Economic Analysis and the Formulation of U.S. Climate Policy

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Abstract

Economic analysts within government agencies as well as outside government has played a noticeable and increasing role in formulating U.S. climate policy. However, that role has remained limited; in particular, economic analysis has largely been ignored and occasionally even derided in the context of setting targets for GHG control. This paper explores this uneasy relationship between analysis and policy during several U.S. administrations. Some of these problems stem from the incompleteness of the economic analyses themselves, and economic analysts sometimes have not been the most effective advocates for their own findings. However, I think one of the biggest obstacles to more effective use of economic analysis in climate policymaking has been a basic lack of desire among many policymakers for the fruits of the analyses. This reluctance has been especially marked when the economic analysis clashes with strongly held preconceptions – from either side – about what climate policy ought to be.

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Introduction

Over the past decade, the academic economics literature on climate change has steadily grown (for reviews, see IPPC 1996c; Shogren and Toman 2000; Kolstad and Toman 2000). Economic analysis of climate policy also is a significant part of the staff work in a number of government agencies. The demand for economic analysis grew as governments debated policies to restrict emissions of greenhouse gases (GHGs), both before and after the December 1997 negotiation of the Kyoto Protocol (UNFCCC 1999b).

Economic ideas have played a noticeable and increasing role in formulating U.S. climate policy. However, that role has remained limited. Over time, economic analysts within government agencies as well as outside government have increased policymakers' confidence in the use of economic incentives as a powerful tool for reducing GHGs. Economic analysis also has played an increasing role in helping shape the international institutions that would be used to implement GHG controls, notably those institutions related to international emissions trading. In sharp contrast, economic analysis has largely been ignored and occasionally even derided in the context of setting targets for GHG control. In particular, analyses of the costs and benefits of GHG control and of the most cost-effective timing of GHG limitation often have been met with skepticism.

In my view there are several reasons for this, each of which is important to bear in mind as one contemplates both the future of climate change policy and the broader role of economic analysis in the policy process. Some of these problems stem from the economic analyses themselves. For example, economic analyses frequently address only part of the policy problem.[1]

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[1] For example, the focus of many long-term analyses on the present value of expected net benefits from policy does not address winners and losers across space or time; and analyses sometimes idealize policy institutions and thereby overstate the benefits of more incentive-based approaches. But these are not inherent weaknesses of the economic approach; they can be rectified by broadening the scope of analysis.

Economic analysts sometimes have not been the most effective advocates for their own findings.[2] However, I think one of the biggest obstacles to more effective use of economic analysis in climate policymaking has been a basic lack of desire among many policymakers for the fruits of these analyses. This reluctance has been especially marked when the economic analysis clashes with strongly held preconceptions—from either side—about what climate policy ought to be.

In the next section I briefly develop some of the principal conclusions from mainstream economic analysis of climate policy. In section III I contrast these lessons with some of the directions taken by theUnited States in developing its own climate policy. Section IV contains some brief concluding remarks, with particular attention to the role of economic agencies in the climate change policy process.

2. Climate Economics: Principal Conclusions

2.1 Balance of concern

There needs to be a balance of concern between the potential for irreversible negative consequences of climate change and the costs of misplaced mitigation investment.

Climate change is a real risk. But the size of the risk is unknown, and climate change will likely take several decades to substantially materialize (IPCC 1996a, 1996b, 1996c, 1998; NRC 2000). The uncertainty and time lag do not justify inaction. But they do underscore the need for a portfolio of actions to mitigate climate change risks, including a better understanding of these risks and of the potential for adaptation as well as emissions mitigation efforts through GHG controls. Climate change is fundamentally a long-term problem, and long-term strategies are needed to address it.

Moreover, the extent to which the public will be committed to undertaking costly mitigation (or other) climate policies depends on the perceived risk. Uncertainty about the severity of the climate change risk will lower the intensity of public concern, especially if other

[2] In particular, we have not always made the point that *any* climate policy decision involves some tradeoffs, explicit or implicit. The debate has instead been framed by those who view either environmental protection or compliance cost avoidance as objectives beyond compromise.

policy matters are seen as more pressing. People's perceptions of the risk depend on how adversely climate change is seen to affect their descendants, and on how concerned they are for the well-being of their descendants versus their own well-being. It depends as well on how concerned people in richer countries are for the future of people in poorer countries. These are complex issues of social values on which consensus is elusive (see Schelling 1995; Howarth 1998).

2.2 A gradual but purposeful approach

As part of a policy portfolio, a gradual but purposeful approach to the implementation of GHG control targets to take advantage of cost savings and opportunities for learning has many desirable features.

A gradual implementation of steadily more stringent GHG control targets causes less existing capital to be made obsolete; it provides more time for new, lower-cost mitigation methods (as well as adaptation strategies) to be developed and disseminated; and it allows society to learn more about both the risks of climate change and the options for responding. Critics of this approach argue that without the necessary commitments to more substantial GHG reductions today, the problem just grows larger and the incentive to continue pushing it off into the future is increased. Moreover, they argue, aggressive abatement activity may help stimulate new technologies for reducing GHG emissions. However, current decisionmakers cannot force their successors to be good environmental stewards in any event. And unless the risks of climate change are suddenly found to be huge or the public becomes very altruistic toward the future, the high cost of rapid action in the near term is a major deterrent to mitigation. It is better to simultaneously begin the work of mitigating GHGs while also making the job of more aggressive abatement easier for future decisionmakers through investments in development of technology for long-term GHG mitigation (for a review of these arguments, see Toman et al. 1999).

