# Philosophers and economists agree on climate policy paths but disagree on why

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## ABSTRACT

The estimated value to society from climate change mitigation is highly sensitive to the long-term social discount rate (SDR). While it is not clear that they possess any special expertise on intergenerational ethics, governmental discounting guidance has almost exclusively been influenced by economists. By contrast, we report the views of philosophers, who are most trained in ethical matters. We show that, as a group, these experts offer strong support for a real SDR of 2%; a value that is also predominantly backed by economists. We find multidisciplinary support for climate policy paths in line with the UN climate targets when views on discounting determinants are applied within a recent update of the DICE Integrated Assessment Model. However, this apparent agreement hides important differences in views on how the ethics of intergenerational welfare can be better incorporated into climate policy evaluation.

## Main

The appraisals of climate mitigation policies and projects are notoriously sensitive to the weight placed on future costs and benefits[1,2]. In Cost-Benefit Analysis using Integrated Assessment Models (IAMs), this weight is determined through the social discount rate (SDR) and its determinants, with small changes to the SDR having significant policy implications. The Trump administration's recalculation of the Social Cost of Carbon (SCC) showed that increasing the real SDR from 3% to 7% reduces the SCC by a factor of seven within its chosen model[3]. By contrast, New York State has raised its SCC from $40 to $125 per ton of $CO_2$ based on a real SDR of 2% rather than 3%[4], while recent interim estimates by the US Environmental Protection Agency (EPA)[5] calculate a central SCC of $190 based on a real SDR that declines from an initial value of 2%. Recent judgements on the SCC and its underlying SDR in the US (Louisiana et al. vs. Biden et al.; Case 2:21-CV-01074) have underscored the importance of this issue.

Despite enormous sensitivities of policy appraisals to discounting choices and their ethical content, recommendations on the SDR have been dominated by economists[6] who do not necessarily have any special expertise in providing ethical advice[7]. Rather, economics has been described as being 'value-free'[8] due to a reliance on revealed preference and economic fundamentals to identify what is socially desirable[9,10]. This has not gone unnoticed, with the Biden Administration being recommended to *"seek broad input"*, including from philosophers [4, p549] who do have specific competencies in such complex ethical matters. While a number of philosophers have engaged with social discounting[11–19], a systematic account of the views of these disciplinary experts has previously been missing. We therefore undertook a comprehensive survey of philosophers with expertise on social discounting, focused on the appropriate intergenerational SDR, and compare the results to those from a previous identical survey of expert economists[20]. We find that philosophers and economists exhibit strong agreement on a long-run real SDR of 2%.

Our survey also allows us to apply philosophers' views on discounting to determine an optimal climate policy path within a recent update[21] of a prominent IAM, DICE[22]. This model is underpinned by the Simple Ramsey Rule (SRR) within the Discounted Utilitarian framework that is commonly understood by experts from both disciplines and found in government guidelines across the world[23–25]. The SRR equates the return to capital through real interest rates ($r$) on the *production* side

of the economy, with the social rate of time preference ($\delta + \eta g$) on the *consumption* side: $r = SDR = \delta + \eta g$, which can be calibrated in different ways (see Methods). Here, $\delta$ reflects societal impatience as measured by the discount rate on utility, while $\eta g$ is the wealth effect that places a lower weight on future consumption if marginal utility of consumption is diminishing ($\eta > 0$) and when future societies are predicted to be wealthier than today ($g > 0$).

Coupled with a direct elicitation of the SDR in its general formulation, we asked for values of each of the components of the SRR: $r$, $\delta$, $\eta$ and $g$. Our results show that experts broadly support the parameter values currently applied by EPA in its latest SCC estimates, although based on very different intellectual arguments. We then apply the philosophers' median recommended values of $\delta$ and $\eta$ as inputs to an updated version of the DICE model[21]. This results in an optimal climate policy path that is almost indistinguishable from that recommended by the median view of economists as previously reported in[21]. Both are highly supportive of the UN Paris climate targets. The median views from both disciplines translate into climate policy paths that limit global temperature change to under 1.5°C by 2100, with estimates for the SCC of around \$220 per ton of $CO_2$ in 2020.

