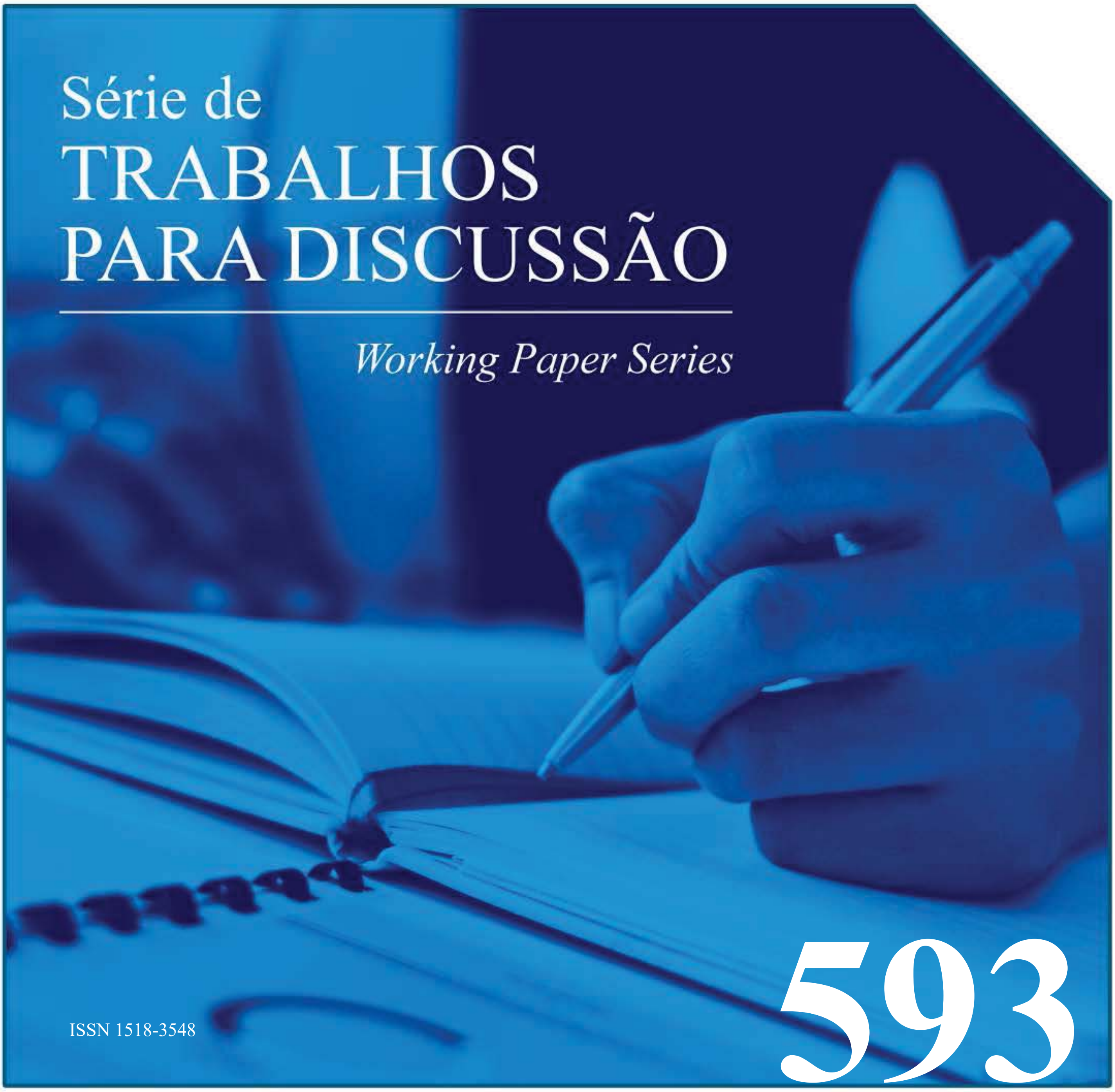

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Social Discounting and the Tragedy of the Horizon: from the Stern-Nordhaus debate to target-consistent prices

Ramiro de Ávila Peres

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SBS – Quadra 3 – Bloco B – Edifício-Sede – 2º subsolo

70074-900 Brasília – DF – Brazil

Toll Free: 0800 9792345

Fax: +55 (61) 3414-2553

Internet: http//www.bcb.gov.br/?CONTACTUS

Non-technical Summary

This paper reviews debates related to the social cost of carbon (SCC) and the challenge of pricing uncertain damages that will occur only in the future. They often revolve around the pure time preference rate, which reflects how much one favors present over future well-being.

