragedy of the commons.

As the dimensions of the commons to be managed expand beyond the community to include the state, then the region, the nation, and finally the world, the diverse rules that govern heterogeneous communities give way to ever more homogeneous regulations that can restrict competition in the name of environmental protection. Customs, traditions, and institutions such as the common law tend to be pushed to one side as statutes and treaties form a more extensive social order. Local sovereignty is compromised as collective decision-making is delegated to state, national, and then international bodies. And the potential rents to be earned by competing countries, far-flung global firms, and accommodating politicians achieve significant value, but not without cost.

Another trade-off accompanies the transfer of sovereignty from smaller to larger communities (Yandle 1997, 29–30; Ostrom and Schlager 1996, 46). When remotely determined homogeneous rules are imposed on diverse communities, some efficiencies in resource use, where more readily measured costs are weighed against locally perceived benefits, are exchanged for the avoidance of more remote costs, not easily observed at local levels. As control becomes more remotely determined, the efficiency losses tend to increase. It is obviously important that the marginal benefits from avoiding global costs exceed the ever-increasing marginal costs of such local efficiency losses.

The Kyoto Protocol is a case in point. The December 1997 agreement to reduce greenhouse gases, endorsed by representatives from 174 nations, joins an estimated 180 other environmental treaties on deposit with the UN Secretary General (Committee to Preserve American Security and Sovereignty 1998). Kyoto and the other treaties differ fundamentally from national decisions to legislate in the interest of cleaner air or water. First, the protocol establishes a relatively homogeneous rule—greenhouse gas reductions based on 1990 emissions—for scores of heterogeneous communities. Next, constitutional constraints and domestic rules of law that normally protect property rights and sharpen the spur of competitive behavior in domestic economies can be relaxed in the name of avoiding global warming. Coordinated output restrictions, ostensibly for environmental protection, are viewed benevolently.

How the Protocol Evolved

The Kyoto Protocol is an evolved agreement rooted in the notion that developed countries, which are necessarily large energy users and greenhouse gas producers, should bear the brunt of reducing emissions in the name of avoiding costly climatic changes.

This idea, discussed formally at Toronto in June 1988 and considered by the U.S. Congress in 1989 in a proposed bill, the Global Warming Prevention Act, was fundamental to commitments reached in 1992, when representatives of 160 nations attended the Rio de Janeiro Conference on Environment and Development (Manne and Richels 1991, 88).

Efforts to contain greenhouse emissions were strengthened at the 1995 Conference of Parties to the Rio de Janeiro Agreement, yielding the Berlin mandate, which stressed the importance of gaining national commitments to greenhouse gas reductions. Then, an ad hoc group that met in Geneva in 1995 and again in 1996 called for binding mandates for thirty-eight developed countries known as Annex I, including primarily the members of the Organization for Economic Cooperation and Development (OECD) and eastern European states. Cooperation and emission reporting were expected of developing countries, and a stronger commitment was expected from eastern European states in transition, but no quantifiable emission reduction commitments were called for. A follow-up meeting for resolving issues left on the Kyoto table took place in Buenos Aires in November 1998.

The Kyoto Protocol, endorsed in Kyoto on December 11, 1997, now awaits ratification by the U.S. Senate, which has indicated that it will not ratify the treaty until the developing world makes reduction commitments.[2] The protocol sets 1990-based emission reductions for greenhouse gases (primarily carbon dioxide) for the Annex I countries, to be achieved by the "commitment period," 2008–2012. At that time, emissions will be averaged across the designated years to determine compliance.

For the protocol to become binding, fifty-five countries must ratify it—which implies that seventeen non–Annex I countries must give their approval—and these ratifying countries must account for at least 55 percent of the desired emission reductions. In April 1998 the European Union members officially ratified and signed the Kyoto treaty, accepting an 8 percent reduction of carbon emissions over the next thirteen years (Leopold 1998). The United States, which had accepted a 7 percent reduction, still had not ratified the agreement, and the likelihood of its doing so was slight. In April, Japan, Australia, Brazil, Canada, Norway, and Monaco signed. Argentina and Pacific island nations had signed earlier.

As of June 1998, forty countries, representing 38.9 percent of the total pledged emission reductions, had officially committed themselves to the December 1997 protocol (List of Signatories 1998). At the November 1998 Buenos Aires meeting, Argentina and Kazakstan agreed to join the Annex I countries in cutting emissions (Fialka 1998), and the United Nations exerted pressure on African countries to join the list of volunteers (BBC News 1998).

2. A nonbinding resolution (S.R. 98) was passed in the Senate by a vote of 95 to 0 on July 25, 1997, requesting that the executive branch sign an agreement only if a commitment is made by developing countries to reduce emissions (Freedman 1997).