However, while there is agreement between the two disciplines on these and other matters, both quantitative and qualitative responses reveal that each has systematically different recommendations for how intergenerational welfare can be better incorporated into climate policy analysis. Philosophers are much more reluctant to reduce the complex matter at hand to simple parameter values within the SRR, reflecting their discomfort with the Discounted Utilitarianism approach. Economists, by contrast, often recommend technical extensions to the SRR to account for uncertainty, distribution and limited substitutability of non-market goods.

In addition, philosophers give systematically lower responses for $\delta$ than economists, reflecting their stronger preference for an impartial perspective of social justice. This impartiality perspective is also reflected in a greater median value for inequality aversion, $\eta$, although its sample frequency distribution does not differ significantly between the two disciplines. Yet, with positive expected growth, $g$, a higher median $\eta$ leads to a *higher* SDR and less weight placed on future well-being. These two effects 'cancel out' on average within the SRR, and the implied climate policy paths are therefore similar to those recommended by economists.

Finally, philosophers place greater weight on normative considerations and less on the potential inefficiencies that arise from ignoring production-side opportunity costs ($r$) compared to economists. Therefore, while providing multidisciplinary support for the UN climate targets, philosophers and economists provide different practical and ethical insights into future methodological improvements for undertaking the appraisal of climate change mitigation policies. As emphasised by [26, pp.648-9], many US statutes require agencies to use the highest quality data to allow them to best take into account the welfare of future generations, including "intergenerational equity". Additionally, Circular A-4 states that "special ethical considerations arise when comparing benefits and costs across generations." This paper explicitly addresses such ethical questions, providing data that are of direct relevance to EPA and other policy-makers for evaluating climate policy paths.

## Expert recommendations for the SDR

The survey, outlined in the Methods, asked respondents for their preferred value of the real, long-term (>100 years) SDR, and the values for each of the components, $r$, $\delta$, $\eta$ and $g$, of one specific formulation of the SDR: the SRR. Additionally, we asked each expert the extent to which the SDR should be based on normative issues, involving justice towards future generations, compared to descriptive issues, such as observed or forecast market rates of return. 'Acceptable ranges', within which each expert thought the SDR could reasonably lie, were also elicited, and an opportunity was given for open-ended qualitative comments.

We identified many fewer philosophers with expertise in social discounting ($n = 46$), selected on the basis of relevant publications, than expert economists ($n = 627$)[20]. However, we received a higher response rate from philosophers (63%, $N = 29$) than in[20] (31%, $N = 197$), thus capturing a more complete account of the relevant expert population. Yet, philosophers were much less willing to provide responses to the quantitative questions. Only 52% ($v = 15$) provided quantitative responses, with some questions receiving as few as 10 answers (see Table SI1). This is comparable to other recent expert surveys on key intergenerational matters[27,28].

We first illustrate the distributions of philosophers' quantitative responses and contrast these with those by economists (Figure 1); see Table SI1 and Figure SI1 for further details. A key finding, depicted in panel (a), is that philosophers and economists have very similar views on the appropriate value for the long-term SDR. Using a non-parametric Wilcoxon rank-sum test, we are unable to reject the null hypothesis that the two sets of responses come from the same distribution ($p = 0.818$). While economists have a slightly lower median response (2.0% versus 2.4%), the mean responses are almost identical at 2.27%. The multidisciplinary agreement on the SDR is further strengthened by examining 'acceptable ranges' for the SDR (Figure 1b). A real SDR of 2% is most often contained within this range for experts in both disciplines; for all but one philosopher and 77% of economists. Expert support falls quickly for higher values of the SDR. There are also no significant differences between the two disciplines on the descriptive components of the SRR; real growth, $g$, and the real risk-free interest rates, $r$, shown in panels (c) and (d) (rank-sum, $p$=0.681 and $p$=0.617).