The SCC measures the marginal cost of the impact on economic growth caused by the emission of a quantity of greenhouse gases equivalent to an additional ton of carbon dioxide (tCO2eq). There is significant variance among estimates of the SCC; one of the reasons for it is a disagreement on how to bring future damages to present values, especially over the so-called "delta parameter" – the pure time preference rate – of the corresponding discount function.

On the one hand, the descriptive approach, associated with William Nordhaus, proposes to use the time preference empirically observed among individuals, which would result in a significant limitation of the present value attributed to the distant future. On the other hand, the normative approach, associated with Nicholas Stern, proposes to treat everyone impartially, in every generation, and so implies transferring more resources to future generations. In the limit, assuming exponential population growth, it would lead to a philosophical stance akin to the so-called "longtermism" (as defended by William MacAskill in *What we owe the future*).

In addition, the analysis points out obstacles to using the SCC to price carbon for climate policies. These include aspects related to economic methodology (such as ecological economics critiques of welfarist accounts of intergenerational allocations) as well as political philosophy. Thus, challenges related to uncertainty about socioeconomic development trajectories, intergenerational justice, and public reason become key. Finally, we present the target-consistent pricing approach, where one calculates a carbon price compatible with specific mitigation targets – an alternative to SCC methodologies. This approach is advocated as a way to avoid the uncertainty and the disagreements associated with the SCC, emphasizing the importance of meeting goals set by binding political decisions – such as the Paris Agreement.

Sumário Não Técnico

Neste texto, analisam-se discussões relacionadas ao "custo social do carbono" (CSC) e ao desafio de precificar danos incertos que ocorrerão apenas no futuro. O debate gira em torno da taxa de preferência temporal pura, refletindo o quanto se favorece o bem-estar presente em relação ao futuro.

O CSC mede o custo marginal do impacto causado no crescimento econômico pela emissão de gases de efeito estufa equivalentes a uma tonelada adicional de dióxido de carbono (tCO2eq). Há variação significativa nas estimativas do CSC; um dos motivos é a divergência sobre a chamada “preferência temporal pura”, o “parâmetro delta” de uma função exponencial de desconto social, que reflete o quanto se favorece o bem-estar presente em relação ao futuro.

De um lado, a abordagem descritiva, associada a William Nordhaus, propõe usar a preferência temporal empiricamente observada entre indivíduos, o que resultaria numa limitação significativa do valor presente atribuído ao futuro distante. Já a abordagem normativa, associada a Nicholas Stern, propõe tratar todos de forma imparcial, em qualquer período, e implica transferir mais recursos às próximas gerações; no limite, assumindo crescimento populacional exponencial, ela pode ser associada à tese do “longo-termismo” (defendida por William MacAskill em *What we owe the future*).

Além disso, a análise aponta obstáculos ao uso do CCS para precificação de emissões em relação a políticas climáticas. Esses incluem tanto aspectos relacionados à metodologia econômica (como a crítica da economia ecológica a abordagens welfaristas de alocações intergeracionais) quanto à filosofia política. Assim, discutem-se desafios relacionados à incerteza sobre trajetórias de desenvolvimento socioeconômico, à justiça intergeracional e à razão pública. Por fim, apresenta-se a abordagem de precificação consistente com objetivos, que calcula o preço do carbono compatível com metas específicas de mitigação, como uma alternativa à metodologia do CSC. Essa abordagem é defendida como uma forma de evitar a incerteza e a divergência associadas ao CSC, enfatizando a importância de atender a objetivos definidos por decisões vinculantes – como o Acordo de Paris.

Social Discounting and the Tragedy of the Horizon: from the Stern-Nordhaus debate to target-consistent prices[*]

Ramiro de Ávila Peres[**]

Abstract

The "social cost of carbon" (SCC) is a value used to price or tax emissions, so internalizing their externalities; economists disagree about it, and one of the sources of dispute is the "pure time preference rate" – which reflects how much one favors present over future well-being. Those advocating a *descriptive* approach, associated with William Nordhaus, propose to aggregate the time preferences empirically observed, often resulting in a low SCC. On the other hand, the normative approach, associated with Nicholas Stern, advocates temporal impartiality; but it implies transferring more resources to the next generations – at the limit, assuming exponential population growth, it can be associated with a "longtermist" stance. We discuss how a different approach could help leaving this dispute behind – by estimating carbon prices that are consistent with the goals of the Paris Agreement – thus emphasizing the role of political and international agreements.

