Science, Public Policy, and Global Warming: Rethinking the Market-Liberal Position

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A survey of market-liberal or libertarian publications and websites finds a large and growing literature on the issue of global warming. Almost without exception, this literature conveys a comforting message: Our planet is in good health. The markets that regulate resource use are working well. The only real dangers come from ill-considered policy initiatives that, if implemented, would do more harm than good. It would seem that the message is well received by its audience—it is repeated, embellished, and applauded with little variation.

In this article, I take a contrarian position, not so much with respect to the science of climate change as with respect to the arguments used by market liberals in support of their message of comfort and complacency. One problem area concerns the proper use of scientific evidence in reaching conclusions regarding public policy. It seems to me that market liberals are often reckless in the degree of certainty they professes regarding climatological hypotheses that are, in fact, still controversial and in early stages of development. A second problem concerns the use of cost-benefit analysis. Market-liberal writers are prone to make cost-benefit arguments regarding climate policy that they would never accept in other contexts. Third, the literature on global warming is often weakly rooted, if rooted at all, in the core principles of classical liberalism from which modern market liberalism has evolved. Instead, it is, for the most part, indistinguishable from what is said by conservatives. It might even be said that there is

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no market-liberal position on this issue—only an echo of arguments made by Republican patriots and the carbon lobby.

In short, the whole issue of global warming policy, as viewed by market liberals, needs to be revisited. This can best be done by going back to some of the classical liberal sources, particularly Friedrich Hayek and John Locke, from which modern market-liberal thought is derived.

Hayek on Liberalism, Conservatism, and Science

A good place to start the rethinking process is with Hayek's essay, "Why I am Not a Conservative" (1960). Hayek identifies a number of traits that distinguish conservatism from market liberalism ("liberalism" without a modifier, in his terminology):

- Habitual resistance to change, hence the term "conservative."
- Lack of understanding of spontaneous order as a guiding principle of economic life.
- Use of state authority to protect established privileges against the forces of economic change.
- Claim to superior wisdom based on self-arrogated superior quality in place of rational argument.
- A propensity to reject scientific knowledge because of dislike of the consequences that seem to follow from it.

Hayek points out that it is wrong to represent the political spectrum as a line, with leftists at one end, conservatives at the other, and liberals somewhere in the middle. Instead, he represents the political playing field as a triangle with socialists, liberals, and conservatives each occupying their respective corners.

When the political left advances proposals for increased state intervention in free markets, liberals tend to see conservatives as their natural allies. This was especially true in the 1940s and 1950s, the background for Hayek's 1960 essay, when socialism seemed to be on the ascendancy. In Hayek's view, the alliance of liberals with conservatives was reinforced by the fact that, in the America of his time, it was possible to promote individual liberty by defending long-established institutions, not just because they were long established, but because they corresponded with liberal ideals.

In our own day, alliances between market liberals and modern conservatives are still possible, but as the nature of conservatism has changed, issues have emerged where market liberals' natural allies are found on the political left. Defense of human rights and due process against expanding executive power is one example. Protecting

freedom of personal choice against government-imposed standards of morality is another. In these cases the alliance of market liberals with the left is rooted in genuine shared values.

In addition, market liberals and parties of the left may sometimes form a united front to attack the entrenched privileges of state-favored elites. However, in this case the alliance is more opportunistic than principled, since the two allies are likely to see different solutions to the problem of privilege. Whereas the left seeks to overthrow privilege by imposing state regulation, market liberals want to remove regulations in order to expose privileged positions to the influence of competition.

In order to apply Hayek's political triangle to the issue of global warming, we need to address several questions. One issue is what the status is of the privileges and interests of those who are threatened by the possibility of climate change and of those who are threatened by proposed actions to mitigate it. Which of these has the greater claim to the sympathy of market liberals, when viewed in terms of the standards they apply in other areas of public policy? Another issue is what the values are that lie behind the positions taken by various parties to the debate. The issue of values may determine when market liberals can make principled alliances with one of the other corners of the triangle and when they want to make only tactical alliances. Still another issue is what manner of argument should be employed. For example, what is the proper attitude toward the purely scientific element in the global warming controversy? It will be worth taking a closer look at this last issue before proceeding further.

Hayek expresses himself so well on the role of science that it is worth quoting him at length:

> Personally, I find that the most objectionable feature of the conservative attitude is its propensity to reject well-substantiated new knowledge because it dislikes some of the consequences which seem to follow from it—or, to put it bluntly, its obscurantism. I will not deny that scientists as much as others are given to fads and fashions and that we have much reason to be cautious in accepting the conclusions that they draw from their latest theories. But the reasons for our reluctance must themselves be rational and must be kept separate from our regret that the new theories upset our cherished beliefs. . . . By refusing to face the facts, the conservative only weakens his own position. Frequently the conclusions which rationalist presumption draws from new scientific insights do not at all follow from them. But only by actively taking part in the elaboration of the consequences of new discoveries do we learn whether or not they fit into our world picture and, if so, how. Should our moral beliefs really prove to be dependent on factual assumptions shown

> to be incorrect, it would hardly be moral to defend them by refusing to acknowledge facts [Hayek 1960: 404].

This passage raises obvious questions for the global warming debate. What lies behind the skepticism of market liberals regarding the propositions that the world is getting warmer at a rate that is unusually rapid in climate history, if not altogether unprecedented, and that this apparent trend is likely the joint product of natural cycles and human activity, rather than of the former acting alone? Are liberals correctly rejecting an inadequately grounded scientific fad? Or are they refusing to acknowledge facts for fear that doing so would upset their cherished beliefs?

Perhaps some market liberals believe that global warming poses an unacceptable dilemma that would force them, one way or another, to act against their deeply held principles. They might, on the one hand, believe that the mechanism of market adaptation through spontaneous order is too fragile to cope with the pace of environmental change that some climatologists foresee and, on the other hand, think that the only imaginable policies for coping with climate change involve an intolerable degree of state intervention. If so, they might refuse to consider evidence that a problem exists rather than face a perceived choice between roasting or succumbing to tyranny in order to remain cool.

