FREE MARKETS, PROPERTY RIGHTS AND CLIMATE CHANGE: HOW TO PRIVATIZE CLIMATE POLICY

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1 Introduction

SHORTLY BEFORE THE INDUSTRIAL REVOLUTION the English philosopher John Locke put forward a theory of property that reflected the emerging capitalist system. This theory has often been interpreted as supposing that we, the human race, live on a frontier with the natural world, looking across to plentiful resources in an as yet un-tamed and un-owned wilderness. In the 1960s Kenneth Boulding, an economist born in Liverpool whose working life was spent mainly in the USA, caught the mood of environmental anxiety by labelling this approach 'the cowboy economy'. He contrasted it with the idea of 'Spaceship Earth', its astronauts, the human race, depending for their lives upon the fragile atmosphere and depleted resources of a tiny planet spinning through an indifferent universe. Will Spaceship Earth land on a new frontier or disappear burning into deep space? Pessimists see the human race represented by Icarus, the young man in Classical Greek mythology whose ambition outstripped the technology available to him. He flew using wings made for him by his father, Daedalus, but the wax holding the wings melted when he flew too close to the sun. In Breugel's famous painting *Landscape with the Fall of Icarus*, he is depicted splashing helplessly into the sea.

Many believers in anthropogenic global warming (AGW) would see the fate of Icarus as a precursor of the fate of the human race. If carbon emissions are not reduced sufficiently to constrain AGW to a level that does not threaten dangerous climate change, our wings will indeed melt. The implication is that there is a case for government intervention in market activity to prevent this disastrous outcome.

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It is true that the effects of AGW might prevent people from exercising their rights to life, liberty and the pursuit of happiness; for example, their territory might be inundated. And it is also true that it is the duty of governments to protect these rights.

However, this duty must not be discharged through government regulation of market processes, for several reasons. First, such a policy is based on the assumption of orthodox or neoclassical economics that AGW is a case of market failure, indeed 'market failure on the greatest scale the world has seen' (Stern, 2007, p.27). For, as Austrian economists and libertarian political philosophers argue, it is not markets that have failed but governments in failing to allocate property rights. Second, far from being the greatest market failure, the AGW hypothesis may rather be the greatest moral panic the world has ever seen.

There is no secure foundation in climate science for the current policy rhetoric; governments simply lack the knowledge to operate climate policy effectively. All existing climate policy instruments including taxes, subsidies, regulation and emissions trading should therefore be swept away.

My aim in this paper is propose an authentically Austrian approach to climate change policy. Such a proposal is necessary because the dominant neoclassical framework fails to provide an adequate defence of property rights and a secure foundation of knowledge for policy. Suppose that global mean surface temperatures are rising as a consequence of AGW and the effects of such increases threaten people's rights to non-interference in pursuing life, liberty and happiness.

In that case policy measures are needed to protect people's rights by curtailing carbon emissions.

But are global mean surface temperatures rising as a consequence of AGW? The earth's climate has always been susceptible to change caused by natural factors over which policy makers have no control, so the only climate change policy that makes sense is adaptation. It is my contention that we do not know that they are and that 'climate change' policy instruments should therefore be withdrawn. It is also my argument that in Austrian economics can be found a policy that could promote advances in climate science that might eventually yield reliable knowledge concerning the putative occurrence of anthropogenic global warming.

The first task to be undertaken in the paper defend the claim that two currently favoured climate policy instruments, taxes and emissions trading, should be abandoned. Section 2 contains expositions of neoclassical and Coasean schools of economic thought that underlie taxes and emissions

trading, respectively, and the Austrian approach to environmental economics that is the foundation for the privatised policy to be advocated later in the paper. In Section 3 it is assumed that there is a secure knowledge base for policy, in other words that the AGW hypothesis is known to be true. It is argued that even in these circumstances taxes and emissions trading both encounter insuperable difficulties and their use would be unlikely to lead to an effective climate change policy. The discussion in Section 4 drops the assumption that the AGW hypothesis is known to be true and examines the climate changed debate, finding that climate science cannot provide a secure foundation of knowledge for current policy.

The second task of the paper is taken up in Section 5, which expounds the Austrian alternative to existing policies. The Austrian way of thinking about the issue interprets climate change as a putative interpersonal conflict rather than market failure. The use of fossil fuels, like any other economic activity, should be subject side constraints designed to protect other people's property rights. Tort litigation on the basis of strict liability would therefore take the place of taxes and emissions trading. By providing a public arena in the courts for the testing of scientific hypotheses about the causes of climate change, litigation would also promote the public understanding and even the advancement of climate science. The aim is to devise a strategy that protects to the greatest possible degree the liberties of all agents, both users of fossil fuels and people whose livelihoods and territories are at risk if the AGW hypothesis is true.

2 Economic approaches to environmental issues

My purpose in this section is to outline three market-based economic frameworks for analysing environmental issues. The three frameworks have a common foundation in liberal political philosophy.

2.1 The liberal foundations of economic analysis

The core liberal principle is to protect the individual from coercion by the social groups to which he or she belongs, by demarcating a private area within which individuals can do as they please, free from interference by the rest of society. This prioritizing of the rights of individuals grew out of an acknowledgement of the diversity of people's opinions, religious beliefs, ethical principles, ethnic and cultural identities, sexualities, economic roles, talents, skills, tastes and preferences. How should the state respond to such diversity? The liberal answer is that its constitution and laws should embody toleration of diverse, beliefs, identities and social and economic activities. The state has an essential, but limited, role in setting up procedures that will

enable different groups of people to live together, respecting one another's right to pursue their own way of life. These procedures must be neutral or impartial with respect to each particular social group or way of life. Some liberal theorists saw an affinity between the neutral state and the free or competitive market, which came to be interpreted as an impartial arena for settling competing claims on economic resources. The principles of liberalism apply to the economic world as well as the political realm. There is the diversity of consumer wants, leaving no obvious way of reaching agreement on what to produce. There is individual autonomy in that producers and consumers make their own decisions about what to buy and sell. There is liberal neutrality, too. For in the absence of a central authority ordering people to produce these goods than those, the goods that are produced will not favour any one source of consumer demand over any other.