There are, though, important areas of disagreement. Philosophers are much less persuaded by opportunity cost of capital arguments for setting the SDR than economists (see panel (e)). The mean (median) recommended weight put on normative considerations are 78.5% (80%) for philosophers and 61.5% (70%) for economists and the distributions are statistically significantly different (rank-sum, $p$=0.040). Panel (f) shows that, for the *"two central normative parameters"* [29, p33] of the SRR, philosophers recommend statistically significantly lower values (rank-sum, $p$=0.043) for pure time preference, $\delta$, than economists despite a few outlier high responses. While it might be expected that this preference for intertemporal equity would lead philosophers to provide higher values for the elasticity of marginal utility, $\eta$, panel (g) shows that this view is not supported by the data, as the rank-sum test fails to reject the null that the two distributions of responses are identical ($p$=0.539). The median response of philosophers is notably higher than that of economists, though, and this has an important part to play in the next section.

## Optimal climate policy paths

To consider implications for optimal climate policy paths, we apply an updated version of the IAM, DICE[21, 22], outlined in Methods. Key changes include an update of the climate module and more recent climate damage estimates. Discounting within DICE requires two input variables from the SRR framework: $\delta$ and $\eta$. For the two summary measures, we use the *median view* from philosophers for these two parameters and the *median run* of resulting climate policy paths. For each parameter pair, the optimal climate policy is computed. The growth path is non-constant and endogenised, not a constant long-term rate from experts' forecasts.

We illustrate climate policy paths for each of the ten philosophers that provided complete pairs of pure time preference and the elasticity of marginal utility (Figure 2). The *median view* represents this summary measure on both parameters individually (Figure 2a), while the specific combination ($\delta = 0.075$, $\eta = 1.25$) is not held by any particular philosopher. The *median run* of philosophers' policy paths, in contrast, is supported by three philosophers with identical views ($\delta = 0$, $\eta = 2$). We observe that 60% of the runs result in temperature changes below 2°C by the end of the century (Figure 2d).

Next we compare policy paths under median philosophers' views with an identical analysis by[21] that uses the median economists' views as reported in[20]. We also calibrate the DICE model using well-known parameter choices by Nordhaus[22] and Stern[30] for comparison. The median philosophers' and median economists' views translate into almost indistinguishable climate policy paths in terms of emission reductions and SCC estimates of around $220 ($219 and $227, respectively) in the year 2020 (Figure 3a). These values are similar to estimates in a recent comprehensive analysis of the SCC[28]. We also observe almost identical temperature changes of around 1.4°C by the end of the century (Figure 3d). The median philosopher view exhibits a lower value of pure time preference than the median economist (0.075% versus 0.5%) but a higher elasticity of marginal utility (1.25 versus 1). Both effectively attach more weight to distributional issues, but with counteracting effects on the SRR. Within DICE, these 'cancel out' and result in very similar optimal climate policy paths. Furthermore, the median runs of philosopher and economist policy paths are also virtually indistinguishable (Figure 3b), with SCCs in 2020 of around $120 ($112 and $130, respectively) and temperature trajectories that stay below 2°C and reach 1.8°C by the end of the century.

## Expert recommendations for intergenerational discounting

Philosophers' qualitative comments were particularly rich. These are compared to those of economists[20], which have not previously undergone detailed analysis. Comments from both philosophers (denoted by P#) and economists (E#) largely fall into the three broad categories that form the basis for the subsections below. We highlight selected comments that showcase areas of agreement and differences in each category (Tables 1 and 2) and provide a complete list of anonymised qualitative remarks, including a more complete analysis of comments (see SI).

