



# Climate change and the ethics of discounting

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Climate policy-making requires a balancing, however rudimentary, of the costs of reducing greenhouse gas emissions against the benefits of reduced risks of climate change. Since those creating and those facing the risks of climate change belong to different generations, striking the balance is preeminently a matter of ethics. In climate policy-making, this issue of intergenerational ethics is hidden behind the choice of the *discount rate*, a parameter used in economic analysis to compare changes in consumption occurring in different years. There is a long-standing debate in ethics and economics as to whether discounting the future is morally justifiable. Some economists have argued that the future should always be discounted against the marginal rate of return on alternative investments, whether for reasons of efficiency, or for reasons of consumer sovereignty and democracy. Other authors, however, have argued against this position, instead proposing discount rates based on a variety of moral principles. Although these counterarguments may be convincing, the debate between the two positions is far from settled. Neither has the debate been settled as to which moral theory the discount rate should be based on. This is hardly surprising, though, given the fact that within ethics itself, the debate over the various moral principles is still ongoing.

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## INTRODUCTION

Climate policy-making requires a balancing, however rudimentary, of the costs of reducing greenhouse gas emissions against the benefits of reduced risks of climate change. After all, it is not only the potential damage resulting from climate change that is substantial but also the cost of reducing that damage, for there is no cheap ‘technological fix’ available. The use of fossil fuels is closely intertwined with our modern lifestyles. We use fossil fuels for heating our homes, for transportation, for lighting, for the production of consumer goods, et cetera. Our appliances can be made more energy efficient or powered using alternative energy sources, but all these options have their

price tag. There is, moreover, no clear emission level beyond which dangerous climate change is induced but below which we are safe; as far as we know based on current knowledge, both climate risk and the costs of risk reduction are continuous functions of emissions.

Where to strike the balance in climate policy is preeminently a matter of ethics, and *intergenerational* ethics in particular. Carbon dioxide not only remains in the atmosphere for centuries to millennia,<sup>1,2</sup> but the thermal inertia of the oceans also causes a time lag between changes in atmospheric concentrations of greenhouse gases and global temperatures.<sup>3</sup> As a consequence, it is primarily the future generations that will face the risk of present emissions rather than the present ones. If we are already experiencing climate change today, it has been caused primarily by the generations before us. In making decisions about climate change mitigation, the moral question we face is therefore what value should be given to the costs of climate change experienced by future generations.

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In climate policy-making, this issue of intergenerational ethics is seldom dealt with head on. Instead, it is hidden behind the choice of the *discount rate*, a parameter used in economic analysis to compare changes in consumption occurring in different years. The notion of ‘consumption’ as used in economic parlance should be interpreted very broadly: from market purchase of goods and services like food and shelter to feeling safe from dying in a flood disaster. At a discount rate of 6%, for example, a change in consumption of €100 next year is valued equally to a change of €94 this year. In standard cost–benefit analysis of projects extending over years or decades, application of a discount rate leads to little debate. In the context of climate change mitigation, however, the choice of discount rate becomes of decisive importance. Discounting at a typical constant rate of 6%, for example, means being willing to spend no more than \$9 today to prevent a million dollars of climate damage 200 years hence. When standard discount rates are applied, therefore, there is scarcely any mitigation effort that passes the cost–benefit test. Indeed, the particular discount rate adopted is the single most important variable explaining why economists differ so widely in their recommendations regarding optimal climate policy.<sup>4</sup>

The question whether discounting the future is morally justifiable has a long pedigree, going back at least to the 18th-century writings of Jeremy Bentham and David Hume.<sup>5</sup> However, with the application of cost–benefit analysis to climate policy, discussion of the issue has been revived and intensified (see e.g., Ref 6 and the response by Ref 7). Since the various views have far from converged (see e.g., Refs 8, 9), much of the literature offers no more than a rephrasing and reworking of older arguments. See for landmark overviews e.g., Refs 4, 10, 11. The purpose of this paper is to provide a broad overview of the debate. Since this review focuses on the ethics of the discount rates employed in climate policy, many other issues at the interface of ethics, economics, and climate change will remain untouched (for these issues, see e.g., Refs 9, 12–14). Neither will new ideas concerning discounting be discussed that do not stem from moral arguments, such as recommendations to use declining discount rates as a means of accounting for the uncertainties surrounding future discount rates (see e.g., Refs 15, 16) and future consumption (see e.g., Refs 17, 18). More generally, it is assumed that uncertain costs and benefits are first converted into certainty equivalents, *before* discounting the latter at a risk-free rate,<sup>19</sup> so that the moral question of how to deal with uncertainty lies outside the scope of the present review.