2.2 Neoclassical environmental economics

Market failure assumes welfare maximisation, in that market failure occurs when markets fail to maximise welfare, that is, they fail to locate the one level of output (of goods whose production is carbon intensive) that brings marginal benefit and marginal social cost into equilibrium. Neoclassical economics developed out of the nineteenth century classical liberal tradition of political thought and its methodology was shaped by the physics of the day. The allegiance to physics has proved to be incompatible with the defence of individual freedom. It is my contention that the influence of physics has overpowered the classical liberal heritage and transformed neoclassical environmental economics into an instrument of the over-mighty state.

The strength that its classical liberal heritage imparts to neoclassical environmental economics lies in the goal of seeking to find a balance between the aims and interests of producers and consumers whose activities damage the environment against those of human and potentially non-human victims of that environmental degradation. This attempted neutrality distinguishes neoclassical environmental economics from authoritarian environmentalism, which places an absolute value on preventing environmental damage whatever the consequences for production and consumption. It is tempting for the authoritarian environmentalist to assume that since pollution is an economic bad, its optimum level must be zero. Why contemplate anything other than zero tolerance for something that damages people's well being? The neoclassical answer is that we want some pollution insofar as it is an unavoidable side-effect of the production of things we would not want to be without. In the absence of rapid technological change to decouple production from carbon emissions, the second-best solution is therefore to reduce the level of production of goods and services in the hope

of bringing into balance the benefits of producing goods and services and the harm of producing carbon emissions. This approach to pollution reflects the origins of neoclassical economics in liberal neutrality; it is not a question of taking sides with either the polluter or the victim of pollution but of devising procedures that enable them to live together without either one inflicting too much harm on the other.

However the influence of the equilibrium models of physics and an interpretation of the associated quest for precise quantification and measurement undermines the liberal ambitions of neoclassical environmental economics. Neoclassical economic analysis has turned away from establishing the harm an individual polluter does in denying other individuals their rights to the continued use of an unpolluted environment. The equilibrium approach to modelling implies the existence of an optimum level of pollution for society, to be calculated by weighing the notional monetary value of the external cost of economic activity against the monetary value of its benefits. The freedom of the individual to produce and consume is constrained according to a calculus of the net value of the activity to 'society'. This methodological strategy takes the analysis to an aggregate level and leads to the coercion of the minority or indeed the individual by the majority. In this way neoclassical environmental economics has betrayed its classical liberal genealogy by giving the state a reason to assume an oppressive role in curtailing individual freedom.

2.3 Coasean economic analysis

Ronald Coase (Coase, 1960) developed a theoretical analysis of environmental problems, or negative externalities, which shared with neoclassical economics the assumption of competitive markets but draws radically different conclusions. The issue of environmental damage is not a case of market failure but arises out of a failure by government to define and allocate property rights. If government defines and allocates property rights, they become, in principle, tradable and disputes can be settled by bargaining and the exchange of property rights without the need for government regulation of or intervention in market processes. The qualification 'in principle' is necessary because bargaining requires the further assumption that there are no transaction costs.

Let us consider the example that Coase uses, in which the negative externality is the damage caused by one farmer's cattle straying on another farmer's crops. From a neoclassical perspective the solution to this problem is to be found by estimating the social cost of cattle production, consisting of the private costs of production plus the external cost in the form of the

damage to the crops, and comparing it to the social benefits of cattle production. Cattle production should be reduced until its (marginal or incremental) social cost equals its (marginal or incremental) social benefits. This necessitates intervention in productive processes by a government agency through taxation or regulation.

By contrast, the Coasean solution can be secured through free bargaining by private individuals. The first question the Coasean asks is whether property rights have been defined. Let us assume that property rights have been defined. The second question is whether there are any impediments to bargaining, that is, whether there are any transaction costs. Let us assume that there are no transaction costs. In this situation the parties to the dispute, or the two farmers in Coase's example, will be able to bargain or negotiate until an efficient outcome is reached. This is a Pareto-efficient outcome, a situation in which it is impossible to make one party better off without making another party worse off. Bargaining will involve exchanging property rights until an efficient outcome is realized. The significance of this process is that the free market or the price mechanism functions for the exchange of property rights just as much as for the exchange of goods or services. In Coase's example, the arable farmer and the cattle farmer bargain until the welfare of each farmer is maximised. Either the crop farmer sells his right to grow crops on the land, or on part of the land, or the cattle farmer sells his right to allow his cattle to roam unchecked over the arable farmland.

There is an equality of misfortune in each farmer's predicament that many people might find disturbing. What if one farmer had been growing crops on his land for decades only to find that the un-owned land next to his is then appropriated and given over to cattle production? Or, what if the livestock farmer had been raising cattle and allowing his animals to stray on to un-owned land for decades only to find that it is then appropriated and sown with crops? Should not priority of ownership and usage count for something? The uneasiness that might be felt about the Coasean bargaining solution is ultimately an ethical position. Priority of ownership and usage of resources, in other words, priority in the definition and allocation of property rights, implies that one farmer is the perpetrator of the external cost and the other the victim, that one caused the problem and the other had it inflicted upon him. However the Coasean position is that their predicament is mutual; they find themselves involved in an interpersonal conflict over the use of resources; neither is more culpable or has a better claim to redress than the other. Without any question of 'who was there first', they exchange property rights until an efficient outcome is reached.

2.4 Austrian environmental economics

It is on precisely this question that Austrians disagree with the Coasean position. However Austrian and Coaseans share the insight that it is not markets that have failed but governments in failing to allocate property rights. Both of these theoretical perspectives are contributions to 'free market environmentalism', which understands environmental problems as interpersonal conflicts to be resolved by allocating and defending property rights rather than market failures to be resolved by government intervention in market processes (Anderson and Leal, 2001).

Two central principles of Austrian economics are that competition is a dynamic process and costs are subjective. From a neoclassical perspective, consumer preferences and resources are given and the 'matching up' or equilibrating function of the market is a merely technical procedure, which could just as well be done by an omniscient and benevolent central planning agency. From an Austrian perspective, however, there is something else that the market does which could not be achieved by an omniscient and benevolent central planning agency. Genuinely innovative consumer goods, if they are be successful, must do more than match a prior specification (set by consumer preferences). For example, suppose that I compile a comprehensive list of the features I require in a car. But I will never dream up something that matches my specification in the uniquely attractive and unexpected way that, for example, the Volkswagen Scirocco does. If I could that, I would be a car designer. Competition is a dynamic or creative process of bringing new products to market, far removed from the movement towards equilibrium of competitive markets in neoclassical economics.