2.3 Well-designed policies are essential

Well-designed, cost-effective GHG mitigation policies are essential. Thus, incentive-based mechanisms warrant a warm embrace, both domestically and internationally.

This economic proposition is the most widely accepted in the climate policy debate, at least in principle. It is now widely understood that no interest is served by cumbersome and inflexible policy tools, and that incentive-based tools like carbon-based energy taxes and various

emissions trading programs create powerful price signals for GHG abatement and technological innovation (Fischer 2001; Fischer et al. 2001; Pizer 2001; Wiener 1999, 2001). Debate continues over how broadly this proposition should be applied, including trade-offs between economic cost-effectiveness and prerequisites for environmental monitoring. These debates are especially pronounced in the development of the "international flexibility mechanisms" for various kinds of emissions trading under the Kyoto Protocol (Kerr 2001; Hahn and Stavins 1999). In addition, there continue to be debates about the political feasibility of incentive-based policies, which tend to make the price effects and overall costs of GHG mitigation more visible. But at the same time, these policies offer new options for addressing distributional as well as efficiency concerns (Wiener 1999; Goulder 2001).

2.4 Devising technology solutions

There are no doubt opportunities for devising and deploying improved technology, at relatively low cost, for GHG abatement. But technology solutions are not a panacea.

Proponents of technology-based solutions argue that economic incentives are inadequate to change behavior to a degree sufficient to reduce climate risk. They advocate public education and demonstration programs; institutional reforms, such as changes in building codes and utility regulations; and technology mandates, such as fuel economy standards for automobiles and the use of renewable energy sources for power generation. They argue that the costs of such changes are negligible because the realized energy cost savings more than offset the initial investment costs.

However, proponents omit several other factors that can cause the overall economic cost of a technology switch to be higher than an engineering-economic cost estimate based only on direct investment outlays and energy expenditures. For example, the new technology may be less reliable or incompatible with existing energy-using processes. It is thus important to distinguish real market failures that impede low-cost choices from market barriers that simply reflect unavoidable direct or hidden costs (Jaffe et al. 2001).

The role for government in reducing real market failures can include basic research and development subsidies to compensate for an imperfect patent system; reform of energy sector regulation and reduction of perverse subsidies that encourage uneconomic energy use; and provision of information about new technological opportunities. Correction of market failures in the development of technology, along with appropriate market incentives for environmental

improvement (point 3 above), is expected to be superior to government selection of technology "winners." In developing countries, economy-wide policy distortions and infrastructure problems compound sectoral market failures, and solutions are found in broader institutional and market reforms, such as greater availability of information and expansion of financing opportunities, as well as reforms in energy sector pricing (Blackman 2001).

2.5 Maximize win-win opportunities

Climate policies should be coupled to broader economic reform opportunities and other environmental policies to maximize win-win opportunities.

As just noted, where uneconomic subsidies that also encourage GHG emissions can be rooted out, the result will be greater economic efficiency (and often better local environmental conditions) as well as lower GHGs. Similarly, where national trade and investment policies limit the spread of cleaner technologies or encourage deforestation, there are clear potential opportunities for win-win reforms. And environmental policies to address national or local concerns also can reduce GHGs.

There are, however, some caveats associated with those observations. Energy subsidies already have been substantially reduced over the past 10 to 15 years in both industrialized and developing countries; distortions remain, but the opportunity for a "free lunch" in reducing GHGs along these lines is diminishing. Moreover, many of the expenditures or tax breaks labeled as subsidies—for example, tax breaks to small U.S. oil producers that do little to stimulate global consumption by lowering international oil prices (Fischer and Toman 2001)—may not in fact contribute much to increased emissions, even if they add to energy producers' profits.

With respect to broader trade, investment, and industrial policies, there are doubtless opportunities for win-win improvement, especially in developing countries (Blackman 2001; López 2001). The same is true of strengthened local environmental policies in developing countries. But no one should underestimate the institutional difficulties and distributional consequences, and thus the political challenges, of such measures. It is also important that policy reforms make sense on their own. GHG abatement should not dominate the policy agenda.

2.6 Addressing domestic political problems

To address domestic political problems arising from the distributional impacts of GHG policy, efforts should be undertaken to compensate the greatest number of real losers with the least waste.[3]

The losers from climate policy—those bearing costs that are disproportionate or in some other sense undue—can be compensated. Domestically, if energy is taxed to reduce GHGs, businesses and households in those regions most harmed could get offsetting tax relief. In a domestic tradable permit system, some permits can be given *gratis* as a form of compensation, or the government can auction the permits and redistribute some part of the proceeds, as with a carbon-based energy tax. To be cost-effective, such compensation schemes should be well targeted to limit compensation paid to those better able to protect themselves from the economic impacts of GHG policies, and they should minimize the overall economic distortion (Goulder 2001). With respect to targeting, care should be taken in evaluating the vulnerability of potential recipients of compensation. Low-income households or displaced workers may be more vulnerable than business managers operating in diverse markets or their shareholders, who have even more opportunities for spreading their risks.

