CLIMATE CHANGE AND THE THREAT OF DISASTER: THE MORAL CASE FOR TAKING OUT INSURANCE AT OUR GRANDCHILDREN'S EXPENSE

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Abstract: Is drastic action against global warming essential to avoid impoverishing our descendants? Or does it mean robbing the poor to give to the rich? We do not yet know. Yet most of us can agree on the importance of minimising expected deprivation. Because of the vast number of future generations, if there is any significant risk of catastrophe, this implies drastic and expensive carbon abatement unless we discount the future. I argue that we should not discount. Instead, the rich countries should stump up the funds to support abatement both for themselves and the poor states of the world. Yet to ask the present generation to assume all the costs of drastic mitigation.is unfair. Worse still, it is politically unrealistic. We can square the circle by shifting part of the burden to our descendants. Even if we divert investment from other parts of the economy or increase public debt, future people should be richer, so long as we avert catastrophe. If so, it is fair for them to assume much of the cost of abatement. What we must not do is to expose them to the threat of disaster by not doing enough.

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Concern is growing that climate change could prove worse than we expect. Recent economic analyses have laid increasing stress on unlikely but catastrophic dangers (Summers and Zeckhauser, 2008; Weitzman, 2007; Weitzman, 2009). Martin Weitzman (2009, p. 1) estimates a roughly five percent chance of a rise of more than 10°C over roughly the next two centuries, and a one percent chance of a rise of more than 20°C. Such runaway global warming could impoverish the planet on a scale from which human beings would find it hard to recover (Godard, 2009, p. 17; McKinnon, 2009). Yet greenhouse gas (GHG) emissions continue to rise in both North and South. And many claim that it is only fair to present-day people that they should do so.

Perhaps the most widely accepted claim about justice between generations is that we should leave our descendants enough to meet their basic needs and lead worthy and satisfying lives (Krebs, 2001; Meyer and Roser, 2009). This reflects the widely shared belief that a key goal must be to reduce deprivation (Casal, 2007, p. 299), an aim that is shared even by critics of more demanding theories of intergenerational justice (Beckerman, 1999, pp. 85, 88; Beckerman and Pasek, 2001, p. 89). It is also widely agreed that poor countries will suffer the worst effects of global warming.[1] One might think that this implies slashing GHG emissions. Yet the most compelling *objection* to drastic cuts appeals to equity: the expectation that our descendants will be richer than we are.

Whether we should 'discount' consumption benefits to future people—in large part because they will be richer—lay at the centre of the debate over the 2006 *Stern Review on the Economics of Climate Change.* Critics argued that on *Stern's* projections, even with substantial climate change, future people would still be many times wealthier in 2200 than they are today (Godard, 2008, p. 33). The *Review*, Partha Dasgupta (2007, p. 6) charged, had assumed that 'that the distribution of well-being

among people doesn't matter much, that we should spend huge amounts for later generations even if, adjusting for risk, they were expected to be much better off than us.' The present paper argues that *Stern* was right not to discount the consumption of future people. The problem with most economic analyses lies deeper—namely, in the assumption that we should maximize utility in the first place.

In the last forty years, utility-maximisation, still largely taken for granted by economists analysing climate change, has come under sustained philosophical attack. The most influential political theory of the second half of the twentieth century, John Rawls' *A Theory of Justice* (1971/1999), explicitly rejects utilitarianism in favour of giving priority to the worst off. Others stress the importance of ensuring that people have enough to lead *sufficient* lives—after which point further increases in consumption or utility matter less, or not at all (Frankfurt, 1987; Huseby, 2010). Both views have played a role in the climate change debate, and both can explain why we must not sacrifice today's poor to tomorrow's rich.

Extended to the intergenerational context, the priority and sufficiency views require us to minimise deprivation—now and in the future. If we knew for sure that future generations of human beings would be materially richer, then that would weaken the case for slashing GHG emissions. But disaster cannot be ruled out. Faced with catastrophic threats, we should minimise *expected* deprivation. Since runaway global warming could affect so many for so long, prioritarianism and sufficientarianism both imply drastic abatement. By any moral measure, the North should pay for it. But if it refuses, action is needed even if it comes at the expense of the South.

In reality, neither the North nor the South appears ready to step up to the plate. We must tap resources from somewhere—and better from rich people than from poor

ones. This article argues that we should look to the rich of the future. If we can shift part of the burden of GHG abatement to our descendants, it is entirely fair to do so. Provided we avert catastrophe, this should still leave future people richer than their counterparts today. They will be able to pay off debt, replace infrastructure or do without some natural resources without giving up too much. What would be truly wrong would be to risk disaster by not doing enough.