Keywords: Intergenerational Justice; Carbon Prices; Social Cost of Carbon; Time Preference; Climate Justice

JEL: Q54; H43; D63

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[**] Credit Unions and Non-banking Financial Institutions Supervision Department, e-mail: ramiro.peres@bcb.gov.br.

1 Introduction: pricing the future

Climate change is a paradigmatic case of collective action problem and market failure: "the outcomes are shared but the cost of behavioural change is often individual" (Boon-Falleur et al., 2022); i.e., the risks and damages resulting from one's present decisions of investment and consumption are externalities that will affect *other* people living in the future[1], in uncertain locations and conditions. The problem we aim at is: how do we *price* uncertain damages that will only *happen in the future*?

In the next section, we roughly present one of the measurements that economists use in policy evaluation – the "social cost of carbon" (SCC) – and briefly review a classic discussion in the corresponding literature. One of the main sources of disagreement in SCC estimates is the so-called "pure time preference rate," the parameter δ (delta) of an exponential discount function, reflecting how much one favors present over future costs and benefits. It reflects a deep philosophical disagreement between scholars.

On the one hand, those who advocate the *descriptive* approach, associated with William Nordhaus (2007), propose aggregating temporal preferences empirically observed among individuals; this results in a drastic discount of the value of effects happening in the distant future – explaining what Mark Carney (2015) dubbed the *tragedy of the horizon*. For instance, at a discount rate of 7% per year a damage of $1,000 happening in 50 years would have a present value equivalent to only $34 *now* (a total discount of 96.6%). On the other hand, the *prescriptive* approach, associated with Nicholas Stern (2007), proposes treating everyone impartially, at any period; consequently, it implies transferring more resources to future generations, up to a point that some would regard as too demanding – as we discuss in Section 3.

Before exploring an alternative methodology[2], we discuss philosophical problems present in both approaches: they tend to conflict with a requirement associated with public

[1] There is a time lag between the emission of a certain amount of greenhouse gases (GHG) and its full warming effects – Pyndick (2022) picks 30 years as a useful simplification. There is another lag between the increase in average temperature and the corresponding economic and social effects. Thus, even though we can observe negative effects of climate change today, they are caused by past GHG emissions; consequently, our present emissions will mostly impact the future. In addition, the rate at which CO2 dissipates from the atmosphere is somewhere between 0.25% to 0.50% per year – implying that at least 78% of the gas will remain in the atmosphere in 50 years. This contrasts with other GHG such as methane – which has a greater warming potential, but dissipates way faster.

[2] We overlook here other main differences between the frameworks sponsored by Nordhaus and Stern – such as the fact that the former uses an *optimum growth* model, while the latter is based on cost-benefit analysis (and their corresponding different interpretations of Ramsey's formula); for more on these distinctions, see Llavador, Roemer e Silvestre (2015). Consequently, unlike Gollier (2013), we do not

reason, as they are not based on reasons that are expected to be acceptable to either side. For *descriptivists*, who favor a “positive” approach, the value of δ results from aggregating individual preferences observed in markets (under the influence of self-interest and cognitive biases), rather than from political deliberation. For prescriptivists, who adopt a “normative” account, the choice of δ presupposes a moral decision to treat as equals individuals who do not (yet) belong to the political community (for climate damage will occur in different countries, in different generations); this implies a position similar to what has been called *long-termism* (that the effects on the distant future is one of the most important features of our actions), considered to be too demanding.