2.7 Risk management

A greater emphasis is needed on price-based approaches over strict quantity targets in the short to medium term to manage the risk of uncertain response costs.

This is the point at which the design of GHG policies meets the question of how climate policy targets are set. The Kyoto Protocol established various fixed emissions targets for the "Annex I" industrialized countries. Meeting these targets no matter what implies exposure to considerable uncertainty about the overall economic cost of the mitigation effort. If technological optimists are right about the potential for huge reductions at low cost, it will be easy to comply, but if not, costs could accelerate rapidly beyond the initial cheap abatement opportunities.

An alternative approach is to set a domestic price ceiling for GHG abatement, a kind of safety valve that prevents such adverse cost outcomes (Pizer 2001). A carbon tax will

[3] Distributional issues also arise internationally – see point #8 below.

automatically have this property: no one will pay more than the tax rate to abate emissions. A tradable permit system can be augmented by a safety valve simply by having the government offer additional permits at the specified ceiling price. Several specific proposals along these lines have been offered in the past few years (e.g., Kopp et al. 1999). There are some practical complications that must be addressed in implementing such policies, especially internationally.

A common critique of the safety valve approach is that it does not treat the targets agreed to at Kyoto as immutable. But the sentiment for meeting the targets, come what may, does not seem strong. Concern in the United States about high abatement costs explains much of the reluctance to ratify the protocol. But it is also easy to envisage a number of other Annex I countries making a best effort and then simply acknowledging failure if they do not succeed. Another prospect is that countries would lobby for loose rules for emissions reduction projects and monitoring, especially in the use of international emissions trading, to lower their costs. This simply creates a less transparent version of a safety valve. Finally, although loosening the emissions caps will do a bit less to slow climate change in the short term, given the long-term nature of the problem, abatement can be accelerated later if need be. A moderate slowdown in abatement is unlikely to have a major social impact, and if new information about climate change risks emerges, the safety valve can be tightened.

2.8 International architecture

Coherent international architecture is the key to success. To this end, serious discussion is needed about common ground for common but differentiated participation of developed and developing countries based on shared burdens and mutual benefit.

The problem of achieving effective and lasting agreements can be stated simply: a self-enforcing deal is easiest to close when the stakes are small, or when no other option exists (a clear and present risk). Climate change falls in between these extremes. Nations have a common interest in responding to the risk, but each nation's incentive to reduce emissions is limited because it cannot be prevented from enjoying the fruits of other nations' efforts. Moreover, since no global police organization exists to enforce an international climate agreement, an agreement must be voluntary and self-enforcing (all parties must have an incentive not to deviate unilaterally from the terms), but this is hardest to achieve when incentive to free-ride is strong, as with climate change (Barrett 1994).

Equity is a central element in resolving this challenge. But no commonly held standard exists for establishing the equity of any particular allocation of GHG control responsibility. Simple rules of thumb, such as allocating responsibility based on equal per capita rights to emit GHGs (advantageous to developing countries) and allocations that are positively correlated to past and current emissions (advantageous to developed countries), are unlikely to command broad political support internationally. Direct resource transfers from richer to poorer countries or increased allocations of international GHG emission quotas likely are needed to increase developing countries' incentives to join an agreement (Wiener 1999). But agreement on the magnitude of such transfers is tantamount to a more fundamental international agreement on what constitutes a fair distribution of responsibility for global GHG reduction. Achieving agreement on this issue proves to be very difficult. And without agreement on international actions, GHG increases are likely, especially if the only measures pursued are limited-scale, "low-regret" policies (Cazorla and Toman 2001).

2.9 Adaption measures

Adaptation measures need to be substantially strengthened, especially in developing countries.

Adaptation means increasing the resilience of natural and socioeconomic systems to respond to a changing and possibly more unpredictable climate system. Adaptation receives relatively little diplomatic attention or financial support in the international climate policy process, and it is viewed with some repugnance by environmentalists, who see it as an excuse to avoid taking action to arrest climate change. I certainly do not believe that adaptation is a substitute for climate change mitigation. But adaptation is an important part of the policy portfolio. Some estimates suggest that adaptive responses by economic actors can substantially reduce the impacts of climate change, at least over the next century (Mendelsohn 1999). Although these estimates remain controversial, they highlight the importance of considering adaptation – especially since past and current GHG emissions already commit us to some degree of climate change in the future.

Adaptation potential is greatest where human involvement in the natural system is high and where knowledge, infrastructure, and financial resources are plentiful. This means that adaptation is easier in agriculture than in wilderness protection, for example. It also means that adaptation is a greater challenge for poorer countries. Finally, a variety of policies can be implemented to strengthen adaptation capacity, including measures designed to overcome

existing distortions and provide benefits in addition to reduced climate change risks. Examples include better water management, limiting encroachment in biodiversity-rich natural areas, and better zoning and building standards in coastal areas (Smith et al. 1996; Pielke 1998).

