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Résumé : Le but de cet article est de tracer les contours du débat sur les relations intergénérationnelles dans un contexte interdisciplinaire soucieux des implications pour l'action. L'article part d'un constat: notre position de base vis à vis du futur éloigné peut être caractérisée comme un problème de "défausse intergénérationnelle". En effet notre position dans le temps nous permet d'imposer aux personnes futures des coûts qu'ils ne devraient pas avoir à supporter et aussi de les priver d'avantages auxquels elles ont droit. Il est évident que ce problème se pose dans deux cas ayant de graves implications intergénérationnelles : le changement climatique et la sécurité nucléaire. Ce problème se trouve encore amplifié par l'inadéquation des outils théoriques à notre disposition: nous manquons des outils conceptuels adéquats pour traiter de questions qui touchent au futur éloigné, comme le montre la discussion de la théorie dominante pour l'évaluation des politiques publiques, l'analyse coûts-avantages.

Abstract : The aim of the paper is to set out some of the basic contours of the debate for an interdisciplinary, and policy-oriented audience. It claims first that our basic position with respect to the further future can be characterized by the problem of "intergenerational buck-passing". This problem implies that our temporal position allows us to visit costs on future people that they ought not to bear, and to deprive them of benefits that they ought to have. The problem is manifest in the case of two serious intergenerational issues: climate change and nuclear protection. Then, it is suggested that the problem is exacerbated by a further problem of theoretical inadequacy: at present, we lack the basic conceptual tools with which to deal with issues involving the further future. This problem is illustrated through a discussion of the dominant theoretical approach in public policy, cost benefit analysis.

Mots clés : Justice intergénérationnelle, Changement climatique, Sécurité nucléaire, Analyse coûts-avantages

Key Words : Intergenerational Equity, Climate Change, Nuclear Safety, Cost-Benefit Analysis

Classification JEL : D90, H43, Q28, I18

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[1] his paper both summarizes and develops arguments of mine given elsewhere. The paper grew out of a presentation originally given to an interdisciplinary workshop organized by the Chaire Développement durable École polytechnique and Électricité de France in Paris in May 2005. The topic of the workshop was the ethics and economics of the further future, as they pertain to climate change and nuclear protection. I am grateful to both organizations, to two anonymous reviewers, and especially to Olivier Godard, both for his hospitality and his own challenging comments. The first draft of the paper was written while I was a Laurance S. Rockefeller Visiting Fellow at the Center for Human Values at Princeton University. I thank the Center and the University of Washington for their support. Finally, the paper reproduces and extends one part of the argument given in Gardiner (forthcoming). I thank the Chaire and Edward Elgar for their permission to use the material from the presentation in this way.

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Introduction

In this paper, I consider the question of why future generations need protecting. My aim is to set out some of the basic contours of the debate for an interdisciplinary, and policy-oriented audience. Though some will, no doubt, remain unconvinced that the problems I identify are as serious as I believe them to be, I hope that all can agree on two things: first, that the basic questions I raise are worth asking; and second, that, since much depends on our answers to such questions, these are matters about which those in the realm of policy ought to be aware.

I begin by claiming that our basic position with respect to the further future can be characterized by what I call "the problem of intergenerational buck-passing". This problem implies that our temporal position allows us to visit costs on future people that they ought not to bear, and to deprive them of benefits that they ought to have. Next, I claim that it is plausible to think that the problem is manifest in the case of two serious intergenerational issues: climate change and nuclear protection. Third, I suggest that the problem is exacerbated by a further problem of theoretical inadequacy: at present, we lack the basic conceptual tools with which to deal with issues involving the further future. I illustrate this problem through a discussion of the dominant theoretical approach in public policy, cost benefit analysis.

I. The problems

Why do future generations need protection? In this paper, I suggest two important reasons. The first rests on the vulnerability of future generations to their predecessors. This problem can be illustrated by imagining a hypothetical case. Suppose that there is a sequence of nonoverlapping generations[1], each of which has preferences that are predominantly (and perhaps exclusively) generation-relative in their scope: they concern things that happen within the timeframe of its own existence. Suppose then that there are goods that are temporally dispersed. Consider two types of such goods. Goods of the first type are such that their benefits accrue to the generation that produces them, but their costs are substantially deferred and fall on later generations. Call these 'front-loaded goods'. Goods of the second type are such that their costs accrue to the generation that produces them, but their benefits are substantially deferred and arise to later generations. Call these 'back-loaded goods'.

In such a scenario, we might expect each generation to *oversupply* front-loaded goods and *undersupply* back-loaded goods. That is, we might expect each generation to engage in what we might call "buck passing behavior": each generation secures benefits for itself by illegitimately imposing costs on its successors, and avoids costs to itself by illegitimately failing to benefit its successors. Moreover, since this is an iterated phenomenon - each generation faces the same incentive structure when it has the power to act – we might expect that it has cumulative effects. That is, we might anticipate that the impact of buck passing is worse for more distant than for temporally closer generations. Let us call this, 'The Problem of Intergenerational Buck Passing'

(PIBP).[2]

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[1] One way to secure this is by definition. So, for example, one might say that the current generation consists of all those currently alive and all the people whom they will live to meet. See De-Shalit (1995).

[2] For an earlier analysis of the problem, see Gardiner (2003).

One thing that it is worth noting about the PIBP is that it does not assume that there ought to be *no* consumption of temporally diffuse goods. Indeed, the use of terms such as '*over*supply', '*under*supply' and 'illegitimate' implies that the PIBP presupposes a normative benchmark of appropriate consumption. Hence, any application of it needs to be understood in the context of such a benchmark. This point is worth noting because it suggests that the PIBP is not a completely general problem. In particular, it does not arise for theorists who deny that genuine questions can be raised about the intergenerational distribution of goods, or claim that any current generation is morally permitted to do completely as it pleases. Such views are, no doubt, worthy of philosophical discussion. Still, since they appear to conflict with some basic moral intuitions, and since they remain very much minority opinions, I shall ignore them here. For in practice the fact that the PIBP arises for all positions that accept any substantive claims of intergenerational justice renders it highly relevant for philosophical and political discussion. In short, though the PIBP makes some moral assumptions, most people will think that they are very minimal; and, moreover, the burden of proof seems to be clearly on those who would doubt this to make their case.