We may add other difficulties: first, the framework above does not take into account particularities of environmental public goods highlighted in the literature on strong sustainability. Also, the factual uncertainty over the impact of climate change and future social and economic trajectories is particularly remarkable; some *Integrated Assessment Models* deal with it by using implausibly simplifying assumptions (such as quadratic damage functions) or by neglecting relevant information (e.g., impacts on mortality – rather focusing only on GDP growth). Moreover, they tend to ignore low-probability catastrophic risks – as including them may lead the cost-benefit analysis to collapse (Weitzman, 2009); but this challenges the very function of the SCC – which is supposed to be a conceptual tool to assist the green economic transition. Thus, in the last section, we present a different approach to carbon prices for policymakers; rather than estimates of future damages, carbon prices used in policy evaluation should be consistent with achieving the goals of climate policies – such as those established by the Paris Agreement. Though target-consistent pricing is already being adopted by major institutions, this approach is not well represented in the economics literature, and it is almost ignored by philosophers in general[3].

This approach mitigates the problems mentioned above; instead of trying to compute an uncertain expected harm to future generations (which leads to an unavoidable comparison with our own present interests), we can benchmark our carbon prices on how much we should reduce our emissions (i.e., on our expected carbon budgets) in order to

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consider if funding climate mitigation would come from a decrease in present consumption or a change in capital allocation, for instance.

[3] One of the few philosophical sources we found that contrasted the SCC and target-consistent pricing approaches is Frisch (2018) – who defends the latter on precautionary grounds. The recent review on carbon tax ethics by Mintz-Koo (2023) only mentions this approach *en passant*, remarking that it will not be analyzed in that text.

comply with goals defined in previous political commitments. It provides a less uncertain basis for policymaking and, since it allows for increased convergence and is derived from previous commitments, a more legitimate one. Interestingly, it also dissolves the objection that time neutrality is too *demanding*: by separating the questions of "how to value the future" and "what we should do", it puts partiality and agent-relative considerations on their proper place.

2 The social cost of carbon (SCC)

When economists aim to assess the externalities of a potentially harmful project (to see if it is worth doing), they often use a "social cost" or a "shadow price" – i.e., a monetary value attributed to an "abstract commodity" that is not traded in a marketplace; in this case, the "commodity" is the impact of the corresponding externality. One example is the cost-benefit analysis of regulations and policies related to activities that emit greenhouse gases and so cause global warming; in this case, what we are trying to measure is the social cost entailed by those emissions[4]. Another important application is the definition of the benchmark for a carbon tax – i.e., how much we should charge to allow the emission of greenhouse gases.

The main methodology for doing so is called *social cost of carbon* (SCC), which measures the marginal cost of the present value of the impact (or how much one would be willing to pay to avoid it) caused by the equivalent of an additional ton of carbon dioxide (CO2) in the atmosphere. For doing so, one usually estimates the amount of gas emitted based on averages for each economic activity, expressed as *tons of carbon dioxide* (tCO2) per unit of fuel. For other gases, a measure called "CO2 equivalent" (CO2e) is calculated using Global Warming Potentials - GWP. To estimate the corresponding damages, climate economists use *integrated assessment models* (IAM) that try to simulate features and connections regarding economic and climate variables across many years (Pyndick, 2022).

There are many different IAMs, and assessing any set of them is beyond our scope. For instance, the US Interagency Working Group (US-IWG 2021) has used the *Policy Analysis of the Greenhouse Effect* (PAGE), the *Framework for Uncertainty, Negotiation*

[4] Notice that this does not apply exclusively to government agencies. Corporations may estimate internal carbon prices to comply with their ESG policies – particularly if they join one of the "net-zero" networks supported by the United Nations Environment Programme (UNEP), or have a project funded by the World Bank, which currently adopts the approach advocated by Stiglitz and Stern (2017).

and Distribution (FUND) and Nordhaus's *Dynamic Integrated model of Climate and the Economy* (DICE). All of these IAMs make assumptions regarding climate sensitivity, the Representative Concentration Pathways (RCP) of GHG in the future, and world trajectories – such as the socioeconomic narratives called *Shared Socioeconomic Pathways* (SSP). Because greenhouse gases often cause persistent warming for many years, IAM damage functions are calculated over decades and centuries[5]. So, we bring these damages to the present value using a *social discount rate* (SDR). The result is our value for the SCC – a monetary value in US$ expressing the economic impact of 1 tCO2e.