The United States was left holding the high trump card. By the terms of the protocol, the parties to the convention have until March 15, 1999, to make their commitments binding. Because it accounts for 36 percent of the industrialized nations' emissions and 23 percent of the world's, the United States alone can prevent the agreeing nations from reaching the 55 percent reduction in emissions required for the agreement to become binding. But whether the protocol is finally ratified or not, Kyoto-inspired restrictions are already in the works.

The Magnitude of the Task

How large is the Kyoto challenge? Consider the tons of emissions to be reduced. In 1990 the Annex I countries, with the United States leading, produced roughly 64 percent of all greenhouse gases, which then totaled 6 billion tons annually.[3] The developing countries, led by China, produced the remaining 36 percent. Forecasts of emissions for the year 2015 place total emissions at 8.45 billion tons, with the developing countries producing 52 percent of the total; the developed countries by then would be minority players. By the year 2100, 19.8 billion tons of greenhouse emissions are expected, with the developing world producing 66 percent of the total.

Data on projected atmospheric concentrations of carbon dioxide illustrate the Kyoto challenge in yet another way. In the absence of any intervention—what some call business as usual—concentrations will rise from 1990 levels of 353 parts per million (ppm) to 383.5 ppm by 2010 (Business Roundtable 1998). With full Kyoto compliance, which means that the developed countries achieve their reduction targets while the rest of the world—largely, China and India—is unconstrained, year 2010 concentrations are projected to reach 382.0 ppm, which is roughly 8 percent higher than 1990 concentrations. Comparison of projected year 2010 business-as-usual concentrations with full-Kyoto-compliance levels shows a 0.39 percent reduction in concentrations, an amount that would be undetectable.

Massive Costs and Differential Effects

The Kyoto agreement contains emission reduction targets for the thirty-eight Annex I countries that average about 5 percent. Table 1 shows the relevant data for country groups and individual countries. As indicated, commitments range from an 8 percent reduction for western European countries to an 8 percent increase for Australia. The table also shows the implied Kyoto emission target and the gap that results when the target level of emissions is subtracted from predicted uncontrolled year 2010 emissions. The gap amounts to a total reduction of 940 million metric tons of carbon.[4] Applying a cost per ton of $23 to $300 for removing these emis-

3. These data are from Antonelli and Schaefer (1997, 18) and are drawn from reports of the Intergovernmental Panel on Climate Change.

sions—the wide range of estimates found in various studies to be discussed later—one obtains a total cost that ranges from $230 billion to $3 trillion. These potentially massive amounts represent costs that some people will pay and revenues that other people will receive. For the terms of Kyoto to be met, the transactions must be completed by the years 2008–2012. The last column of the table shows the implied percentage reduction for each area. This indicates the relative burden. Two countries, Japan and the United States, stand out with respect to the burden to be borne. The differential effects are significant.

Table 1: World Total Carbon Emissions, Annex I Countries (millions of metric tons per year)

Region/ Country	1990 Emissions	2010 Emissions	Kyoto vs. 1990	Kyoto Target	Kyoto Gap	Gap to 1990
Japan	308	466	94%	290	176	–57.3%
United States	1,337	1,803	93%	1,243	560	–41.9%
Canada	137	182	94%	129	53	–33.8%
Western Europe	1,016	1,208	92%	935	273	–26.9%
Australia	100	127	108%	108	19	+19.0%
Former USSR	1,029	872	100%	1,029	(157)	NA
Eastern Europe	309	306	94%	290	16	–5.0%

Source: Business Roundtable 1998, 12.

Carbon Credit Trading and Cartel Opportunities

Provisions of the Kyoto agreement allow the trading of emission credits across the world. Though controversial and still embryonic, such trading figures into the cost estimates just mentioned. If an industrial firm in the United States, for example, could purchase emission reductions from sources here or in another country at a price less than its control cost, the purchase of those carbon credits could reduce total control costs. But for purchases to occur, there must be suppliers as well as an effective institutional infrastructure to accommodate the trading.

The data on tons of emissions to be reduced by country and region illustrate the challenge faced by the United States, which is responsible for 560 million metric tons of reductions. Assuming emission reduction trading were operational, the states of the former USSR and eastern Europe would offer a fertile market for the purchase of credits. But the total tons of emissions to be reduced by the United States is large when compared with the excess available to the former USSR and with total emission magnitudes elsewhere. Domestic trading, which would take place at higher

4. These data are taken from "The Kyoto Protocol: A Gap Analysis" (1998, 32), and were developed by Dr. Bert Bolin, a member of the Intergovernmental Panel on Climate Change.

cost, could supplement a world market for emission credits if one should arise before the 2008–2012 deadline. But what if a group of countries could cartelize and exclude the United States?

Throughout the Kyoto negotiations, leaders from the European Union (EU) opposed credit trading as a substitute for taking action in each country. At the same time, the EU leadership favored an exclusive EU carbon-credit trading market, which the United States opposed. Finally, emission trading entered the agreement, and the EU achieved its goal: a trading cartel that allows the EU flexibility in setting reduction goals for member states but excludes the United States and Japan, the two countries with the most to gain by trading and the most to lose if the trading option is foreclosed.