## SOME BASICS

The debate on the ethics of discounting cannot be understood without first understanding the most essential characteristics of Ramsey’s neoclassical model of economic growth.<sup>a,20</sup> Ramsey originally intended his model to answer the question of how much of its income a nation *should* save. Later, the model was also used to *describe* the actual economy, particularly to describe household saving behavior, capital accumulation, and economic growth. Understanding the basics of Ramsey’s model is required not only because the debate is largely formulated in terms of this model but also to understand the relation between ethics and efficiency as will be discussed in the next section.

The model starts from the fact that households obtain returns to capital and labor and must choose whether to consume or save these returns. In making this decision, households face an intertemporal optimization problem of how to optimize utility (or *bliss*, as Ramsey calls it) over their lifetime. It is assumed in the model that households do not simply *maximize* intertemporal utility, but prefer present over future utility, owing to erroneous overestimation of the value of benefits occurring earlier in time (temporal myopia) or weakness of the will (*akrasia*), for example. The intertemporal welfare function ( $W$ ) is thus given by

$$W = \int_{t=0}^{\infty} u(c(t)) e^{-\rho t} dt \quad (1)$$

where  $c(t)$  is the consumption at time  $t$ ,  $u(c)$  is the utility accruing from consumption, and  $\rho$  is the pure rate of time preference (also called utility discount rate). Utility ( $u$ ) is usually a concave function of consumption ( $c$ ), since the higher the level of consumption, the less additional utility is provided by additional consumption: better an additional dollar as a poor student than as a well-paid doctor. Since people generally expect to become wealthier in the future, i.e., enjoy higher consumption levels, this gives them a second reason besides impatience to discount future consumption over present consumption. The consumption discount rate  $CDR$  thus reads:

$$CDR = \rho + \mu g \quad (2)$$

where  $g$  is the expected growth rate of consumption and  $\mu$  the absolute value of the elasticity of marginal utility (a measure of the relative effect of a change in consumption on welfare). This so-called Ramsey equation holds only under conditions of certainty. An uncertain future can give rise to precautionary savings and consequently a lower  $CDR$ .<sup>22,23</sup>

As stated earlier, in optimizing utility over time, individuals choose either to consume the returns to capital and labor or to save and thus postpone consumption. Because of their positive *CDR*, consumers require a reward for postponing their consumption. Producers are willing to pay this reward because capital is productive, i.e., there is a positive marginal rate of return on investment (*MRRI*). The outcome of this supply and demand for capital is a market interest rate (*i*).<sup>24</sup> In a world without market failure, taxes, or risk, *i* equals both *CDR* and *MRRI*.

$$i = MRRI = CDR = \rho + \mu g \quad (3)$$

Finally, it should be observed that supply and demand for capital also result in an equilibrium saving and consumption rate ('marginal propensity to save and consume'). If *MRRI* were larger than *CDR*, people would increase their savings and vice versa. A typical savings rate is in the order of 20%, and the consumption rate therefore about 80% (see e.g., Ref 6, p. 161; Refs 19, 25). In other words, when income decreases by one Euro, people cut back 80 cents on consumption and 20 cents on savings.

Although Eq. (2) describes only how individual households discount their own future consumption, the question of how to value the consumption of future generations has been framed in terms of the same Ramsey equation. In the intergenerational context, however, the meaning of the parameters changes:  $\rho$  does not simply denote impatience or akrasia regarding changes in our own well-being, but becomes a parameter for our concern for other people's well-being, while  $\mu$  does not simply express the relative effect of a change in consumption on welfare, but becomes a parameter for aversion to intertemporal inequality.<sup>26</sup>

It should be noted that although the Ramsey model and equation are central to the discounting debate, some economists have criticized the model for being too simplistic. It has been argued that the model's underlying assumption of a finite number of agents (or a single representative agent) with an infinite time horizon makes it impossible to separate people's preferences regarding their own future consumption from considerations of intergenerational equity. These economists have therefore used models that assume overlapping generations consisting of agents with a finite time horizon, optimizing their life cycle well-being. In such 'overlapping generations models' intergenerational equity is not introduced by exogenously imposing a certain discount rate, but by lump-sum transfers and allocation of natural resource entitlements between the generations.<sup>27,28</sup>