Fortunately, the supposed dilemma is a false one. Liberals have long acclaimed the market as a way of adapting to change, and climate change should be no exception. For example, Robert Davis (2000) of the University of Virginia has showed how air-conditioning and other market-mediated innovations, have, over recent decades, reduced mortality from urban heat waves.

Also, market liberals should know well that effective environmental policy does not have to take the form of heavy-handed command-and-control measures. In dealing with local air pollution, traffic congestion, and land-use issues, market liberals have developed imaginative, workable proposals and in several cases have made headway in getting them adopted. As recently as the 1970s, market-based solutions to environmental problems were regarded as libertarian science fiction. Beginning with the use of averaging, banking, and trading in dealing with lead gasoline additives in the 1980s, and continuing with policies dealing with CFC (chlorofluorocarbon) phaseout, NOx (nitrogen oxide) precursors for acid rain, and continuing with the very recent Environmental Protection Agency measures on mercury pollution, market mechanisms have become very much part of the mainstream. Similarly, congestion pricing for urban roadways, also once regarded as science fiction, is now an established policy in cities like

New York, Singapore, Melbourne, and Toronto. The same kind of market-oriented policies should be possible in the case of climate change.

In short, if one takes into account both the market's potential for adapting to change and market-based policy alternatives, there is no reason for market liberals to be anything but open-minded toward ongoing developments in climate science, whether those developments, as they unfold, reveal indications or counter-indications of global warming.

There could, instead, be another explanation for some market liberals' apparent close-mindedness toward the global warming hypothesis. It could be that, when taking a position on issues of climatology, they are speaking not from perceived threats to their beliefs, but out of loyalty to conservative interests with whom they have struck some tactical alliance. For example, policies designed to reduce greenhouse gas emissions, no matter how carefully market-guided in their design, are likely to undermine the interests of politically powerful producers of carbon-based energy. Equally, they are likely to have a disproportionate impact on the United States relative to other, less carbon-intensive, economies. It is understandable that a conservative member of Congress could be pledged to uphold the interests of energy-industry workers or shareholders from his or her home constituency. It is also understandable that a U.S. negotiator at an international conference could work to increase the benefits for the United States of a proposed treaty while shifting the costs to other countries. What is harder to understand is why market liberals would see fit to support such positions, unless for the narrowest of tactical reasons.

Even when fear of change or tactical considerations do not introduce bias in selection and interpretation of scientific material, it may not be wise to base the market-liberal position on global warming too heavily on science alone. The danger is that there is then no fall-back position if future trends in science more strongly establish climate change as a reality. As an example of heavy reliance on scientific material, consider the chapter on global warming from the *Cato Handbook on Policy* (Michaels 2005). Without making any allegation of bias in selection or interpretation of scientific sources, it can be noted that the entire chapter is devoted to purely scientific issues, with the exception of a couple of sentences at the end, which allude briefly to estimated costs and benefits. Some points made in that document also illustrate how fast the scientific ground can shift from under the policy argument. For example, the argument is made that the frequency and intensity of hurricanes in the Atlantic and Caribbean are currently "no different than the regime that was dominant in

the 1940s, 1950s, and 1960s" (p. 484). Perhaps this statement seemed safe when it was made in early 2005, but then came along later that year the greatest number of named storms in history, the single strongest storm (measured by barometric pressure), the most economically destructive storm ever, and, to top things off, the latest recorded post-season storm, which lingered on past New Year's Day. Does one bad season constitute proof of a causal link from climate change to storm intensity? As a matter of science, no doubt it does not. But as a matter of argumentation, those who want to urge inaction on global warming might now do best not to mention hurricanes at all.

In focusing too heavily on scientific evidence, market liberals sometimes seem to be making the unspoken concession that, if global warming turns out to be real, then the policy proposals put forward by the nonliberal side are the only ones possible. In that case, if policymakers later do decide to act against climate change, market liberals will have lost their chance to have their voices heard in shaping the specifics of policy design. At a minimum, it would be more prudent to take a two-track approach: "We are not yet convinced that global warming is a reality, but if it turns out to be, here is how it should be handled."

The danger is even greater when market liberals rely on scientific sources that represent a minority within the climatology community. Confronted with the charge that they are relying on minority scientific views, market liberals sometimes reply that science is not a democratic process that establishes the validity of propositions by head-count. They go on to point out that all dominant scientific theories were once minority opinions. This is a weak argument. All mature oak trees were once acorns, but of all the acorns that fall to the forest floor, only a tiny percentage become oaks. Likewise, the chance that any one contrarian in the scientific community will be vindicated is small.

At the risk of digressing from the main theme of this article, it is perhaps worth adding that the perceived validity of one or another hypothesis may not always depend on purely scientific factors alone. In their choice of research fields, and sometimes even in their conclusions, scientists may be influenced by considerations of funding. Funding for science, in turn, depends on the whole range of factors falling under the heading of public choice theory. The interaction of self-interested behavior by allocators of government research grants with the grant-seeking behavior of researchers could plausibly produce systematic biases. For example, research that produces eye-catching findings may be more likely to generate follow-up funding

than that which reports ambiguous results. To the extent this is true, public choice considerations may bias reported research results toward the extremes, and in some cases, asymmetrically toward one extreme rather than the other.[1]

A detailed investigation of how public choice considerations operate in the case of global warming would have to deal with several issues. First, it would be necessary to penetrate beyond the widespread feeling among scholars that if only their particular line of research were adequately funded, their point of view would become the generally accepted one. Complaints of this kind, often accompanied by accusations of bias by grantors, can be found in any field of study, whether economics, climatology, or women's studies. What is needed is some way to sort the naïvely self-justifying allegations from the valid ones.

Another issue to be addressed is the relationship between political pressures at various levels of government. In one recently publicized case, James Hansen of NASA reported political pressures to suppress his findings confirming climate change. On the other hand, some observers believe that at the operational level, where specific funding requests are considered, there is a bias in favor of projects that tend to confirm global warming. For example, Margaret Kris (2005) cites Jeff Kueter, president of the George C. Marshall Institute, as arguing that "White House policy is not filtering down to career bureaucrats" when it comes to funding of global warming research. It appears likely that there are conflicting biases at different levels of the government bureaucracy.