Estimates of the Cost of Kyoto

Academic Studies

Academic economists have done substantial research on the economics of controlling greenhouse gases (Manne and Richels 1991; Nordhaus 1991; Pearce and Barbier 1991; Whaley and Wigle 1991; Jorgenson and Wilcoxen 1993; Kosobud et al. 1994; Larsen and Shah 1994; Sinclair 1994; Holtz-Eakin and Selden 1995; Carrato, Galeotti, and Gallo 1996; Chen 1997). Among the studies are estimates based on large national econometric models, reports focused on Europe, and several studies that examine the relative costs associated with different regulatory instruments including emission taxes and permit trading.

When reviewed together, the academic studies indicate that carbon emission reductions of the magnitude called for by the Kyoto Protocol cannot be obtained at low cost. For example, the Jorgenson-Wilcoxen (1993) study assumes that U.S. carbon emissions would be held to 1990 levels and—incorrectly, as it turns out—that a 14.4 percent reduction in year 2020 emissions would achieve 1990 levels. (More current data indicate that a reduction of at least 36 percent would be required.) The authors apply emission taxes as the control instrument. Even with an assumed reduction much lower than that required by Kyoto, the study indicates that coal would be taxed at $11.01 per ton, oil at $2.31 per barrel, and natural gas at $0.28 per thousand cubic feet. The resulting revenues would yield $26 billion annually to the federal government. The authors find that coal would sustain a 40 percent price increase and an associated 26 percent decline in production. They predict that the rate of GDP growth would decline by an amount that ranges from a small fraction of a percentage point to one percentage point, relative to baseline growth.

Making somewhat similar assumptions and again applying emission taxes as the control instrument, David Pearce and Edward Barbier (1991) examine the U.K. economy. They estimate that a 67 percent increase in taxes for coal, along with 40 percent for gas and 54 percent for oil, would be required to achieve 20 percent reduction

of U.K. carbon emissions by 2005. Pearce and Barbier emphasize that unilateral action can accomplish very little. If there is an uncontrolled component of the world economy, domestic energy use and carbon emissions may fall, but importation of substitutes could lead to carbon emission replacement by exporting countries.

Allan Manne and Richard Richels (1991) come close to meeting some of the terms of Kyoto in their global analysis of the cost of achieving 20 percent reductions in emissions by the year 2030. They accurately assume that the industrialized world accepts the reduction goal and the developing world does not. Their estimates of GDP effects indicate that the United States would sustain rising GDP losses across the control period, hitting a net loss of 3 percent by the year 2030. Losses for the OECD countries are shown to be much lower, reaching 1 to 2 percent in 2030. Mexico and other oil-producing countries sustain even larger losses, and China has the largest losses of all, losing 10 percent of GDP in the last half of the twenty-first century. They show that the price of coal increases fourfold and, remarkably, that substitution effects cause the demand for oil to increase, not decrease. This study illustrates Europe's relative gain from the protocol and helps to explain China's adamant opposition to it.

Other academic studies offer similar findings. Most relevant for present purposes, the research tells us (1) that the potential cost of the Kyoto Protocol to the United States would be far greater, both in total and in relative terms, for the United States than for other industrialized countries; (2) that a number of major European countries, including the United Kingdom and Germany, have already made adjustments that lighten their load; (3) that producers of substitutes for coal have much to gain; and (4) that the costs and the effects of compliance would differ significantly across countries, depending on the nature of the control instruments and the permit markets.

Economic Studies by Consulting Firms, Government, and Trade Associations

As the details of the emerging Kyoto Protocol became more predictable, groups with the most to lose or to gain, government agencies, and consulting firms came forward with more focused studies of Kyoto's impact. In some cases, the findings help us to understand more about the stakes involved for special-interest groups. The government studies arrive at cost estimates that vary far more widely than those in either the academic research or the work of private consulting groups. The estimate by the President's Council of Economic Advisers, for example, indicates that achieving the carbon reductions required by the protocol would impose very low costs on the U.S. economy.

The consulting firm DRI/McGraw-Hill provided an economic impact study for the United Mine Workers/Bituminous Coal Association, itself an interesting alliance (Impact of Carbon Mitigation Strategies 1997). The study contains scenarios in which greenhouse gas emissions would be stabilized at 1990 levels and at 10 percent lower

levels by 2010. Instead of taxes, the study assumes government-issued marketable permits to be the control instrument. The report estimates that permit prices would range from $180 to $280 per ton of carbon across the control period if the goal were to maintain 1990-level emissions. Permit prices would be higher in the 10 percent reduction case. The permit prices reflect the incremental cost of reducing emissions by a ton of carbon. The study shows coal prices rising sevenfold, electricity prices about 100 percent, and retail gasoline prices 40 to 50 percent. Estimated employment losses reach 1.4 million jobs for the years 2000–2020, and GDP growth would be reduced by one percentage point at most as the economy adjusted to the constraints.