THE LONG SHADOW OF THE FUTURE

Much of the effect of our GHG emissions is likely to endure for hundreds or thousands of years. This makes the weight we accord to future people extraordinarily important (Grubb, 1995, p. 472). Utilitarianism normally weights everyone's well-being equally, exposing it to the objection that it can demand huge sacrifices. Any permanent loss, however small, becomes with time all but infinitely costly. In the case of global warming, GHG abatement 'would confer benefits not only in 2100 but in every subsequent year, perhaps for millions of years' (Posner, 2004, p. 152). We might be required to make huge sacrifices for the sake of trivial future benefits, because over time those benefits would add up to be so great (Nordhaus, 2008, pp. 182-83).

We can undertake a good deal of abatement at minimal cost. Some measures may even save us money (Spash, 2005, pp. 162-63). Still, critics argue that climate mitigation on the scale envisioned by Al Gore or the *Stern Review* will not come cheap. While William Nordhaus estimates that even these plans are likely to cost less than two percent of world income (2008, p. 90; cf. Helm, 2008; Quiggin, 2008, p. 195), in absolute terms this is a large sum. At the same time, economists widely expect per capita consumption to go on rising (Dietz, Hepburn and Stern, 2008, p. 378). This raises an objection to deep emissions cuts on grounds of equity: 'Can we

justify current generations sacrificing 2-3% of GWP to increase the wealth of future generations who even after deduction for the high damage scenario are 2-15 times richer than the present generation?' (Lind, 1995, p. 384.)

It is bad enough that refusing to discount could require today's rich to sacrifice for those who will be richer tomorrow. What is *really* troubling is that drastic abatement could impose a heavy burden on the world's poor. '[T]he one thing that is certain about the global warming issue is that an immediate significant cut in fossil fuel consumption means a drastic cut in world energy consumption and hence in standards of living', warns Wilfred Beckerman (1995, p. 79). 'And the social and political upheavals to which this would lead would also be catastrophic. Furthermore...a rise in income levels is the only way that the urgent environmental problems facing the 75 per cent of the world's population that live in developing countries can be overcome.' While rich countries may be able to weather a depression without widespread death and disease, this is not true of the poor ones (Beckerman, 1995, p. 16; Malnes, 1995, p. 125).

The solution, in the eyes of many economists, is to discount benefits to future people. This will prevent the present from being sacrificed to an immensely populous future (Arrow, 1999, pp. 14-15). Moreover, discounting seems consistent with the standard assumption that an additional unit of income to the rich provides less utility than the same increment to the poor. As Colin Price (2003) notes, diminishing marginal utility is widely seen as the 'respectable case for discounting'.

Nevertheless, this solution is *ad hoc*: discounting the future does nothing to solve the general problem that utilitarianism is too demanding (Caney, 2008, pp. 549-50). Moreover, it misleadingly implies that future people's consumption counts for less, when what we really mean is that the consumption of the rich matters less, or

that we value equality among generations, or that no generation should be asked to give up too much. Worse yet, utilitarianism still requires that the poor be sacrificed to the rich if the latter can gain enough. Seeking to avoid this, we might put another finger on the scales, so that benefits that convey the same amount of *utility* matter more when they go to the badly off (Cowen and Parfit, 1992, pp. 148-49). Nevertheless, if there are enough well-off people, or if the benefits extend far enough into the future, the needs of the poor can still be outweighed by the luxuries of the rich (Crisp, 2003, p. 754; Meyer and Roser, 2009, pp. 234-35; Roser, 2009b, p. 15).

The root of the problem is the belief that we should maximize utility in the first place. In fact, the duty seems much clearer to ensure a 'minimum level of well-being below which no generation should fall' (Roser, 2009b, pp. 13-15; quotation from Broome, 1992, p. 106). This is usually presented as protecting people's rights (Caney, 2008; Spash, 2005). Even those who reject strong positive obligations to the inhabitants of other countries can agree that it is wrong, other things being equal, to harm them (Shapcott, 2008). The same goes for other generations (Davidson, 2008). Thomas Schelling's comparison of climate change mitigation with foreign aid misses the mark because the question is not one of *helping* future people (Sunstein, 2007, pp. 266-67). A closer analogy would be with not raping and pillaging one's neighbours.