Finally, a thorough study of the issue of biases in research funding would have to take into account private as well as public sources of funding. Private funding can sometimes be available on a surprisingly generous scale for minority science. For example, Randall Mills and his company Blacklight Power have attracted some $50 million in private funding for research into hydrogen energy that is based on theories that lie far outside the mainstream of contemporary physics.[2] Private funding serves as a healthy factor protecting minority science from establishment bias but, in other cases, it is alleged to be a source of bias itself. For example, organizations opposing genetically modified crops complain that their views are swamped by masses of supposedly biased research funded by agribusinesses. In the field of

[1]For a discussion of biases in government funding of scientific research, see Savage (1999). Biases in corporate funding of research have been the subject of a series of conferences held by the Center for Science and the Public Interest.

[2]For an account of Mills's work and funding sources, see Matthews (2006).

climate science, there are reports of bias both for and against the global warming hypothesis with regard to funding from private foundations and energy-industry sources (Kris 2005).

Fascinating as these issues are, they are tangential to the theme of this article. For present purposes, it will be enough to treat public choice considerations as an additional source of uncertainty that must be faced by policymakers, who must worry not only about complex scientific arguments, but also about whether the researchers involved are being objective. We will return to the consequences of uncertainty in a later section of this article.

Climate Change and Property Rights: A Lockean Perspective

If the market liberal position on global warming cannot rely on science alone, what should it be built on? The answer, to take the lead of market-liberal thinking as applied to other environmental issues, is a theory of property rights.[3] Following our plan to go back to first principles, we can begin with the writings of John Locke (1690), whose views on property rights and just government are the very cornerstone of classical liberalism.

Locke's thinking on property can be summarized in terms of three rights and three corresponding duties:

Rights:[4]

- to property in one's own person
- to property in the fruits of one's own labor
- to property in land and natural resources taken from nature when mixed with one's own labor

[3]A seminal source is Ronald Coase (1960). His analysis of pollution and property rights, as well as the importance of transaction costs in understanding the relationship between the two, is now widely accepted by market liberals. The same cannot be said of some of the policy conclusions that Coase, and others since, draw from the analysis in the 1960 article. For a critique of Coase from a property-rights viewpoint, see Cordato (2004).

[4]"Though the earth, and all inferior creatures, be common to all men, yet every man has a property in his own person: this no body has any right to but himself. The labour of his body, and the work of his hands, we may say, are properly his. Whatsoever then he removes out of the state that nature hath provided, and left it in, he hath mixed his labour with, and joined to it something that is his own, and thereby makes it his property. It being by him removed from the common state nature hath placed it in, it hath by this labour something annexed to it, that excludes the common right of other men: for this labour being the unquestionable property of the labourer, no man but he can have a right to what that is once joined to, at least where there is enough, and as good, left in common for others" (Locke 1690: chap. 5, sec. 27). That the principle for acquiring property applies not just to nuts and berries, but to the land itself, is made clear in Locke (1690: chap. 5, sec. 32): "As much land

Duties:[5]

- to abstain from harming others
- to abstain from taking property of others
- to leave enough and as good for others when taking from the common

The rights and duties are inseparable. One cannot claim the former without binding oneself to uphold the latter. Because the three Lockean duties are central to the issue of global warming, it will be worth taking a moment to examine them in more detail.

The first two duties are incorporated in another body of principles that market liberals endorse, the English common law. Without implying that seeking legal redress is necessarily the best way to deal with large-scale environmental harms under existing laws and court institutions, it is helpful to use analogies with the law to draw attention to ethical and philosophical parallels between environmental harms and other more familiar harms.

In law, the duty not to harm others is covered by the tort of assault, which means threatening or attempting to inflict offensive physical contact, combined with an immediate ability to do so, with the result that the victim is put in a state of apprehension. If the threat is carried out, battery is committed. Following common practice, when no confusion arises, we will use the term assault as shorthand for assault and battery, the combined making and acting on a threat.

The duty not to harm others in their property is covered by the common law tort of trespass. According to one standard legal source, the tort of trespass to land occurs "any time a person, without permission, enters onto land that is owned by another, or causes anything or anyone to enter onto the land or remains on the land, or permits anything to remain on it" (Jentz et al. 1993: 99). Actual harm is not an essential element of this tort. Trespass to personal property occurs "whenever any individual unlawfully harms the personal property of another or otherwise interferes with the personal property owner's right to exclusive possession and enjoyment of that property." Assault

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as a man tills, plants, improves, cultivates, and can use the product of, so much is his property. He by his labour does, as it were, inclose it from the common."

[5]With regard to the first two duties, Locke (1690: chap. 2, sec. 6) writes, "The state of nature has a law of nature to govern it, which obliges every one: and reason, which is that law, teaches all mankind, who will but consult it, that being all equal and independent, no one ought to harm another in his life, health, liberty, or possessions." The third duty is given, among other places, in the admonition to leave "enough, and as good, . . . for others" (chap. 5, sec. 27).

and trespass were well established in common law at the time Locke was writing. More recently, both have become codified as part of criminal law.

Certain defenses are allowed against a charge of assault or trespass. Consent of the victim is one. Also, if no causal relationship can be shown between the action of the defendant and the offense to the victim, the tort is not proved. However, certain attempted defenses are not recognized as legally valid:

- A showing that others have committed the same offense against the same victim without being held to account, so that the actions of the present defendant are responsible for only a small part of the aggregate harm to the victim.
- A showing that the defendant gained benefits from the tort, the value of which exceeds the costs to the victim.
- A showing that the defendant has committed the same tort in the past without being held to account.

The relevance of these defenses to the case of global warming will be discussed in the next section.

