ECONOMIICS OF GLOBAL WARMING*

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ABSTRACT

This paper conveniently skips any controversy associated with the science of climate change. On the assumption that greenhouse gas emissions are causing climate change that is detrimental to humanity, the paper focuses on some economic dimensions of the issue which seem to be poorly understood by Australian media commentators, policy analysts, interest groups and the political parties. Using a neoclassical welfare economics framework the paper explores the costs and benefits of greenhouse gas abatement with reference to the findings of the Stern Report, the setting of greenhouse gas targets by Australian political parties, the danger of the government "picking winners" and the emerging carbon theory of value. The paper concludes with a brief review of the relative merits of a carbon tax and a cap and trade approach.

Key Words: climate change, economics, targets, policy, carbon tax, cap and trade.

INTRODUCTION

Climate change has been described as "the overwhelming moral challenge for this generation of Australians" (Howard 2007) and by Al Gore as a "generational mission" (Appleton, 2007). While there has been some muffled debate over the science of global warming, the case for policy action seems to have been strengthened with the release of the Stern report because of its apparent economic justification for greenhouse action. Indeed one of the main messages of that report was that the "benefits of early action outweigh the costs". Indeed, one well known ABC science commentator, has argued that "doing anything has got to be better than doing nothing"(Dr Carl 702 13 December 2006).

Much political focus in Australia has been on setting GHG targets and establishing a tradable carbon scheme, although other actions raised by policy analysts and interest groups include sustainable energy targets, banning coal mining, clean coal technology, reducing tourism travel, carbon taxes, improvements in fuel and air traffic control efficiency, smaller houses etc. Increasingly, media focus has been on the carbon footprint of different actions, industries and developments.

This paper conveniently skips any controversy associated with the science of climate change and focuses on some economic dimensions of the issue which seem to be poorly understood by Australian media commentators, policy analysts, interest groups and the political parties. In doing so I am accepting, without questioning, the hypothesis that

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human activity through greenhouse gas emissions is causing climate change that is detrimental to humanity.

ECONOMIC ANALYSIS OF GLOBAL WARMING

Economics is concerned with the allocation of scarce resource to maximise the welfare of the community. These scarce resources include land, labour and capital including natural capital. In a competitive market, the system of private property rights and the price mechanism (interaction of supply and demand) function together to produce a quantity of a good at a price that maximise the net benefits to society.

However, where markets fail, government intervention is required to determine how resources should be allocated and to put policies in place to correct for market failure. A common cause of market failure is the existence of externalities and public goods. These are also relevant to global warming since GHGs are an externality of other economic activities that impact on market and global public goods e.g. the environment, via climate change.

With respect to GHG emissions, market failure has meant that more GHG is being produced than is optimal. Government intervention may therefore be justified provided it will improve the net benefits to society. This intervention may include determining the level of emissions that are optimal and the most appropriate means of achieving these levels. The method used by economists to determine the optimal level of GHG emissions or appropriate abatement measures is benefit cost analysis. The costs of abatement measures are weighed against the climate benefits of abatement. For a proposal to be desirable from an economic perspective, the benefits of abatement need to exceed the costs. However, because of the global public good nature of the greenhouse effect such an analysis needs to be undertaken at a global level, although the distribution of cost and benefits will also be an important political issue. Hence, government intervention to determine appropriate targets is required at an international rather than national level.

It follows from the above that resolution of science debate about global warming is necessary but not sufficient to justify specific policy actions. Doing anything is not necessarily better than doing nothing.

What is needed is prediction about the cause and effect of different policy actions or targets rather than the cause and effect of GHGs more generally. For instance, if actions are to be taken that reduce global CO2 concentrations, what are the costs of these actions and what are the benefits in terms of avoided net environmental damage costs. The latter requires scientific prediction about the change in climate from taking action compared to not taking actions and the valuation of these avoided impacts using market and non-market valuation techniques.

While the Stern Report is often put forward as providing economic justification for taking action and in particular stabilizing GHG levels at 550 ppm by 2050, it does not undertake such a benefit cost analysis. Instead, it compares the magnitudes of the costs of abatement

(1% of GDP pa) to the costs of climate change (5-20% of GDP pa) and concludes that the latter justifies the former. There are a number of mistakes here. Firstly, the costs of climate change do not equal the benefits of emission reduction, since any abatement will not avoid climate change altogether but simply slow it down. Nordhaus has estimated that stabilising the concentration of atmospheric carbon dioxide at 550ppm (as proposed by Stern) would reduce the rise in temperature (in 2100) from 2.53 degrees Celsius to just 2.42 degrees Celsius (Lomborg 2006). Hence, the benefits of emission reductions are likely to be considerably smaller than the costs of climate change (Tol 2006).