Though ignored by the wide public until recent years, it is hard to exaggerate the relevance of the SCC; Cass Sunstein (2021) – who presided over the Office of Management and Budget (OMB) when the US Interagency Working Group (IWG) defined the SCC for the United States – considers the definition of the SCC one of his greatest achievements in life, despite all the uncertainties and compromises between different experts and policymakers that it entailed. However, the SCC has varied a lot since then: it went from $50 during the Obama Administration to a minimum of US$1 during Trump's term (GAO, 2020) – and was raised back to US$ 51 at the beginning of Biden's term. Yet, economists agree that this value is still low, because it neither considers more recent macroeconomic changes and regulatory guidelines[6], nor new research on expected climate damages, such as the sixth assessment reports issued by the IPCC. Proposed updates of the SCC for US easily reach $185 (Rennert et al., 2022).

There is a lot of heterogeneity in the literature in general: estimates of the SCC may reach values beyond US$ 2.000[7] (see, e.g., Wang et al., 2009). Part of this discrepancy is due to factual uncertainty about future damages, and the social and economic trajectory of the world; but much of the difference refers to the choice of the SDR - especially from disagreements about the *pure time preference rate* δ.

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[5] Actually, the result will be a range of values for the SCC, according to different scenarios – which will then be aggregated into a point-estimate.

[6] For instance, Carleton and Greenstone (2021) recommend using a new SDR of 2%, given that interest rates have been low in the last decade, which would increase the SCC to $125.
Scholars (economists, philosophers and climate scientists) have demanded a revision that incorporates more recent information (e.g., Wagner et al., 2021). It is possible that this will happen after the OMB updates its guidelines for policy evaluation (Circular A-4 and Circular A-94).

[7] Of course, we should use monetary values referring a specific year (e.g., "2018 US$"), or convert them to monetary units of a specific period, in order to take into account the effects of inflation. However, this is not necessary for a philosophical discussion, as we are not advocating any specific value for the SCC.

3 Social discount, pure time preference and the divide between descriptivists and prescriptivists

A discount rate brings to a *present value* future risks and benefits. This reflects the intuitive idea that we value experiences and resources in the present more than in the future[8], and such a rate can provide a measure for this preference. And by discounting the future with an exponential function, one can put a finite value on possibly infinite streams of costs and benefits (which behave as a geometric progression[9]).

The *social discount rate* (SDR) used in cost-benefit analysis represents the present value of projects whose effects will be perceived in the future[10]. But why do we discount future costs and benefits? First, because the future is *uncertain*; second, to take into account *opportunity costs* – or other features such as a decline in the marginal utility of consumption (i.e., we value an additional $1 more when we are poorer) or aversion to inequality (we prefer to benefit poorer people). Arguably, another factor is that we intrinsically favor the present – we have a *pure time preference*. So, an SDR d is often calculated with a function incorporating a formula devised by Frank Ramsey (1928):

$$d = \delta + g * \eta$$

It has three basic parameters:

a) the elasticity of the marginal utility of consumption η;

b) the average rate of economic growth g (estimating how future variations in income will impact the utility of consumption); and

c) the *pure time preference rate* δ, which reflects how much we prefer present benefits over future ones, regardless of variations in wealth or consumption (i.e., the parameters η and g). While η and g reflect uncertain factual judgments about the variation in income and consumption of individuals over time, the parameter δ stems from a normative judgment or preference; it is usually interpreted as a trade-off between the value of the well-being of individuals in different time periods.

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[8] More concretely, suppose you are indifferent between receiving 100 euros today or 115 in a year; this means that the present value of "115 euros in a year" for you is 100 euros. Thus, your discount rate is 15% per year: 100 * (1.15 ^ 1) = 115

Or:

$v_1 = v_t \cdot (1 + d)^{-t}$

Where t is the period and d is the discount rate.

[9] Suppose you receive $100 each year; with a discount of 15% per year, the present value of the sum of those payments has a limit of $766.70.

[10] It is worth noting that, though we base most of the discussion on cost-benefit analysis, its adoption is far from being widespread, and so far it “has played no more than a minor role in the design of climate policies” (Bureau, Quinet, and Schubert 2021).

3.1 Descriptivists: the pros and cons of partiality

The debate on SDR has thus divided scholars into "descriptivists" and "prescriptivists" (Kelleher 2017, 442; see also Greaves, 2017). There is a **philosophical** dispute between these approaches – a discussion about the normative assumptions and the purpose of analysis, rather than a factual disagreement about observations or predictions[11].