### Discounted Utilitarianism and the SRR
Discounted Utilitarianism underpins most discounting guidance[25] and often manifests as the SRR, a specific formulation of the SDR, e.g.[23]. A number of economists and philosophers expressed discomfort with using these frameworks as the basis for evaluating intergenerational decisions, but for different reasons. A critique from several philosophers concerned the difficulties of embodying all concepts of fairness consistently in such a limited ethical framework, resulting in discarding morally relevant information (P15, P3). This includes the intratemporal distribution of income, and the pathways of physical and economic outcomes over time that are lost in intertemporal aggregation (also E77). While sustainability rules may offer one way to introduce rights or duties into the Utilitarian framework, some philosophers propose stepping back completely and reassessing the essential moral issues at stake. One example is 'moral modelling'[31], which argues that decision theory can embody many ethical approaches despite having largely consequentialist foundations (P5; see Table 2). Rank-Ordered Utilitarianism, emphasising a generation's well-being rank[32], was suggested from both disciplines as an alternative to a zero or

non-zero pure time preference (P3, E76). Some economists also proposed alternative criteria, such as sustainability rules and 'tolerable windows' approaches to rule out certain adverse outcomes for future generations (E28, E52).

By contrast, rather than mainly proposing alternatives to Discounted Utilitarianism itself, economists predominantly recommended technical extensions to the SRR. Examples include substitutability and environmental scarcity (E5, E51, E48)[33,34], distributional issues (E20)[35,36], uncertainty (E8)[37] and, relatedly, declining discount rates (E42)[1,38]. Resolving the perceived inadequacies of the SRR via mathematical extensions within the Discounted Utilitarian framework, rather than departing from it altogether, appeared popular amongst economists. This may help explain Figure SI2, which plots the frequency distribution of $SDR - (\delta + \eta g)$ across experts in each discipline. This distribution has a mean of -1.21% (two-sided t-test: $p < 0.000$) for economists but is insignificantly different from zero for philosophers ($p=0.517$).

### Normative versus positive weight

The Stern-Nordhaus debate was ostensibly polarised between positive and normative approaches and this framing continues to this day. Within the SRR approach, the SDR can be calibrated from the opportunity cost of capital, $r$, as recommended in, for example, Circulars A-4 and A-94 of the Office of Management and Budget in the US. However, these Circulars also acknowledge the virtue of alternative approaches such as using a shadow price of capital to value displaced investment. Alternatively, the SDR can be estimated from the consumption side as also recommended by the use of observed savings rates in Circular A-4, or calibrated to the SRR as in the HM Treasury's Green Book in the UK. The latter is seen as a predominantly normative approach, although $g$ is a descriptive variable[25]. Yet, rather than experts being polarised, the quantitative and qualitative responses show that a large majority of both economists and philosophers find normative *and* positive issues relevant (P10, P2, P14, E26, E17).

As revealed by their quantitative responses, philosophers place stronger emphasis on normative issues, and this is also reflected in their comments. Within Discounted Utilitarianism, a number of philosophers take a fully normative approach to determining the SDR, believing that "uncertainty and justice should be key determinants" (P12). This position is also reflected in the comments of some economists. By contrast, some economists, but no philosophers, are 100% 'pure' positivists, believing that interest rates should be used to calibrate the SDR (E32). Some philosophers do, though, report that normative questions can only be answered when the positive facts are known (P10; see Table 1). The responses from both disciplines give little support for the purely positive position being taken to discounting that underpins the latest estimates of the SCC published by EPA[5], where $\delta$ and $\eta$ on the consumption side of the SRR are calibrated on a purely descriptive basis; e.g.,[39,40].