In a study commissioned by the American Petroleum Institute, WEFA assumes U.S. carbon emissions stabilize at 1990 levels by the year 2010 (National Impacts 1998). The study rejects the possibility of an intercountry permit market, owing to the lack of legal infrastructure, and assumes a U.S. permit market instead. The analysts then assume that uncontrolled emissions would be 27 percent above 1990 levels by 2010, and 46 percent above the target by 2020. To achieve the necessary reductions, carbon permit prices would have to rise across the control period from $100 per ton per year to $300.

According to WEFA, the emission reductions would lead to a 30–55 percent increase in consumer prices, with energy-intensive sectors sustaining shocks comparable to those associated with the Arab oil embargoes of the 1970s. Real GDP would fall 2.4 percent below baseline 2010 estimates, that loss alone amounting to $227 billion 1992 dollars. Cumulative GDP losses across the years from 2001 to 2020 would total $3.3 trillion, and employment decline would exceed 22.8 million workers by the year 2010.

With regard to international competitiveness and trade, the WEFA study notes:

> One key reason for the lower level of real GDP is reduced global competitiveness. Because the imposition of the carbon target and permit system is not borne equally by all countries . . . U.S. exports are relatively more expensive on the world market, while the prices of many imported products will fall. As a consequence, exports are lowered dramatically, while imports are increased substantially. (National Impacts 1998, 4–5)

The report notes that chemicals, paper, textiles and apparel, and computer and electronic parts production would be severely affected.

The U.S. Department of Energy has prepared a number of studies of Kyoto Protocol effects, with widely varying estimates of costs. The agency's first 1997 study (Office of Policy and International Affairs 1997) assumes a control target of achieving 1990 emission levels by 2010; it considers both a U.S. and an international market for tradable permits. In a strictly domestic market, permit prices would rise to $150 per ton of carbon emissions. With a world market, the price would be $40. Assuming a

domestic control scenario, U.S. coal consumption falls by 50 percent by 2010, and the price triples. Total GDP losses across the period have a present value of $418 billion, and revenues from permits reach $400 billion by 2010.

In sharp contrast to this DOE study, a 1997 report prepared by the same agency's Office of Energy Efficiency and Renewable Energy, known as the "three labs" study (Interlaboratory Working Group 1997), indicates that Kyoto's costs would be inconsequential. This happy outcome is associated with the successful outcomes of yet-to-be-specified federal programs to create energy-efficient technologies and encourage switching from high- to low-carbon fuels. The report's authors do not estimate the costs of the federal programs or explain how those programs would accomplish the predicted feat in just thirteen years.

In a 1998 report, the DOE reversed itself again, indicating that gasoline prices would rise approximately 66 cents per gallon and electricity prices 86.4 percent above business-as-usual baseline prices (U.S. Department of Energy 1998). Unlike the "three labs" study but more in line with DOE's first 1997 study, this more recent analysis predicts that GDP in the year 2010 would be $397 billion lower than its baseline forecast.

Faced with conflicting evidence from the DOE on Kyoto's economic effects and with other major studies showing substantial costs, Congress was apparently confused. Along with other experts, Janet Yellen, chairwoman of the President's Council of Economic Advisers, gave testimony to Congress in March 1998, before the October 1998 DOE report was published (Yellen 1998). Yellen's analysis indicates that Kyoto will be practically costless to the U.S. economy.

To arrive at this optimistic conclusion, she makes a number of assumptions that implicitly expand the time span of her analysis far beyond the 2010–2012 compliance period. Specifically, she assumes that improved forestry practices and reforestation, which obviously take decades to complete, would cheaply offset carbon emissions and that U.S. firms and government agencies would participate in assisting developing countries in "clean economic development," thereby gaining emission credits. In addition, she assumes that U.S. carbon emitters would participate in a world market for trading emission credits, a process for which no institutional framework had been created at the time of her testimony. Beginning with a baseline estimate of $240 per ton for reducing carbon from emissions, Yellen applies the effects of her assumed cost savings and arrives at a final cost of $23 per ton for removing carbon.

Finally, one last study deserves comment. Ronald J. Sutherland, senior economist for the American Petroleum Institute, prepared an interesting analysis of Kyoto policy options that starts with a relatively simple econometric model for explaining carbon emissions in developed countries (Sutherland 1998). Accepting the agreement's binding time constraint, Sutherland shows that it would be practically impossible for the United States to achieve Kyoto's goals, especially if nuclear energy production were

ultimately replaced by gas-fired turbines, as now predicted. He forecasts three important effects. First, clean nuclear fuel would be replaced with dirtier natural gas. Second, continued income growth would lead to a predictable increase in the demand for energy, and therefore to more carbon emissions. And third, the price increases necessary for achieving Kyoto goals, like those estimated by WEFA and the DOE, would simply not be accepted.