Descriptivists favor a *positive approach* claiming that the δ parameter should reflect individuals' observed temporal preference for present well-being, leading to the adoption of a relatively higher SDR. A major example is William Nordhaus (2008), whose renowned DICE model uses a pure time preference rate $\delta = 1.5\%$ (which slowly declines to 1% after 300 years) and an SDR $d = 5.4\%$ per year. We can also include in this camp those who advocate the *social opportunity costs* (SOC) methodology, which, rather than using Ramsey's formula, uses as SDR a long-term rate of return (such as the risk-neutral long-term interest rate), seeking to reflect the opportunity cost of investing in a project; though this entails a lower *d* for developed countries (but not for poorer ones), it replaces the implicit normative decision over how to trade-off future and present costs and benefits with (supposedly) pure empirical reasoning.

On the other hand, *prescriptivists* favor an explicitly normative approach, leading to a low SDR, under the assumption that present well-being is not worth more than the future – i.e., "temporal neutrality" (Sullivan 2018), which would imply "intergenerational equality"; so, δ should be zero. This group is led by Nicholas Stern (2007), who assumes $\delta = 0.1\%$[12] and an SDR of 1.4%. Thus, the present value of a damage to occur in 100 years would be *at least* more than 50x greater for Stern than for Nordhaus.

Descriptivists argue that an SDR should reflect an aggregation of effective individual judgments and preferences (which can be inferred from financial markets) – a

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[11] In addition to discount rates, Stern and Nordhaus also disagree about climate sensitivity (i.e., how much the climate changes for each ton of CO_2 emitted) and the progress of carbon capture technologies (Etienne et al., 2012).

[12] In lieu of a pure time preference rate Stern uses δ = 0.1% as "extinction" or "existential" discounting – so avoiding an important objection presented by Koopman (1960) that "no equitable preference ordering exists for a sufficiently unrestricted domain of infinite utility streams" (Chichilnisky, Hammond, and Stern, 2020). However, this value of 0.1% does not represent our "background existential risk"; after all, as Ord (2022) argues, the *homo sapiens* has existed for so long (more than 200,000 years) that we must assign a very low probability to extinction from natural causes. On the other hand, we could interpret this existential discount as a bundle of other considerations that would render our analysis meaningless (e.g., civilizational collapse); but then, 0.1% might be too low.

position that might be dubbed *consumer sovereignty* (Zaddach, 2016) – rather than a choice made by an expert, a technocrat, or a central authority. This better reflects the social opportunity costs of investing in projects of uncertain future – avoiding, e.g., the frequent waste caused by unnecessary long-term infrastructure projects that ambitious authorities often choose to do in order to foster their reputations.

There is a simple (but powerful) "arbitrage" argument backing this view. Suppose that you can: a) either receive $100 now, or b) safely invest those $100 to receive it back in one year, plus the expected rate of return on investment; if you are "impatient" and your personal discount rate is higher than this return, then you are better off choosing (a) and receiving the money now – but if it is lower, then you better choose (b) and invest it, so you will have more to spend later on. The rate of return here provides you with a measure of your opportunity costs[13].

The first problem is that this approach penalizes intergenerational projects, so that the well-being of future generations becomes practically irrelevant as we increase the temporal scope of the analysis (after all, one of the functions of the SDR is to constraint "infinite utility streams"). Second, while the reasoning behind above is plausible for projects with a temporal scope of one or two decades (so avoiding irrational or opportunistic behavior of policymakers), it is not clear why we should extrapolate it to projects that have relevant macroeconomic implications spanning through more than one generation – such as climate change mitigation. Afterall, unlike the case of investment decisions made by individuals, we are not allocating resources to the same set of individuals; and, unlike intragenerational social projects, the risk of opportunistic behavior by policymakers due to a low SDR is likely absent[14]. Moreover, the macroeconomic variables are not only *uncertain* in the long run; they display *endogenous* uncertainty, and our policy choices will affect them – e.g., climate disasters will influence economic growth, and the decisions of monetary authorities on interest rates, and households' willingness to consume and save.

[13] Economists often use risk-free interest rates here – to take risk aversion into account. Historically, there is a great distance between the rate of return in capital markets (7% in US) and real interest rates (1% in US) – the so-called *equity premium puzzle*. Thus, unlike what we have been describing here, a descriptivist who discounted future effects according to real interest rates would value these effects *more* than a prescriptivist (Gollier, 2013); but that is not so for less stable economies (cf. Moore, Boardman and Vinning, 2020). A sophisticated version of this approach used in cost-benefit analysis is called *social opportunity costs*.