The neoclassical analysis of externalities is further undermined by the subjectivity of costs. Costs are subjective in the sense that they exist only in the mind of the individual and cannot be measured by anyone else. The search for an objective estimate of the value of the damage incurred by the victim of pollution is therefore futile. The economic agents who bear the external costs of production do not participate in the 'measurement' of those costs. Austrian economists therefore reject the neoclassical strategy of seeking to realize a market equilibrium where marginal social benefit equals marginal social cost, on the grounds that market are never in equilibrium and costs are subjective.

In analysing climate change, the Austrian approach uses a praxeological framework, that is, one that begins from individuals using resources to seek their goals. This underlies an alternative framework for formulating AGW policy, based on an Austrian approach to environmental economics (Cordato, 2004) and informed by a libertarian political philosophy (Nozick, 1974).

Climate change is an example of interpersonal conflict over the use of resources as some individuals use the atmosphere as a carbon sink, changing the climate and thereby making it impossible, for example, for other individuals to rely upon an unchanged climate as a resource for growing crops in particular locations. Economic activity giving rise to CO_2 emissions would proceed without hindrance from existing policy instruments but would be subject to side constraints concerning the avoidance of harm to others. It is for the courts to decide, calling on the testimony of expert witnesses, whether CO_2 emissions are responsible for such harm by causing dangerous AGW.

The purpose of climate change policy is to allocate the missing property rights (to a climate unchanged by human activity) and install legal institutions that will enable goal-seeking individuals to defend those rights against invasion. True, this is an arduous task but less so, it will become clear, than the neoclassical approach to climate change policy, which seems to be based upon guesswork and wishful thinking and without serious prospect of success. The conclusion is that, from a free market or Austrian perspective, environmental problems arise, not out of market failure, but from government failure to specify and enforce property rights.

3 Neoclassical and Coasean approaches to climate change policy

Let us examine the climate policy recommendations of neoclassical and Coasean economists on the assumption that the maximum level of atmospheric CO_2 consistent with averting dangerous climate change and hence the safe level of carbon emissions are known. Even if we make this assumption, the policies that follow from neoclassical and Coasean perspectives encounter insuperable difficulties, justifying recourse to an alternative Austrian framework of thought. This assumption is relaxed in Section 4, reinforcing the case for the Austrian approach.

3.1 Environmental taxes

The market-based policy instrument supported by neoclassical economic analysis is the environmental tax. What are the difficulties in implementing an environmental tax? The biggest problem is the cost of gathering information on external costs. This is not always an insuperable obstacle. In fact the UK taxes on landfill and on the extraction of aggregates such as sand and gravel are designed to equate marginal social costs and benefits. However the external costs of landfill and aggregate extraction are mainly local, consisting in loss of tranquility and landscape value to people living near the sites, and hence relatively easy to quantify through standard

procedures such as house price comparisons and surveys. A tax on production causing carbon emissions is a very different matter, because the external costs are remote in time and space and, as will be explained in Section 4, difficult to quantify.

However policy makers may take a more pragmatic approach, designing incentives to change behaviour in roughly the right direction. Rather than taxing the output of goods whose production causes carbon emissions, a carbon tax penalises carbon emissions directly. The advantage of a carbon tax is that does not require producers to reduce output provided that they can reduce carbon emissions for an unchanged level of output by switching to a less carbon-intensive, or ideally a carbon-neutral, production process. The information costs of a carbon tax designed to encourage innovation and the uptake of new energy technologies are relatively low. Policy makers need to know enough about the cost structure of firms to be able to calculate the level of tax necessary to persuade them to invest in new less carbon-intensive technology.

The EU has so far failed to agree to impose a carbon tax but Norway, Sweden, Finland and Denmark introduced carbon taxes in the early 1990s. The success of a carbon tax in reducing emissions depends on two main factors. First, carbon taxes are not a 'quick fix' but 'are typically effective in the medium to longer term. In the short run, demand for carbon-creating activities, such as electricity generation and transport, tends to be unresponsive to changes in price (Helm, Hepburn and Marsh, 2005). In the UK the Royal Commission on Environmental Pollution estimated that petrol would need to increase in price by 9% (in real terms) a year for 10 years to meet the government's CO_2 reduction targets. It is not clear that any government would risk the electoral unpopularity that such a tax rate might cause.

Second, a carbon tax will be effective only if it is internationally harmonised. Otherwise, firms in high-tax countries will be placed at a competitive disadvantage and might relocate to low-tax countries. This would reduce the effectiveness of the tax, which is intended to reduce carbon-intensive activities rather than redistribute them across countries. Unfortunately, the four Scandinavian countries that introduced carbon taxes in the early 1990s 'have not been able to harmonise their approaches—demonstrating the difficulty of co-ordinating tax policy internationally, even among a relatively small group of countries' (Stern Review, HM Treasury, 2006). The US policy stance is not sympathetic to taxes, while the developing countries are unwilling to take action because they see climate change as the product of carbon emitted by industrial countries in the past. Harmonising a carbon tax on a global scale is achievable only in the very long term, if at all.

Some members of the European Union subsidise fossil fuels, particularly coal. For example, in Germany 'coal remains untaxed under the ecological tax reform introduced in 1999' (European Environmental Agency, 2004, p.14); this subsidy was worth about €3.5 billion in 2001. The economic purpose of a subsidy is to increase the output of a good that provides positive externalities or public benefits such as vaccinations against infectious diseases and education. On economic grounds, and assuming a substantial anthropogenic contribution to climate change, there is an unanswerable case for phasing out subsidies to fossil fuel industries. However such a policy recommendation would meet vigorous resistance on political grounds, because fuel subsidies are typically a form of employment protection without which jobs would be at risk.

A global carbon tax or even one covering most major carbon-emitting countries seems to be a distant prospect.