Secondly, Stern's estimate of the costs of climate change at $85/tCO2 is considered to be an outlier in the marginal damage cost literature (Tol 2006). It is based on the PAGE 2002 climate model which assumes that all climate change impacts are necessarily negative and assumes that vulnerability to climate change is independent of development, implying overly pessimistic estimation of impacts (Tol 2006). Costs are also estimated without reference to any potential technological change that allows for adaptation or 'deadweight losses' associated with taxing activities through incentive effects and transaction costs (Dr J Bennett, 2007, pers. comm. 26 August). Apart from apparently cherry picking the most pessimistic impact scenarios from the literature (Lomborg 2006, Tol 2006) the high damage costs suggested by Stern arise from his adoption of a near zero discount rate meaning that impacts hundreds of years into the future carry as much weight as impacts tomorrow. As identified by Nordhaus, following the Stern Reviews methodology, more than half of the estimated damages "now and forever" occur after 2800. Using a more standard discount rate, leads to the social costs of carbon declining by a factor of 10 (Nordhaus 2007a).

Illustrating the importance of assumptions about the discount rate is the fact that Stern identifies that the "effects of our actions now on future changes in the climate have long lead times. What we do now can have only a limited effect on the climate over the next 40 or 50 years. On the other hand what we do in the next 10 or 20 years can have a profound effect on the climate in the second half of this century and in the next" (Stern p. i). What he is essentially identifying is that for an investment of 1% of GDP pa we essentially get no benefit over the next 40 or 50 years. In a standard economic analysis, using discounting to reflect marginal social time preference and the opportunity cost of capital, it is questionable whether such an investment of resources is likely to be efficient.

Indeed, it must be remembered that the proposed 1% of GDP investment ($450 billion) are scarce resources that can potentially be used to invest in all sorts of public policy outcomes. To put this investment in perspective, the UN estimates that if it spent a fraction of this figure ($75 billion) – it could solve almost all the world's major basic problems. We could give everyone clean drinking water, sanitation, basic health care and education right now (Lomborg 2006)

The Stern findings differ markedly from economic models that calculate least-cost emission paths to stabilize carbon concentrations or paths to balance the costs and benefits of emission reductions. Mainstream economic models find it economically beneficial to take steps today to slow warming, but efficient policies generally involve

modest rates of emission reductions in the near term, followed by sharp reductions in the medium and long term (Nordhaus 2007b). This "optimal" economic response was estimated to have net present value of global benefits of $3.4 trillion relative to no controls. This total involves $2.2 trillion of abatement costs and $5.2 trillion of reduced climate damages. Note that even after the optimal policy has been taken, there will still be substantial residual damages from climate change, which Nordhaus estimates to be $17 trillion. The reason more climate damages are not eliminated is that the additional abatement will cost more than the additional reduction in damages (Nordhaus 2007b). So the optimal level of abatement is not 100

SETTING OF TARGETS

Perhaps stemming from the focus of the Kyoto Protocol, policy responses in Australia have tended to focus around the setting of targets for our GHG emissions. In an increasingly politicised environment leading into the 2007 Federal election, a bidding war on targets seems to have occurred. The Labour party announced its policy of a 60% reduction in carbon emissions by 2050. The Greens party was advocating an 80% reduction in carbon emissions by 2050 (Costello 2007). The NSW Government already committed to a 60% cut in GHG emissions by 2050 and a return to 2000 emission levels by 2025, called on the Federal Government to do the same (Peating and Clenell 2007). The Australia Institute in the middle of this discussion about targets undertook modeling that suggested that "the GHG cuts Australia must achieve to prevent "dangerous" climate change must be substantially higher than thought, with modeling……suggesting that it should be as much as 95% by 2020".

While it is very easy to nominate a target, any target, the economic efficiency of these targets is rarely tested. Indeed, all these suggested targets would appear to have been proposed without any consideration of their costs and benefits to society. The Labour Party's, Shadow Treasurer, Wayne Swan when asked what Labour's policy of a 60% reduction in carbon emission would cost the Australian economy, responded that the "Government refuses to do the modeling" (Costello 2007). Similarly, the Greens Senator, Christine Milne admitted that there had been no economic modeling in relation to her party's proposed 80% reduction in GHG, and that it was the responsibility of the Government to undertake such modeling (Costello 2007). So emission targets are being proposed with no consideration of the economic costs. What about the economic and environmental benefits in terms of avoided damages costs associated with global warming. Again, little information was provided. However, with a global public good such as global warming, in the absence of international agreements and coordinated actions, Australian meeting any of these targets would have no measurable effect on climate change, with our current contribution to global GHGs being in the order of 1% to 2%.