To summarize, the points laid out above support an international climate agreement and domestic implementation program with the following properties:

- moderate and flexible initial targets that accelerate over time;
- flexibility in compliance strategies, with strong reliance on market-based mechanisms;
- targeted and cost-effective compensation mechanisms for those whose cost burdens are judged too heavy;
- early and positive engagement with developing countries, both in exploiting win-win opportunities and in broadening commitments to global GHG control consistent with developing countries' interests in economic progress;
- strong support for research to develop more cost-effective abatement strategies; and
- strengthening of opportunities for adaptation, as well as GHG mitigation, in both industrialized and developing countries.

The Kyoto Protocol stands in sharp contrast to several of those points. Although the protocol embraces the use of incentive mechanisms in principle, it also calls for substantial emissions control (for the United States, more than a one-third reduction in carbon dioxide (CO_2) relative to the expected business as usual) to be achieved in a relatively short period to meet inflexible, binding targets. The protocol also focuses primarily on near-term emissions abatement. It thus exacerbates the concerns of those who see a risk of excessive cost in meeting the protocol target, without a compensating benefit. Efforts to build support for safety valve proposals by economists thus far have had little success.

The compatibility of the protocol with the effective use of market mechanisms remains to be seen. The text of the protocol provides for the international use of various emissions trading mechanisms, both among Annex I countries and through emissions-reducing projects in developing countries, that would generate tradable emissions credits (the so-called Clean Development Mechanism). However, the "modalities and procedures" are still being debated, and some participating countries want significant procedural constraints lest the environmental integrity of the protocol be compromised; they seek to substantially limit the overall use of

international mechanisms, preferring to see more domestic action that will stimulate longer-term emissions control. The goals of environmental integrity and longer-term GHG control are laudable, but those who would sharply limit opportunities for cost-reducing emissions trading do not seem to fully appreciate the deleterious effects of these stances on environmental progress: by making participation in the shorter term more costly, they reduce incentives to participate in real emissions control.

The protocol also leaves to the future the issue of developing countries' commitments to GHG limits. There is broad international acceptance of the principle of common but differentiated responsibilities for countries at various stages of economic development, but when and how developing countries would be engaged continues to be a source of dispute. In the current climate negotiations, debate focuses even more directly on the question of what financial and technical resources developed countries can and should provide to developing countries for GHG mitigation and adaptation. Moreover, provisions for effectively engaging developing countries in mutually beneficial GHG mitigation through the CDM remain undeveloped and therefore iffy.

3. Economics and U.S. Climate Policy

The issue of how international climate negotiations evolved is beyond the scope of this paper. I will instead consider one piece of the puzzle, namely the way that economic analysis has—and has not—influenced climate policy in the United States. The analytical approach to climate policy questions has become steadily more sophisticated over the past five years. Nevertheless, the impact of this analysis on actual policy positions remains uncertain. In what follows I put particular emphasis on developments during the eight years of the Clinton administration.

In the first Bush administration the topic of climate change commanded interest at the highest levels. However, some leading figures in the administration were skeptical about the need for substantial reductions in GHG emissions because of the apparent scientific uncertainty surrounding the nature of climate change and the risks it might pose. The first Bush administration advocated "actions which will have broad-ranging benefits," such as eliminating chlorofluorocarbons (CFCs) and other stratospheric ozone-depleting substances that are also GHGs (under the Montreal Protocol); implementing various pollution-control measures that also would promote energy efficiency (under the Clean Air Act); increasing forest sinks; encouraging

energy efficiency in buildings, appliances, and lighting; and increasing the use of renewable and nonfossil sources of energy. The broad-ranging benefits included, in the judgment of some proponents, decreased foreign oil imports and increased use of U.S. energy sources and technologies as well as environmental benefits.

Still, it was during the first Bush administration that the 1992 United Nations Framework Convention on Climate Change (UNFCCC 1999a) was negotiated as well as ratified. The administration also was a leader in drawing attention to the economic dimensions of climate change. A great deal of very important stage-setting work for more cost-effective GHG mitigation policy was done during the first Bush administration. Among the issues addressed at this time were the need to manage multiple GHGs and sinks like forests, not just the energy sector's CO_2 emissions, so that net GHG abatement could be accomplished as cost-effectively as possible; and the importance of allowing for international as well as domestic emissions trading policies, again for cost-effectiveness (Stewart and Wiener 1992).

In the wake of the successful negotiations to phase out CFCs and other substances that deplete the stratospheric ozone layer, some countries in the late 1980s began calling for significant reductions in global GHG emissions, to be led by industrialized countries. But there was little momentum, and the UNFCCC contained only voluntary, nonbinding targets for industrialized countries to reduce GHGs to 1990 levels by 2000.