[14] Quite the opposite, authorities are more likely to benefit by adopting a short-termist position – so pleasing voters and special interests.

In addition, it is not clear why inferring SDR from an aggregation of individual decisions in markets would be more rational or legitimate than using public deliberation (as proposed by Sen, 2007). This objection is particularly strong for climate policy – after all, climate change is a paradigmatic case of market failure precisely *because economic agents tend to neglect the externalities* caused by GHG emissions. When someone, e.g., buys a Treasury bond, they are likely thinking about how such an investment might be used throughout their own *uncertain short life span* – so they tend to focus on outcomes they can foresee, and look for returns that might benefit themselves or their inheritors; just like someone who buys carbon-intensive products, they are likely not considering how such decision might impact, in a diffuse and indirect way, others in the long run (such as those who will be affected by global warming).

S*ocieties* do not share the same limitations: institutions have a much larger capacity to aggregate and process information than individuals (as exemplified by markets themselves), and populations have no definite life span. After all, *homo sapiens* has been around for hundreds of millennia, and is probably not going extinct soon - if we do not engender our own demise (Ord, 2020). So, there is no reason why we should use the rates that individuals deploy to discount risk and time regarding their own welfare to assess the prospects of others[15].

Indeed, when scholars defend a positive δ, they are not assuming that, from an impartial point of view, effects are less valuable when they are more distant in time – despite what the usual utilitarian framework seems to imply. They are instead claiming that those effects are less valuable to a *particular evaluator*, in a specific point in time (e. g., us, now); it allows for *partiality*: e.g., the fact that I “love my children more than my grandchildren”, and that I recognize that others may do so, too, even though we do not consider any person as intrinsically more valuable. As we will see soon, this has a point: preventing that caring for the future becomes too demanding; but we see this principle as misplaced here: though we may value our children much more than our grandchildren, we do not value our great-great-great-great-grandchildren similarly more than other distant descendants – as a positive δ would require (s. Parfit, 1984, 485-486).

[15] While considering human time-inconsistent preferences, Dasgupta and Maskin (2005) argue that individuals evolve and survive better if they are endowed with hyperbolic discount factors. Psychology research may add additional objections to linking SDR and individual discounting. Frederick (2003) has shown that respondents in surveys can display very different temporal preferences, depending on the specific question that is asked, by evoking or suppressing different considerations (e.g., uncertainty) - and in some cases, the preference for the present welfare disappear.

3.2 A critique of prescriptivism: demandingness and the permission of partiality

The prescriptive approach has the opposite problem. If future population is expected to be much larger than the present one, and if our economic decisions often have (exponentially) cumulative effects, then temporal neutrality requires us to give much more weight to the impact of our actions over the future. This amounts to a conclusion associated with *longtermism*: one of the main moral features of our actions is their impact on the long-term prospects of humanity (as advocated by MacAskill. 2022).

Thus, we should *sacrifice* much of our present consumption in favor of risk mitigation measures and of higher savings rates. However, we usually assume that it is morally or politically permissible for individuals to be somewhat partial to their own interests, or to give special weight to some relationships, such as kinship (Mogensen, 2022), or even to proximity (Lloyd, 2021). Schelling (1999, 396-97) even complains that low SDRs imply favoring those who are better-off, no matter where they might be.

Even philosophers that embrace prescriptivist SDRs tend to concede that the unborn may have a different moral status; e.g., because of philosophical arguments such as the *non-identity problem*, they can't be harmed or wronged in the same way that existing people can be. Suppose, e.g., that a future person, Sarah, complains that climate change caused by carbon emissions of previous generations violates her rights; however, she would not come to exist otherwise, so "she cannot plausibly claim she had a right to a better life, which we violated by emitting greenhouse gas. […] We simply could not have given Sarah a better life by emitting less gas" (Broome 2012, 55)[16].