3.2 Emissions trading

A Coasean explanation of climate change it is that is a consequence of government failure to establish a comprehensive allocation of property rights, by omitting to allocate the right to use the atmosphere as a receptacle for GHG emissions. According to this view, the atmosphere should be treated as property; firms or nations must buy or be allocated the right to use this property as a receptacle for carbon emissions up to a limit that does not result in a rise in the global mean temperature. Once property rights have been allocated, trade can take place. As with any other market, the government defines who owns what and enforces the contracts people make. The state sets the market in motion, so to speak, and then stands back to allow it to operate freely. In the case of carbon trading, once the permits have been allocated, trading can take place and the price mechanism will not only achieve a reduction in carbon emissions but will do so at least cost to the economy.

The Kyoto Protocol envisages a major role for market mechanisms, in particular carbon emissions trading, in achieving GHG emissions reduction targets at the lowest possible cost. The Kyoto targets apply only to the major industrialised economies which are historically the major emitters. Despite the prospect of much lower emissions reduction costs from carbon trading, the USA resisted any mandatory emissions reduction targets, while China and India expressed resistance to mandatory targets for the post-Kyoto period (after 2012). In contrast the EU had established a multinational emissions trading system (ETS). If the EU ETS proves to be effective in reducing emissions at least cost, a similar scheme may be introduced by other

countries, possibly incorporating all of the major emitters which are responsible for 80% of global emissions

The EU ETS is a 'cap and trade' scheme. The EU, as a supranational organisation, establishes property rights in the atmosphere by setting a limit, in other words *capping,* emissions for a given period of time and allocating permits to firms in carbon-intensive industries to emit carbon up to this limit. The firms can then *trade* the permits. Some firms will emit less carbon than their allocation allows, perhaps because they have installed low or non-carbon technology, and can recoup some of the investment costs by selling their surplus permits. Other firms will want to emit more carbon than the permits allocated to them allow, perhaps because their carbon-intensive capital equipment is not yet due to be retired. Until they can invest in cleaner technology, they will need to buy permits to cover their excess emissions.

In principle, a cap and trade system is the least-cost method of reducing emissions because it mobilises the decentralised knowledge of costs. Each firm can choose to invest in new technology at a pace that suits it, minimising its costs and its prices to consumers. Nevertheless, whether carbon emissions are reduced at all, never mind at least cost, depends crucially on the quality of government decision-making in the design of the emissions trading system. Three key decisions need to be made: about the limit to be placed on emissions, the coverage of the system and the method of allocating permits among participating firms.

First, the level of emissions should be consistent with the long term objective of policy, such as avoiding dangerous climate change (the agreed goal of the Kyoto Protocol). This can only be based on scientific evidence and a prediction about future 'business as usual' emissions, to be discussed in Section 4; such predictions inevitably introduce uncertainty into the trading system, and this may compromise its acceptability to participating firms.

Second, the coverage of the trading system may, at least in its early stages, be limited to carbon-intensive industries that are not at immediate risk from competition in international markets. Industries that are granted exemption are protected and, in effect, subsidised. The UK ETS and EU ETS both include significant exemptions.

Third, the choice of the method of allocating the first permits, between free distribution or auction or a mix of the two, is crucial. Free distribution may be an essential part of a strategy to win acceptance from sceptical firms, but it has its risks. One is that free distribution can act as a barrier to the entry of new firms, undermining the degree of competition in industries covered by the scheme. Incumbent firms receive a free allocation of permits when the trading system begins, but new entrants have to purchase permits at

the prevailing market price. The implication is that 'the free distribution system imposes a bias against new users in the sense that their financial burden is greater than that of an otherwise identical existing user' (Tietenberg, 2005, p.184).

The combination of baseline and credit approach and free distribution of permits can have unwelcome effects on the distribution of income. For example, firms such as electricity generators may increase prices in anticipation of receiving insufficient permits and having to purchase extra permits at the predicted market price. If the quota is sufficient to cover actual emissions for most firms, the carbon price (the price of permits) will collapse and the funds raised for purchasing will become windfall profits. The distributive effects on society as a whole are likely to be regressive, with money being redistributed from electricity customers, many of whom will be on low incomes, to shareholders who may be expected on average to be more affluent. The EU ETS in its first phase experienced some major problems surrounding the setting of the national quotas, which were too generous. However, it is possible that the second phase will be more effective in setting more stringent targets that persuade more firms to invest in low-carbon technology.

The EU ETS has to meet several difficult conditions if it is to become part of an effective international carbon trading scheme. The number of permits allocated by free distribution must be limited, and at least some permits should be auctioned. The scheme should cover all carbon emissions with no industries exempt. And the carbon market should be reasonably competitive. An effective international trading scheme also requires international political agreement on an emissions reduction target and a schedule for reaching it. The prospects for international collaboration on these terms seem remote.

Even assuming that the maximum level of atmospheric CO_2 consistent with averting dangerous climate change and hence the safe level of carbon emissions are known, the policies implied by neoclassical and Coasean economics are deeply problematic. Is this assumption sound?

4 The insecure knowledge foundations of climate policy

The benefit to society of policies for the abatement of climate change is the reduction in damage caused by, or the costs of, emissions that would otherwise have occurred. The policy objective is to minimise the economic impact of climate change, that is, the damage that it is believed to cause. The standard approach to assessing the economic impact of climate change

requires giving a monetary value to the costs that may be incurred by some of those affected net of the benefits that may accrue to others.

The alternative Austrian policy framework, which will be put forward in Section 5, rejects the standard approach to assessing the impact of climate change. Measuring the net effect fails to recognise the significance of the infringement of property rights that AGW involves. This view is shared with the libertarian perspective on climate change advanced by Adler (2009).

The main source of climate science upon which policy makers rely is the United Nations Inter-Governmental Panel on Climate Change (IPCC).

4.1 The IPCC and climate science

The economic impact of climate change is measured by neoclassical economists as the 'social cost of carbon'. There are three main steps in modelling the social cost of carbon:

- the effect of CO_2 emissions on atmospheric concentrations of CO_2 and hence on global mean surface temperature;
- the effect of increases in global mean surface temperature on physical phenomena such as sea level and the extent of deserts; and
- the monetary value of the impact of these physical changes on economic activity.

Each one of these steps is fraught with uncertainty.