### Calibrating the components of the SRR

Philosophers and economists alike provided comments on calibrating the components of the SRR and the difficulties involved. One broad critique from economists was that there is no empirical support for the SRR as a descriptive model (E8; see Table 1). While modal responses on pure time preference in both disciplines suggest that remoteness in time itself has no moral significance [19, p357], this view is contested within both groups. Among those arguing for a non-zero $\delta$, existential hazard risk is the most frequent motivation (P5, E4), and both groups also recognize tyranny arguments between generations that can arise from an inappropriate choice of $\delta$ (P5, E5). Positive rates of time preference result in weights approaching zero on the utility of very far-future generations, which may be morally unacceptable. In contrast, $\delta = 0$ can lead to 'hair shirt' outcomes for the current generation, who would be required to save 'damaging' amounts for the benefit of their distant descendants (P5).

Yet philosophers rely less on positivist considerations, preferring a variety of alternatives to classical Utilitarian consequentialism, including agent-relative ethics, suggesting that it is morally acceptable to place greater weight on those nearer and dearer to inform our preferred utility discount rate (P5). Economists more often used positive arguments for $\delta > 0$, and a deference to individual preferences (E17). Although one philosopher proposed that "people's actual behaviour in discounting reflects their genuine normative concerns" (P4), they were ultimately introspective on the validity of that assumption. While both groups engaged with the consequentialist approach, philosophers tended to invoke rights and duties (P15). Finally, only one philosopher commented on the elasticity of marginal utility, recommending a different value of $\eta$ for "wrongful harm to future generations" than other effects, again leaning on the idea of rights and duties to future generations (P2). For economists, the qualitative comments reveal that $\eta$ has different meanings with others also questioning whether it is appropriate to use a single value for this parameter in all contexts (E18, E5).

## Discussion

Expert advice plays a key role in complex areas of public policy including discounting and its application to climate policy appraisal[1,41-43]. Yet academic guidance in this area has been sought predominantly from one discipline, economics, where experts do not have any special insights into the underlying ethical issues at stake. Our survey of philosophers meets the need for broader multidisciplinary input into this policy field[4].

We find considerable agreement between the two disciplines for a long-term real SDR of 2%; a value that has underpinned recent estimates of the SCC[28]. Furthermore, median discounting values and median policy runs from each discipline result in almost identical optimal climate policy paths that support the UN Paris climate targets. Yet each discipline brings distinct expertise to bear. While economists provide guidance on technical extensions to discounting rules[25], philosophers point to broader extensions to Discounted Utilitarianism: the limitations of consequentialism, the rights of future generations, and the duties of the present generation.

When estimating the welfare cost of future climate damages, the SDR is critical. Embedding this within an intergenerational welfare setting requires many competencies, and may require deliberative and multidisciplinary perspectives[4]. The different motives held by philosophers are complementary to those of economists and recommend alternative approaches to current climate policy analysis. Philosophical perspectives offer ethical checks and balances within IAMs to narrow the set of acceptable consequentialist climate policies, or offer altogether different procedural lenses through which to evaluate climate policy. Examples here include Rank-Ordered Utilitarianism, sustainability rules and 'tolerable windows' approaches. That economists and philosophers can agree on policy outcomes builds academic expert consensus, a key input to any legal challenge as recently seen in the US. These insights will be overlooked if economists continue to dominate the debate. Yet, how to structure such interaction within "larger-scale, participatory and deliberative, integrated scientific assessment processes", as remarked by one philosopher (P17), is an avenue for consideration in future research and policy.

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## Figure Legends /Captions

**Figure 1. Comparison of philosopher and economist recommendations on intergenerational discounting and key determinants.** (a) Real social discount rate, SDR; (b) percentage of experts whose SDR range they are comfortable with recommending includes the SDR-value given on the $x-$axis; (c) real growth rate, $g$; (d) real risk-free interest rate, $r$; (e) normative weight; (f) pure time preference, $\delta$; and (g) elasticity of marginal utility, $\eta$. Number of observations for philosophers (economists) from top left to bottom right: n = 11(181), n = 11(182), n = 10(181), n = 10(176), n = 13(182), n = 14(180), n = 10(173). Boxes in panels (a) and (c) to (g) represent interquartile ranges (25 to 75 percentiles). The thick horizontal black lines depict medians and the crosses mean values.