Locke's third duty, to leave enough and as good for others when taking from the common, can be called the duty not to engross. Engrossment, as Locke uses the term, means unjustly acquiring most or all of something at the expense of other holders of common rights. Locke understands that without a restriction on engrossment, the process of taking from the common could lead to unacceptable results. In one of his clearest statements, he qualifies his principles for taking as follows:

> It will perhaps be objected to this, that if gathering the acorns, or other fruits of the earth, &c. makes a right to them, then any one may ingross as much as he will. To which I answer, Not so. The same law of nature, that does by this means give us property, does also bound that property too. . . . As much as any one can make use of to any advantage of life before it spoils, so much he may by his labour fix a property in: whatever is beyond this, is more than his share, and belongs to others [Locke 1690: chap. 5, sec. 31].

Engrossment of land, as opposed to nuts or game, would occur if a person claimed more land than he or she could "improve, cultivate, or use the product of" (Locke 1690: chap. 5, sec. 32).

The duty not to engross has important implications for the process of enclosing land or other resources from the commons—implications that seem not always to be clearly understood by market liberals who enthusiastically cite Locke as a basis for a theory of property. One implication is obvious: The whole or a disproportionate part of the

land cannot be enclosed, or privatized, by the first individual who happens to come along. Think of a Walter Raleigh standing on the Atlantic coast of North America and claiming a swath of property that extends westward all the way to the Pacific. Less obviously, it means that the "mixing of labor" principle can never be used to enclose the entirety of any commons even if each person who comes along takes only that modest amount that he or she can use personally. Instead, at some point a scarcity constraint is reached beyond which enclosing even one more small parcel fails to leave "enough and as good for others." Beyond that point further enclosure may occur but, if so, it must proceed using some different mechanism that requires the consent of all who hold rights in common to the unenclosed remainder.

In this regard, Locke contrasts the situation of a country like the America of his day, where land existed in abundance, with that of England, where the scarcity constraint had already been reached. In the latter case, he writes,

> No one can inclose or appropriate any part, without the consent of all his fellow commoners; because this is left common by compact, i.e. by the law of the land, which is not to be violated. . . . Besides, the remainder, after such enclosure, would not be as good to the rest of the commoners, as the whole was when they could all make use of the whole; whereas in the beginning and first peopling of the great common of the world, it was quite otherwise [Locke 1690: chap. 5, sec. 35].

It is not that Locke thinks the remaining land is better used when held in common than when held privately. Quite the contrary, just a few paragraphs later, he asserts that one acre of enclosed land is as productive as 10 or more acres held in common. Still, if the remaining commons is to be privatized, this must happen by the consent of all the tenants in common. To use modern terminology, they must be bought out, not simply expropriated. If the value of the land really increases through enclosure, a buyout should be feasible. But until the actual consent of the tenants in common is secured, justice trumps efficiency. We must either find efficient rules for managing the land that is still held in common, or we must, for the sake of justice, be resigned to live with the possible inconveniences and inefficiencies of common property.

Applying the Lockean Framework

In this section we consider the implications of the Lockean approach for global warming policy. In doing so, we will, for the moment, set scientific uncertainties to one side. We will take it as a

certainty that a harmful amount of global warming is taking place and that this warming is caused by human emissions of greenhouse gasses. In the next section we will consider how our conclusions should be modified to allow for the fact that both the alleged harms from global warming and the causal pathways are not, in fact, understood with certainty.

We can start by looking at cases in which warming has an impact on private property rights that have been clearly established. For the sake of discussion, let us cast in the role of victim a Bangladeshi farmer whose private land is threatened by inundation from a few centimeters further rise in the level of the oceans, and may already be subject to more frequent flooding from the small rise in ocean levels that has already taken place. In the role of defendant, we will cast a coal-fired power plant in the American Midwest. What defenses does the power plant have against a complaint of trespass by the farmer?

One attempted defense might be that the power plant in question contributes only a tiny part of present greenhouse gas emissions. Furthermore, it could be argued that the measured rise in the ocean is the product not just of today's emissions but is, in part, the cumulative result of emissions back to the start of the industrial age, the effects of which have themselves been aggravated by coming on top of a natural warming cycle.

As a matter of justice, this defense would fail. We have already seen that it is no defense against the torts of assault or trespass to argue that others participated in the offense. Suppose I am beaten by a gang of youths, but only one of the gang is apprehended. Would we let him off on the grounds that he caused only part of the harm, or on the grounds that his accomplices got away scot-free? Would we allow the defense to introduce evidence that I had been beaten by other gangs in the past? We certainly would not, and the same principles should apply to our power plant.

A second attempted defense might be that any harm to the farmer was unintentional on the part of the power plant. Its owners may have known nothing about climatology or the low-lying geography of Bangladesh. However, this defense of "sorry—I didn't realize it would hurt" would also fail in a court of law. If the underlying act is intentional—in this case, generating power and releasing greenhouse gasses into the air—intent to accomplish the ultimate harm is irrelevant. In law, one is assumed to intend the consequences of one's actions. For example, a drunk driver cannot plead that he did not intend to run into a pedestrian. The court would hold that the act of drinking was intentional, and that impaired driving is a foreseeable consequence of drinking (Jentz et al. 1993: 92).

A third defense might be to invoke costs and benefits. The power plant might plausibly argue that the cost of mitigating the damage, say by substituting nuclear or solar energy for coal, would exceed the cost of the damage, or the cost of adapting to the damage by building a sea wall or purchasing alternative land on higher ground. If correct, do such calculations constitute a valid defense against environmental assault or trespass?

The question is an important one, since the cost-benefit argument is very often invoked in the case of global warming. Typically, cost-benefit studies find that there would be some benefits from slowing global warming, but often they find that the costs are greater than the benefits. For example, a widely cited analysis of the Kyoto Protocol by Nordhaus and Boyer (1999) estimates discounted costs of implementation at about $800 billion to $1.5 trillion, compared with discounted benefits of about $120 billion.