The science of climate change is far from settled. Some scientists maintain that global temperature changes are caused largely by natural forces including variations in solar activity (Baliunas, 2002; Carter et al. 2006; Singer 1999; Svensmark and Calder 2007).

According to Popper (1965, pp. 24-5) science proceeds by the refutation of conjectures that fail and the tentative acceptance of conjectures that withstand empirical testing. The pursuit of knowledge involves the 'friendly-hostile co-operation' of scientists in testing each others' conjectures against the evidence. Knowledge is never more than provisional, consisting of a collection of conjectures that that have so far survived rigorous testing but may succumb in the future. From this perspective, the IPCC's is not science but a politically driven selection from the full range of scientific opinion. The Summary for Policymakers of the IPCC's Fourth Assessment report of 2007 is 'the product of political bargaining among member governments' (Kasper, 2007, p. 90; McKitrick et al., 2007). A publication that

political representatives have negotiated line by line is not science as conjecture and refutation. Johnston (2010, p. 78) argues that the establishment (in effect, the IPCC) response to disconfirming evidence is virtually never to accept that the climate models might be wrong but to question the evidence. In many cases 'there is no indication that climate scientists are converging toward the use of standard observational datasets that they agree to be valid and reliable (Johnston, 2010, pp. 78-8). Failures to comply with standard scientific procedures, by the IPCC itself and by some of its contributing researchers, have been well-documented and are a matter of public scandal (Booker, 2010; Johnston, 2010; for many other references see the Global Warming Policy Foundation website).

In these circumstances predictions of the physical effects of increases in global mean surface temperatures (usually assumed to be of 2–3°C) are inevitably controversial (Byatt, I. (2006); IPCC, 2007; Stern, 2007; Booker, 2010). These impacts include an increased risk of flooding from melting glaciers, followed by disruption to water supplies, affecting up to one-sixth of the world's population, mainly in the Indian subcontinent and parts of China and South America. In higher-latitude areas, such as Northern Europe, agricultural yields may increase with a temperature increase of 2–3°C, but declining yields, especially in Africa, could leave hundreds of millions of people without sufficient food. Increased mortality from heat-related deaths and the spread of tropical diseases is predicted, although there will be fewer deaths from exposure to cold. With warming of 3-4°C, thermal expansion of the oceans is predicted to cause rising sea levels, which could lead to inundation of low-lying coastal land, displacing "tens to hundreds of millions" of people. The risks are greatest for Southeast Asia (Bangladesh and Vietnam), small islands in the Caribbean and the Pacific, and large coastal cities, such as Tokyo, New York, Cairo, and London. Extreme weather events may become more frequent.

To the Austrian economist and the libertarian, these putative effects of AGW are the heart of the matter. To the degree that they will occur in the future, they will infringe upon the rights of many individuals to non-interference, specifically to a climate unchanged by the economic activities of others. The final step in modelling the social cost of carbon is irrelevant to the Austrian economist and libertarian political philosopher, for any benefits to others do not cancel out the denial of negative liberty, or freedom from interference, that AGW could entail.

It is therefore a matter of great concern that the IPCC, as the most influential source of scientific advice on climate change, should have failed to abide by the standard norms of scientific procedure.

4.2 Measuring the economic impact of climate change

This section reviews the problems of modelling the social cost of carbon because, although the net impact is irrelevant from the Austrian and libertarian perspectives, the uncertainty of the results undermine the application of neoclassical and Coasean policy measures and make it difficult to be sure, for any useful time scale, of being able to identify specific infringements of property rights.

4.2.1 Modelling the monetary value of climate change impacts

It is easy enough to begin to model the social cost of carbon by putting a monetary value on some of these impacts. For example, there is a lot of expensive real estate with known market prices in major coastal cities such as London, New York, and Tokyo. Moreover, without offices or factories for people to work in, or homes for them to live in, output would fall, at least for a while. Declining crop yields (adjusted for higher prices) and also fish stocks would reduce the value of world output. Standard practice is to estimate the loss of output consequent upon people's incapacity for paid and unpaid work.

Adding "non-market" impacts on the environment and human health is much more problematic. Nonmarket impacts are those that cannot be given a monetary value by referring to a market price. The costs of disease or of lost agricultural land in subsistence economies, for example, do not have a market price. These estimates are highly controversial. Since standard practice is to estimate health impacts in terms of market values, as lost output from incapacity to work, applying this and other techniques to estimate the cost of nonmarket impacts is subject to considerable uncertainty.

The risk of catastrophic weather events caused by climate change increases still further both the potential total cost and the potential for error. Finally, a disproportionate burden of climate change is likely to fall on poor regions. If this were given a stronger relative weight, the total cost of global warming could increase to "around 20%" of global GDP, in Stern's (2007) estimate. However, this estimate assumes that vulnerability to climate change is independent of development, although it seems more likely that such vulnerability depends on the capacity to adapt and hence on the level of development (Tol and Yohe, 2006, p. 237).

Clearly, putting a monetary value on the economic impact of climate change is subject to considerable uncertainty.

4.2.2 The choice of discount rate

The most important source of uncertainty arises from the fact that the effects of climate change are expected to occur year by year over a very long period of time. This gives rise to significant differences between estimates of the monetary value of those effects. Since many economic impacts of climate change are not expected to occur until decades or even centuries into the future, their occurrence is inevitably subject to a degree of uncertainty. The impacts of catastrophic climate change may never happen, so economists discount, or reduce the value of, their costs. As you add up the costs of climate change year by year, you might want to adjust downward those expected in later years—that is, you might want to discount them to reflect the uncertainty of their occurrence. The lower the rate at which you discount such costs, the higher will be their present value.

The Stern Review (Stern, 2007), commissioned by the UK government, calculates the present value of the costs of climate change by averaging the total costs over the number of years the model runs at an unusually low rate of discount. Nordhaus (2007) ran the Stern model to calculate the costs of climate change, including nonmarket and catastrophic impacts that take Stern's estimate up to 14% of world output, for each year the model covers. According to Nordhaus (2007), the model projects a mean loss of only 0.4% of world output in 2060, rising to 2.9% in 2100 and 13.8% in 2200. Losses averaging about 1% over the period 2000–2100 become about 14% because the losses in the distant future are extremely high and a low discount rate is used. Nordhaus (2007) argues that, "using the [Stern] Review's methodology, more than half of the estimated damages… occur after the year 2800."