Still, we should not focus on the negative right not to be harmed by climate change to the exclusion of the positive right to development. Some draw a sharp distinction between acts of commission and acts of omission, seeing only the former as rights violations. Anthropogenic climate change is an act of commission, whereas many see failing to address poverty as an act of omission (Dasgupta, 2008, p. 159; Spash, 2005, pp. 230-31). Indeed, if our duty to our fellow creatures is simply to avoid *harming* them, or to leave them 'enough and as good' of the earth's natural

endowment as we have enjoyed ourselves, then we can easily justify draconian environmental protection (Elliot, 1986; cf. Davidson, 2008). Yet many will find this implausibly libertarian. If the same resources can spare ten people from the effects of climate change or save a thousand from naturally-occurring malaria, are we really obliged to choose the former on the grounds that anthropogenic carbon emissions violate people's negative rights, whereas anopheles mosquitos do not? Surely it is unfair that *anyone* should suffer undeservedly, whether as the result of human-induced harm or natural circumstances (Arneson, 2000, p. 346).

PRIORITY TO THE DEPRIVED

If we reject a sharp distinction between negative and positive rights, perhaps it is best to aim at *minimizing deprivation* (cf. Wolf, 2009, p. 356). Both the priority and sufficiency views stress this goal, but they define it differently. Prioritarians in turn differ among themselves in how much preference they accord to the worst-off. The worse off a person is, the greater value *weighted prioritarianism* accords to benefiting her. Nevertheless, benefits to the well-off can outweigh this preference if they are big enough. In contrast, Rawls (1971/1999) rejects utilitarianism in favour of *absolute* priority for the worst-off (Crisp, 2003, pp. 752-54). Under conditions of moderate scarcity, if everyone followed this rule, it would guarantee enough to live on. In the real world, however, where some face extreme scarcity and not everybody does as Rawls says they should, absolute priority could mean unacceptable tradeoffs (McKerlie, 1994; Wolf, 2009, p. 357). If climate change threatens to kill a hundred people, absolute prioritarianism may require us to prevent this even if the same resources spent differently could rescue a million people from desperate poverty.[2]

Sufficientarians seek to ensure that people can lead a satisfactory life. They set the bar higher than survival: a sufficient life entails more than 'merely having enough

to get along or enough to make life marginally tolerable', and is 'deeply satisfying' (Frankfurt, 1987, p. 38; Frankfurt, 1997, p. 5). Whereas absolute prioritarianism says we must give priority to the worst off regardless of the cost, sufficientarianism may allow us to help another group of *badly* off people, if we can do more for them, or if they are greater in number (Meyer and Roser, 2009, p. 224; Wolf, 2009, p. 352). Yet our goal cannot be simply to maximize the proportion of people with good lives. That would do too little for those in desperation. It would tell us to help two poor people rather than one person who is starving.[3] The most plausible solution combines the sufficiency and priority views. It gives *absolute* priority to ensuring that people have what they need for a good life, and *weighted* priority to reducing more severe deprivation (Crisp, 2003; Brown, 2005). We thus give priority to reducing *average deprivation*, measured in terms both of its extent and its severity.[4]

If future people are our moral equals, there seems no reason not to minimize deprivation between generations as well as within them. This means putting the needs of the hungry present before the wealthy future (Gaspart and Gosseries, 2007). It also means putting poor countries before rich ones. The latter should bear most of the burden of mitigating climate change. Compared with the North, even decades later much of the South is likely to be poor. Spending by rich states today will still help people—now or in the future—who are on average worse off (Schelling, 1995, pp. 398-99). Even so, some say the North would get more bang for its buck by spending the money on other things. Rich states could pay compensation to poor ones for climate change, offer direct assistance in adaptation, or simply invest the money in other worthy projects, such as wiping out malaria.[5] In short, it may seem that equity speaks for not for putting the brakes on climate change, but helping the poor ride it out.

This is not the case. While investing elsewhere may *enable* us to protect or compensate future generations, there is no guarantee that we will actually do it. We or our children might blow the money in a spending spree instead. Even if environmental preservation has a lower aggregate payoff, it may be a surer means of seeing that the benefits reach the right parties (Farber and Hemmersbaugh, 1993, pp. 297-98; Lind, 1995; Tremmel, 2009, p. 73). Moreover, though poor *humans* may adapt to climate change, many non-humans clearly will not (Shue, 1995, p. 255). Worldwide, there are fifty birds for every human. Even in densely settled Britain, wild mammals considerably outnumber human beings (Gleich, Maxeiner, Miersch and Nicolay, 2002, pp. 262-67). The destruction of these animals' habitats can only produce enormous suffering. If animals have moral standing, then intergenerational justice must take account of their interests (Krebs, 2003). Finally, climate change could turn out worse than we expect, and leave our descendants poorer than we are.