There are formidable methodological difficulties involved in any cost-benefit study of such a large-scale phenomenon as climate change. One problem that is especially important, given the long periods of time involved in global warming, is the choice of an appropriate discount rate. The present value of costs or benefits realized a century or more in the future will either loom large or become vanishingly small depending on the discount rate one chooses.[6] Another important issue is where to draw the line in counting costs and benefits. Should calculations include only direct, or also indirect costs and benefits? As an example of indirect benefits, University of Virginia climatologist Patrick Michaels (2004) calculates that "fossil-fuel powered societies of the 20th century saw a virtual doubling in life expectancy, largely as a result of the technological and scientific development. Because of the number of people affected, this is equivalent to saving about a billion lives." As another example, *New York Times* columnist Thomas Friedman has emphasized in a series of columns that proper accounting of the costs of fossil fuel consumption should include not just pollution and climate change, but also geopolitical costs arising from the way that high energy consumption enriches hostile regimes elsewhere in the world.

These methodological issues, however, are not germane to this

[6]Using a modest discount rate of 2.5 percent means that the present value of $100 in costs or benefits 200 years from now is just 71 cents—equivalent to saying that costs and benefits that far in the future are almost irrelevant for today's decisionmaking. For a discussion of the discount rate and other methodological issues in cost-benefit studies of global warming, see Cline (2004). He finds larger present-value benefits of reducing greenhouse gas emissions than do Nordhaus and Boyer.

article. What is important for our purposes is only that human activities leading to climate change produce some adverse effects, regardless of how large they are or whether or not they are outweighed by benefits. We will therefore set all questions of cost-benefit measurement to one side by stipulating that the costs of mitigating global warming would exceed the benefits of doing so. How should such a finding affect the market-liberal position on global warming policy?

To begin, we should note that a cost-benefit defense is not valid against intentional torts like assault or trespass. In the case of trespass, the common law does not require any demonstration of harm at all. Unless property owners consent to intrusions, they have (with a few narrow exceptions) an absolute right to exclude them. Even in the case of assault, it is not necessary to prove physical harm. Contact that is merely unwanted or unpleasant can also constitute assault. Nor, in the cases of trespass or assault, are defendants allowed to introduce evidence as to their own gains. If I trespass on your property and cut down a tree that blocks my view, I cannot defend myself on the grounds that the increase in the value of my property is greater than the reduction in the value of yours. Similarly, in our earlier example, the gang member who beat me would not be allowed to plead that the thrill he got from administering the beating was greater than the pain I suffered as a result of it. There is no reason why a tort committed at a distance, via greenhouse gas emissions, should be treated differently from one committed at close range with a blunt instrument. The bottom line is: If you intentionally harm someone, you are liable for that harm, no matter how large the benefit you get from your action.

This does not amount to a blanket rejection of cost-benefit analysis as a tool of decisionmaking. Suppose, for example, that a railroad company is considering construction of a tunnel in place of a track through a mountain pass that is sometimes blocked in winter. The proper approach would be to compare the benefits of the tunnel (fuel savings, scheduling improvements) against the costs of digging it, both properly discounted at an interest rate reflecting the opportunity cost of capital. The same approach would be appropriate for a government considering a tunnel on a public highway. But even if the benefits outweigh the costs, liberal principles would require the builder of the tunnel, whether private or public, not just to calculate the costs but actually to pay them. For example, the tunnel will require some land for the entrance, the approaches, and for dumping waste rock. A favorable cost-benefit calculation would not justify digging the tunnel on land not owned by the builder, or dumping waste on someone else's land without their permission. But that is exactly what is advocated when it is argued that no action should be taken against global

warming, because the costs of reducing greenhouse gas emissions exceed the gains (the reduction in harm to victims) of doing so.

A comparison can be made with the liberal attitude toward the state's power of eminent domain. Market liberals have long been wary of this power. Although eminent domain is allowed by the U.S. Constitution, market liberals have traditionally argued that it should be used only in rare circumstances, as a last resort, when problems of strategic bargaining, holdouts, or transaction costs might otherwise bring some essential activity to a standstill. Recent attempts to use eminent domain to condemn land for ordinary commercial projects like shopping centers have been almost universally criticized by market liberals. Yet even eminent domain requires that the owners of the condemned property be compensated. Proposals to inundate low-lying coastal property in order to keep Midwestern electric rates low are not usually accompanied by even the fig leaf of a promise to compensate those who are harmed.

Much the same can be said of the argument that adapting to climate change is less expensive than mitigating it. Yes, a case can be made that adaptation is sometimes more cost-effective than mitigation, and a global strategy should of course take both into account. Convincing data to this effect are provided by Indur Golkany (2005). However, to establish that adaptation is more effective than mitigation is only the beginning of the argument for permitting continued greenhouse gas emissions, not its conclusion. A market-liberal position, based on Lockean property rights concepts, would insist not just on a demonstration that adaptation is theoretically superior, but on the actual undertaking of adaptation measures, at the expense of the interests that stand to benefit from continued emissions. Not just that, the true liberal position would insist that actual consent of the harmed parties be secured, rather than allowing the adaptation versus mitigation decision be made elsewhere and imposed on the victims.

Up to this point, the analysis has been artificially simplified by casting the global warming scenario as a clash of clear-cut private property interests, the Midwestern power plant versus the Bangladeshi farmer. This approach has made the problem into something like the example used by Coase (1960) of the farmer versus the railroad, expanded to a global scale. A more complete discussion needs to take into account the role of unenclosed commons as well as private property.

In the case of global warming, the relevant unenclosed commons include the world air-shed, which, in one of its several competing uses, serves as a sink for greenhouse gasses, and the oceans, which serve as a sink for heat generated by the greenhouse effect and a

catchment basin for melting ice. (We are still stipulating scientific certainty of these effects.) Whatever adverse impact the Midwestern power plant has on the Bangladeshi farmer are transmitted through the effects of greenhouse gas emissions on these common-property resources. What does a Lockean approach tell us about rights to make use of the global atmospheric and oceanic commons, and about how those rights might be established?