## ETHICS VERSUS EFFICIENCY

It has often been argued that the choice of the intergenerational discount rate has little to do with ethics but is simply a matter of efficiency (see e.g., Ref 29, pp. 461–463; Ref 30, p. 274). Setting the discount rate below the marginal rate of return on alternative investments would imply making investments to mitigate climate change that have a lower rate of return than available investment alternatives. This would not be in the interests of future generations: if they could choose between an investment of a thousand Euros today to prevent a thousand Euros of climate damage in a hundred years' time and an investment in, say, the general economy with a 6% annual rate of return delivering more than 300,000 Euros in a hundred years' time, future generations would choose the latter.<sup>31</sup> The argument is spurious, however (see e.g., Refs 32, 33), not because future generations would not prefer the more profitable investment, but because in reality there is no such choice.

The reason for this is that climate mitigation seldom fully displaces alternative investments, but is generally largely at the expense of present consumption. For example, if a government imposes climate regulations, consumers finance the higher expenditures partly by reducing their consumption of other goods and partly by reducing their savings. Similarly, when a government itself invests, these investments are financed through taxes that once more are at the expense of both consumption and savings in society (see e.g., Refs 19, 34, 35). As stated in the previous section, the ratio between consumption and savings is about four to one. Integrated assessment models used for climate policy analysis, such as DICE/RICE<sup>36,37</sup> and FUND,<sup>38,39</sup> already take into account that climate expenditures reduce both consumption and alternative investments. The models result in different streams of consumption from the present to the far future, depending on the specific policy choices made. To compare these different consumption streams, consumption in different years is discounted at the consumption rate of interest. Since such integrated assessment models already take the impacts of climate mitigation on alternative investments into account, the choice of the consumption rate of interest is unrelated to the issue of efficiency.

However, even if the present society were willing to put money in an investment fund earmarked to compensate future generations for climate damage, this would be a pledge that is impossible to fulfill. As Lind argues (Ref 33, p. 382; see also Refs 4, 40, p. 134):

we would have to find a way, say through a trust fund, to guarantee that the returns on this additional investment were fully reinvested and not returned to the income stream where they would mostly go to consumption with only a relatively small part being reinvested. Without this continual reinvestment, the arithmetic of compounding which is fundamental to the 'give them the cash' alternative does not work. Furthermore, this policy would have to be sustained by successive governments for a hundred years. Even if this generation were to set up such a fund, it could not commit the governments of future intervening generations to do so. There would be every incentive for some future generation to break the chain of intergenerational transfers and consume all or part of the resources in the trust fund.

In other words, we need to be realistic about the implications of alternative policy choices for present and future consumption (Ref 41, p. 226), meaning we need to take into account realistic saving and consumption behavior and realistic marginal rates of return on these savings. However, how to discount future consumption relative to present consumption remains a matter of ethics rather than efficiency.

## THE PRESCRIPTIVE–DESCRIPTIVE DEBATE

Some economists have argued that although the choice of discount rate may be a matter of ethics, it should not be freely chosen by governments, economists, or moral philosophers on the basis of their own personal moral views. To safeguard principles of democracy and consumer sovereignty, the choice of the discount rate ought to be based on the preferences society reveals through the intertemporal choices made in actual saving behavior reflected through capital markets (see e.g., Ref 42, pp. 113–114; Ref 43, pp. 57–58; Ref 44, p. 97; Ref 45, pp. 132–133; Ref 46). According to these economists, a person's saving is not aimed only at his or her own consumption and market rates would therefore reflect present people's judgments of the benefits to future people too. Marglin, for example, called basing the discount rate on one's own moral view 'an authoritarian rejection of individual preferences'<sup>47</sup> (p. 197) and considered it 'axiomatic that a democratic government reflects only the preferences of the individuals who are presently members of the body politic'<sup>44</sup> (p. 97). In the IPCC's Third Assessment, Arrow et al.<sup>4</sup> called this the *descriptive approach*, in contrast to the *prescriptive approach* that sees no difficulty in basing the discount rate on one's own moral analysis (see for further discussion of this distinction<sup>48</sup>). More recently, the descriptive approach has been advocated

by Nordhaus<sup>7</sup> and Weitzman<sup>49</sup> (p. 712), among others. In response to the moral choices made by Stern<sup>6</sup> in his Review, Nordhaus<sup>7</sup> (p. 691) remarks that