Now, here I want to make only two general points about intergenerational buck passing. First, other things being equal, it seems to pose a moral problem. This is clearest in the case of front-loaded goods, because it seems unethical for an earlier generation to foist costs on a later generation without any compensation and without its consent. But it is also relevant for back-loaded goods. On the (modest) assumption that, other things being equal, any given current generation has an obligation to engage in at least some back-loaded projects (e.g., some with extremely low present costs and extremely high future benefits), then each generation will fail in its duties to the future if it fails to invest in such projects.[3]

Second, under some circumstances, the problem may become very serious. For one thing, the impacts imposed on future generations may be very large. Sometimes this will because the impact of a single generation's behavior is great; more often, perhaps, it will be because of the substantial *cumulative* effects of the behavior of many generations. For another, the impacts passed on may be of an especially pernicious kind. For example, they might erode the fundamental preconditions of human life and society in ways that might easily have been avoided.

Most people would, I think, accept both that the problem of intergenerational buck passing is a genuine moral problem, and that sometimes it may be very serious. Moreover, given this, they would maintain that we have a moral reason to limit the impact of our generation-relative preferences.[4] The question then becomes how and to what extent such a

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[3] Perhaps there would be no moral problem if each generation were to consume to the same extent, so that each takes from the future only as much as has been taken from it by the past. But even this claim is questionable. First, such a situation may be suboptimal, and immoral for this reason, if intergenerational justice requires optimality (or at least suboptimality at a higher level). Second, the response looks best if the relevant costs and benefits are simply passed on from one generation to another. But this raises two obvious issues. For one thing, it seems too neat a picture - many effects of overconsumption are likely to be spread out over many generations, and also to be cumulative. For another, when sanitized in this way the model starts to mimic theories of intergenerational justice that rely on indirect reciprocity across generations. But, of course, it would be no surprise to find that distributions that satisfy a (correct) theory of intergenerational justice are not prey to the PIBP. Third, it is not clear that distribution is the only thing that matters. For example, if Sammy takes Fred's lunch and Fred takes John's lunch and then John takes Sammy's lunch, they all end up with an equal share (one lunch). Nevertheless, none has his own lunch, and each has a legitimate complaint against one of the others.

[4] Such a limitation might take a number of different forms. For example, perhaps we should subject our generation-

limitation is to be achieved. To answer this question, we need a theory of intergenerational justice.

Unfortunately, this leads us to our second problem, which is that we are not currently well placed to offer a theory of intergenerational justice. In general, the intergenerational context brings together a number of extremely difficult theoretical issues: for example, scientific uncertainty, contingent preferences, contingent persons, nonhuman animals, and nature. More specifically, the dominant theory in the world of public policy – cost benefit analysis – faces major challenges in dealing with the long-term future.[5] In this article, I shall try to illustrate the relevance of these points through a discussion of two specific topics in intergenerational ethics: climate change and nuclear protection.

II. Manifestations of Intergenerational Buck-Passing

1. Climate Change

Let us begin with climate change. It is by now fairly uncontroversial that human activity is altering the Earth's climate. It is also reasonably clear that climate change involves temporally dispersed goods. For one thing, carbon dioxide is the most important greenhouse gas produced by human beings; and once emitted, molecules of carbon dioxide remain in the upper atmosphere contributing to warming for a surprisingly long time, of the order of hundreds, and perhaps thousands, of years.[6] For another, many of the basic climate processes set in motion by an increase in the greenhouse effect manifest themselves over very long time scales. Sea level rises, for example, may occur over a millennium.[7]

These facts have two salient implications. The first is that the climate change that the earth is currently experiencing is primarily the result of emissions from some time in the past, rather than current emissions. As an illustration, one reputable estimate suggests that by 2000 we had already committed ourselves to a rise of 1 degree Kelvin over the observed rise of

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relative preferences to certain direct constraints. Alternatively, perhaps we should seek to engage other intergenerational preferences that we either already have or ought to develop.

[5] A third problem is that when the buck passing and theoretical problems are taken together, they constitute a recipe for moral corruption. On the one hand, the existence of temporally dispersed goods creates an incentive for cheating future generations, and there are ways in which our theoretical ineptitude creates good cover for this. On the other hand, the absence of good theory for dealing with questions involving future generations leaves open a convenient space for many mechanisms of moral corruption. For more on this issue, see Gardiner (forthcoming).

[6] The usual estimates suggest a mean of a few hundred years. But in a recent paper, David Archer claim that such estimates obscure the fact that a small portion of the CO2 remains in the atmosphere for a long time: "… we expect that 17-33% of the fossil fuel carbon will still reside in the atmosphere 1kyr from now, decreasing to 10-15% at 10kyr, and 7% at 100 kyr. The mean lifetime of fossil fuel CO2 is about 30-35 kyr" (Archer, 2005, p. 5). Archer does concede that the usual estimates may be appropriate for some purposes, because they capture the behavior of the majority of the carbon. However, his reason for conceding this appears to be that "one could sensibly argue that public discussion should focus on a time frame within which we live our lives, rather than concern ourselves with climate impacts tens of thousands of years in the future." I am not sure how to understand this argument. For one thing, the rationale appears to rule out the usual estimates as well; for another, such limits seem to manifest the PIBP. Hence, in the end, I see the merit of Archer's own suggested simplification: "a better approximation of the lifetime of fossil fuel CO2 for public discussion might be 300 years, plus 25% that lasts forever" (Archer, 2005, p. 5).

[7] For more on both claims, see IPCC (2001, p. 16-7), especially the graph on p. 17. Recent work on sea level suggests that changes there can be more abrupt and have been so in the past.

0.6 degrees Kelvin, and that this implies a lag of twenty years.[8] The second is that the full, cumulative effects of our current emissions will not be realized for some time in the future. So, climate change is a substantially deferred phenomenon.

These facts suggest that intra-generational motivation for acting on climate change may be low. For, on the one hand, the Earth may *already be committed to* many of the effects that the current generation is likely to experience; and, on the other, the impacts of its own emissions will fall on other (future) generations. The circumstances are thus ripe for intergenerational buck passing.

There is also reason to believe that the problem of intergenerational buck passing is already manifest. In 1988 the United Nations Environment Program and the World Meteorological Association established the Intergovernmental Panel on Climate Change to provide member governments with state of the art assessments of "the science, the impacts, and the economics of – and the options for mitigating and/or adapting to – climate change".[9] The IPCC published its first comprehensive report in 1990. It has followed up with updated reports in 1995, and 2001. Moreover, the U.S. National Academy of Science reviewed the issue in 2001, at the request of the Bush Administration, and found itself in general agreement with the IPCC.[10] The main scientific and policy conclusions have remained consistent across all of these reports: climate change is a real problem and it must be addressed.