The Clinton administration came into office with stronger rhetoric about the need for GHG control policies. However, they began with voluntary, technology-based measures, promulgated in the 1993 Climate Change Action Plan (Clinton and Gore 1993). This approach was based on the premise that substantial progress toward reducing GHG emissions could be achieved without adverse economic consequences. The administration touted the economic benefits of cleaner and more climate-friendly technology. In practice, the voluntary, technology-based approach reflected a compromise within the administration between those who saw the need for aggressive GHG control measures and those who were more skeptical.

The administration at various times in its first term considered some modest legislative measures to help limit GHGs. There was, for example, some discussion of policies to reduce tax benefits for employer-provided parking, and efforts to provide support for mass transit. But a centerpiece of its early legislative efforts, the attempt to raise energy taxes (the Btu tax), went down to ignominious defeat in Congress. Only a small increase in the gasoline tax was achieved,

and even this policy was hotly contested. Moreover, the energy tax measures ended up being sold to a large extent as budget policies, not environmental policies.

By 1996, it was clear that the United States would fail to achieve the voluntary UNFCCC goal of reducing emissions to 1990 levels by 2000. Reasons cited included less program funding than anticipated from a Republican congressional majority and, no less important, overly optimistic goals and a misspecified baseline (for example, oil prices did not rise as projected and economic growth was unexpectedly rapid).

During the early years of the Clinton administration, several overlapping groups of policy proponents often dominated the debate. One group of players in the development of administration positions tended to emphasize the risks that climate change could pose. A second group downplayed the importance of response costs by emphasizing a potential free lunch in the technological arena. A third group emphasized the need for theUnited States to appear environmentally responsible in the international arena.

One consequence was a virtual lack of interest among senior policymakers in the growing literature on the economic benefits and costs of GHG control (see Fankhauser et al. 1998 for a review of benefit and cost estimates). The great skepticism with which this literature was regarded among the political leaders of the administration was based on a view that the benefits of GHG control were being understated and the costs were being exaggerated.

One frustrating element for economists involved in the debate was a widespread confusion between *total* and *incremental* benefits and costs. The standard economic models did not assert that GHG control should be avoided, and in fact they implied that the presence of more low-cost and no-regret abatement opportunities argued in favor of more stringent control. However, the economic models cast doubt on the wisdom of many policy proposals circulating during the period, including stabilizing emissions at levels well below 1990 levels over a fairly short period of time.

Equally frustrating for economic analysts was the use by advocates of studies that purported to show that the total cost of reducing GHGs would be low if a combination of energy efficiency standards and policies encouraging the voluntary adoption of clean technologies were pursued (e.g., Interlaboratory Working Group 1997). The low total cost of such policy packages was to a significant extent a consequence of the free lunch from improved energy efficiency. Aside from having doubts about the size and price of this lunch, economists rarely were

successful in drawing attention to regulatory actions that had high incremental costs and thus were hard to justify, even if the total cost of the policy package was low.

Given their mindset and their bad experience with proposals for energy tax increases, administration policy leaders also paid relatively little attention to economy-wide analyses of GHG abatement costs or incentive-based policy instruments during Clinton's first term. Discussions of carbon-based energy taxes and (to a somewhat lesser extent) emissions trading were to some degree taboo. Nor was there much interest in relating work within the agencies to economic research work being done outside on the administration on the impacts and costs of climate policy, such as the work of the Stanford Energy Modeling Forum.

Instead, an elaborate bottom-up effort was undertaken to "find the tons" by cataloguing abatement opportunities in various sectors. A large interagency working group led by White House offices was assigned the task of reviewing agency analyses of abatement opportunities. The proposals, all offered in good faith and after hard work by the agencies, included such things as improved building insulation or electric motor designs, and increased carbon sequestration on unproductive agricultural lands. The proposals were supposed to include estimates of the cost over time to achieve the carbon savings, but these estimates were spotty and often involved only direct outlays for government programs, not the broader notion of economy-wide opportunity cost that is relevant for economic trade-offs. In a number of cases it was not even clear what policy levers would or could be manipulated to achieve the posited carbon savings, or how the proposed actions were additional to those already embodied in the 1993 Climate Change Action Plan. Even efforts to create a kind of qualitative supply curve for the bottom-up GHG reductions by indicating the kinds of cost thresholds at which they might be possible was viewed as both too speculative (probably true, given the limited data) and too politically sensitive.

The administration's concern about environmental risk and diplomatic appearances, belief in massive win-win opportunities, and the apparent failure of voluntary targets led to U.S. support at the 1995 international climate meetings in Berlin for binding national emissions targets to be applied relatively quickly to developed countries' emissions. However, the administration did not spell out which goals or policies it would support, or what economic impacts it expected to result from binding GHG emissions targets. During the two years of negotiations leading up to specific emissions targets and a timetable for emissions control in the 1997 Kyoto Protocol, the administration was caught between domestic skeptics (many but not all in the Republican Party) who questioned the need for the entire enterprise, and international diplomatic pressure for tougher action coupled with some pressure from domestic environmental

groups. The Kyoto negotiations included a last-minute compromise by Vice-President Gore accepting a stricter target. The U.S. delegation also pushed hard for the cost-reducing international flexibility mechanisms built into the protocol.