The Review takes the lofty vantage point of the world social planner, perhaps stoking the dying embers of the British Empire, in determining the way the world should combat the dangers of global warming. The world, according to Government House utilitarianism, should use the combination of time discounting and consumption elasticity that the Review's authors find persuasive from their ethical vantage point.<sup>b</sup>

Other authors, however, have disagreed with the idea that the discount rate used for climate policy analysis ought to be based upon the preferences revealed in capital markets. First, it is doubtful whether society's saving behavior actually reveals any societal preferences as to how to weigh climate damage against present consumption losses. Although people may also save for their descendants, capital markets primarily reveal current consumers' preferences toward transferring their own consumption to the future, while climate change policy is about weighing up changes in consumption across different people and generations (see e.g., Refs 51, 52 and Ref 53, p. 396). There is little reason to consider the two related: from the observation that I am saving an apple so I can eat it tomorrow, it cannot be deduced that I am either willing or morally obliged to save an apple so someone else can eat it tomorrow. Neither can it be deduced from the fact that I do *not* save an apple for myself that I am unwilling to save it for someone else. One reason is that the welfare of future generations may be viewed as a public good and that people therefore face a social dilemma: I may only be willing to save for the future if I know that others are doing the same, rather than free riding on my efforts.<sup>44,52,54</sup> Moreover, it has been argued that if people's preferences count, it is problematic that future generations are themselves unable to express their preferences in capital markets (see also e.g., Ref 52, p. 482; Ref 55, p. 61, Ref 48). Finally, there are no alternative investments with a risk profile and time span comparable with those of investments to mitigate climate impacts from which to deduce revealed preferences (Ref 56, p. 71; Ref 9, p. 229).

However, even if capital markets revealed societal preferences as how to weigh climate damage against present consumption losses, it is not obvious that governments ought to base their policies on them. If a government has reason to believe that the majority of people have preferences for something that is morally wrong, it also may have reason to override people's preferences. As Pigou remarked (Ref 56, p. 29): 'The state should protect the interests of the

future in some degree against the effects of our irrational discounting and of our preference for ourselves over our descendants.’ Depending on one’s political views, one may deem governments justified to act paternalistically and protect people against temporal myopia, as in the case of compulsory savings to provide adequately for retirement, for example (Ref 57, p. 120). Moreover, there is a distinction between the policy that a government may *recommend* and *communicate* to society, and the policy that it *implements* after public deliberation. In this respect, the moral choice of discount rate is no different from the scientific assessment of climate change. In the latter case, too, governments may recommend climate policy on the basis of the scientific state of the art as assessed by the IPCC, although they may be bound by democratic principles to base actual policy on popular (dis)belief regarding climate change (Ref 21, p. 42). This difference between a government’s policy recommendations and actual policy implementation is congruent with Marglin’s plea for consumer sovereignty and democracy (Ref 44, pp. 97–98), which according to him

is not to suggest a simplistic “recording machine” theory of government, in which the government plays only the passive role of registering and carrying out the articulated desires of the members of society. I certainly would allow an educational role for government, including the education of today’s citizens to the “rightful claims” of future generations.

In other words, even if capital markets revealed societal preferences on how to weigh climate damage *and* one rejects ‘Government House utilitarianism’ as Nordhaus does, governments could still *inform* society about the climate policy it deems necessary on the basis of its own moral judgment.