Since 1990, then, the countries of the world have known that they should deal with climate change. Given this, in the absence of the PIBP, we might have expected action on two fronts. First, the current generation ought to have attempted to limit the magnitude of future climate change by reducing its emissions. In the jargon of the IPCC, it ought to have engaged in *Mitigation*. Second, the current generation ought to have begun to make serious preparations in order to limit the impacts of climate change to which the Earth is already committed. That is, in the terms of the IPCC, it ought to have invested in *Adaptation*.

But notice that both of these activities involve temporally dispersed goods. Mitigation involves the present generation forgoing front-loaded goods. It must resist taking benefits now because of the later costs to future generations. Adaptation involves the present generation's taking on back-loaded goods. It must incur costs now in order to provide benefits to future generations later. Hence, given the PIBP, there is every reason to suspect that the current generation will fail to engage in Mitigation or Adaptation to a reasonable level.

There is strong evidence that this is the case. So far the world's reaction to the climate change problem has been weak on both fronts. There is much to be said about this. But here let me make just three quick points about mitigation. First, there has been little substantive progress on mitigation. For one thing, global emissions have risen sharply since 1990 – of the order of 30% - and show no signs of slowing down.[11] For another, in those places where gains

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[8] Wetherald et al. (2001).

[9] IPCC (2001a, p. vii.)

[10] See U.S. National Research Council (2002).

[11] Grubb et al. suggest that Non-Annex I emissions will grow by 114 percent during the period, and (even if the US had adopted Kyoto) this would have led to a global emissions rise of 31 percent above 1990 levels. See Grubb et al. (1999, p. 156). Estimates of current emissions are broadly consistent with this kind of figure. For example, Marland et al. suggest that global emissions rose around 19% from 1990 to 2003, and similar growth in the next decade would yield a 32% on 1990 by 2012; similarly, a recent report from the US government forecasts that emissions will rise 75% from 2003-2030 under a "business-as-usual" scenario. (See Marland et al., 2006, and US

have been made – such as Germany and the United Kingdom - these are largely for unrelated intragenerational reasons, not because of climate change policy. Moreover, at least in the UK, these gains are under threat and may be undone in the coming decades unless further action is taken.[12]

Against this, it might be claimed that at least some progress has been made procedurally, with the development and ratification of the Kyoto Protocol. There is something to this claim, but we should be careful not to overstate it. For one thing, [this is the second point] the Kyoto Protocol posits targets for only the period 2008-2012, and these targets are widely thought to be extremely weak, and even perhaps higher than would be expected under business as usual.[13] Given that we eventually need much deeper cuts, and need to start making them in the next few decades, the hard work remains to be done. For another [the third point], the history of agreements about climate change is not promising. In the early 1990s, a number of countries made voluntary commitments to stabilize emissions by 2000, but none achieved this. This resulted in the negotiation of the Kyoto agreement. Since then we have seen withdrawals and renegotiations, and now there are worries that many of those committed to cuts may not make their targets.[14] Can we really be so sure then that Kyoto does constitute progress, rather than just another stalling process? In many ways, the answer to this question depends on how we build on Kyoto, not on Kyoto itself.[15]

There are then good theoretical, historical and political reasons for thinking that the problem of intergenerational buck passing is manifest in the climate change problem. I shall now argue for a similar result for nuclear protection.

2. Nuclear Protection

The relevance of the PIBP to nuclear protection can be illustrated by focusing on two prominent dangers posed by ionizing radiation. The first involves the storage and disposal of nuclear waste. Such waste appears to be a front-loaded good. On the one hand, its benefits – the energy created by the processes that produce it – accrue predominantly to the present generation; on the other hand, the costs of storage and disposal are spread out over many generations. The second danger involves the possible long-term genetic effects of radiation. This appears to be a back-loaded good. The costs of avoiding such effects fall on current people; but the benefits arise in the future, to those who do not suffer the effects. The circumstances, then, are ripe for a PIBP arising over nuclear waste and genetic effects. But is there any reason to think that it is manifest?

Department of Energy, 2006.)

[12] Black (2005).

[13] Babiker et al. (2002) claim that revisions made to the Protocol in Marrakech in 2001 substantially weakened it: "for [the EU, Japan and other OECD countries] … the Bonn-Marrakech agreement would, by our reference forecast, allow a 9% emissions growth from 2000 to 2010". Moreover, they claim: "if the current slow economic growth in Europe and Japan persists for a few more years then the reference projections of emissions used here would be too high, because only slightly slower growth in emissions would yield do-nothing emissions lower than the cap". (See Babiker et al, 2002, p. 202.).

[14] For example, it was recently reported that Canada is now producing 35% more greenhouse gases than it promised under Kyoto, and that its environment minister now says that it has "no hope" of meeting those commitments. Mcllroy (2006).

[15] For further discussion, see Gardiner (2004a) and Desombre (2004).

Let us begin with the issue of waste. The *International Atomic Energy Authority* speaks directly to the issue of protecting future generations its Safety Fundamentals. Its Principle 4 says:

> 4) Radioactive waste shall be managed in such a way as to assure that predicted impacts on the health of future generations will not be greater than relevant levels of impact that are acceptable today.[16]

And Principle 5 adds:

> 5) Radioactive waste shall be managed in such a way that will not impose undue burdens on future generations.[17]

At first glance, these principles seem to block the PIBP. Principle 4 appears to demand that the health of future people be treated in accordance with the same standards as the health of current people; and Principle 5 seems to restrict the more general burdens that may be passed on to the future.

But we should be careful here. First, notice that Principle 4 does allow a form of intergenerational buck passing. For much depends on how and why the health standards for current people are established. Historically, these have been set in accordance with the idea of the amount of health risk that it is worth taking on *in order to realize some economic benefit.* But then the situation for current and future people is asymmetric. For the current generation, the question is how much of a health risk are they willing to accept for the sake of a given economic benefit that accrues *to them.* Hence, the underlying rationale is one of *compensation:* current people take on a risk in the expectation of receiving some benefit. But for future generations, the question is different. They are probably being asked to accept a given level of health risk for the sake of benefits that accrue largely to *current people.* So, the rationale of compensation does not apply.

Consider the following parallel. Suppose I am away on a business trip. You call me on the phone to say that my office building is on fire. I scream, "No! The signed photograph of me with David Beckham is in there"; and I beseech you to run into the building in order to save it. But you refuse. In response, I retort, "You are being unreasonable – if I were there, I would be willing to take the risk of dying from the rampaging fire in order to save my precious photograph." How good a response would this be? Not a very good one, I would suggest. Perhaps you should be willing to take some risks on my behalf; but this is not one of them, and the fact that I would be willing to take such a risk on my own behalf does little to change this.