That last element of the negotiations indicated a growing appreciation of the importance of flexible, incentive-based policies at an international level. Economic analysis played a major role in building the case for these policies by showing their potential cost savings and by analyzing how the institutions governing the flexibility mechanisms might operate (for example, how different liability systems for emissions trading would affect incentives to invest in and monitor the quality of abatement activity). Nevertheless, the Kyoto negotiations were inconclusive on the all-important details of how the mechanisms would operate (and subsequent negotiations have done little to close the gap). Moreover, there was an interesting schizophrenia in the U.S. policy debate: increased support in the U.S. policy process for international flexibility mechanisms did not automatically lead to increased interest in exploring domestic mechanisms. Domestic mechanisms that made the incremental cost of GHG control plainly observable were still seen as politically problematic.

In contrast to the discussion of means for GHG control, the process of setting targets for GHG emissions continued to be viewed mainly as a diplomatic, not economic, matter. In particular, a striking and intellectually influential paper by Wigley et al. (1996) on the opportunities to achieve long-term GHG control more cost-effectively through more gradual and accelerating targets was largely discounted as providing too much scope for abdicating responsibility. The U.S. negotiating position leading up to Kyoto contained some limited provisions for borrowing against future emissions obligations as a way to smooth the path of GHG control, but this approach was roundly condemned by other countries and dropped in the final stages of negotiations.

The safety valve concept discussed in the previous section also was raised with the administration, but it, too, was rejected in the weeks before the final Kyoto negotiations. The United States maintained that developing countries should be asked to implement improved domestic policies and practices that would reduce GHGs while apparently serving their own self-interest. However, this position also was dropped in the final Kyoto negotiations when developing countries strongly criticized it.

The willingness of countries to implement tough standards (as opposed to just agreeing to them) was debated, but the Kyoto Protocol did not contain any concrete compliance provisions.

Enforcement in international environmental (and other) agreements is inherently limited, given the unwillingness of individual countries to sacrifice too much sovereign authority. However, the complete absence of compliance provisions in the Kyoto Protocol meant that despite the primacy accorded environmental integrity in the negotiations, the actual environmental contribution of the agreement remained open to question. The lack of compliance provisions also meant that countries could posture as green with strong rhetoric about the need for strict measures but not have to take tough measures in practice.

As negotiations proceeded toward the Kyoto Protocol, the U.S. Senate in summer 1997 passed, by a vote of 95 to 0, a nonbinding resolution offered by Senators Byrd and Hagel. The Byrd-Hagel resolution first stated that the United States should accept no climate agreement that did not demand comparable actions by all participants, developed and developing country alike. This provision was stimulated by concern about the competitive effects on the U.S. economy. However, it has led to much contention since its passage because it contradicts the sense of the 1995 Berlin Mandate on developed countries' activity. It arguably also contradicts the language about "common but differentiated responsibilities" for GHG control in the U.S.-ratified UNFCCC because it would make developing countries undertake costly GHG abatement policies.

Another provision of the Byrd-Hagel resolution, which has received less attention, called for documentation and justification for the economic costs that legally binding GHG targets would entail. This part of the resolution was a concrete signal to the administration of congressional interest in the economic implications of a climate change agreement.

After the Kyoto Protocol was negotiated, President Clinton stated that the agreement would not be sent to the Senate for ratification until policymakers had settled disputes about policies for flexibility in the means of compliance, costs of compliance, and "meaningful participation" by developing countries. Acrimonious debate erupted sporadically between the administration and Congress as well as among various nongovernmental stakeholders about budgetary priorities related to climate change programs and the consequences of climate policies for the U.S. economy.

As pressure mounted on the administration, even before the Kyoto Protocol was negotiated, to explain the price tag for GHG control, the administration reconstituted an interagency analytical team (this time chaired within the Commerce Department). Attention continued to be paid to bottom-up cost estimates for specific abatement opportunities, and

economists involved in the process continued to call many of these analyses overly optimistic. However, there was a new focus on findings from various economy-wide models. The administration team worked with a small number of selected models, including a long-term equilibrium model of the U.S. economy, an engineering-economic model of the energy sector, and a macroeconomic forecasting model with a detailed energy sector representation. Janet Yellen, chair of the President's Council of Economic Advisers (CEA) at the time, was given the task of speaking for the administration on the economic assessment. While the administration engaged in efforts to estimate the costs to the U.S. economy of GHG limitations, it simultaneously repeated much of its earlier rhetoric about the immediate win-win economic benefits of GHG reduction.

The dilemma for the administration both before and after the Kyoto negotiations was that it felt it needed to take a relatively strong stand on GHG control on environmental grounds, but given the hostility of the U.S. public (and Congress) to higher energy prices, it could not say publicly that GHG control would significantly increase energy costs. The administration maintained throughout the Kyoto negotiations and thereafter that the targets being negotiated would not be unduly burdensome.[4] It was widely believed at the time that the administration had its own ceiling on what would be a politically manageable increase in the price of fossil fuels, though such a ceiling was not publicly stated or documented and its existence is a matter of speculation.[5] Expressed in terms of carbon content, the ceiling was reputed to be on the order of $20 per ton of carbon. This translates into about 5 cents per gallon for gasoline (about the same size as the gasoline tax increase enacted in 1993 after the fight over the Btu tax).