## DIFFERENT MORAL APPROACHES TO DISCOUNTING

The previous two sections have shown that the literature provides ample arguments why the social discount rate adopted for cost–benefit analysis of climate policy involves a moral choice. The literature also shows that there are a variety of moral theories to guide this choice. A common distinction in the economic literature is that between *welfarist consequentialism* and *deontology*. Welfarist consequentialism combines the views that the rightness or wrongness of an act depends only upon its consequences, and that these consequences can be fully assessed in terms of impacts on utility only (Refs 58, 59; Ref 6, p. 32). Welfarist consequentialism corresponds to

what Nozick (Ref 60, pp. 153–155) calls a *patterned* principle of justice according to which justice is determined by how things are distributed (who has what), as judged by some structural principle(s) of just distribution. A utilitarian, for example, who chooses between two given distributions by seeing which yields the greater sum of utility would hold a patterned principle of justice. In contrast to welfarist consequentialism, deontology states that whether a distribution is just depends upon how it came about. If I steal something from you, that offers me more utility than it does you, this may increase the overall utility, but it would not be just if you were entitled to the thing. According to deontological ethics, violating rights is wrong irrespective of possible positive consequences. In this section, first a number of welfarist consequentialist approaches are discussed before reviewing several deontological approaches.

### Welfarist Consequentialism *Utilitarianism*

The most common approach to discounting in the climate debate is (classical) *utilitarianism*. According to utilitarianism, the right act is the one that maximizes utility (or happiness, well-being, or some other comparable measure) for all concerned. The utilitarian approach has two consequences for discounting. The first of these is that time as such is irrelevant. Sidgwick,<sup>61</sup> one of the founding fathers of utilitarianism, already observed that ‘the interests of posterity must concern a Utilitarian as much as those of his contemporaries.’ In other words: changes in future utility count as much as changes in present utility.<sup>c</sup> The second consequence is that, given the diminishing marginal utility of consumption, discounting is indeed required if future generations are expected to be wealthier than we are today.<sup>d</sup> According to Marshall,<sup>64</sup> ‘a pound’s worth of satisfaction to an ordinary poor man is a much greater thing than a pound’s worth of satisfaction to an ordinary rich man.’ According to utilitarianism, we should therefore discount future climate damage at a rate equal to the expected growth rate of consumption times the absolute value of the elasticity of marginal utility: the Ramsey formula with the pure rate of time preference set to zero. This is the approach followed by e.g., Ramsey,<sup>20</sup> Pigou,<sup>56</sup> and Harrod<sup>65</sup> in the general discounting debate and by e.g., Cline,<sup>32</sup> Schelling,<sup>53</sup> Azar & Sterner,<sup>66</sup> Broome,<sup>67,68</sup> and Stern<sup>6</sup> in the climate debate.

A common criticism of the utilitarian approach is that it would be overdemanding to treat other people’s happiness as being fully on par with one’s own

and would alienate people from their personal projects and commitments (see e.g., Ref 50; Ref 69, p. 277; Ref 70; see Ref 71 for a defense of the demands of utilitarianism). If applied across the board in intergenerational policy making, i.e., beyond climate policy as well, it would require governments to tax away present consumption to the benefit of future consumption; see e.g., Refs 7, 41, 72–75; Ref 26, p. 155; Ref 76, p. 47. If applied across the board in *intra*-generational policy, utilitarianism would require a massive redistribution from the currently rich to the currently poor. However, if the utilitarian approach is restricted to climate policy, it may be queried whether such an approach is coherent (see e.g., Ref 9, p. 230). The objection is not that utilitarianism does not correspond to revealed public preferences, an objection refuted in the section on the *prescriptive-descriptive debate*, but that it is incoherent if the same government advocates fundamentally different moral principles in different policy areas.

### *Agent-Relative Ethics or ‘Discounted’ Utilitarianism*

In response to the criticism that classical utilitarianism would be overdemanding, some authors have argued for ‘discounted’ utilitarianism on the basis of an ‘agent-relative’ ethics. According to this view, it is always morally justified to pay more attention to what is near than to what is distant and thus to apply a positive pure rate of time preference. Arrow<sup>35</sup> looked for support for such ‘discounted’ utilitarianism in Scheffler’s claim that each person has an ‘agent-centered prerogative’ allowing each agent to devote energy and attention to his or her own projects and commitments.<sup>70</sup> However, as Caney (Ref 77, p. 550) and Dasgupta (Ref 26, p. 146) have observed, Scheffler’s argument does not lend itself for Arrow’s purpose. Scheffler rejects any type of maximizing consequentialism, even if this maximizing consequentialism would acknowledge that the pursuit of personal projects might be constitutive of the good. Instead, Scheffler is looking for a middle ground between consequentialism and deontology and therefore would *not* argue that we are allowed, under all circumstances, to discount other people’s well-being.