A second problem with Principle 4 also involves an asymmetry. The principle specifies the conditions under which future people can be called upon to assume costs for the sake of the current generation, but not *vice versa.* In other words, it is concerned only with the conditions under which the production of frontloaded goods may be permissible; not with those under which back-loaded goods ought to be produced. But, given the PIBP, this is

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[16] IAEA (1995, p. 6)

[17] IAEA (1995, p. 7.)

entirely predictable.

The situation with Principle 5 – "radioactive waste shall be managed in such a way that will not impose undue burdens on future generations" - is more complex. As stated, the principle is ambiguous: "undue" might mean either "excessive" or "inappropriate". If it means "excessive", then there is still room to pass on some kinds of burden to future generations without compensation, so long as one does not surpass the threshold of excessiveness. This might be avoided if "undue" means "inappropriate". But then we need some account of what this means, and this requires rather than indicates some principle of intergenerational ethics.

Fortunately, the IAEA offers some guidance on this issue, since it both states that Principle 5 "is based on the ethical consideration that the generations that receive the benefits of a practice should bear the responsibility to manage the resulting waste" and offers an account of how this responsibility should be understood:

> "The responsibility of the present generation includes developing the technology, constructing and operating facilities, and providing a funding system, sufficient controls and plans for the management of radioactive waste."

And:

> "The management of radioactive waste should, to the extent possible, not rely on long term institutional arrangements or actions as a necessary safety feature …"[18],

These statements signal awareness of the compensation issue, and also try to resolve it. But it remains unclear whether they are adequate to the task. There are three issues.

First, and most obviously, there are problems with application. It is all very well to *say* that the current generation should take responsibility for the waste. But it is very difficult, if not impossible, for that generation to do so over periods of hundreds of years. Inevitably, some responsibility will fall to future people. Given this, the IAEA advice seems liable to mislead, and in such a way as to underestimate the burden that ought to be assumed by the current generation.

Second, there are problems concerning the IAEA's inference of its interpretation of Principle 5 from the ethical consideration. Presumably, it is possible for future people to benefit from the present generation's investment in nuclear energy – for example, this may reduce the magnitude of harmful future climate change – and in this case, perhaps the present generation ought not to be responsible for all of the associated costs. Failing to recognize this may lead to an underinvestment in nuclear technology on the part of the present generation, and so aversely affect future people.

Third, there are problems with the ethical consideration itself. Why assume that the costs must always be born by the beneficiaries? For example, if future generations are likely to be much worse off than we are – perhaps because of an abrupt climate change - then it may be necessary for us to absorb some costs in order to benefit them.

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[18] The quotations in this paragraph are from IAEA (1995, p. 7).

We can conclude, then, that though the IAEA principles initially appear to avoid the PIBP, this appearance is deceptive. At best, the principles simply impose some upper limits on the amount of intergenerational buck passing that can occur. This might be valuable, but it does not suffice to eliminate the phenomenon altogether.

Let us turn now to genetic effects.[19] In its draft recommendations of 2004, the International Commission on Radiological Protection (ICRP) introduces a new, sharply reduced[20] estimate of genetic risk that "takes only into account the risk up to the second generation", and so "[restricts] the evaluation period to only 2 generations".[21] But critics judge this restriction to be scientifically unacceptable. There are three basic reasons.

First, it is the two-generation model that drives the reduced estimate of genetic risk, rather than any other scientific rationale. The critics say that no deep change in the science is reflected in other, comparable reports, and that "the sharp decrease of the genetic risk coefficient recommended by the ICRP in its new draft is based only on its choice to take now the effect on the generations father than the second as being zero".[22]

Second, there are good scientific reasons for concern about longer-term effects. For example, "it is known from animal experiments that manifestation of most genetic effects requires integration over a larger number of generations".[23]

Third, the science with respect to human beings is still underdeveloped, and historically there has been a tendency to underestimate the dangers. Hence, the critics say: "on scientific grounds it is plausible that the genetic risk coefficient could be higher than the new ICRP estimation and even higher than its own estimate".[24] Thus, there is an inductive argument from the trajectory of the science to suggest that we should be modest about current ability to predict health impacts, and so adopt an attitude of precaution. But, as the critics point out:

> "… the ICRP takes a position exactly opposite to the application of the principle of precaution (understood here as recommending measures of precaution or prevention to avoid plausible but uncertain serious detrimental effects)"[25]

These comments suggest that the two generations restriction is not just scientifically, but also morally, unacceptable. Nevertheless, (alas) it makes perfect sense in light of the PIBP.

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[19] These remarks are based on comments on the regulations made by respected scientific experts. As I am not a scientist myself, I am not in a position to assess the soundness of such comments. So, here I simply assume that they have status.

[20] Belgian Federal Agency for Nuclear Control (2005, p. 2).

[21] Belgian Society for Radiological Protection (December 2004, p. 5).

[22] Belgian Federal Agency for Nuclear Control (2005, p. 2).

[23] Belgian Society for Radiological Protection (December 2004, p. 5).

[24] Belgian Federal Agency for Nuclear Control (2005, p. 2).

[25] Belgian Federal Agency for Nuclear Control (2005, p. 2).

III. A Manifestation of Theoretical Inadequacy: Cost-Benefit Analysis

It seems likely then both that climate change and nuclear protection provide a good setting for the PIBP, and that the problem is actually manifest in the real world. However, no doubt by this point some people will be thinking that I have neglected an obvious rejoinder to my concerns. Outside of philosophy, they will say, we do have a theory to deal with intergenerational problems. In the real world, policy analysis is dominated by cost benefit analysis (CBA), and this has standard mechanisms for dealing with the future. Moreover, these mechanisms are employed in both climate change and nuclear protection. What more, it will be asked, do we need? My response to this objection is almost as obvious as the question itself. Conventional CBA, I want to argue, is not a solution – it is part of the problem.[26] This brings us to the second of our two main problems, that of theoretical inadequacy.