Many argue that we should discount the future because future people will be richer. The sensible ones recognise that this is a gamble, even if it is a gamble with good odds (Sunstein, 2007, p. 258). Even an optimist like Beckerman admits the 'remote possibility' that global warming could impoverish future generations (Beckerman and Hepburn, 2007, pp. 190-91; Beckerman and Pasek, 2001, pp. 99, 105). If we are *very* unlucky, it could 'effectively destroy planet Earth as we know it' (Weitzman, 2009, p. 5) or even leave the earth uninhabitable (Broome, 1992, pp. 15-16, 23). Martin Weitzman (2009, p. 1) notes 'deep structural uncertainty in the science coupled with an economic inability to evaluate meaningfully the catastrophic losses from disastrous temperature changes. The climate science seems to be saying that the

probability of a disastrous collapse of planetary welfare is nonnegligible, even if this tiny probability is not objectively knowable.'

One of the most prominent advocates of a go-slow approach to climate mitigation, William Nordhaus (2008, pp. 28, 145-47), rules out such 'genuinely catastrophic outcomes' by assumption, noting that 'preliminary runs' of his model 'suggest' that we do not need to worry about 'a permanent Great Depression, civilizational collapse, or even human extinction.' Yet he confesses that '[u]ntil geophysical modelers develop mechanisms for generating abrupt or catastrophic changes, there is little that economic models…can do to introduce results based on established scientific findings in integrated assessment models'. Indeed, '[w]e cannot rule out the potential for catastrophic impacts that might justify trillions of dollars of abatement costs.' Nordhaus *thinks* climate change won't wreck the planet, but he isn't sure. Meanwhile, '[w]e should start with the clear and present dangers, after which we can turn to the unclear and distant threats.'

This logic is weak. There is no reason to be confident that that 'starting with the clear and present dangers' will work. If climate change poses the threat of catastrophe, we may need to act *now* (cf. Hansson, 2004, p. 357). Moreover, the fact that a threat is *unclear* says nothing about whether it is *small*. We are dealing not with a well-defined risk, but with an uncertain chance of disaster. We might gamble and have bad luck; we could also be wrong from the outset about what the odds really are (Arrow et al., 1996, p. 67; Ryan, 2007, p. 176). We are especially likely to misjudge the probability of unlikely risks (Bier et al., 2004, pp. 78, 93). Uncertainty about climate change gives grounds for *greater* caution rather than less (Broome, 1992, pp. 17-18; Stern, 2009, p. 35). As Weitzman (2009, p. 5) observes:

> The tiny probabilities of nightmare impacts of climate change are all such crude ballpark estimates (and they would occur so far in the future) that there is a tendency in the literature to dismiss altogether these highly uncertain forecasts on the "scientific" grounds that they are much too speculative to be taken seriously….[But] other things being equal, the more speculative and fuzzy are the tiny tail probabilities of extreme events, the less ignorable and the more serious is the impact on present discounted expected utility for a risk-averse agent.

Here the preponderant weight of the future comes back into play. Both egalitarianism and utilitarianism admit a case for discounting losses to future people if they will be better off. But neither an aversion to inequality nor declining marginal utility justifies discounting their interest in being *as well off* as we are. Global warming could impoverish future people for many decades, for centuries, or even for good. Even if it did not leave them *economically* worse-off, it could deprive them of good health or other basic needs, bringing them below the threshold of sufficiency in another fashion. Rich people as well as poor ones deserve protection against being poisoned or cooked (Caney, 2008, pp. 550-51; Davidson, 2008, p. 472; Spash, 2005, pp. 228-29). In contrast, provided economic growth continues, the material misery of today's poor countries 'must eventually be eradicated' (Beckerman and Pasek, 2001, p. 119). If economic growth does *not* continue, this is likely to be the result of runaway climate change or another catastrophe like nuclear war.[6] In the United States, 'increases in prosperity are likely notwithstanding the aging of the Baby Boom generation', observes Neil Buchanan (2009c, 1270-72, emphasis added),

> with even pessimistic forecasts showing impressively high cumulative economic growth leading to very high average future living standards….The

> estimates from the Social Security Trustees…have been very steady over the years, and the scale of revisions necessary to result in a forecast of zero net growth (or something even close to that level) over a several-decade span appear to be beyond reason. Short of unpredictable cataclysms (*weather-related disasters*, world war, the collapse of global capitalism), these forecasts are apparently among the most solid available.