**Figure 2. Philosophers' views on climate policy paths.** Optimal climate policy paths in an updated DICE-IAM for each philosopher's view on the two normative policy parameters, pure time preference and elasticity of marginal utility, and the parameters of the *median view* and *median run*: (a) Views on the normative policy parameters; (b) Social cost of carbon (SCC) per ton of $CO_2$ in 2020 US dollars; (c) industrial emissions in $GtCO_2$; and (d) global mean temperature change in $^\circ$C compared to 1850–1900 levels.

**Figure 3. Philosopher and economist agreement on climate policy paths.** Optimal climate policy paths for different views on the two normative policy parameters in an updated DICE-IAM. (a) Views on the normative policy parameters, pure time preference and elasticity of marginal utility, including the median economist and median philosopher views, parameter choices in line with the median policy run (only applicable for philosophers; see Methods), as well as of views by Nordhaus[22] and Stern[30]; (b) Social cost of carbon (SCC) per ton of $CO_2$ in 2020 US dollars; (c) industrial emissions in $GtCO_2$; and (d) global mean temperature change in $^\circ$C compared to 1850–1900 levels.

## Methods

### Sampling, respondents, survey text and response bias

We sampled economists based on keyword searches for various forms of the term "(social) discounting" in 100 leading economics journals to determine pertinent publications. This process yielded 627 potential expert authors, 197 of whom participated in the survey that was administered between May and November 2014. Further details are provided in[20]. For replication see[44].

For philosophers, we took a broader approach to search for articles on "discounting", "discount rate" and "social discount*" in the abstract or main text of philosophy papers stored at PhilPapers, PhilIndex and Scopus. This was accompanied by a purposive search of philosophers who work in the area based on our readings and recommendations from well-known academics in the field. We then checked, on a case-by-case basis, whether there was any evidence within their publications for expertise on "(social) discounting". We identified 46 potentially relevant experts, 29 of whom participated in the survey that was administered between October 2016 and April 2017. While the number of philosophers engaging with social discounting is lower than for economists, our survey design identifies a more complete account of the population of philosophers who can be deemed as 'expert' for our purposes. We updated the PhilPapers-PhilIndex-Scopus search in 2019, additionally picking up 10 potentially relevant experts in an attempt to expand the sample size, but none of them chose to participate.

The invitation e-mail and survey text is provided in SI. We pretested the survey to ensure that it was understandable to both expert groups. For the philosophers, we provided additional clarification to some of the economic terminology.

Overall, many more economists ($n = 627$) were identified in[20] as potential experts on social discounting than philosophers were for this survey ($n = 46$). However, we received a higher response rate from philosophers (63%, $N = 29$) than in[20] (31%, $N = 197$). Thus, while the absolute number of responses is lower for philosophers, we capture a more complete account of the expert population on social discounting in the field of philosophy than in economics.

A core difference between the two expert groups is the relative types of responses they were willing to provide. Only 52% ($v = 15$) of philosophers provided any quantitative responses, with some questions receiving as few as 10 answers; see Table SI1 in the SI. A much higher proportion of economists, 94% ($v = 185$), were prepared to give numerical values, with each question receiving at least 173 answers. By contrast, all philosophers, bar one, provided open-ended qualitative comments, against only 51% of economists ($v = 100$). Thus, even though the number of quantitative responses by philosophers is comparable to some recent expert surveys on key intergenerational aspects[27,28], here we place greater weight on analysing the textual responses of both philosophers and economists, alongside the quantitative results.

We did not find evidence for potential non-response and strategic response biases in the economists sample[20]. The SI reports these standard tests also for the philosophers sample[45–47], with a specific focus on characterizing the larger share of philosophers that provided qualitative responses.