The Relevance of CBA

The relevance of CBA to actual climate change and nuclear protection policy is very evident. Given our increasing confidence in the science surrounding climate change, economic arguments have become the main refuge of those opposed to action; and mainstream economics – in the form of standard cost benefit analysis - has been suitably obliging. The benefits of combating climate change, we are told, are not worth the costs. So, Bjorn Lomborg, for example, says:

> "Economic analyses clearly show that it will be far more expensive to cut CO2 emissions radically than to pay the costs of adaptation to the increased temperatures."[27]

On the issue of nuclear protection, the influence of CBA is even more evident. The standard international reference point for policy on nuclear issues is the work of the ICRP, and in particular its three principles for radiological protection. But for much of the recent past, these principles have been understood through traditional CBA.[28]

Describing the 1977 recommendations, Roger Clarke states that the first two principles, justification and optimization, were explicitly conceived of by the ICRP in cost benefit terms, and as requiring a "classical use of cost-benefit analysis"[29] for their implementation. For example, Clarke says:

> "The principles of justification and optimisation aim at doing more good than harm and at maximizing the margin of good over harm for society as a whole. They therefore satisfy the *utilitarian principle of ethics*, whereby actions are judged by their overall consequences, usually by comparing in monetary terms

[26] In my view the term 'cost-benefit analysis' itself is vague, and understood differently by different advocates. Hence, I'm not arguing here that no practice that might fit under the umbrella of the term could turn out to be useful, just that the problems mentioned below undermine the use of conventional CBA (of the sort employed by Nordhaus and embraced by Lomborg) in the context of climate change. (See below.)

[27] Lomborg (2001, p. 318).

[28] At least, this is how Clarke describes matters. Scientists and regulators familiar with French and Belgian practices have suggested to me that it has not been the case in those countries.

[29] Clarke (2003, p. 42).

> the relevant benefits (e.g., statistical estimates of lives saved) obtained by a particular protective measure with the net cost of introducing that measure."[30]

Similarly, the third principle, of dose limits, was regarded as both secondary concern, and as ultimately something to be derived from the dictates of CBA.[31]

CBA in Normal Contexts

Now, there are many things that might be said in criticism of CBA even in normal contexts. Consider, for example, the following objections from the literature. The first is that the initial appeal of CBA is largely superficial. CBA is easily confused with cost effectiveness. Everyone is in favor of cost effective policies – that is, those that take the least costly means to independently justified ends. But CBA aims to tell us which ends we ought to have; and this is much more controversial.

The second is that CBA is too narrow. It is usually limited in the kinds of costs it can take into account to those whose value can be expressed in economic terms and that arise in the near term. It thus tends to focus on short-term consumption goods and ignore wider and longer-term values, such as community, aesthetic, spiritual, environmental and nonhuman values.

The third is that it confused. In a classic work, Mark Sagoff chastises CBA for confusing preferences, whose strength may be measured in terms of their intensity, and values, whose importance must be understood in terms of the reasons that underlie them. In attempting to reduce all matters of value to matters of preferences as measured by market prices, Sagoff argues that CBA is not only guilty of a category mistake, but also reveals itself as an essentially undemocratic decision procedure.[32]

The final objection is that CBA is partisan. It is, it is said, a manifestation of a particular and controversial moral philosophy, utilitarianism. Moreover, it shares the standard defects of that philosophy. In particular, it ignores the question of how benefits and costs are distributed and so fails to respect the importance of the individual.

In theory, most enthusiasts for CBA accept the spirit of these criticisms, but argue that CBA can be modified so as to avoid them. First, they propose that CBA should seek to be more thorough in its capturing of relevant costs and benefits, and more explicit about what it excludes. Second, they claim that CBA should be more modest in its ambitions. It ought not present itself as the exclusive method of practical decision-making, but rather as only one essential ingredient in a broader political process.[33]

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[30] Clarke (2003, p. 41; italics in original).

[31] Clarke (2003, p.42).

[32] Sagoff (1988).

[33] Schmidtz (2001).

CBA and the Further Future

It is an open question to what extent these concessions are manifest in the real world of policy. But I do not want to pursue such matters here. Instead, I want to focus on a separate set of objections to CBA that apply specifically to its use in the intergenerational context.[34] Consider, for example, what John Broome, White's Professor of Moral Philosophy at Oxford, and formerly a Professor of Economics at the University of Bristol, has to say about CBA and the long-term future. Broome is a defender of CBA in normal contexts.[35] But about climate change he says:

> "Cost-benefit analysis, when faced with uncertainties as big as these, would simply be self-deception. And in any case, it could not be a successful exercise, because the issue of our responsibility to future generations is too poorly understood, and too little accommodated in the current economic theory."[36]

Why would CBA be "self-deception" in the case of the long-term future? Broome emphasizes uncertainty. In the further future, "society is bound to be radically transformed in ways which are utterly unpredictable to us now".[37] Moreover, in the case of climate change, these changes are not exogenous to the problem at hand. For example, Dale Jamieson points out that the regional effects of climate change are varied and uncertain; predicting human behavior is difficult since climate impacts affect a wide range of social, economic, and political activities; we have limited understanding of the global economy; and there will be complex feedbacks between different economic sectors.[38] Under such circumstances, a reliable fine-grained cost-benefit analysis is simply not possible.

The uncertainty problem poses a very serious challenge to CBA for the further future.[39] But notice that Broome says that *even if this problem could be resolved*, CBA "could not be a successful exercise because the issue of our responsibility to future generations is too poorly understood, and too little accommodated in the current economic theory". There is, then, an even more basic problem for CBA. What does he have in mind? This emerges later in the book, when he says:

> "It is people who are now children and people who are not yet born who will reap most of the benefits of any project that mitigates the effects of global warming. Most of the benefits of such a project will therefore be ignored by the consumer-price method of project evaluation. It follows that this method is *quite*

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[34] The material in this section builds on several paragraphs from the section on economics in Gardiner (2004b).

[35] "In principle I favour conventional decision theory [i.e., "expected utility theory" (p. 18)]. Nevertheless, when it comes to global warming, I do not think the decision-making process can be simply a matter of calculating expected utilities and then going ahead. The problem is too big for that, and the uncertainties – particularly the historical uncertainties – too extreme." (Broome, 1992, p. 19).

[36] Broome (1992, p. 19).

[37] Broome (1992, p. 10).

[38] Jamieson (1992, p. 288-89).

[39] It is true that uncertainty is a challenge for all theories in this context. But presumably the point is that theories that do not demand such specific and fine-grained information are better placed than conventional CBA. Moreover, even if it were true, the claim that other theories must fail too in this context hardly legitimates the use of conventional CBA.

> *useless* for assessing such long-term projects. This is my main reason for rejecting it [for climate change]".[40]

The "main reason", then, that Broome invokes for the failure of conventional economic analysis is that it ignores most of the benefits of climate change mitigation *because* these are deferred to later generations. In essence, the problem is that mitigation constitutes what I have called a *backloaded good* – a good with costs for the current generation but whose benefits accrue to later generations. Thus, Broome's point is that since conventional CBA either ignores or undervalues such goods, it must be rejected. To this we might add that the neglect of such goods suggests a manifestation of the PIBP.