If we must choose between two policies, both of which may impoverish people's lives, we ought to choose the one that minimizes expected per capita deprivation. This is a product of the share of the total population—present and future—who are at risk, the estimated probability of their falling below the threshold of sufficiency, and the likely severity of the deprivation.[7] Given the vast number of future people, barring the chance of human extinction, *any* significant likelihood of permanent impoverishment must outweigh even a high probability of continued poverty in parts of the world over the next few generations.[8]

Strictly speaking, such tradeoffs are unnecessary; ambitious abatement measures *need* impoverish no one. While their cost would be large in absolute terms, as a percentage of world income they are small, with Nordhaus (2008, p. 90) estimating their cost at 1.5 percent. Weitzman (2007, p. 720) notes the *Stern Review*'s stress on

> the immorality of relegating future generations to live under the shadow of the open-ended possibilities of uncertain large-scale changes in the climate system, when for a mere annuity cost of a percent or two (or at most three) of GDP each year we might have purchased an insurance policy on their behalf that avoided this scary uncertainty (or at least greatly reduced it) ….

Ambitious mitigation need not bring a single person below the poverty line if we were only prepared to redistribute enough resources.[9] 'The fallacy', Richard Posner (2004, p. 115) observes, '…is to think that we have a choice between only two policies: we can either expand health insurance or take measures against catastrophic risks. We can do both. We would just have to give up something else.'

MOTIVATING MITIGATION

But it doesn't seem we will. Since today's rich states reap most of the benefits of carbon emissions, while externalising most of the costs to other countries, species and generations, they have a strong incentive to continue (cf. Gardiner, 2006b). Nor do the world's poor seem ready to make cuts that restrict their economic development (Malnes, 1995, p. 125). Powerful countries might *impose* the costs of mitigation on weaker ones—a process which may already be underway (Isla, 2009). Of course, this would be deeply unfair. In particular, policies that deprived the poor of necessities so that the rich could continue their 'luxury emissions' would be a crying injustice (Shue, 1993). All the same, it would be a lesser injustice than risking long-term catastrophe. As Clark Wolf (2009, p. 373) puts it, 'Unless our efforts to mitigate the effects of climate change will cause more misery and deprivation than they will relieve, we have an obligation of justice to undertake them.' Even the prospect of condemning several more generations in the South to poverty—terrible in itself—dwindles next to the danger of *permanent* impoverishment.

Nevertheless, far better that the rich should pay for abatement. The problem is that they are unwilling to do enough. And indeed, while they should do more, it does not seem quite fair to ask them to bear the whole burden. We ought to pursue ambitious mitigation, because we live at a time when climate change is coming to a head. But this may leave us with a lower material standard of living than our parents

enjoyed (Malnes, 1995, p. 108). At the same time, our descendants are likely to be materially far richer. The problem is not that they are *likely* to be impoverished if we do not do enough. Rather it is that if things turn out much worse than we expect, they could be disastrous indeed. Abatement is akin to taking out an insurance policy, or investing in bonds rather than stocks: it 'reduces the variance in what may happen' (Broome, 1992, pp. 17-18, quotation at p. 17; Roser, 2009a, p. 21, n. 46).[10]

Suppose I hold a well-paid job with good prospects for promotion. Barring accidents, I can expect to save enough to leave my heirs a large legacy. Yet if I am killed on the job and a market crash wipes out my savings, I will leave my family penniless. Of course I should take out life insurance. That my heirs will *probably* be richer is no excuse for exposing them to disaster. Yet finding the payments onerous, I may be tempted to skimp, and hope for the best. That would be the wrong choice. It would be better to save less, and use the money to pay the insurance premiums. That would not be unfair to my heirs: they will still have more than I had. Nor is it unfair to put my savings in bonds with a lower rate of return.[11] If I live to a ripe old age, my heirs will inherit a smaller fortune, but still more than I have now. Since I already have enough to live comfortably, they will have comparatively little interest in 'potential gains…above the minimum that can be guaranteed by the maximin approach'.[12] This is a paradigmatic case for precautionary action (Gardiner, 2006a, p. 47). It is better to inherit less, but to be spared the threat of disaster.

Likewise, in the case of catastrophic threats, we ought to take out 'insurance'. It is fair for the rich to make their still richer descendants pay part of the premium (cf. Lind, 1995, p. 382). Indeed, if we anticipate that our descendants will be richer, there is some case for transferring resources from the future even if we use them simply for our own consumption (Gaspart and Gosseries 2007; Zelenak, 2009). When we borrow

from our grandchildren for their own protection, the case becomes overwhelming. Some find the notion that we could legitimately pass on costs to our descendants hard to swallow. Is not 'seeing our children and grandchildren do better than we have done…the real promise of America', as Senator Hatch asserts (2009)? It is hard to see why this must be the case. We have no reason to think that they will be more virtuous or harder-working than we are. As Brian Barry (1983, p. 20) observes, 'none of the usual justifications for an unequal claim—special relationships arising in virtue of past services, promises, etc.—applies here' (cf. Tremmel, 2009, p. 175). An inheritance equal to our own is the obvious baseline. Deep cuts in GHG emissions promise our descendants the best chance of receiving at least that much.