One result of adding common property to the mix is to give our hypothetical power plant a possible new line of defense, namely, the first-use principle. As a simple example of this principle, suppose I build a drag strip in a rural area and operate it for several years without drawing objections from the neighboring farmers. Later, someone buys part of an adjacent wheat field and builds a housing development. According to the first-use principle, the buyers of the houses have no right to complain about the noise of the drag strip. I was there first, and the noise was priced in when the sale of the houses was negotiated. The situation would be different if I built my drag strip in the middle of an established residential area. Then, the first-use principle would cut in the favor of homeowners, and I would either have to pay compensation, shut down, or limit my races to silent electric cars. Reduced to simple terms, the first-use principle is nothing more than the Lockean doctrine that the acorns in the forest belong to the first person to pick them up.

In the global warming case, our Midwestern power plant could argue that it has established ownership rights to the sink-value of the air-shed by emitting greenhouse gasses into it for many years without anyone's objection. No one has the right to come along now and change the rules of the game. If the emissions are to be stopped, it is the power plant that must be compensated for any abatement costs.

The problem is that the first-use principle ceases to be decisive when it runs up against a scarcity constraint, that is, against the Lockean duty not to engross. In the case of greenhouse gasses, it can be argued that energy users have the right to "enclose" air-shed rights under the first-use principle only so long as enough and as good is left for others. Suppose we reach a point beyond which further appropriation of air-shed rights encroaches on the interests of others who have common-property rights to the world's atmosphere and oceans. From that point on, following Lockean principles, further enclosure cannot proceed by unilateral taking. Instead, if emissions are to be increased at all (or even to continue, if the limit has already been crossed), they can only do so with the consent of all of the tenants in common, including our Bangladeshi farmer and anyone else similarly harmed. If the polluters want to gain that consent, they should

bargain for it by offering buyouts, side-payments, or financing of adaptation costs.

To be more specific, we could turn from the general issue of climate change to the debate over the Kyoto Protocol. With regard to this agreement, it is often objected that the United States would bear a disproportionate share of compliance costs since its emissions of greenhouse gasses are, at present, farther above the 1990 reference level than those of other industrial nations. Viewed in Lockean terms, this amounts to arguing that the United States should be let off the hook exactly because it has, in the past, been the most extreme engrosser of the world's common property.[7] This is a profoundly illiberal position to take. Defending the rights of property that has been unjustly acquired is a conservative position, not a liberal one. It reminds one of arguments made in defense of property in slaves, at the dawn of the American republic, by writers who, in other respects, were staunch disciples of Locke.

The Significance of Scientific Uncertainty

In the previous section, for the sake of discussion, we treated it as a scientific certainty that harmful global warming is taking place and is caused by human activities. In this section, we relax that assumption to allow for scientific uncertainty. The question to be addressed is, can an action that is proscribed when it is certain to do harm become permissible if the harm is less than certain?

To be sure, some people on the market-liberal side of the debate have denied that there is any scientific uncertainty. Statements to the effect that "there is no credible evidence supporting the theory of global warming" continue to appear from time to time (see, for example, Holcberg 2001). Most serious writers on the subject are more cautious, however. They allow that there is some credible evidence on both sides of the scientific debate.

Consider, for example, Britain's recent report on "The Economics

[7]To avoid misunderstanding, the "engrossment" of air-shed rights with which greenhouse gas emitters are here charged is something different from the more general allegation that rich nations use more than their fair share of the world's resources. It is a cliché in certain circles to decry the fact that the United States, with x percentage of the world's population, uses some much larger percentage y of its copper, natural gas, olive oil, or whatever. A market liberal would reply that as long as the greater consumption of high-income countries reflects the fact that they produce more, and as long as they acquire goods through voluntary exchange, not through unilateral expropriation, the fact of producing and consuming large quantities of goods and services does not in itself constitute engrossment in the Lockean sense.

of Climate Change" (House of Lords 2005). That report is cited approvingly by many market-liberal and conservative writers as a counterweight to the report of the Intergovernmental Panel on Climate Change (IPCC 2001), a favorite of environmentalists. After hearing from many witnesses, the authors of the House of Lords report agree that "forecasters do seem to indulge periodically in 'end of the world' stories." On balance, though, they conclude, "We do not believe that today's scientists are 'crying wolf': They may turn out to have been wrong in some respects, but the arguments on which they base their case are better researched than in earlier cases" (House of Lords 2005: 20). Even the IPCC report, if it is read closely and not just mined for the most sensational passages, includes a wide range of projections and lists many "key uncertainties" in the literature on climate change.

Furthermore, as mentioned previously, we should also take into account possible nonscientific sources of uncertainty. In addition to limitations of data or theories that are available for interpreting the data, it is possible that reported scientific findings are subject to biases motivated by political, ideological, or grant-seeking considerations. This problem makes it even more difficult to be sure that the whole truth about climate change lies on one side or the other of the debate.

What difference do the uncertainties make? One way to answer that question is to see how we deal with uncertainties in other contexts.

In daily life, we sometimes deal with uncertainty simply by ignoring the worst and hoping for the best. Suppose, for example, a male executive, during a meeting with an attractive female associate, is tempted to take a hands-on approach to management. He knows well enough that any intentional, unwanted touching will constitute the tort of assault. However, he is uncertain, at least in his own mind, whether his touch will be unwanted. To his way of thinking, some women like that kind of thing. If he takes his chances and makes a grab, should he be allowed, if rebuffed, to make the defense that he was not certain that his act would be ill-received? No, he should not. Our executive, and the rest of us too, know that we should avoid intentional acts that have a reasonable probability of causing harm, even if they are not certain to do so. Intentionally taking an action that has a substantial probability of environmental harm is no different.

This does not mean that we must, like members of a certain religious sect, go around wearing masks to avoid inhaling some endangered species of gnat. Sometimes the evidence pointing to possible harm is so tenuous as to approach zero. For example, some people

believe that radiation from electric transmission lines causes cancer. However, despite repeated investigation, the scientific evidence supporting the transmission line-cancer link is vanishingly slim. We need not be deterred from building transmission lines. But the evidence of a linkage from greenhouse gasses to global warming is several orders of magnitude stronger, even if it falls short of perfect certainty. It is strong enough to nullify the "I wasn't sure" defense attempted by our chauvinist executive.