Why does conventional economic analysis ignore or undervalue backloaded goods? The answer appears to be that it is because it employs a positive discount rate.[41] As another economist, David Pearce, puts it:

> "The problem that arises with discounting is that it *discriminates against future generations.*"[42]

Discounting is "a method used by economists to determine the dollar value today of costs and benefits in the future. Future monetary values are weighted by a value <1, or 'discounted'" (Toman 2001, p. 267). The SDR is the rate of discounting: "Typically, any benefit (or cost), B (or C), accruing in T years' time is recorded as having a 'present' value, PV of: $PV(B) = B_T/(1+r)^T$" (Pearce 1993, p.54). In public policy in general, the rates used vary, but are usually in the range of 2-10 percent. In climate change in particular, the standard economic models employ rates of around 5%: for example, Bjorn Lomborg uses 5 percent; William Nordhaus 6-3 percent.

What are the problems with using a positive SDR for issues involving the long-term future, such as climate change? There are many; but here I shall list just four general issues.

The first is practical. Under positive discount rates, all but the most catastrophic costs disappear after a number of decades, and even these become minimal over very long time periods. As an approach to intergenerational equity, this seems to reduce cost-benefit analysis to absurdity. Consider the following example, from Columbia University economist Graciela Chichilnisky:

> "… at the standard 5% discount rate, the present value of the earth's aggregate output discounted 200 years from now is a few hundred thousand dollars. A simple computation shows that if one tried to decide how much it is worth investing in preventing the destruction of the earth 200 years from now on the basis of measuring the value of foregone output, the answer would be no more than one is willing to invest in an apartment."[43]

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[40] Broome (1992, p. 72; emphasis added).

[41] Broome makes it clear that he wishes to reject positive discount rates for the long-term impacts of climate change, and that he favors a rate of zero. (Broome, 1992, pp. 19, 72, 108.)

[42] Pearce (1993, p. 54, italics in original).

[43] Chichilnisky (1996, p. 235). She uses the example to illustrate the point that that discounting future utility "can

Thus, the charge of absurdity.

The second issue is theoretical. The SDR lacks a clear, consistent and general rationale. In a classic article, Tyler Cowen and Derek Parfit argue that in practice the SDR is actually given several distinct rationales, but none of them ultimately succeeds:

> "At most, these arguments might justify using such a rate as a crude rule of thumb. But this rule would often go astray. It may often be morally permissible to be less concerned about the more remote effects of our social policies. But this would never be because these effects are more remote. Rather it would be because they are less likely to occur, or would be effects on people who are better off than we are, or because it would be cheaper now to ensure compensation, or it would be for one of the other reasons we have given. All of these different reasons need to be stated and judged separately, on their merits. If we bundle them together in a social discount rate, *we make ourselves morally blind.*"[44]

The third issue is the dominance of the SDR. The result of a CBA in a case such as climate change is essentially determined by whatever SDR is chosen. For example, critics claim that the choice of SDR in Lomborg's favored economic analysis – that of Nordhaus – effectively swamps the contribution of the climate change model, rendering it irrelevant.[45]

The fourth general issue is that of indeterminacy. In a recent article in the *American Economic Review,* Harvard economist Martin Weitzman tells us that "no consensus now exists, or for that matter has ever existed, about what actual rate of interest to use", and that the results of a CBA

on a long-term projects are "notoriously hypersensitive" to the rate chosen .[46] These issues are problematic both in themselves and because they exacerbate the third problem.

At first glance, each of the four general issues poses a strong challenge to the legitimacy of using conventional CBA with a positive discount rate for the long-run costs of climate change. Moreover, when taken together, the challenge becomes even more powerful. There is, it seems, a strong burden of proof on those who would employ standard discount rates in their calculations to justify this practice.

In my view, this burden has not yet been met. Distinguished economists have offered a variety of arguments in support of social discount rates. In my opinion, these arguments fail. Still, I cannot hope to justify this claim in what remains of the current paper.[47] So, instead, I will

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produce outcomes which seem patently unjust to future generations" since "under any positive discount rate, the long-run future is deemed irrelevant". She concludes that it is "generally inconsistent with sustainable development"; and, immediately afterwards, she invokes the issue of climate change, and cites Broome with approval. Alex Dubgaard employs a similar example against Lomborg (Dubgaard, 2002, p. 200-201).

[44] Cowen and Parfit (1992, p. 158-159; emphasis added).

[45] Schultz and Kasting (1997), cited by Gundermann (2002, p. 147). By contrast, Christoph Lumer reports that his wider utilitarian and prioritarian models are not dominated by a 3% discount rate. See Lumer (2002, p. 78).

[46] Weitzman (2001, p. 260-1).

[47] I pursue the issue in more detail in work currently in progress.

focus on just one approach – that of temporally declining discount rates - on the grounds that this seems to be by far the most influential at the time of writing.

The Further Future Revisited: Declining Discount Rates

A recent overview piece published by the OECD (Pearce et al., 2006) describes a "revolution" in the economic literature on discounting. The revolution takes the form of a rejection of uniform positive discount rates in favor of a schedule of positive rates that decline over time. So, for example, Martin Weitzman suggests that, based on his theoretical manipulation of a survey of the opinions of economists, the following schedule of rates should be adopted: [48]

Time period	Name	Marginal discount rate (Percent)
Within years 1 to 5 hence	*Immediate* Future	4
Within years 6 to 25 hence	*Near* Future	3
Within years 26 to 75 hence	*Medium* Future	2
Within years 76 to 300 hence	*Distant* Future	1
Within years more than 300 hence	*Far-Distant* Future	0

Table 1: "Approximate Recommended" Sliding-Scale Discount Rates (Pearce et al., 2006)

According to the OECD report, such a schedule constitutes a "middle way" on the topic of discounting, since it is consistent with the theoretical underpinnings of CBA, but "does much to overcome the tyranny of discounting which is so widely noted by philosophers and environmentalists".[49] In short, the revolution is said to substantially diminish the problem of absurdity but in such a way as to be consistent with mainstream economics.

The first question to ask is whether a schedule of declining rates really does solve the absurdity problem. Here, there are several reasons for caution. First, it is not true that the employment of temporally declining rates considered merely *as such* will allow us to avoid absurd results.