Using estimates of the price elasticity of demand from ten large-scale studies, Sutherland shows that gasoline prices would have to rise from $1.25 per gallon now to $4.23 per gallon in 2010 to meet Kyoto's U.S. goals. This increase, he believes, would be politically impossible to achieve. Creating an even greater challenge, post-2010 prices would have to rise continuously to offset increases in demand generated by rising incomes. Unlike the more optimistic findings of those who implicitly abandon Kyoto's time constraints, Sutherland demonstrates the hopelessness of relying on technical change, prices, and controls to reach Kyoto's U.S. goal for 2010.

Focusing on the studies that come closest to meeting the actual constraints imposed by Kyoto, we can deduce that the incremental cost of reducing emissions by a ton would range from $100 and $300. Given the number of tons to be cut, total reduction costs would amount to $1 trillion to $3 trillion. Coal obviously would be the hardest-hit industry. All fossil fuels would rise in price, but some, such as natural gas, would become relatively cheaper. In short, the resources to be transferred in credit markets would be massive, as would be the substitution effects across energy commodities and energy-intensive industries.

The Struggle for Advantage

My theory of Bootleggers and Baptists, a subset of the economic theory of regulation, calls attention to coalitions that seem to prevail when environmental and other social regulation is being formulated (Yandle 1983).[5] Although powerful interest groups still matter, this theory tells us that at least two interest groups must work in the same the direction. One group, the Bootleggers, look to regulation to enhance their market position or to limit competition. The other group, Baptists, adds a moral dimension to the regulatory cause that happens to solve the Bootleggers' problem. Traditionally, for example, both Baptists and Bootleggers have supported laws that limit the legal sale of alcoholic beverages.

In the post-Kyoto period, we should expect to find environmentalists playing the role of the Baptists. The theory suggests that we should find allies among the Bootlegger population—countries, industries, and firms that foresee a greener bottom line by supporting the "green" position. Within industries, some firms have specialized assets

5. The economic theory of regulation is associated with Stigler (1971) and Peltzman (1976). Posner (1974) added elements to it.

or outputs favored by rules that raise the cost of competing assets and products. With the Kyoto agreement, countries such as the United Kingdom are positioned to exploit carbon reductions already made and to raise the costs of competing economies. Other countries can become low-cost suppliers of carbon reduction offsets. But unlike conventional regulatory arrangements that involve one national government regulating domestic industries, Kyoto presents us with the unusual situation of countries behaving like firms, strategically positioning themselves to benefit while gaining protection and credibility from international environmental groups that embrace Kyoto as a necessary part of their crusade.

Post-Kyoto Episodes

Consider the following anecdotal evidence. In January 1997, Enron Corporation, a major provider of low-carbon natural gas, announced that it was forming the Enron Renewable Energy Corporation in an effort to "take advantage of the growing interest in environmentally sound alternatives of power in the $250 billion U.S. electricity market" (Salisbury 1998b). The new division will develop nontraditional energy products, which suffer a competitive disadvantage in current energy markets. Recognizing this disadvantage, Tom White, Enron Renewable Energy CEO, supports President Clinton's $6.3 billion plan to fight global warming, which includes $3.6 billion in tax credits to spur the production and purchase of renewable energy and related technologies (Salisbury 1998b).

Of course, taxpayer subsidies can become habit-forming. On April 9, 1998, the National Corn Growers Association announced a major lobbying effort to prevent congressional efforts to eliminate the 5.4-cent-per-gallon subsidy to producers of corn-based ethanol (National Corn Growers Association 1998). The association's newsletter claimed that "ethanol is good for the economy, good for the environment, good for America," a theme endorsed in a speech by Mary Nichols, U.S. EPA Assistant Administrator for Air and Radiation, when she addressed the National Ethanol Conference in Des Moines, Iowa: "One area where I think we can do more together is the area of climate change and global warming" (Stark 1998). The celebration of ethanol did not mention that ethanol production may use more energy than it provides or that the federal government's $600 million annual ethanol subsidy assisted the production of beverage as well as industrial alcohol (Bandow 1997). On May 6, 1998, Republican leaders salvaged the subsidy, partly in the name of global warming prevention (Pianin 1998). Global warming appears to have saved the day for the corn producers.