Nordhaus (2007b) examined the economic efficiency of what he referred to as "ambitious" policies, proposed by Al Gore in 2007 (90% reduction in USA CO2 emissions below current levels by 2050) and the German Government in 2007 (limit global CO2 emissions in 2050 to 50% of 1990 levels). He found them to be inefficient

because they are much more expensive than necessary to achieve a given climate objective. His estimate of the optimal emissions reductions rate for CO2 relative to the baseline is 15% in the first policy period, increasing to 25% by 2050 and 45% by 2100.

With regard to targets, whether they be for GHG or vegetation conservation, it is very important that policy makers understand the consequences of what they are advocating. (Costello 2007). In the words of the Australian Treasurer, Peter Costello, to adopt a policy with no idea what it will do to jobs, interest rates, business or families….is deeply shocking…and utterly irresponsible (Costello 2007). Nevertheless, it is not an uncommon practice in Australian environmental policy.

CARBON LEVELS TO PROMOTE OR QUESTION PROJECT AND POLICIES

One response to global warming has been for environmental interest groups to question the desirability of specific projects, policies, or industry sectors and promote others based solely on their carbon implications. Examples including proposals to ban coal mining, promote fuel efficiency of cars and high-efficiency light bulbs, subsidising ethanol, providing research support for solar power, criticize house sizes (McMansions) etc.

However, from an economic perspective this makes little sense. All projects and policies, even those advocated by green groups, are using scarce resources and may also involve externalities e.g. electric cars need batteries with high levels of lead and use a lot of energy to produce (Dr J Bennett, 2007, pers. comm. 26 August). All these costs and benefits must be considered in deciding the desirability of actions and whether government intervention is warranted, not just GHG generation. There are also much simpler economic policy responses to global warming than government intervention to pick individual winners in the greenhouse “moral challenge”. These are discussed in a later section.

A pertinent example of greenhouse gas emissions being used to oppose a proposal relates to the Anvil Hill Coal Mine. While a benefit cost analysis of the mining proposal was undertaken, including valuing carbon generation associated with the mining Project, much of the debate over the project moved to the GHG implications of burning the coal (which would mainly occur overseas). Environmental Groups called for people to “Act now to stop the mining of Anvil Hill and dangerous climate change” (http://www.anvilhill.org.au/). This reflects a wider aversion by the environment movement to coal mining and coal fired electricity in general. However, from an economic and global warming perspective such arguments are spurious and ideologically driven.

The mining proposal itself stacked up well when all costs and benefits were considered in a BCA framework, with significant producer surpluses from the mining activity and modest environment impacts that were to be internalised through a range of mitigation measures, including biodiversity offsets.

The majority of the coal was proposed for export, with the major destinations for Hunter Valley coal exports being Japan, Korea and Chinese Taipei (ABARE, 2005). There is no doubt that the burning of the coal overseas would generate greenhouse gases. However, whether the mine was approved by the NSW Government or not would not change the level of emissions, because Anvil Hill coal would be simply be substituted with coal from elsewhere (Smith and Munro 2007). The Global consumption of coal is not limited by supply and so with coal found in more than 100 countries around the world and reserves sufficient for hundreds of years (O'Neil 2006), other producers would simply fill the void.

Many of the countries that the coal would be exported to were also signatories of the Kyoto Protocol and hence had some existing commitment to GHG reductions and in any case have the sovereignty to address GHG emissions as they see fit within any requirements of conventions and protocols to which they are signatories.

A policy approach that revolves around government intervention to "picking winners" whether it is energy efficient light bulbs or ethanol petrol is also fraught with danger. While global warming is an example of market failure, the possibility of government failure in relation to global warming policy should not be ignored (Robson 2007). Picking winners is extremely susceptible to rent seeking behaviour from special interest groups looking for government support for their product, policy and position.

Picking winners can also be associated with forcing a "corner solution" i.e. no flexibility permitted to account for the specific requirements of consumers. For example, dimmer switches cannot be used for energy efficient light bulbs. They also cost more indicating that they use more of other scarce resources (Dr J Bennett, 2007, pers. comm. 26 August).

CARBON LEVELS TO GUIDE CONSUMER BEHAVIOUR

Some groups promoting GHG reductions have taken this one step further to use carbon to identify appropriate behaviours for individuals and consumers, imposing the preferences of one group in society onto all others in society. Lynas in Carbon Counter: Easy Ways to Reduce Your Carbon Footprint, describes his 'visions of a sustainable Britain' which includes a 'quieter, slower life, where people take more time when traveling and travel less. According to Lynas the battle against global warming will allow us to cure the problem of human hubris (Appleton 2007). Lynas's Carbon Calculator shows the way in which global warming also provides a new structure for person life, with carbon becoming the universal moral measure (Appleton 2007).

While Lynas's vision is perhaps an extreme example, evidence of the same sort of spurious vision is emerging in Australia as politicians and green groups criticise the size and energy inefficiency of housing on the fringe of Sydney (even though new housing is required to meeting energy efficiency requirements of the BASIX system).