The discount rate used may influence the results of a model more than any other parameter used in the model. There is no agreement about the appropriate rate of discount to use. Stern (2007) argues that any discount rate greater than zero unfairly devalues the interests of future generations. The low discount rates favoured by Stern (2006) virtually guarantee a high estimate of costs of climate change (Tol and Yohe (2006, p. 238). Stern's "baseline" cost of 5% of world GDP is higher than the results of other models, which are typically of 1–2% of world GDP. However other ethical approaches are at least as convincing. For example, agent-relative ethics holds that agents naturally value people who are linked to them by kinship or proximity above strangers who are remote in space or time.

4.2.3 Future emissions scenarios

The IPCC (2007) estimated that the likely range for global average surface air warming for 2090-2099 relative to 1980-1999 was from 1.8°C to

4.0°C. The immediate source of this variability is uncertainty about the future course of the global economy and hence of the level of CO_2 emissions. The IPCC prepared six sets of emissions scenarios, each reflecting a possible course of global economic growth over the next century. The lower emissions scenario assume global convergence on a services and knowledge economy using clean technologies or a world characterised by local and environmentally sustainable solutions to economic problems. The higher emissions scenarios assume rapid economic growth and regional convergence. The figure of 1.8°C is the best estimate from a range of 1.1°C to 2.9°C for the lowest emissions scenario, while the figure of 4.0°C is the best estimate from a range of 2.4°C to 6.4°C for the highest emissions scenario.

How do we know what the world economy will look like 100 years from now? Wisely, the IPCC has demurred from making any such prediction; the scenarios are possible future courses that the world economy might take. Of the six scenarios, the IPCC asserts that that: "All should be considered equally sound." It is widely believed that the impact of an increase in global temperature of less than 2°C will be mild, and that cereal yields will actually increase in temperate regions. With a global temperature increase of 4°C, the impacts are projected to be catastrophic, with up to 80 million people exposed to malaria, and up to 300 million more affected by coastal flooding each year, with rising risks of extreme weather events. But, on the IPCC's own admission, it is impossible to say whether the impact of climate change will be beneficial, mild or catastrophic.

4.3 Policy implications

The policy implications of this outcome and of the uncertainty that surrounds so many stages of estimating the social cost of carbon are radical. The imposition of a carbon tax and the use of carbon trading are equally without foundation. It is true that 'Acting on reasonable estimates is better than acting on no estimate' (Pearce, 2005, p. 101). However, when there is nothing to choose between beneficial and catastrophic scenarios, there are no reasonable estimates and no basis for action.

If AGW is understood as an external cost of using fossil fuels in the production of goods, the urgent task is to create a 'comparable carbon price signal around the world' (Stern, 2007, p. 530). This price will be higher than the current price in order to reflect the costs imposed on third parties by AGW and reduce output to the optimal level. Stern (2007) goes on to argue that either a price instrument (tax) or quantity control (tradable permits) 'could establish the common price signal across countries and sectors' (p.

351). A tax on fossil fuel use would raise the price of carbon and reduce emissions to a level that avoids dangerous climate change. A quantitative limit on carbon emissions, through a cap and trade system of carbon trading, would in principle secure the appropriate level of emissions directly and the price of tradable permits would set the carbon price as a side-effect. Both of these policy measures assume that we can answer the following questions: What is the safe quantity of carbon that can be emitted over the century and hence what is the safe or optimal quantity of goods produced using fossil fuels? However, there is far too much uncertainty about the social cost of carbon to be able to answer these questions.

In order to set the carbon price through tax 'across countries and sectors' governments must know the value of the negative externality and the social optimum output of fossil fuel and GHG atmospheric concentrations. They must know the safe quantity of carbon emissions and therefore the quantity of goods that should be produced using fossil fuels throughout the global economy. What drives the price signal is therefore a quota. The price signal is merely an instrument used to control the quantity. Ultimately there is no real difference between price (tax) and quantity (trading) control.

This is why tax is not best understood as market based instrument, as though the government imposing the tax is a particularly knowledgeable and helpful additional agent; taxes are distortions of and interventions in the market just as much as regulation. Taxes impose an administered price derived from a judgement about quantity. The problem remains the same whether the policy instrument is taxation or trading: a reasonable person cannot do otherwise than conclude that the safe or optimal quantity (of goods produced using fossil fuels) is unknown.

5 An Austrian and free market perspective climate policy

The Austrian perspective on environmental problems is set out by Rothbard (1990), (Cordato (1992, 2004) and Pennington (2005), while Adler (2009) defends a complementary libertarian political philosophy. The essential point is that environmental problems arise because one economic agent, such as a polluter, acts in a way that is inconsistent with other agents' being able to carry out their plans and exercise their rights. The policy implication is that government has no cause to intervene in market exchange where property rights have been allocated and legislative procedures exist that that make it possible for the victim to take legal action against the polluter. The polluter must be shown to be causally responsible for a specific invasion of the victim's rights.

In the case of climate change, government intervention has already taken place on a large scale. The Austrian or libertarian policy must therefore be to privatising 'climate change policy', repealing all existing climate change legislation. The tax treatment of fossil fuels should be revised to eliminate any tax contribution that had been imposed with the intention of reducing carbon emissions. Regulations aimed at reducing carbon emissions should be rescinded. National or supranational missions trading systems should be wound up; if private firms and individuals wished to continue to issue and trade permits, they would of course be free to do so. Official carbon emissions reduction targets should be abandoned. There should be no 'climate change policy' objectives or instruments. It would be up to individuals or organisations who believed that AGW was infringing their property rights to seek redress in the courts. There simply should not be a public policy towards 'climate change'. Instead the courts should build up a body of common law and establish precedents to guide the actions of the users of fossil fuels—a privatised policy.