At the opposite pole from hoping for the best and ignoring the worst lies the minimax strategy for dealing with uncertainty. This approach focuses on minimizing the chance of a maximum loss. An example from public policy would be the defense system the U.S. government is building to protect against a nuclear missile attack from North Korea. Although the probability of such an attack is small and the efficacy of the defense system is uncertain, a successful strike by even a single nuclear missile would be so catastrophic that it justifies the expense, at least in the opinion of some people who appear otherwise rational. The fact that more lives could be saved, in terms of mathematical expectations, by spending the same hundreds of millions of dollars on, say, diabetes clinics, is, for them, beside the point. To take another example, this time from the private sector, we know that some people, in planning for retirement, invest in a portfolio of stocks, while others buy certificates of deposit or insured annuities. The latter sacrifice the higher expected rate of return of the stock portfolio to protect themselves against the small possibility that a large-scale market crash could have a catastrophic effect on their standard of living.

A minimax strategy is most likely to make sense when the mathematical expectation of loss is hard to calculate and the feared loss is of a nature that would make a qualitative, not just a quantitative, impact on individual welfare. Some of the risks of global warming may fall into this category, for example, the possible disruption of Atlantic currents that keep Europe warm in the winter. The consensus among scientists seems to be that the probability of such an event is small, at least for the near future. However, it could fit the minimax pattern if, as some oceanographers think, the current might, under some future conditions, stop abruptly with a catastrophic impact on the European climate.

When it comes right down to it, the merits of a minimax strategy depend less on science than on subjective risk preference. There is no objective way to prove that a minimax strategy is the best in a given situation, but equally, no reason to exclude this approach from the discussion of public policy. This should be especially true for market

liberals, who, in other contexts, are quite comfortable with taking people's subjective risk preferences as they find them. In discussing financial markets, people with greater than average risk aversion are characterized as "prudent," and markets are lauded for their ability to accommodate their preferences. Why is it, then, that when climate policy is being discussed, people with greater than average risk aversion are dismissed as "alarmists" who do not even deserve a seat at the table?

A third approach to decisionmaking with uncertainty, the "reasonable care" standard, lies between a strategy of hoping for the best while ignoring the worst and the strong risk aversion of a minimax strategy. According to the reasonable care standard, when there is risk that some activity may cause harm, one should take all cost-effective precautions. Cost-effective, in this case, means those precautions which, at the margin, have a cost that is less than the resulting reduction in the expected value of harm.

One application of this standard is to the law of negligence. Suppose I own a trucking company, and you are injured when the brakes on one of my trucks fail, causing it to collide with your car. In a suit for negligence, one issue that could arise is whether I took reasonable precautions to avoid brake failure. Did I buy quality parts from a reputable manufacturer? Did my mechanics make regular brake inspections? If it turns out that I tried to save a few dollars by using substandard parts and skipping inspections, I could be judged negligent and required to pay damages. If I did take reasonable care, I would be judged not negligent and the loss falls on you, the victim.

Applied to the issue of global warming, the reasonable care standard suggests that we should take measures to reduce greenhouse gas emissions up to the point where the marginal costs of doing so begin to exceed the expected value of the marginal gains. This is an improvement over the head-in-the-sand idea that we should do nothing at all until we are fully certain about every detail of climate science. Still, applying the reasonable care standard to the case of global warming is open to an important qualification.

In tort law, the reasonable care standard is most widely accepted in reference to negligence, an unintentional tort. However, as discussed in the previous section, emissions of greenhouse gas are better viewed as intentional torts, akin to assault or trespass. When we build a coal-fired power plant, we intend all of the foreseeable results, not just generation of energy but also emissions of carbon dioxide. We just don't know how much damage the emissions will do. Rather than the analogy of brake failure, to which the reasonable care standard applies, the carbon emissions are more like drunken driving. As

explained earlier, both the drinking and driving are intentional acts. We are not excused from the consequences of drunken driving just because we don't know exactly what we will hit in our drunken state—a tree, a car, or a school bus. Despite the uncertainty, we are liable for any harm we cause, and we are required to pay damages.

This reasoning does not absolutely mean that the power plant should not be built. It could be correct that the cost savings from using coal rather than solar energy outweigh the expected value of damage done from the incremental global warming, and even true that there is a nonzero possibility of zero damage. Still, that does not excuse owners of the plant from liability for harm. If harm can later be demonstrated, restitution must be made through payment of appropriate damages or investment in adaptation projects.

To put it another way, the presence of uncertainty cannot mend the flaws in the cost-benefit argument that were discussed in the previous section. Remember, the most widely cited cost-benefit studies do not claim that the harm done by global warming is zero, only that the benefit of doing anything about it is exceeded by the costs of mitigation. Earlier we saw that such calculations, when both costs and benefits are known with certainty, does not create a right to take other people's property without payment. By the same token, the reasonable care standard, which is the application of cost-benefit principles under uncertainty, does not offer an escape from contingent liability if intended actions turn out, after the fact, to cause harm that was not certain to occur when the actions were taken. Unfortunately, an acknowledgment of contingent liability is too often missing from market-liberal writings on the subject of global warming. Instead, estimates of the expected value of costs and benefits are treated as dispositive, with the implication that emission sources should be held harmless even if the climatological optimists on whose research the estimates were based turn out to be wrong. This does not, to me, seem a sound position for a market liberal to take. It sounds more like a conservative defense of arbitrary privilege, similar to claims of sovereign immunity made by kings and presidents.

Conclusion

What, then, is the bottom line? What is the proper market-liberal position on global warming? If that position is to be constructed on a sound Lockean respect for the persons and property of others, some of its outlines are clear, even if many details remain to be filled in.

First, market liberals should keep arguments based on comparisons of costs and benefits in proper perspective. The fact that an action produces net benefits, even very large net benefits, does not shield the actor from liability if it also does harm. The relative magnitude of the costs and benefits, or their relative probabilities, is, in this regard, irrelevant. The duty not to harm people in their persons or property is not to be bypassed on the basis of any facile cost-benefit calculus. This is an essential part of what distinguishes the classical liberal tradition from other political theories that would invoke the power of the state to override individual rights in favor of some greater societal utility. This being said, cost-benefit calculations may in some other respects be relevant to the formulation of a market-liberal position on global warming. They may help choose between different mechanisms for implementing climate change policy. They may be relevant to the decision of whether to abstain from possibly harmful actions, or to risk possible harm while accepting a contingent duty of restitution. And they may be relevant to whether harm is better avoided by mitigation of climate change, or instead compensated through investments that help victims of climate change to adapt.