For the illustration of economically optimal climate policy paths, we rely on an updated version of the IAM DICE[22] by[21], who showed implications of the views of economic experts only. The model was updated to account for recent scientific evidence on the carbon cycle, energy balance model and climate damage estimates. It also included non-$CO_2$ forcing in line with lower temperature scenarios, and technical requirements on the availability of negative emissions technologies and the speed of decarbonization. In addition for the present paper, we consider the views among the ten philosophers, who provided complete pairs on the two key normative policy parameters: pure time preference and the elasticity of marginal utility. We additionally, consider the median view among these respondents, and also illustrate the median model run. Note that in the comparison to the economists views in Figure 3, we do not represent the view of the median economist run as a pair of parameters because they are time-varying (see[21]).

### Calibration of the Simple Ramsey Rule

The Simple Ramsey Rule can be calibrated in different ways. The approach taken recently by EPA[5] in its latest interim estimates of the SCC, based on[40] and[28], is to work from the production side of the economy, $r$. Such an approach is supported by [48, pp207-8], who "recommend continuing to rely on existing asset markets to guide the discount rate choice", as well as Recommendation 6-2 of the National Academy of Sciences[39] report which stated that parameter values should reflect the consumption rate of interest. An alternative, which we take here following[20], is to directly apply expert recommendations concerning the appropriate parameter values. These will reflect both normative considerations of what these parameters ought to be from an ethical perspective, as well as perceived production-side opportunity costs.

## Data Availability Statement

The data that support the plots within this paper and other findings of this study are available at the following repository:https://doi.org/10.5281/zenodo.7852217).

## Code Availability Statement

All code used to produce the analysis is available at the following repository:
https://doi.org/10.5281/zenodo.7852217). Details of implementation can be found in the Methods.

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## Author Contributions Statement

F.N., M.D., M.F. and B.G. designed research, F.N., M.D. and B.G. analyzed data, F.N., M.D., M.F. and B.G. wrote the paper.

## Competing Interests Statement

F.N., M.D., M.F. and B.G. declare no competing interests.

# Tables

**Table 1.** Selected qualitative responses on the Simple Ramsey Rule, its components, and normative versus positive weightings

| Philosophers | Category | Economists |
|---|---|---|
| The Ramsey formula requires some empirical input, specifically the rate of economic growth. (P13) | Ramsey Rule ($N_E = 17$, $N_P = 3$) | My discount rate is less than implied by the Ramsey rule because I use the extended rule, incorporating uncertainty. (E24) <br> To employ the Ramsey rule [positively] [...] we need some serious research into the empirics of the Ramsey rule. [... yet] there is no empirical support for the Ramsey rule as a positive description. (E8) |
| I think it's morally acceptable—and in many contexts even required—for us to give greater weight to the concerns of those nearer and dearer to us than to those further away. (P5) <br> I do not believe in pure time discounting at all. The idea is that time itself has no moral significance in itself. (P6) <br> I mostly buy the Parfitt-Cowen response [...] but shoehorning existential risk into the discount rate [is reasonable]. (P5) | Pure time preference ($N_E = 10$, $N_P = 7$) | I see no reason to treat generations not equally. (E5) <br> Pure time preference should probably reflect some catastrophic risk: 0.2% or so. (E4) <br> I [...] favor a preference-based view of well-being, [...] some deference to individuals' own preference parameters. (E17) |
| 0 in the case of wrongful harm to future generations (e.g. climate change) [...] 1.5 for all other effects. (P2) | Elasticity of marginal utility ($N_E = 12$, $N_P = 1$) | [$\eta$ ...] being based on representative agent or [CRRA] formulations [...] is largely a distributional/equity consideration [...] (E13) |
| As climate change accelerates, and if the projections are at the medium to high end, this threatens to turn negative. I'd guess somewhere in the range of +2% to −2%. (P1) | Growth rate ($N_E = 14$, $N_P = 3$) | I foresee a very bright economic future with a continued 2 percent growth rate for the coming century. (E8) <br> I have never understood why economists always assume that consumption will rise at a constant rate. (E1) |
| [T]he normative question of what social discount rate is required by justice to future generations can only be answered once the descriptive issues have been answered. Therefore it is not possible to assign proportions to these two. (P10) | Normative weight ($N_E = 16$, $N_P = 10$) | I don't think normative issues outside of an objective should have much of a role. [...] Indeed, under a different social welfare function there is a different positive description of the appropriate discount rate. (E23) <br> The components of the SDR are overwhelmingly normative. (E13) |