Following the corn producers' cue, U.S. soybean producers heralded the environmental benefits associated with blends of diesel fuel and soybean oil (National Biodiesel Board 1998). In efforts to gain regulatory approval of biodiesel as an "alternative fuel" to substitute for ordinary diesel, which would insure the industry's participation in the Department of Energy's alternative fuel program, the lobbying

organization indicated that "biodiesel helps reduce the effects of global warming by directly displacing fossil hydrocarbons" (National Biodiesel Board 1998).[6]

As regulation theory predicts, not every member of an industry expects to benefit by Kyoto restrictions. For example, Dean Kleckner, president of the 4.8-million-member American Farm Bureau Federation, opposed the protocol "because of its potential harm to U.S. farmers." Kleckner reflected the concerns of farmers who expect to see Kyoto-induced higher prices for food, fertilizer, and fuel (Farm-State Senators Skeptical 1998). The differential effects generated by regulation explain the formation and destruction of political coalitions.

The Breakup of Anti-Kyoto Coalitions

The Kyoto Protocol provides a setting in which some Bootleggers become converted to Baptists. One of the larger anti-Kyoto groups, the Global Climate Coalition (GCC), which was formed by major oil producers and hundreds of other firms, attempted to debunk Kyoto's weak scientific underpinnings and emphasized the expected economic costs of the protocol. However, some of the members began to see a silver lining around the Kyoto cloud. In June 1998, Shell Oil announced its departure from GCC. Friends of the Earth representative Anna Stanford claimed credit for Shell's green conversion, declaring: "We're delighted that our hard work has paid off, that Shell has bowed to public pressure and seen that the future lies in fighting climate change and investing in green energy" (Shell Withdraws from Global Climate Coalition 1998). Shell responded that "there are enough indications that CO_2 emissions are having an effect on climate change" (Magada 1998) and that the firm was "promoting the development of the gas industry particularly in countries with large coal reserves such as India and China" (Magada 1998). With Kyoto's help, firms with strategically located supplies of clean natural gas could improve their bottom lines while improving their green image.

British Petroleum's (BP's) earlier decision to part company with the GCC made Shell's departure a bit easier. Following serious discussions with leaders of the Environmental Defense Fund and the World Resources Institute, the Baptists in this case, John Browne, CEO of BP, indicated that firms such as BP should play a "positive and responsible part in identifying solutions" to the global warming problem (British Petroleum to Take Action 1997). Anticipating increased demand for oil as a cleaner coal

6. Although differential effects may explain the different positions taken by members of the oil industry, the situation faced by coal producers was more clear-cut. Coal producers and related unions are among the most vocal in their opposition. They succeeded in obtaining West Virginia legislation prohibiting the state's division of environmental protection from "proposing or implementing rules regulating greenhouse gas emissions from industrial sites." But when Governor Cecil Underwood signed the bill, he indicated that the state "should continue to encourage the development and implementation of technologies that allow the clean burning of coal" (Governor Signs Bill 1998).

substitute, BP also announced significantly increased investment in the development of solar and alternative energy technology.

In November 1998, the American Automobile Manufacturers Association, speaking for General Motors, Ford, and Chrysler, refused to help pay for Global Climate Information Project television ads opposing Kyoto (Look Who's Trying to Turn Green 1998). (The project is another major coalition of firms, labor unions, and farmers.) Shortly thereafter, the World Resources Institute gathered executives from GM, BP, and Monsanto to pledge support for Kyoto. Bill Ford, the newly named president of Ford Motor Company, stated: "There is a rising tide of environmental awareness. Smart companies will get ahead of the wave. Those that don't are headed for a wipeout" (Look Who's Trying to Turn Green 1998). Of course, pure environmentalism might explain the behavior of firms leaving the anti-Kyoto club, but other incentives may be involved, too.

In October 1998, Senate Bill 2617 was introduced, amending the Clean Air Act to "provide regulatory relief for voluntary early action to mitigate greenhouse gas emissions."[7] The proposed legislation, which received strong bipartisan support, would provide advanced carbon-reduction credits for actions now under way to reduce emissions. If enacted, the rule change could provide immediate and massive bottom-line benefits to carbon-emitting firms. For example, in the past three years, Mobil Oil has cut CO_2 emissions by 1 million tons (Salisbury 1998a). At $300 per ton, that reduction becomes a potential asset worth $300 million. The U.S. electric utility industries have actions under way that will cut emissions by 47 million tons of CO_2 in two years. The potential side payments associated with this much emission reduction are enough to make a firm revise its anti-Kyoto stance and then push for restrictions and an emission-credit market.

Trimming the Budding Permit Market

Strategic actions taken to limit the scope of the budding permit market would redound to the benefit of U.S. firms that gain "advanced credit" for actions already taken. With the market constrained to the United States, credit prices would be higher than otherwise. British Deputy Prime Minister John Prescott may not have realized that his efforts to make the United States feel the pain of Kyoto could play into the hands of American firms with pre-endowed credits. Early on, Prescott showed disgust at the idea that U.S. agents would "buy tradable greenhouse emission permits from Russia" (Raven 1998). He stated that "Europe has always been clear that while we accept the trading possibilities in this matter, they should not be used as a reason for avoiding taking action in your own country" (Raven 1998). However, the European Commission's June 3, 1998, communication setting out principles for the November Buenos Aires meeting of Kyoto parties sent a somewhat confusing signal: "It is recognized that the flexible mechanisms can play an important role in meeting commitments at least cost, thereby safeguarding