5.1 Strict liability

There is no need for new assignments of property rights. If A's use of fossil fuels causes B's land to be destroyed through inundation or desertification, this is evidently a tort. Legislation and judicial practice differ across countries concerning the importance of the law of nuisance with its emphasis on strict liability and the law of negligence. In some countries legislative revision might be needed, essentially to reverse the effective replacement of the law of nuisance by the law of negligence (Morris, 2003). There is a substantial literature on the issue of strict liability versus negligence (Schäfer, 2000; Schäfer and Schönenberger, 2000). The principle of strict liability and the law of nuisance focus on causality (Hoppe (2004), Cordato (2004), Morris (2008)) and it is precisely the question whether the human use of fossil fuels causes global warming that is at issue. If an activity undertaken on A's property causes a nuisance on B's property, A is liable, regardless of whether A intended the nuisance or took reasonable precautions against it or whether any benefit accrues to the public (Morris, 2008, p. 241). This is consistent with Nozick's (1974) principle of freedom of action subject to side constraints. In this context a side constraint is a rule prohibiting actions that cause damage to property through AGW. From my Austrian-Nozickian perspective, the neoclassical principle of attempting to establish the optimal level of carbon emissions is unjust, in permitting individuals to be injured and their private property rights overridden if the result is a net increase in benefit throughout society as a whole (see Adler, 2009).

Legislation and judicial practice also differ across countries concerning the preference for compensation through the payment of damages or injunctive relief; in the case of AGW an injunction would constrain firms to reduce carbon emissions to a level that does not cause dangerous AGW (Swanson, 2000). A drawback of tort legislation is the difficulty of estimating the cost of damage and determining the level of compensation. However the objective of AGW tort cases is to establish causality and, in view of the informational demands of assessing compensation, recourse to injunctions is to be preferred.

Several putative objections may be made to the Austro-libertarian strategy but in fact these are more correctly interpreted as advantages of recourse to litigation in defence of property rights.

5.2 The combined-effect rule

Objection 1

It is impossible to decide the issue of the extent of responsibility of an individual fossil fuel user.

Reply

There is no reason to pursue the question of the extent of responsibility of an individual fossil fuel user. In fact the issue of responsibility would be simplified. There is no reason to pursue the question of the extent of responsibility of an individual fossil fuel user, trying to quantify the effect of its emissions on, for example, sea-level rise. It is true that carbon emissions from an individual firm may cause climate change only when combined with those emitted by many other firms. However, under the combined-effect rule, an individual firm would be held liable (and subject to an injunction to cease the activity) because its emissions have contributed to climate change even though they would not have had any effect on the climate on their own (Morris, 2008, p. 247).

This aspect of the use of tort litigation in climate change cases is worth further discussion. It might be thought that tort litigation would be too complicated and inefficient to be workable. True, there are many cases of climate change litigation going through the courts in the US, so far without much success. However, plaintiffs have generally sought to prove corporations guilty of failures of compliance with environmental legislation and regulations rather than seek recourse to tort litigation (Sheppard, 2007). The claim currently going through the US courts that CO2 emitters are

responsible for the damage caused by Hurricane Katrina is an exception (Freddoso, 2010) and an ambitious one in seeking damages for the effects of a specific extreme weather event.

The use of tort has been discussed in the academic literature on environmental law and no insurmountable obstacles have been discovered. According to Grossman (2003, pp. 32-3; Allen, 2003), a seemingly indivisible harm can be apportioned according to quantities of pollution discharged, or in the case of litigation climate change CO_2 (which of course is not a pollutant) emitted. The settlement of litigation concerning Agent Orange (the code name for herbicides used by US military forces in the Vietnam war) assessed damages in terms of a formula that balanced market share and dioxin content (Hughes, Lin, and Nesser, 2001, p. 55). A similar formula could be devised for CO_2 and climate change. Its use would not lead to undue inefficiency, because there is a manageable number of significant CO_2 emitters (Warne, 2007); 122 corporations account for 80% global CO_2 emissions (Burges Salmon, 2005, p. 13).

It seems highly unlikely that a lengthy series of tort cases would be required. A single high-profile case would clarify the prevailing state of climate science and plaintiffs and defendants alike would adapt their behaviour in response to the verdict until developments in climate science raise doubts about its continuing validity. If firms emitting CO_2 were found to be infringing or violating the property rights by increasing the risk of dangerous climate change, it would be reasonable to require them to reduce those emissions, not immediately over time. This would signal to other CO_2 emitters that they should pre-empt possible tort litigation by voluntarily reducing emissions. Tort litigation could, if appropriate, be more effective and efficient in securing a reduction in CO_2 emissions through the workings of the market rather than interminable inter-governmental negotiations have proved to be.

5.3 Property rights in the climate

Objection 2

The absence of explicitly allocated property rights in a climate unaffected by human activity renders litigation unfeasible.

Reply

The absence of explicitly allocated property rights in a climate unaffected by human activity would not render litigation unfeasible. The rule

of 'coming to the nuisance' holds that 'the party that first used the resource should be granted the right to continue to use it' (Cordato, 1992, p. 103). How this might be applied in the case of AGW requires extensive analysis but it is reasonable to envisage a presumption in favour of parties that have relied upon the prevailing climate to settle particular areas, using them for agriculture and other economic activities, long before the use of fossil fuels on an industrial scale.

In general existing national legislation is adequate and property rights are simply waiting to be enforced or protected. Any assumption that individuals must leave it to governments to tackle the perceived threat of AGW might be seen as an aspect of dependency culture. The Austrian strategy is to take away the existing policy framework and leave it to people to seek redress in the courts if they believe that their rights to continue to earn their livelihoods unhindered by adverse changes to the climate induced by the economic activity of others have been impaired.

5.4 The burden of climate policy on firms

Objection 3

Climate change litigation would impose an extra burden of compliance upon industry.

Reply

There are three reasons for believing that under a privatised climate change policy, litigation will not impose a further burden of state intervention on industry. The first is that, while some firms will face litigation, all will be free from the impositions of existing 'climate change policies', which will have been rescinded. The EU's proposed regulations governing vehicle carbon emissions will be abandoned and, most importantly, the EU ETS will be wound up. The second reason is that there is no presumption of guilt, unlike Simms (2003) who is intent upon 'making the guilty pay'. The third reason is that the process of establishing guilt or innocence, probably through a series of court cases, will take time. Privatising AGW policy will delay severe reductions in carbon emissions perhaps indefinitely. This outcome is to be welcomed. If carbon emissions do cause AGW, it is their atmospheric concentration accumulating over a period of time that does so and not the additional carbon emitted in any one year. It is reasonable to exploit the opportunity that this time-lag provides to add to human knowledge of the possible effects of carbon emissions on the global climate and hence reduce the risk of incurring unnecessary costs through intemperate collective action.