However, this carbon centred approach ignores the significance (utility) of the things we do. Plane journeys to see sick relatives or to visit prostitutes are weighted the same, in parts per million. The ways in which human beings judge whether something is worthwhile – did it have a useful result? Did it bring joy or pain? - are suspended. In this framework, the market is no longer the appropriate mechanism for allocating scarce resources, resources are allocated on the basis of carbon. Indeed Lynas suggests that the only solution is carbon rationing. "People would trade carbon as a parallel virtual currency, swiping their carbon cards at the petrol pump…" (Appleton 2007)

This is akin to the "Marxist theory of value" in which the labour input was all that matters. Now it's a carbon theory of valuing, ignoring the scarcity and contribution made by other resources (Dr J Bennett, 2007, pers. comm. 26 August).

POLICY RESPONSE

However, it is likely to be highly economically inefficient for the government to use GHG levels to vet development proposals, "pick winners" for government funding and support or impose or shame people into some subjective idealised behaviour on the basis of carbon counting.

For any policy to be effective in slowing global warming it must raise the market price of carbon, which will raise the price of fossil fuels and the products of fossil fuels. Prices can be raised by limiting the number of permits that are available (cap and trade) or by levying a tax on carbon emissions (Nordhaus 2007b). This will achieve a number of outcomes:

- it will provide signals to consumers about what goods and services are high-carbon ones and should be used more sparingly – allowing their choices to have regard to all the attributes of the goods and services.

- it provides signals to producers about which inputs use more carbon (such as coal and oil) and which use less or none (such as natural gas or nuclear power), thereby inducing firms to substitute to low-carbon processes.

- it gives market incentives for inventors and innovators to develop and introduce low-carbon products and processes that can replace the current generation of technologies.

- It will economise on the information that is required to do all these three tasks. Through the market mechanism, a high carbon price will raise the price of products according to their carbon content. Ethical consumers today, hoping to minimize their "carbon footprint," have little chance of making an accurate calculation of the relative carbon use in, say, driving 250 miles as compared to flying 250 miles. With a carbon price, the total embodied carbon would be priced, and the cost of all activities would rise by the tax times the embodied carbon. Consumers will still not know how much of the price is carbon, but they can make their decisions confident that they are paying for the social cost of their carbon footprint (Nordhaus 2007b).

As identified by Norhaus (2007b p 29) “raising the price of carbon is a necessary and sufficient step for tackling global warming. The rest is largely fluff”. That is, “picking winners” is not required.

The Australian Government is leaning towards setting up an emissions trading system (cap and trade) to raise the price of carbon, rather than a carbon tax, with economic modeling still to be done to ascertain the best target (Rehn 2007). However, the logic of implementing such a scheme and identifying our own target “without waiting for the rest of the world” would seem questionable given the global public good nature of the issue. International coordination and cooperation is a necessary requirement for any efficient and effective policy.

Nordhaus (2007c) has also questioned whether, even at the global level, cap and trade systems are likely to be the most appropriate approach to raising carbon prices citing issues of setting base lines and targets, their poorer performance under conditions of uncertainty, the extreme volatility of quantity systems, absence of revenues to government (unless permits are auctioned which rarely occurs) and their susceptibility to corruption. He favours a “harmonized carbon tax” where all counties would agree to penalise carbon emission in all sectors at an internationally harmonized carbon tax. The price could be set at a level estimated to limit GHG concentrations or temperatures changes below some level thought to be “dangerous interference” or more desirably the price that would induce the estimated optimal level of control. The price could also be adjusted over time as required.

Based on economic analysis equating marginal benefits to marginal costs, Nordhaus (2007b) suggest an optimal carbon tax of $27 per tonne carbon in the first period, rising to $90 per tonne carbon by 2050 and $200 per ton carbon in 2100.

CONCLUSION

Notwithstanding, the scientific debates on global warming, policy development to address GHG emissions is difficult and complex. Nevertheless, economics provides a number of important pointers. The global public good nature of the issue means that unilateral action is pointless. International cooperation and coordination are essential. Costs and benefits of targets or abatement measures need to be considered to ensure that scarce resources are not wasted. Greater and greater abatement levels, while providing political mileage, will result in greater and greater levels of wasted resources. Modelling suggest that targets of 15% reduction in the first policy period, increasing to 25% by 2050 and 45% by 2100 are likely to be optimal. Resources will also be wasted if governments use GHG levels to vet development proposals, “pick winners” for government funding and shame or force people into subjective idealised behaviour. For any policy to be effective in slowing global warming it must raise the market prices of carbon and in so doing enable the market to then efficiently allocate scarce resources. While Australia seems to be headed towards a cap and trade approach to raising prices, “without waiting

for the rest of the world", there would appear to be a number of compelling reasons for an internationally harmonised carbon tax instead.

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