A second argument for an agent-relative ethics is found by Arrow by referring to Phelps and Pollak’s game-theoretical approach to altruism.<sup>78</sup> Beckerman and Hepburn elaborate this game-theoretical line of thought further along Humean lines.<sup>63</sup> According to Beckerman and Hepburn (Ref 63, p. 200), ‘our moral intuitions have evolved in a manner that leads to one having special obligations to one’s own group—be it one’s family, one’s friends, one’s nation, or one’s

generation.’ They then cite Hume<sup>79</sup> (Book III, Part 2, Section i):

A man naturally loves his children better than his nephews, his nephews better than his cousins, his cousins better than strangers, where every thing else is equal. Hence arise our common measures of duty, in preferring the one to the other. Our sense of duty always follows the common and natural course of our passions.

In fact, a form of reciprocal altruism would be conducive to the peaceful and successful evolution of human society. In the intergenerational context, however, there is hardly any option for reciprocity. From a game-theoretical point of view, there is little reason to take the interests of future generations into account beyond the next two generations (see Ref 80 for a contractarian defense of intergenerational justice). However, as Beckerman and Hepburn themselves observe, Hume also stated that no ‘ought’ propositions logically follow from ‘is’ propositions. Neither game-theoretical insight into the kinds of cooperation that promote our self-interest nor an empirical observation of our moral sentiments can tell us how we *ought* to act or what discount rate we *ought* to use. Moreover, while one may have ‘special’ obligations to one’s own group, as Beckerman and Hepburn believe, this does not mean we cannot have other obligations that are universal, such as respect for other people’s rights. Without acknowledging obligations that do not depend on special ties, an agent-relative ethics would justify racism, sexism, nepotism, and the like. As Parfit<sup>81</sup> (p. 36) argues:

Perhaps the U.S. government ought in general to give priority to the welfare of its own citizens. But this does not apply to the infliction of great harms. Suppose this government decides to resume atmospheric nuclear tests. If it predicts that the resulting fallout would cause several deaths, should it discount the deaths of aliens? Should it therefore move the tests to the Indian Ocean? It seems plausible to claim that, in such a case, the special relations make no moral difference. We may take the same view about the harms that we impose on our remote successors.

### *Prioritarianism, Sufficientarianism, and Rawls’ Difference Principle*

Through the ages, average per capita income has grown and most economists see no reason why this trend will not continue into the distant future.<sup>e</sup> Although classical utilitarianism offers some reason to discount the future to account for this increase in per capita consumption, it still justifies large-scale savings for the future. However, there are other moral

approaches on the basis of which far lower savings are advocated, but that, contrary to the previously discussed discounted utilitarianism, still reject a positive pure rate of time preference. First of all, there is an ‘amplified’ kind of utilitarianism: *prioritarianism*.<sup>83</sup> According to this theory, changes in utility or well-being matter more the less well-off one is, and accordingly the factor  $\mu$  in Eq. (2) is set higher than the absolute value of the elasticity of marginal utility that is used in the case of utilitarianism. For an application of prioritarianism to the discount rate, see Refs 84, 85, and for discussion of the prioritarian approach, see Ref 86 and Ref 14, pp. 145–148. Others have questioned the necessity to save for the future altogether, such as Baumol<sup>87</sup> (p. 800):

A redistribution to provide more for the future may be described as a Robin Hood activity stood on his head—it takes from the poor to give to the rich. Average real per capita income a century hence is likely to be a sizeable multiple of its present value. Why should I give up part of my income to help support someone else with an income several times my own?

There are two moral theories to back up Baumol’s thoughts: *Rawls’ difference principle* and *sufficientarianism*. In *A Theory of Justice*, the political philosopher Rawls rejected utilitarianism and argued for a society in which the position of those who are least well-off is optimized (according to the ‘maximin criterion’ or ‘difference principle’).<sup>88</sup> Although Rawls himself saw reasons not to apply the difference principle in the intergenerational context, other authors did, arriving at a high or even infinite value of  $\mu$  (see e.g., Refs 89–92; see for further discussion also Refs 93, 94). If future generations are wealthier, *any* expenditure on mitigation will worsen the position of the least well-off generation, the present. The same conclusion would be reached by sufficientarians, according to whom social benefits and burdens should be redistributed only in so far as redistribution is required to let people attain a sufficient level of well-being.<sup>95–98</sup> For a discussion of a sufficientarian approach to discounting, see e.g., Refs 99–101.