5.5 'The science is settled'

Objection 4

The plaintiffs would always win because the science is settled.

Reply

The science is far from settled, as suggested in Section 4. There is increasing doubt about many aspects of the climate change thesis. In September 2010, the Royal Society, the UK's most authoritative scientific body, reflected this growing uncertainty in publishing a revision of its guide to climate science (Royal Society, 2010). The principal message is that 'The size of future temperature increases and other aspects of climate change, especially at the regional level, are still subject to uncertainty (p.3).' A conclusion that is more damaging the climate alarmist case is that some uncertainties are unlikely ever to be significantly reduced, because of, for example, the lack of observations of past changes relevant to some aspects of… climate change (p. 12)'.

In this context of uncertainty litigation could have two positive effects on climate science. The courts would call expert witnesses as happened in the Microsoft case. Fred Singer, the doyen of climate sceptics, has said that 'We look forward to having our day in court where we can cross-examine the "evidence" of the warm-mongers (also known as AGWAs—[anthropogenic global warming] alarmists) (Singer, 2008).

The first effect of litigation would therefore be to improve the public understanding of the science of climate change. Reports of the testimony of a range of expert witnesses would disseminate a more balanced account of climate science than the biased and artificially constructed dogma of the IPCC. The structure of the climate change debate would no longer be presented as bipartisan, with the united scientific establishment against a tiny minority of eccentric and extreme sceptics, but would instead be seen to include a range of reasonable positions including moderate scepticism on many aspects of climate change.

The second effect of litigation would be to further the advancement of climate science. Litigation or the threat of it would provide a powerful incentive for firms using carbon-intensive production processes to fund research into climate science and its dissemination, challenging the IPCC's virtual monopoly in communication and stimulating scientific progress. It would achieve this worthwhile goal by intensifying competition among scientific hypotheses concerning climate change, so that in a form of 'creative

destruction' falsified hypotheses might be discarded and others accepted as provisionally true. Climate science would then more closely resemble the friendly-hostile cooperation of scientists that Popper championed.

5.6 Climate change litigation as a public good

Objection 5

Litigation would be biased against the poor victims who lack resources to bring actions.

Reply

Let us suppose, first, that the AGW hypothesis is true. While industrial production using fossil fuels is concentrated in affluent nations, it seems to be likely that the people most at risk from climate change live in low-income societies without the resources to defend their territories and livelihoods against the impacts of rising temperatures. Climate change policy has so far achieved very little in tacking this perceived issue. It is clear that policy makers in the industrial nations have been reluctant to construct a superstructure of effective action to match their extravagantly developed rhetorical base.

Litigation however holds out the prospect of effective action on behalf of those without the resources to undertake it themselves. In fact litigation is a public good, in that its benefits are both non-excludable and non-rival. Litigation is non-rival in that A's seeking to show that B is strictly liable for effects *x* does not entail that there is less litigation 'left over' for others to use. On the contrary there may be bandwagon effects.

On the other hand, it is possible that potential plaintiffs might play a 'waiting game', each one being unwilling to proceed until it sees the outcome of another's case. This seems unlikely because so many non-governmental organisations (NGOs) and regional governments have had recourse to litigation in order to try to enforce compliance with environmental legislation. It is hard to believe that no NGO or state government would accept the risk failure in pursuit of an objective so many of them value so highly.

It is even more important that the possible benefits of litigation concerning putative climate change would be non-excludable. This outcome follows from the fact that climate change is, if it a problem at all, is a problem the world over. If carbon emissions are indeed causing dangerous climate change, it does not matter *where* they are reduced; wherever the reductions occur, eventually atmospheric concentrations of carbon will be reduced. For

example, if an insurance company in a rich nation brings an action against an industrial producer in the same nation emitting carbon into the atmosphere. Assume that the court orders the producer to curb its carbon emissions, setting a precedent that is widely followed. The benefits of a lower atmospheric concentration of carbon would avert dangerous climate change not only for the insurance company that took the initial action, saving it millions of pounds in claims for flood and storm damage, but everyone all over the world. People living in low-lying areas would no longer fear inundation and so on.

Let us suppose, second, that the process of litigation shows over time that the AGW hypothesis is false. In that case, litigation lifts the burden of abatement not only from industrial producers in the rich world but also from economic agents the world over, from industries in developing nations and from farmers in poor countries.

5.7 World government?

Objection 6

An allegedly privatised climate policy would, relying on litigation, would require an agreed international legal framework and a supranational governance structure.

Reply

Litigation would not need a framework of international environmental law to be effective. The discussion in Section 5.6 has shown that action by plaintiffs against a fossil fuel user in their own country could have spill-over effects of international scope.

The existence of free rider problems is often seen as a justification for government intervention. However there would not be a free rider problem in the case of climate change litigation. The opposite is the case. The free rider problem presupposes self-interest as the only motive of agents. But some plaintiffs would be motivated by a desire to help the poor and the weak, that is, they would act for altruistic reasons. Far from free riders being a problem, non-paying beneficiaries would be welcomed aboard.

6 Conclusion

Much of the paper has been devoted to defending the claim that the preferred climate policy instruments, taxes and emissions trading, should be

swept away. There are weaknesses in the theoretical perspectives used to justify these policy instruments and climate science cannot provide the knowledge that is needed to justify current policy. The constructive part of the paper consists in the proposal for a privatised policy, based on Austrian and libertarian frameworks of thought. These ways of thinking about the issue share an interpretation of climate change as a putative interpersonal conflict rather than market failure. The use of fossil fuels, like any other economic activity, should be subject side constraints designed to avoid the infringement of other people's property rights. Tort litigation on the basis of strict liability would protect these rights, insofar as they need protecting. By providing a public arena for the competitive testing of scientific hypotheses concerning climate change, such litigation would also promote the public understanding and even the advancement of climate science. The goal has been to devise a strategy that protects as much as possible the liberties of all agents, both users of fossil fuels and people whose livelihoods and territories are at risk if the AGW hypothesis is true.

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