The challenge is to find ways of transferring resources from the future (Lind, 1995, pp. 382-83). One possible means is public debt (Bradford, 1999, p. 42; Revesz, 1999, p. 1007). Economists have long debated whether the present generation is able to pass on the burden of the public debt at all.[13] Indeed, it does not seem possible for the present generation *taken as a whole* to borrow money from the future. Any loan made now comes out of today's spending and investment, and will in turn be repaid to future people (Buchanan, 2004, pp. 324-25). Nevertheless, public debt may transfer wealth from present-day creditors to present-day citizens and taxpayers, and in turn from future taxpayers to future creditors (Lerner, 1961). It benefits today's taxpayers at the expense of tomorrow's. And it is today's taxpayers who must be persuaded to foot the bill.

Some deplore such intergenerational cost-shifting as unjust (Boettcher and Tremmel, 2005; Wolf, 2008). 'What will…$400 million for climate change research do to help you and your family?' demands US Representative Michele Bachmann (2009), complaining that the Obama administration's stimulus package will 'cost the

American taxpayers, their children and their grandchildren more than $1 trillion'. Warning of 'global warming taxes that will hike costs for every American who turns on a light switch', Representative Lynn Westmoreland (2009) denounces a 'felonious theft from future generations with the trillions in IOUs we'll be handing them.' Yet even if running up debt means our descendants pay higher taxes, or receive fewer government benefits, this will not make them poorer than we are so long as the rise in pretax incomes keeps pace (Buchanan, 2004, p. 314; Buchanan, 2009c, p. 1292; Gaspart and Gosseries, 2007, pp. 206-7). Critics of deficit spending must explain why we owe them more.[14]

At some point government borrowing could become unsustainable (Shaviro, 2009). If Britain, for example, cannot issue further debt without risking a 'buyers' strike' from the bond market (Lanchester, 2010; cf. Weale, 2009, p. 5), then further deficit financing may not be an option. The question is whether most leading industrialized economies are near that point. It is hard to believe that after so much deficit spending—including the huge sums spent lately on the bank bailouts—debt-funded climate change mitigation is the feather that would break the camel's back. Indeed, some argue that with national economies functioning at less than full capacity, deficit spending is likely to stimulate the economy and private investment, increasing resources for both present and future people. In any case, the question is a practical one, rather than a matter of intergenerational justice. If we have reason to worry about deficits at all, it concerns their fiscal sustainability today, not because they amount to 'generational theft' from our descendants (Buchanan, 2009b, pp. 50-52).

Another way to compensate ourselves at the future's expense is to save and invest less in other areas, spend less on research and development, and consume resources in an unsustainable fashion (Zelenak, 2009, p. 1361; cf. Modigliani, 1961,

p. 736; Revesz, 1999, p. 1007). '[A] global climate initiative that is for reasons economic or political likely to crowd out basic scientific research', Lawrence Summers and Richard Zeckhauser argue (2008, p. 133), 'should be judged more harshly than an equivalent project that would affect only consumption.' Should it? Only if we ought to increase the wealth of the future. If future people are likely to be richer, there is at least as strong an argument for investing less (Mishan, 1963, p. 539 n. 16). '[N]o substantive case', maintains Clive Spash (2005, p. 238), 'has been made that controlling emissions would do more than reduce the rate of growth of material consumption for industrially developed economies.' Growth in living standards comes not only from saving and sacrifice, but also from technological and institutional innovation (Brennan, 2007, p. 280; Gaspart and Gosseries, 2007, p. 206; Tremmel, 2009, pp. 165-66). If we fund climate change mitigation by dissaving in other areas, this can and will be offset up to a point by the accumulation of human knowledge.[15]

There is also a strong pragmatic argument in favour of burden-shifting to the future: *the present generation seems more likely to support abatement if it can pass on part of the costs* (Bradford, 1999, p. 42; cf. Weale, 2009, p. 6). While voters might balk at policies that explicitly transferred wealth from the future (Zelenak, 2009, p. 1381), they already elect politicians who run up debt merely to fund increased consumption (Kielmansegg, 2003). When debt is used to reduce the threat to future generations, as in the case of a just war, the moral case for burden-shifting is far stronger. 'Quite aside from obvious incentive considerations', as Franco Modigliani (1961, p. 753) observes, 'there may be perfectly good equity reasons for lightening the burden of the generation that suffered through the war by granting them a more comfortable life after the war, at the expense of later generations.' The same goes for lightening the sacrifices our generation must bear to avert the threat of catastrophic

climate change. Faced with curbs on carbon emissions, Eric Posner (2007, pp. 142-43) warns, American '[c]onsumers would respond by saving less and spending more at the margin' and 'might simply demand additional government programs that transfer wealth from the future to the present—for example, tax cuts without spending cuts and thus increased debt, or energy projects that degrade the environment in a manner outside the jurisdiction of the [US Environmental Protection Agency], or disinvestment in basic research.' *That would be an acceptable price to pay.* Our duty is not to make the rich of the future richer, but rather to avert disaster.