March 1998 testimony by Yellen provided a carefully hedged statement that the United States could implement its Kyoto target while remaining within an acceptable range of energy price increases, and with correspondingly modest impacts on the economy as a whole (Yellen 1998). In response to criticism that the administration did not provide documentation of its conclusions, the CEA released a July 1998 report (CEA 1998). This report stated that under the most favorable policy circumstances, the effects on energy prices and the costs to the United

[4] A White House press briefing after the Protocol signing in Kyoto included remarks by Treasury Secretary Lawrence Summers that the Protocol would be good for the economy, as well as laudatory statements by environmental officials in the administration.

[5] The irony of this possible "political safety valve" was not lost on those economists that advocated for an explicit and transparent ceiling price on GHG abatement costs.

States of meeting the Kyoto Protocol emissions target could be extremely small. It said that these costs were "likely to be modest if those reductions are undertaken in an efficient manner employing the [various international] flexibility measures for emissions trading." By "modest," the administration report meant an annual decrease in gross domestic product (GDP) of less a few billion dollars per year, or about 0.1% of GDP; no expected negative effect on the trade deficit; increases in gasoline prices of only about 5 cents a gallon; lower electricity rates; and no "significant aggregate employment effect."[6]

Critics labeled the report unduly optimistic and out of step with mainstream economic analyses. Although the figures are theoretically possible, they are quite optimistic. A critical assumption in the administration scenario was a very high degree of success in implementing the Kyoto Protocol flexibility mechanisms, especially emissions trading with developing countries and the former Soviet Union. The CEA analysis presumes extremely heavy use of emissions trading by the United States to meet its Kyoto target, and an extremely efficient market in which this international trading takes place. Developing countries like China and India are assumed to be very active participants in supplying emissions permits, even though they do not have emissions obligations under the protocol and even though many developed and developing countries have expressed significant reservations about supplying large numbers of emissions permits to Annex I. Moreover, political constraints on the transfer of billions of dollars per year to developing countries and to Russia (which is likely to be a large permit supplier since its Kyoto allocation exceeds its expected emissions in 2008) are ignored. And transactions are assumed to be frictionless, notwithstanding the likely burdens of international transacting (especially through the CDM).

Another point of contention in the application of the models underlying the 1998 CEA report involved the assumptions made about the baseline trend in energy efficiency improvement. Really just shorthand for a much more complex process of technological innovation and diffusion in response to changing energy prices and factors, this parameter is an easy way to introduce into the models different assumptions about the availability of low-cost

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[6] The pre-Kyoto Protocol results from the interagency analysis team also are within this range (see Yellen 1998). One exception is that the earlier estimates involving a reduction of emissions to 1990 levels by 2010 would cost Americans 900,000 jobs by 2005 and 400,000 jobs by 2010. In the July 1998 report, a more ambitious emission control objective is found to have a smaller employment impact.

emissions opportunities and the impacts of governmental efforts to stimulate such reductions voluntarily. Historically, the rate of energy efficiency improvement in the United States has hovered between 0.5% and 1%. Reflecting the administration's confidence in the potential for low-cost GHG abatement, the interagency team looked at energy efficiency improvement rates in excess of 1%.

The CEA numbers also can be seen as optimistic compared with the results of a Stanford Energy Modeling Forum study of the cost of meeting the Kyoto targets (Weyant and Hill 1999). Consequently, the CEA report did not quiet the U.S. debate over the actual cost of meeting the Kyoto target, and whether the cost was worth it.

In fairness to the analysts in CEA and other agencies that worked on the 1998 report, it should be noted that the report does contain some information about the costs of achieving the Kyoto targets under less optimistic scenarios. Specifically, Table 4 on page 52 of the report includes information about the percentage reduction in GHG permit prices and direct compliance costs under different scenarios for international emissions trading, relative to a domestic-only approach. From this table and other information in the report, one can construct the cost of a domestic-only approach, which is several times that under optimistic trading assumptions. One can then guess at the magnitude of costs under limited trading as a result of various institutional and policy frictions. That the information about domestic-only action is provided so indirectly speaks volumes about the political climate in which the CEA and other analysts were operating.

In the wake of the Kyoto Protocol negotiations, economists in and outside government have studied the design of GHG abatement policies as well as overall costs and have made some important contributions. For example, economic analysis has underscored the counterproductive character of quantitative "supplementarity" limits on use of the flexibility mechanisms: such limits would distort international economic activity by creating different "carbon prices" in each country, and it would be difficult to determine whether any given transaction was in compliance with some relevant set of supplementarity constraints. Nor would such limits necessarily benefit developing countries, since they would limit demand for emissions credits through the CDM. But the last chapter in the story of international flexibility mechanisms has yet to be written. This is also true of the broader question regarding the influence of economic analysis on the outcome of the post-Kyoto negotiations.