Although it is not a criticism of the applied moral theories per se, Schelling<sup>53</sup> has warned for a fallacy of composition if a single discount rate is used for the anticipated higher wealth of future generations. Even if average per capita income were to rise in every country over the coming centuries, it could still be the case that those investing in mitigation today are wealthier than those reaping the benefits in the future. The present income of the average inhabitant of the United States could still be higher, for example, than the income of the average inhabitant of Bangladesh

in a hundred years’ time. In that case, the discount rate based on marginal utility comparisons should be negative. It is therefore necessary to disaggregate.

While most economists anticipate higher future wealth, some authors have also contemplated the opposite possibility. For example, Dietz and Asheim have investigated ‘sustainable discounted utilitarianism’, an approach that gives priority to the future in conflicts where the future is *worse* off than the present.<sup>102</sup> In this approach, the utility discount rate is set to zero if present utility exceeds future welfare, for example, if the future consequences of climate change entail that present utility exceeds future welfare. If the future is better off, however, then ‘sustainable discounted utilitarianism’ coincides with discounted utilitarianism.

## Deontological Approaches

Welfarist consequentialism makes no distinction between decisions that result in equal patterns of welfare, even though they may affect entitlements or rights unequally. Consistent with such views on justice, decisions about mitigating climate change have often been compared with income redistribution through taxes and social security within one and the same generation. According to Schelling (Ref 53, pp. 396–397), for example, decisions about greenhouse abatement are

about redistributing income - our income. To invest resources now in reduced greenhouse emissions is to transfer consumption from ourselves - whoever ‘we’ are who are making these sacrifices - for the benefit of people distant in the future. It is very much like making sacrifices now for people who are distant geographically or distant culturally. ... What we are talking about is very much like a foreign aid program, with some of the foreigners being our own descendants who live not on another continent but in another century.

On the basis of a deontological ethics, however, various authors have argued that climate policy is morally incomparable to an aid program. The crucial reason is that by emitting greenhouse gases, we are inflicting *wrongful harms* on future generations (see e.g., Ref 103), while by refraining from distributing our income to them, we do not. People are not in the same way entitled to wealth redistribution as they hold rights not to be harmed in bodily integrity and personal property. As Sen has already pointed out, welfarism would often be inadequate if we were to acknowledge that the liberty of future generations is unacceptably compromised by failure to control pollution, for example (Ref 104, pp. 344–348).

According to Spash (Ref 57, p. 128; Ref 105) the harm to future generations caused by climate change violates their *basic human rights*. Since Spash believes that the violation of basic human rights can be justified neither by compensation to future generations nor by benefits to present generations, he rejects cost–benefit analysis of climate policy and thus also the concept of discounting. Climate change that violates human rights should simply be prevented. In recent years, Caney has followed the same line of thought as Spash by stating that the human rights that are violated by climate change have lexical priority over other concerns and ought to be protected whatever the costs,<sup>106</sup> or that these costs are in any event not unreasonably demanding (Ref 77, p. 539). However, where Spash rejects the notion of discounting altogether, Caney argues for a zero discount rate when it comes to persons' moral worth and human rights (Ref 77, p. 550). The meaning and purpose of this zero discount rate is unclear, however, since a discount rate only has meaning when values are weighed against each other (Ref 107, pp. 16–17), a procedure that Caney rejects by affording human rights lexical priority. A 'discounted' human right or moral worth at say 10% of its 'full' value—if that were to have any meaning—would still trump other concerns.

A possible criticism of the approach adopted by Spash and Caney is that, as explained in the introduction, preventing *all* violations of future generations' human rights is impossible and that therefore some cost–benefit analysis is inevitable. Davidson takes a middle course between deontology and consequentialism by acknowledging the moral difference between wrongful harms and other acts, but allowing cost–benefit analysis.<sup>108</sup> Cost–benefit analysis of climate policy based on a zero consumption discount rate is argued for, consistent with the standard of reasonable care in national and international negligence tort law. On the one hand, consistency with negligence tort law would imply treating future generations as moral equals, meaning abstaining from 'decisions which would, according to our present knowledge and values, impose on them such costs and risks as we would not be willing to assume by ourselves' (Ref 109, p. 158; see also Refs 110, 111). On the other hand, restricting a zero discount rate to wrongful harms to future generations solves the criticism expressed in the section on *Utilitarianism* that applying a zero discount rate across the board would be overdemanding (Ref 108, p. 63; Ref 77). When there are no wrongful harms at stake, we would be morally free to discount the future. It is thus not the case, contrary to what some authors have claimed (Ref 9, p. 229) that discounting purely for time *always* implies a rejection of