Transfers of wealth from the future should be used to fund abatement not only at home in the North, but also, and especially, in the South. Not only is these countries' participation essential in the long run, but here there is the strongest case on the basis of equity for tapping the wealth of the North's descendants, who can be expected, if catastrophe is averted, to be far richer than most inhabitants of the South today (Buchanan, 2009a, pp. 1404-5; Buchanan, 2009c, p. 1256). It is well known that the rich countries contribute less foreign aid than philosophers say they should. They may be more willing to fork over if they can pass on part of the bill. Happily, there is nothing unjust in their doing so.[16]

CONCLUSION

Utilitarianism notoriously allows the trivial interests of the many to overwhelm the vital interests of the few. This is enough, in Nordhaus's (2008, pp. 182-83) eyes, to damn the *Stern Review*. 'Using its growth projections', he charges,

> the *Stern Review* would justify reducing per capita consumption for one year today from $6,600 to $2,900 in order to prevent a reduction of consumption from $87,000 to $86,900 starting two centuries hence and continuing at that rate forever after. This bizarre result arises because the

> value of the future consumption stream is so high with near-zero time discounting that we should sacrifice a large fraction of today's income in order to increase a far-future income stream by a very tiny fraction.

Nordhaus's solution is to discount the value of additional consumption by future people. This solution is misleading. In reality, we do not—or, at any rate, *should* not—believe that people's consumption matters less merely because they will live in the future. As Tyler Cowen and Derek Parfit (1992, p. 148) advise, 'we should say what we mean.' What we mean is that no benefits to the well-off, however numerous the latter may be, can ever justify depriving the needy. We need an ethic that will not allow the luxuries of the rich to trump the needs of the poor. We find this in minimizing expected deprivation.

Once we reject utilitarianism, we no longer need to discount. We are more than rich enough to minimize expected deprivation without assuming intolerable burdens. In the case of climate change, we have the choice of two ideal type strategies for doing this. On the one hand, we can pursue ambitious mitigation; on the other, we can let the planet warm on the assumption that our savings and additional growth will allow us to adapt successfully to climate change, or compensate for the damage (Toman, 2005, p. 82).[17] Adaptation and compensation *may* work out—for humans, if not for other species—but they carry the small chance of long-term or even permanent catastrophe. In contrast, so long as mitigation is not so drastic as to halt growth, within a century even today's poor states should be far richer than they are today. Given the vast number of future people who would suffer from runaway climate change, minimizing expected deprivation calls for precaution. As Wolf (2009, p. 373, emphasis in original) says, 'Present investment to mitigate climate change does not

aim to make later generations better off than earlier ones. Instead, it aims to protect later generations from risks that might make them much *worse* off than earlier ones.'[18]

We can easily afford to spend one or two percent of world income and still meet everyone's basic needs. The benefits the rich would forego in order to avert the threat of disaster are trivial in comparison. Yet they refuse to do so. Fortunately, through long-term borrowing or diverting funds from other investments, we can ensure that the rich of the future share the burden of climate mitigation. As Wilfred Beckerman and Joanna Pasek (2001, p. 105, emphasis added) observe,

> Future generations are *likely* to be much richer than is the current generation, and there is *little reason* to believe that the steady rise in real incomes will be significantly reduced by climate change….However, we do have a moral obligation to take account of the *possibility*, however small, that climate change could seriously depress the living standards of future generations.[19]

Well said. But this means that the world has little to lose and much to gain from passing on part of the burden of abatement. Our much richer descendants can well afford to pay off some debt if this ensures that they really are richer.

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[1] Jamieson, 2005, p. 227; Spash, 2005; Tol, 2008, p. 442; cf. Evers, Stamf and Traufetter, 2010.

[2] Or would it? Rawls (1971/1999, p. 84) suggests that the worst-off might be defined as 'unskilled worker[s]', or 'all persons with less than half of the median' income and wealth. That is to define 'worst off' fairly inclusively. In this case, Meyer's and Roser's (2009, p. 224, emphasis added) warning that maximin requires us to prioritise 'the smallest improvement of the *smallest* number of the worst off' may not apply to Rawls. Rawls himself did not extend his difference principle to relations between countries or generations, and might reject the prioritarian analysis developed here (thanks to an anonymous referee for pointing this out).