Note: $N_E$ and $N_P$ refer to the number of qualitative remarks from economists and philosophers, respectively.

**Table 2.** Selected qualitative responses on extensions and alternatives to discounting

| Philosophers | Category | Economists |
|---|---|---|
| Because the discount rate is dependent on assumptions about future scarcity,[...] etc. there should be no single discount rate across the board. Natural assets, monetary investments, infrastructure project etc. should be discounted at different rates. (P16)<br><br>If there are real sustainability issues and we fail to take the path towards a sustainable development, then the growth rate of real per-capita consumption will be negative. (P2) | Limited substitutability ($N_E = 20$, $N_P = 4$) | If future costs/benefits accrue, e.g., to environmental amenities, I would argue for a very low discount rate, based on an expectation of increasing relative prices for these goods. (E48) |
| [I]f we're concerned about risk, then we should just model risk explicitly, but given the complexity of climate policy evaluation, I think shoehorning existential risk into the discount rate is a reasonable thing to do. (P5) | Uncertainty ($N_E = 20, N_P = 4$) | We need to admit that the current state of the world is full of uncertainties. [Yet] most uncertainties are neglected, and sometimes few remain when these are considered most important, [...] or easiest to accommodate. (E8)<br><br>Discounting rates are useful but do not provide (accurate) market values of risky assets... but what does? (E56) |
| [A]n intergenerational sort of "differentiated love," to use the Confucian term, justifies a strictly positive rate of pure time preference that declines to zero over the course of a few generations. (P5)<br><br>A discount is certainly justified [because] marginal utility of income will decrease with increasing material well-being, especially in countries counting at present as developing countries. But this consideration does not justify a discount merely for temporal distance. (P8) | Declining discount rates ($N_E=20, N_P=3$) | I am more comfortable with declining discount rates [...] due both to declining time preference rates and to uncertainty about future consumption growth. (E42) |
| In the case of a project that potentially harms people living abroad in health and property, these harms should be given equal weight in project appraisal. (P2) | Heterogeneity, distribution, aggregation ($N_E = 19, N_P = 1$) | The normative approach is based on weighing WTP for different generation, with less weight on the richer ones. It makes no sense to use this in combination with valuation studies where each individuals WTP are not weighted similarly by income. (E20) |
| As you know, the correct way to handle the 'opportunity cost of capital' is not by adjusting the social discount rate. (P13) | Opportunity cost of funds ($N_E = 8, N_P = 2$) | SDRs should reflect the social opportunity cost of funds. (E61)<br><br>An opportunity cost of investment funds should be the instrument of capital rationing. (E15) |
| Instead of "cost-benefit," or "discount rates," long-term future assessments should be made according to a "sustainability index," which gives primary consideration, not to "market preferences," but rather to sustaining environmental conditions and resource availability. (P15)<br><br>I think of [...] policy evaluation as something closer the Katie Steele's "moral modeling" than to some kind of Benthamite calculus (P5) | Alternatives to discounting ($N_E = 15, N_P = 9$) | Instead of imposing a [SWF] and calculate the corresponding optimum, it is "better" to depict a set of feasible paths of consumption, production, temperature, income distribution, etc., and let the policymaker make a choice. (E12) |

Note: $N_E$ and $N_P$ refer to the number of qualitative remarks from economists and philosophers, respectively.