7. Communication with Cato Institute, November 30, 1998.

the competitiveness of EU industry. The existence of the EU bubble does not prevent the Community from fully participating in international emission trading" (Climate Change 1998, 2). The EU expects to gain internally by allocating burdens differentially across countries while meeting an overall goal and to gain externally through managed emission trading. Still, the Communication endorses Prescott's position regarding U.S. trading strategies:

> At Buenos Aires, discussions on emission trading should focus on ensuring the establishment of strict rules and for setting minimum requirements that any Party or private entity needs to fulfill in order to participate in international trading. . . . It is also necessary to define the Protocol's use of the word "supplemental" in respect to the contribution of the flexible mechanisms. In principle a ceiling should be set for trading to ensure that the main reduction in emissions are by domestic efforts. (Climate Change 1998, 2)

Analyzing the EU Allocation Scheme

In June 1998, EU leaders met to negotiate each member's reduction allocation (Friends of the Earth 1998). The draft proposal called for the individual reductions shown in table 2, which lists proposed emission reductions in descending order.

Table 2: EU Member State Emission Reduction Goals: 1990–2010

Country	Percent Change from 1990 Levels
Luxembourg	–28.0
Denmark	–21.0
Germany	–21.0
Austria	–13.0
United Kingdom	–12.5
Belgium	–7.5
Italy	–6.5
Netherlands	–6.0
France	0
Finland	0
Sweden	+4.0
Ireland	+13.0
Spain	+15.0
Greece	+25.0
Portugal	+27.0

Source: Friends of the Earth 1998.

Modeling the Proposal

To explain these proposed targets, I fitted a regression equation, using as a dependent variable the number of tons of carbon emissions to be added or reduced in the 1990–2010 time period for each European Union country. This was calculated by multiplying the percentages in table 2 by each country's 1987 level of carbon emissions.[8] Independent variables included in the linear model are the 1995 GDP per capita in U.S. dollars, the 1995 ratio of carbon emissions to GDP (kg/US$), the 1998 population of the country, and the year when each country joined the European Union.[9]

The politics of redistribution suggest that higher-income countries will absorb more of the environmental cleanup load than lower-income countries. The estimated regression coefficient of the GDP-per-capita variable should be negative. On the other hand, the cost of emission reductions will be higher for countries that have "cleaner" GDP. Generally speaking, the lower the amount of CO per dollar of output, the more costly it will be to reduce emissions by another ton. The estimated regression coefficient of the carbon-to-GDP variable should be negative. Thus, for example, France, although its large economy produces a large amount of emissions and the country has a relatively high income per capita, also has a relatively clean GDP. Therefore, France is being asked only to maintain its 1990 emission level.

In the regression equation, the population-size variable permits a test of the redistribution argument that smaller groups value a one-ton allowance more than larger groups, all else equal. The argument is based on the public-choice logic that a given concession to a less populous country is worth more per capita than the same concession to a more populous country (Chen 1997). This implies that the estimated regression coefficient of the population variable should be negative. The year of EU entry is included in the regression equation to test for the effect of side payments from older to newer members. The threat of exit is always greater for newer members than for older ones. Side payments in the form of emission allowances help to keep newer members in the fold. By this argument, the estimated regression coefficient of the year-of-entry variable should be positive. A competing argument maintains that newer members are not as well seasoned in the bargaining process as older members. In that case the estimated regression coefficient of the year-of-entry variable should be negative.

8. Data on emissions from Larsen and Shah (1994, 843). For 1995, data for Luxembourg were not available in *The World Bank Tables* and were constructed by interpolation from Larsen and Shah.

9. Data for the independent variables are for 1995, except for population, which is for 1998, and are taken from World Bank 1998.

The Estimate

The following ordinary-least-squares equation, with intercept suppressed, was estimated:

$$tons = -1.477\ percap - 52046\ CO/GDP - 449.128\ pop + 31.173\ year$$

$$(-2.934) \qquad (-2.255) \qquad (-4.707) \qquad (2.980)$$

$$R^2 = 0.63 \quad F(3,11) = 9.04$$

Student's *t*-ratios are shown below the coefficients. As hypothesized, the proposed reductions follow a rough pattern that yields fewer tons of emission growth for higher-income countries, fewer tons for countries with higher carbon-to-GDP ratios, lower allowances for higher-population countries, and higher allowances for newer members of the European Union. For example, Spain, a recent EU member, has a lower income per capita and a "dirtier" GDP than France, but contributes a smaller total carbon load to the environment. Spain is allowed to increase emissions by 15 percent over the 1990 baseline amount, whereas France is to achieve and then maintain the 1990 emission level.