[3] Maximizing the proportion of future lives above sufficiency is, however, plausible as a *population principle.* See Rendall, forthcoming, n. 31.

[4] This should not encourage us to kill off people whose lives fall below the sufficiency threshold—a criticism sometimes levelled at average utilitarianism (McMahan, 1981, 113). Premature death is in most cases a particularly severe form of deprivation. Killing even badly-off people would increase average deprivation rather than diminishing it.

[5] Beckerman, 1995, pp. 92-95; Goklany, 2001, p. 81; Schelling, 1995; Tol, 2008, p. 442.

[6] Brennan, 2007, p. 277; Tremmel, 2009; cf. Helm, 2008; Posner, 2004, p. 165.

[7] Compare Roser's (2009c, pp. 9-10) consideration of a rule minimizing the expected probability of rights violations, possibly weighted according to their severity. Cf. also Malnes (1995, pp. 64-65).

[8] Minimizing expected deprivation is thus sensitive to probabilities, and thus does not always entail eliminating the worst-case scenario. The very worst scenario in the case of climate change is that we spend lots of money and catastrophic climate change ensues anyway (Chisholm and Clarke, 1993, p. 114). Moreover, instead of runaway climate change, we could suffer some other long-term catastrophe such as an asteroid collision or nuclear war. We might then wish we had pursued the business-as-usual strategy. Ambitious GHG cuts, however, could well *avert* catastrophe. Economizing on mitigation, in contrast, promises only modest additional resources. Perhaps we would save enough to deflect an asteroid or prevent some other catastrophe, but it is far from sure that the money would actually go to fund such projects rather than to tax cuts or agribusiness subsidies. Nor will saving 1-3% of GWP do much to reduce the threat of nuclear war. Ambitious action against global warming remains the best strategy for minimizing expected deprivation.

[9] Caney, 2009, p. 179; Spash, 2005, p. 232; cf. Gardiner, 2006a, pp. 55 n. 68, 56 n. 71; Wolf, 2009, p. 362.

[10] Why, rather than pursuing abatement, should we not just literally take out insurance? Some have suggested this solution. Yet even if money can compensate for environmental damage (a big if), it would not be an adequate buffer if we were unlucky. If we suffered a worldwide disaster, even if it did not lead to mass deaths or human extinction, it is highly unlikely that insurers could compensate all losses (Price, 2003).

[11] I am grateful to Dominic Roser for suggesting the analogy of buying bonds.

[12] If the reduced legacy leaves my heirs poorer than their contemporaries, to be sure, they might suffer *relative* deprivation even if they are comfortably off. They could become seriously discontented, thus falling below the threshold of sufficiency (Huseby, 2010). An analogous problem could arise if some countries incur heavy mitigation expenses while others free-ride off their efforts, leaving the latter with higher national incomes. But while invidious comparisons between countries may cause some frustration (Graham, 2005, pp. 49-50), this remains a minor danger compared to impoverishment.

[13] For reviews and discussions of the literature, see Cooper (1986); Labonte and Makinen (2005); Vaughn and Wagner (1992). Ferguson (1964) collects most of the early work.

[14] For an attempt to do so, see Shaviro (2009).

[15] Tremmel (2009, pp. 165-68, 197-99) argues that innovation makes it unnecessary for us to save more than we inherited, but that '[n]o generation has the right to dissave' (p. 167).Tremmel, however, believes that we are obliged to promote increasing welfare over time. If intergenerational equity requires only equal welfare, then gains produced by innovation could compensate for a modest amount of dissaving (cf. Zelenak, 2009, p. 1361).

[16] Anti-cosmopolitans might criticise the transfer of resources to other countries. By minimizing the threat of global catastrophe, however, such transfers will benefit the rich countries' own future citizens.

[17] Roser (2009c, p. 19) maintains that we should aim at rising utility levels for future generations so as to provide a margin of safety in case things go worse than we expect. This would be certainly better than doing nothing—but higher spending directly on disaster-aversion projects would be a more efficient form of 'insurance'.

[18] This does raise the concern that even *tiny* possibilities that the world could fall permanently below sufficiency would acquire huge weight, requiring us 'to devote all our resources to catastrophe-averting projects above the modest expenditures necessary to maintain at a subsistence level the scientific and technical personnel employed on the projects' (Posner, 2004, p. 153). I plan to address this issue in a future paper.

[19] Beckerman and Pasek themselves deny that there is 'any need to sacrifice current standards of living [through mitigation] in order to protect posterity from poverty' (2001, p. 105).

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