Everything depends on the magnitude of the rates. Examples such as that given above from Weitzman look encouraging, to be sure. But this is primarily because the magnitudes of the rates they employ are relatively low (1-4%), come down quickly, and then reduce to zero; hence, they appear to be a substantial improvement over conventional CBA (uniform 5%, continued indefinitely). This obscures the fact that the considered by itself the formal idea of temporally declining discount rates is consistent with an infinite number of possibilities schedules of magnitude and timing, many of which would actually make the absurdity problem worse. Consider, for example, the following schedule:

- 1-5 years: 27%
- 6-10 years: 24%

[48] Weitzman (2001, p. 270).

[49] Pearce et al. (2006, p. 189).

- Over 10 years: 22%

This would have the effect of reducing a benefit of 1 million dollars 100 years from now to a net present value of 17 cents, whereas a standard uniform rate of 5% would "only" reduce it to $7604. In short, merely invoking temporally declining discount rates as such does not solve the absurdity problem. We need to know the magnitudes. And this makes it very relevant to recall that indeterminacy about the magnitude of the discount rate was the fourth of the standard problems mentioned above.

The second reason for caution is that even declining rates of low magnitudes seem merely to mitigate the absurdity problem rather than actually to solve it. For even very low rates do show considerable compounding effects over very long time periods. (This is perhaps why the OECD report claims only that the new paradigm "does much to overcome" the absurdity problem.) First, consider again Chichilnisky's example. She points out that at a standard discount rate of 5%, the value of the world's output 200 years in the future reduces to a net present value of a few hundred thousand dollars. But a very low uniform discount rate of 1% would reach the same conclusion in around 980 years.[50] This raises some obvious questions. For example, if the result is absurd in 200 years, why isn't it absurd at 980 years? (Is there some time horizon over which it ceases to be absurd?) Moreover, by choosing smaller, or declining rates, haven't we just deferred the absurdity problem, rather than actually solving it? And what justifies the choice to defer it for 200 rather than 980 years?

Second, Weitzman's proposal avoids the same conclusion by putting a zero rate in place after 300 years. In effect, this means that there is a cap on the maximum amount of discounting that can occur: after 300 years, the net present value of $1 is fixed at 1.8 cents. But, again, there are obvious questions. Does a weighting of 1.8 cents give rise to absurd results? (If not, why not?) And why stop discounting at 300, rather than 400 or 500 years? (If we did that, the cap would be set at around 0.7 cents or 0.25 cents per dollar respectively.)

We can conclude that it is not at all obvious that the idea of temporally declining rates does help to solve the absurdity problem. But there is a more fundamental issue. This is that, even if a schedule of temporally declining rates did seem to deal with the absurdity problem, it would be vital to know how it did so. Merely asserting a schedule of declining rates would not be enough. We would need to know why we were justified in applying such a schedule.

As it turns out, a number of different rationales have been offered for temporally declining rates. Some claim that such schedules have an empirical basis in people's actual behavior; others that they evolve out of attempts to incorporate various kinds of uncertainty into decision-making; and still others that they are necessary in order to prevent the complete dictatorship of one generation's interests over another's.[51] It has even been argued that they reflect the "professionally considered gut feeling" of economists.[52]

Now, each of these rationales deserves careful consideration in its own right, and unfortunately I do not have the opportunity to provide that here. But it is worth pointing out

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[50] For 200 years, a uniform 5% rate produces a discount factor of 5.8×10^{-5}; a uniform 1% rate produces a discount factor of 5.8×10^{-5} in 981 years.

[51] Frederick et al. (2002); Weitzman (1998, 1999), and Gollier (2002); Chichilnisky (1996).

[52] Weitzman (2001, p. 271).

that the sheer diversity of defenses on offer is an issue in its own right, since it resonates with the second standard criticism of discount rates, namely that they lack a clear and consistent rationale, and, more specifically, that the existing accounts fail to give completely general reasons for discounting, and may even come into conflict with one another. This makes Cowen and Parfit suggestion plausible: that we should take each of these arguments on its merits, otherwise we are in danger of making ourselves "morally blind".

Equally importantly, the various rationales do not seem to be of the *right kind* to address the problems of intergenerational justice that need to solved. Suppose, for example, that one is concerned about the absurdity problem, and in part because one believes that the minimal concern discounting displays for some future generations manifests the PIBP. Then, one finds out that temporally declining discount rates mitigate that problem somewhat. At first, one might be reassured. But suppose then that one learns of the various rationales for declining rates. The first is based on the preferences of each generation. (The last is based on the preferences of each generation's economists). But this reintroduces the worry about the PIBP. If each generation's preferences are dominantly generation-relative, then we have reason to be concerned about policy based on purely descriptive claims about such preferences, partly because it would not be surprising to find that they undervalue the future to at least some extent. This suggests that if we take a generation's preferences seriously, it will be at least partly because we have *independent reason* to think that these preferences embody or reflect an acceptable theory of intergenerational justice. But this implies that the real justification for declining rates must be elsewhere.

The second rationale is uncertainty. One worry about this rationale is that it seems too contingent – it suggests that if only we knew more about the future we would still be justified in using standard discount rates, even given the absurdity problem. But, again, this claim requires independent defense. Another worry is that even if the rationale is reasonably secured in practice (given, for example, Broome's point about historical uncertainty about the further future), it seems to provide the wrong kind of basis for intergenerational justice. Suppose, for example, that the PIBP is manifest and we intentionally adopt policies that leave some generations in the future impoverished. Does it seem plausible to say that what went wrong is that we failed to take uncertainty into account?

The third rationale comes from social choice theory. The most prominent proposal here comes from Graciela Chichilnisky. She argues that a concern for sustainable development requires allowing neither present nor future generations to completely dictate policy, and that this is compatible with temporally declining rates. On the face of it, this sounds promising. But, again, there are important problems.

First, though the claim that sustainable development requires nondictatorship of both present and future generations has the ring of truth to it, it is important to understand what "dictatorship" might mean here. There seem to be two possibilities. On the one hand, 'nondictatorship' might mean simply that the interest of all such generations must be taken into account in deliberation in some way. Unfortunately, this claim risks triviality. Even standard rates of discount do allow some role for the interests of future generations. The problem is not that such interests are not taken into account at all, but rather that the degree to which they are taken into account is absurdly small. Hence, if this is all that is being proposed, the nondictatorship requirement itself is in danger of being absurdly minimal. On the other hand, the requirement might be understood in a more substantive way, as asserting at least a

minimal theory of intergenerational justice. But then everything depends on what that theory is. Here Chichilnisky does seem to make two more substantive proposals. First, she suggests that we "assign weights which decline into the future, and then assign some extra weight to the last generation".[53] But, other than wishing to avoid dictatorship, it is not clear what the rationale for this approach is, or what it amounts to in practice. (Much, of course, depends on what the requisite "weights" are; but we also need to understand the last generation is to get "some extra".)