Recognizing the limits of an analysis based on such a small sample, it may still be instructive to interpret the equation's coefficients. At the mean of the estimate, a $1,000 increase of per capita GDP is associated with a 1.47-ton reduction in allowed carbon emissions. An increase of one gram per GDP dollar of carbon emissions (the sample mean is 420 grams) is associated with 52 additional tons of allowed emission growth. An increase of 1 million in population is associated with a loss of 449 tons of emission allowances, and an increase in the year of membership from, say, 1974 to 1975, is associated with an increase of 31 tons in allowances.

Because it is always cheaper to reduce emissions when concentrations are higher, the EU proposal establishes future sellers and buyers of tradable emission-reduction permits. Nation-states with little room for emission growth or lower emission concentrations will buy permits from states with dirtier carbon streams and larger allowances for emission growth. The allocation scheme enables us to predict that wealth will flow generally from northern to southern European countries, at least for trades within the European bubble. The EU plan of encouraging bubble trading within the EU and managing external trades places the central government in the traditional protectionist position of controlling exports and imports. But, in this case, the goods traded are permits (emission reductions), not commodities. An examination of the residuals in the regression equation for emission allowances, to identify allowances more than one standard deviation from the mean value, shows France gaining—and therefore being a potential seller of permits—and Germany and Portugal losing disproportionately in the political process that determined emission allowances.

Final Thoughts

The Kyoto Protocol is perhaps one of the most far-reaching international accords to be reached in modern times. And for all we know, global climate change may be one of the most serious threats faced in modern times. But whereas the climatic theory and evidence of global warming are shaky or at least controversial, the economic theory and evidence that help explain Kyoto policies are well established.

At the outset of this article, I asserted that Kyoto was more about cartelization and rent-seeking than about actions to reduce carbon emissions. To support such a proposition, one must show that the protocol itself contains a framework that allows, if it does not encourage, cartelization; that the scheme for reducing emissions gives rise to differential effects; that the magnitude of costs involved and opportunities for cartelization are large enough to offset the cost of organizing cartels; and that evidence of actions already taken buttresses the cartelization hypothesis.

Having considered the foregoing detailed discussion of the protocol, its costs, its differential effects, and a variety of related activities, the reader can judge whether the evidence is compelling. Agreeing that Kyoto is more about rent-seeking cartel efforts than about heat-reducing climate control does not negate the possibility that global warming is a real phenomenon that deserves attention. But if global warming is a genuine threat, the analysis presented here suggests that the Kyoto Protocol is not a useful mechanism for allaying that threat. What then might be a more suitable response? Several policy actions come to mind.

First, an independent research organization funded by tax revenue should be commissioned to measure, monitor, and report on temperature changes and related conditions. The monitoring organization should be insulated from the political process. Specifically, it should not be a part of the United Nations or the U.S. Environmental Protection Agency. In addition to monitoring and reporting, the organization should analyze data and provide evidence of the extent to which warming is related to human activities as opposed to natural atmospheric changes.

Second, if there is persuasive evidence that human activity is causally related to global warming, nations must determine whether on balance the warming entails more costs than benefits. If global warming is beneficial for some countries but harmful to others, actions can be considered for accommodating migration and other remedies for negatively affected people as well as for the affected natural environment. If human-induced global warming is found to be harmful on balance, then policies should be adopted to alter the actions that contribute significantly to the problem. Kyoto-type restrictions of carbon emissions may become relevant, but the mechanisms for achieving such reductions must include all people and must allow for side payments and other measures that enable developing countries to have access to energy.

Third, if global disaster is pending, access to accurate information becomes a top priority. As argued by Friedrich Hayek (1945), the price system is the most effective

and lowest-cost information system available to mankind. Political actions that disguise or distort accurate prices should be eliminated. In particular, subsidies and taxes that affect important relative prices should be eliminated.

Fourth, incentives to encourage changes in investment, the discovery of new technologies, and the migration of capital and people should be enhanced. Capital-gains taxes should be repealed. Depreciation schedules should be shortened. Immigration policies should be liberalized. Markets and borders should be opened.

Of course, in making such policy recommendations, one presupposes a public-interest theory of government, in which politicians desire to minimize social costs and resist the pressures that emerge when special interests struggle for advantage. Unfortunately, the Kyoto story I have just told provides little if any reason to believe that public-interest policy recommendations, even if logically sound and empirically well founded, will receive serious consideration.

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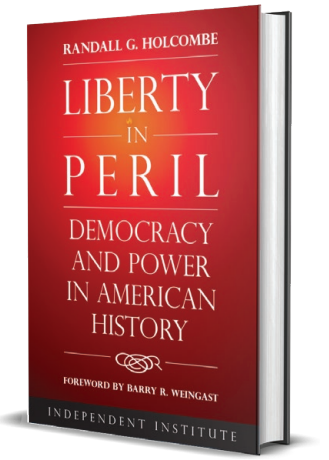
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