Second, the market-liberal position should be distinct from a conservative position that defends unjustly acquired privileges. Liberalism in America, in particular, grew up in a Lockean state of nature where it was really true, or at least seemed true, that homesteaders, loggers, grazers, and industrialists could take what they needed while leaving "enough and as good for others." What the environmentalist side of the global warming debate is telling us is that we no longer live in such a world. It is not just that we can take no more from the commons; we have quite possibly already taken so much as to have breached our duty not to engross. To be sure, the science of just how much can safely be taken is not yet perfect. We may be way past the limit already or still a bit short of it. But to cry foul because those who have taken the most are now asked to bear a substantial share of the costs is not liberalism.

Third, market liberals should keep a clear head when it comes to the relationship between science and public policy. It is fine to be legitimately cautious when policies are urged on the basis of weakly established scientific fads. One should be vigilant against attempts to smuggle questionable economic or political assumptions into scientific analysis, as is sometimes done in the global warming debate, and also to possible biases in research produced by grant-seeking and public choice considerations. But at the same time, as Hayek warned, any reluctance to accept new scientific theories must itself be rational

and must be kept separate from the regret that the new theories may upset cherished beliefs (let alone that they threaten the financial interests of useful allies). This is a fine line to walk, and I fear that the market-liberal camp may at times have overstepped it.

Fourth, market liberals should think about the implications of their principles not just for public policy, but for their personal conduct. It is fashionable in some conservative circles to ridicule environmentalism as a new religion that calls for a personal morality of abstinence (see, for example, Schlesinger 2005). Perhaps market liberals would not want to describe their beliefs as a religion, but all of the great thinkers to whom they pay homage make it clear that the duty not to harm others in their persons or property is not just an abstract guideline for public policy, but a specific imperative of personal morality. To cede the moral high ground on environmental issues to the left is not just tactically foolish, it is unprincipled. To put it simply, a market liberal should not be ashamed to drive a Prius rather than a Humvee.

These broad outlines of a market-liberal position on global warming leave a great deal of room for debate and discussion. They leave open the whole area of how to design a policy to deal with global warming. Are the flaws of the Kyoto Protocol so serious that it is worse than doing nothing at all? Perhaps so—even its staunchest supporters acknowledge that it has many limitations. Should we act now, based on current scientific knowledge? Or should we wait, while firmly insisting on the principle of contingent liability, being prepared to make restitution should subsequent harm turn out to be greater than optimists think it will be? In formulating global warming policy, should each country act unilaterally, based on a duty to avoid harm regardless of what others do, or is it best to try to negotiate international agreements? If measures are to be taken, what role should be given to market-based mechanisms like tradable permits? How can such market-like devices, if used, be introduced in a way that respects existing property rights? How do such devices relate to Lockean principles regarding enclosure and management of residual unenclosed commons?

By addressing these and other questions, market liberals can make a uniquely valuable contribution to the global warming debate. If, however, they allow themselves to be perceived as ostriches whose only policy in the face of uncertainty is to hope for the best while ignoring the worst, and base their position on climate policy on arguments that they would disdain in any other context, they will end up making no useful contribution at all.

References

Cline, W. R. (2004) "Meeting the Challenge of Global Warming." Copenhagen Consensus Program of the National Environmental Assessment Institute (www.cgdev.org/doc/expert%20pages/cline/ClChan300404.pdf).

Coase, R. (1960) "The Problem of Social Cost." *Journal of Law and Economics* 3: 1–44.

Cordato, R. (2004) "Toward an Austrian Theory of Environmental Economics." *Quarterly Journal of Austrian Economics* 7 (1): 13–16.

Davis, R. E. (2000) "Links between Deaths and Climate Weakening Over Time." *Environmental News* (1 February). Chicago: Heartland Institute.

Golkany, I. (2005) "Living with Global Warming." National Center for Policy Analysis, *Policy Report*, no. 278.

Hayek, F. A. (1960) "Why I Am Not a Conservative." Postscript to *The Constitution of Liberty.* Chicago: University of Chicago Press.

Holcberg, D. (2001) "Global Warming vs. Prosperity." *Capitalism Magazine* (21 March) www.capmag.com/article.asp?ID=418).

House of Lords (2005) "The Economics of Climate Change." Select Committee on Economic Affairs, Second Report of Session 2005–06. London.

Intergovernmental Panel on Climate Change, IPCC (2001) *Climate Change 2001: Synthesis Report* (www.ipcc.ch/pub/un/syreng/spm.pdf).

Jentz, G. A. et al. (1993) *West's Business Law,* 5th ed. St. Paul, Minn.: West Publishing.

Kris, M. (2005) "Lobbying and Law—Cold Cash and Global-Warming Research." *National Journal* (2 April) (www.marshall.org/article.php?id=284).

Locke, J. (1690) *Second Treatise of Government* (www.constitution.org/jl/2ndtreat.htm).

Mathews, R. (2006) "The Atom Bombshell that is Splitting Opinion." *Financial Times* (10 March): 7.

Michaels, P. J. (2004) Private communication.

_____ (2005) "Global Warming and Climate Change." In *Cato Handbook on Policy*, 6th ed., 479–89. Washington: Cato Institute. (www.cato.org/pubs/handbook/hb109/hb_109–48.pdf.)

Nordhaus, W. D., and Boyer, J. G. (1999) "Requiem for Kyoto" (www.econ.yale.edu/~nordhaus/homepage/Kyoto.pdf).

Savage, J. D. (1999) *Funding Science in America.* Cambridge: Cambridge University Press.

Schlesinger, J. (2005) "The Theology of Global Warming." *Wall Street Journal* (8 August): A10.