Second, Chichilnisky recognizes that her view could do with additional philosophical underpinnings. But her gloss on this issue is hard to fathom, and her solution unnecessarily radical. The key problem, as she sees it, is that we need to understand our concern for the future when "nobody alive today, not even their heirs, has a stake on the welfare of 50 generations into the future".[54] Fair enough. But then she understands this as the question: "whose welfare do sustainable preference represent?".[55] This is a strange question. The obvious answer is: the welfare of present and future generations. But this is not how Chichilnisky understands the problem. We can see this from her immediate answer:

> "Perhaps an answer for this riddle may be found in a wider understanding of humankind as an organism who seeks its overall welfare over time. … If such unity existed, humankind would make up an unusual organism, one whose parts are widely distributed in space and time and who is lacking a nervous system on which the consciousness of its existence can be based. Perhaps the advances in information technology described at the beginning of this article, with their global communications reach, are a glimmer of the emergence of a nervous system from which a global consciousness for humankind could emerge."[56]

It is clear from this that Chichilnisky thinks that making sense of intergenerational ethics requires positing an entity with intergenerational preferences that persists through the realization of those preferences. (For Chichilnisky, this means that it must have its own welfare and consciousness.) But her reason for taking such a view is opaque, and many less extreme solutions are available.

My discussion here has been brief and sketchy. But I hope that it at least makes plausible the claim that the four standard problems – absurdity, multiple rationales, dominance and indeterminancy – remain despite the apparent revolution in economic thinking about discount rates. Indeed, the discussion suggests that, rather than solving the problem, these recent works illustrate the fact that better theory is needed.

The "Zero Discounting" Objection

Before closing, it is perhaps wise to say something about one prominent objection to the criticisms I have raised to the social discount rate: namely that "'not discounting' is the same as

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[53] Chichinisky (1996, p. 243).

[54] Chichinisky (1996, p. 250).

[55] Chichinisky (1996, p. 250).

[56] Chichilnisky (1996, p.250-251).

discounting at 0% rate of discount and this has its own problems".[57]

There is much that might be said on this topic; but again I will limit myself to just one general point: on the face of it, this objection is simply mistaken. It is true that many who reject discounting in some contexts – such as Broome in the case of the further future – end up endorsing a zero rate of discount in those contexts. But this does not mean that rejecting discounting implies endorsing a zero rate.

Consider how discounting is defined:

> "Discounting refers to the process of assigning a lower weight to a unit of benefit or cost in the future than to that unit now. The further in the future the benefit or cost occurs, the lower the weight attached to it."[58]

According to this definition, discounting involves three main components: first, it assigns weights to future benefits and costs; second, these weights are lower than those assigned to current benefits and costs; and third, the weights are lower the further in the future the benefit or cost is.[59] To this definitional features, we might add that, in the views we have been considering, those who discount assign the same weight to *all* costs or benefits that occur within the same time period, making no distinctions between different kinds of costs and benefits.

The practice of discounting is thus a complex phenomenon. Given this, it seems to me both that one might reject it by disputing any number of its constituent claims, and that in doing so one need not thereby be endorsing a discount rate of zero.

Consider the following examples of ways of rejecting discounting. First, the view that the same weight should be assigned to all kinds of costs and benefits might be rejected by some theories of justice on the grounds that it is necessary to distinguish between luxuries and basic necessities. (For example, perhaps there are good reasons not to discount necessities that do not apply to luxuries). Second, the view that weights should decline over time might be rejected because one thinks that some things (e.g., lives, the value of a beautiful view) do not decline in importance over time, or even perhaps get more important as time goes on. Third, one might reject the view that future benefits and costs must receive lower weights than current benefits and costs because one believes that the current generation has a strong obligation to make sure that future people are much better off than they are. Finally, and most noticeably, one might even reject the claim that weights *can* be assigned to some future benefits and costs, or at least that such an assignment is anything other than arbitrary, and thereby useless. (As we have seen, one reason to think this would be that such costs and benefits cannot be known with the precision necessary to make fine-grained calculations possible.)

Now, very few of these rationales for rejecting discounting seem to *imply* the

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[57] Pearce et al. (2006, p. 184).

[58] Pearce et al. (2006, p. 184).

[59] I take it that 'weights' here refers to discount factors rather than discount rates, since traditionally, most proponents of CBA adopt a uniform SDR which (hence) does not itself decline, but has compound effects which mean that the associated discount factors decline over time.

acceptance of a zero rate. First, and most obviously, the claim that weights cannot even be assigned to future costs and benefits directly rules out *any* kind of weighting, including a uniform rate of zero discount. Second, the policy goal of making future people better off than current people might justify weighing future benefits *more heavily* than current benefits, and so imply a *negative* rate (e.g., of –2% per year) rather than one of zero. Third, a desire to distinguish between luxuries and necessities might imply a complex schedule of positive, zero, and negative discount factors for different kinds of benefits and costs in different time periods. (In advance of the announcement of a particular theory of intergenerational justice, how would one know?)

These examples show that rejecting discounting in no way commits one to endorsing a uniform rate of zero. Given the prevalence of the contrary claim, this is an interesting result in itself. But in the present context its relevance is this: even if there are problems with zero rates of discount, these need not undermine the criticisms of normal discount rates considered as such.[60] And this point is enough to restore the burden of proof on the usual views.

There is much more that might be said about CBA in general and discount rates in particular. But for present purposes we can draw two important conclusions. First, even many of those who are enthusiastic about CBA in normal contexts are deeply suspicious when it comes to cases that involve the long term future - such as climate change and nuclear waste. Second, they have good reason to be so. The Problem of Theoretical Inadequacy is thus very much with us.

Conclusion

In this paper, I have argued that future generations are vulnerable to intergenerational buck-passing, that such buck-passing appears to be manifest in the real world of policy, and that the dominant theory of policy-making – conventional CBA – is part of the problem.

If I am right, then we face a real and pressing problem of intergenerational ethics. Future generations need protection. The challenges facing us are twofold. First, we must address the Problem of Theoretical Inadequacy by working out what it means to protect future people. Second, we must find ways actually to give them that protection by neutralizing the PIBP.

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[60] As it happens, I am not convinced by the usual objections to zero rates either; but I will not pursue that issue here.

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