The formal debate on the design of any U.S. policies to limit GHGs is even less advanced. A new Bush administration has bluntly reiterated its lack of interest in the Kyoto

agreement; and developed a new energy plan with great emphasis on expanding energy use and less emphasis on alternative energy development. A new climate plan has been issued with increased attention on alternative technologies and a number of voluntary measures. For economists who greeted the 1993 Clinton-Gore action plan with skepticism, this is something of an irony. In the broader discussion of climate policy there is some support for a cap-and-trade system for limiting domestic CO_2 (and perhaps to some extent other GHGs). But the coverage and structure of this system remain uncertain. Would permits be required only of electricity generating plants, and maybe large fossil fuel users? Or would the permitting system attempt more comprehensive emissions coverage by applying "upstream," to fossil fuel suppliers?[7] Another question is whether some or all permits would be auctioned—thereby creating a highly visible and politically uncomfortable price signal—or distributed *gratis*.

One strategy that environmentalists would like to pursue is an increase in vehicle fuel economy standards. Economists generally oppose this policy on grounds of inefficiency (it affects emissions intensity but does not limit and may even encourage vehicle usage), and political opposition is strong. The alternative of fuel taxes remains politically toxic, especially in the wake of the energy cost jumps in 1999–2001. More broadly, how much will theUnited States seek to orient other policies—in particular those involving conventional pollutant control and electricity restructuring—to influence future GHG growth? How much more effort will be devoted to measures that promote technological innovation to reduce GHGs?

4. Concluding Remarks

Against this backdrop, what can be deduced about the ability of economic analysis to affect U.S. climate policy? Generally, economists are perceived as having no good news. Economic analysis has offered a number of useful ideas for increasing the cost-effectiveness of GHG policies. But it also has emphasized the near-term costs of GHG control, as well as long-term benefits, and the importance of adaptation to climate change as a risk-mitigation measure. This emphasis has been seen by many advocates in the debate as incorrect both factually and philosophically.

[7] CO_2 from the power sector is only about one-third of the total U.S. emissions of CO_2.

Under the circumstances, it is difficult to develop a constituency for good economic analysis within the policy process. Green politics—pressure from domestic environmental constituencies and international diplomats—often overwhelmed the counsel of economists during the Clinton administration. Economists in government agencies like CEA cannot be (as one colleague put it) skunks at the picnic, or else they will not get invited to meetings on other important issues. Although the political winds have changed with the new Bush administration, it remains to be seen whether the new climate policies are more ound. Certainly they will be open to criticism if no actionis taken to create a price incentive for reducing GHGs, or if the tax code is peppered with costly special benefits to subsidize specific new technologies.

Given the substantive uncertainties and political controversies surrounding complex environmental issues like climate change, it is important to preserve an independent, not overly politicized capacity for economic analysis within the executive branch. CEA is unique in its ability to provide the President high-quality and objective yet timely and relevant economic analysis of such policy issues.[8] However, several other agencies, including the Environmental Protection Agency (EPA), the Energy Department, and the Treasury Department, play important roles in this process. It is hard to see what virtue is served over the long term by limiting the flow of good economic information and analysis or by channeling analysis only to satisfy immediate political ends.[9]

From those observations I draw two sets of recommendations for strengthening the quality and credibility of administration economic analysis of climate change. First, there is a need for continued close links between government policy analysts, as consumers of economic analysis, and the world of nongovernmental research. This link has become stronger, in part because of government financial support for climate change economics research. CEA also can play an important role in maintaining these links, given its own ties to the research world and its ability to impartially referee analytical disputes. To play this role, however, CEA needs the organizational and financial capacity to convene workshops and commission reviews of the state of knowledge.

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[8] The CEA is a small agency with no permanent staff and limited resources. Its sole institutional agenda is to bring economic insight and analytical rigor to administration policy debates.

[9] In particular, if the reputation of the CEA for objectivity is compromised, it will not be easy to rebuild and there will be a larger cost to an administration in terms of policy credibility.

The other set of recommendations concerns internal safeguards against abusing or ignoring economic analyses in evaluating climate policies. In 1996, the Office of Management and Budget published updated guidance for agencies to use in carrying out their own economic assessments of proposed rules. One can debate how well this guidance has been followed by agencies, but the ideas expressed in it nonetheless carry considerable intellectual weight. Among the provisions in the guidance are the following points:

- Regulators should seek to quantify risks, benefits, and costs and monetize these values to the greatest extent practicable.
- Regulators should consider realistic baseline conditions and make realistic evaluations about the impacts of proposed policies.
- Regulators should consider a range of plausible goals and actions.

What if these general principles were (truly) applied not just to agency rules, but also to administration policy pronouncements? At a minimum, the 1998 CEA report would have been different. More to the point, more rigorous analysis would add credibility to policy statements on climate change and filter out those that do not meet high standards. CEA could play a critical role in this process by testing the intellectual integrity of different ideas, bringing in relevant outside analysis, and providing or coordinating background material in support of those assertions that have passed through its first coarse filter. An approach like this to climate policy might enhance what all sides in the debate advocate: reliance on good science.

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