moral equality and thus would be on par with racism or sexism. If I decide, for example, to deplete my bank account before my death instead of bequeathing some of the money to my children, knowing they are amply able to care of themselves, this would not imply a negation of their moral equality. My children are simply not entitled to my savings. Similarly, if a government does not offer the same social security to foreigners or future generations as it does to its present citizens, this does not imply denying foreigners or future generations moral equality. Within a country, there is a strong degree of social cooperation: citizens not only have equal rights to social security but also have equal duties to contribute to its maintenance, via income tax, for example. Since foreigners and future generations are not part of this social cooperation, there is justification for excluding them from claims to social security (Ref 111, p. 108). In other words, whether discounting implies the denial of moral equality depends on the circumstances (what is being discounted) and the principles of justice adhered to.

## CONCLUSION

Economists differ widely in their recommendations on how to mitigate climate change, ranging from business-as-usual to immediate and radical cuts in emissions. At first sight, this variety of opinions could easily be attributed to controversy over the science of climate change. However, few of the economists in question are 'climate skeptics.' On further reflection, the disagreement turns out to originate primarily in differences in opinion about how to weigh climate damage to future generations against present mitigation costs by means of a social *discount rate*. Some economists have argued that the future should always be discounted against the marginal rate of return on alternative investments, whether for reasons of efficiency or for reasons of consumer sovereignty and democracy. Other authors, however, have argued against this position, instead proposing discount rates based on a variety of moral principles. Although these counterarguments may be convincing, the debate between the two positions is far from settled. Neither has the debate been settled as to which moral theory the discount rate should be based on. This is hardly surprising, though, given the fact that within ethics itself, the debate over the various moral principles is still ongoing.

As a final note, it should be remarked that despite the large body of literature on the ethics of discounting, the issue has been discussed primarily in terms of our moral duties and obligations to future



generations, i.e., in terms of what we *owe* to them knowing that we may affect their well-being. There is, however, also a broader view on morality, an all-inclusive theory of conduct that includes views on the good life (see also Ref 112, p. 106). For example, we may care about our descendants not only because we owe it to them but also because it gives meaning in our lives. The prospects of future generations therefore may affect our own well-being here and now.<sup>113</sup> Although hardly investigated to date, a broad morality might shed new light on the issue of discounting. Psychological studies have already shown that given the same total amount of consumption, people may prefer it to be spread out in time in an increasing to a declining series of consumption levels. This would imply a negative pure rate of time preference.<sup>114</sup> Such preferences for improvement may be related to one's views on meaning in life, and may not only describe preferences regarding the course of one's own life, but also the course of the intergenerational human project. Spash (Ref 57, p. 120, note 7), for example, notes how 'the Russian people made extreme sacrifices after their revolution in order that their descendants might be better off.' Future research in this direction would certainly be a welcome addition to the existing literature.

## NOTES

<sup>a</sup> This section is based on Ref 21.

<sup>b</sup> The term 'Government House utilitarianism' is from Williams<sup>50</sup> (p. 139), describing the paternalistic morality agreeable to colonial administrators, overruling the morality of the common man.

<sup>c</sup> See also Bentham,<sup>62</sup> who on the one hand acknowledged the existence of pure time preference when stating that the value of pleasure or pain depends upon 'its propinquity or remoteness' (Ref 62, Chapter IV, §2 and §17), but at the same time argued that the government ought to make efforts to inform people of the negative consequences of their time preferences (Chapter XV, §24).

<sup>d</sup> Beckerman and Hepburn<sup>63</sup> observe that the marginal utility of consumption depends largely upon the consumption level of one's peers. Since the people we compare ourselves with are generally contemporaries, inequality in consumption between the generations is likely to be less important than inequality within a generation (p. 195).

<sup>e</sup> Some economists, however, have queried whether climate change itself may not hamper economic growth (see e.g. Ref 82, p. 65).

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