Moreover, assuming a non-decreasing population and compound effects of damages, investments and technological change, the utilitarian framework adopted by Stern would lead us to regard future generations as *utility monsters* (Llavador, Roemer and Silvestre 2015, 10):

> Nordhaus proposes a thought experiment in which scientists learn that a 'wrinkle' in the climate system will cause damages equal to 0.1% of net consumption per year starting in two hundred years and forever after. He points

[16] This is not an endorsement. Notice, though, that even if non-existence were ethically relevant, this doesn't explain why we should distinguish between a person who will be born next year and one who will come to live in a century – as temporal partiality would entail.

> out that, with Stern's discount rate, we should be willing to pay 56% of one year's world consumption today to remove the wrinkle— about $30 trillion, approximately one- half of today's global gross domestic product (GDP), to fix this tiny problem in the distant future (Llavador, Roemer and Silvestre, 2015, 24).

Thus, intergenerational justice scholars often try to find a compromise between the problem of "irrelevance of the distant future" (implied by high SDRs that favor the present) and the "sacrifice" of present generations (implied by temporally neutral low SDRs). The idea is to find a justification for a *threshold* beyond which we are allowed to treat future generations without impartiality – such as the Rawlsian *just savings principle*, or a prohibition of excessive sacrifice of the present (Parfit, 1984, 484). The challenge, then, is to define this threshold in a non-arbitrary way, based on some conception of intergenerational cooperation.

An alternative would be to adopt different SDRs for different types of assessments: *descriptivist* high SDRs for, e.g., infrastructure projects and regulations (that have no macroeconomic or intergenerational major effects), and low SDRs for climate policy – leading to a higher SCC. This type of compromise has found support in questionnaires among economists in the area (Drupp et al., 2015), and some governments do recommend different SDRs for different activities[17]. In addition, Nordhaus and other great economists inclined towards the descriptivist account have presented a compelling case for using Weitzman's *gamma discounting*, or the *declining discount rate* (DDR) framework: "if the discount rates that will be applied in the future are uncertain but positively correlated, and if the analyst can assign probabilities to these discount rates, then the result will be a declining schedule of certainty-equivalent discount rates" (Arrow et al. 2014, 145).

This seems to confirm that the resistance to adopting $\delta = 0$[18] and low SDRs is indeed the "sacrifice of the present": though people complain of attributing the same value to effects happening (i) tomorrow and in 100 years, they have no qualms with doing it for

[17] There is a theoretically interesting problem of temporal inconsistency when we consider different discount rates for distinct periods – i.e., this is formally similar to hyperbolic discount, and could lead to something like "akratic" behavior. However, its practical importance seems to be low, since long-term planning has much more challenging issues (Strulik, 2021).

[18] We mean *approximately 0* – existential discounting is still important to avoid the objection presented by Koopman (1960).

effects in (ii) 300 and 400 years. But, again, $\delta > 0$ implies that the *difference* in value between (i) and (ii) *should be the same*.

4 Objections to the SCC

4.1 The challenge from public reason

In the core of the current liberal political tradition, there is a commitment with the justification of political power in a fair and stable society (Quong, 2014). To be legitimate, a state's authority must be justifiable to citizens. Public reason must thus consist of reasons "that citizens can reasonably expect that others can reasonably accept in their capacity as free and equal citizens." (Freeman, 2007, 404-405).

However, our discussion about time preference presents what Rawls calls a problem of "extension" for public reason – a matter that is not easily answered within a political conception of justice (Rawls, 1996, 244). This debate not only involves a matter of intergenerational justice (as we have stressed so far), but also reasons relating to *global justice*[19] and environmental protection.

Both the descriptivist and prescriptivist approaches pose challenges to a discussion based on public reason: in the former case, the discount rate results from the aggregation of individual preferences observed in markets (under the influence of self-interest and cognitive biases), rather than from *political deliberation*. On the other hand, the prescriptivist admittedly makes a moral decision to treat as equals individuals who do not belong to the political community – i.e., people who will exist in the future in different parts of the globe – and expects others to follow along. Descriptivists can *prima facie* dispute this requirement of impartiality, since unborn people don't share the burdens and benefits of cooperation with those alive; they may claim that one has a right to be limitedly partial towards oneself (and those who are close), and a positive δ reflects that[20].

Rawls (1971, 263) clearly sided with the prescriptivists in viewing pure time preference as morally unjust; and yet, he recognizes that this does not solve the problem of intergenerational justice, for justice as fairness aims at sharing the burdens and benefits of cooperation among citizens from *one generation to the next*. So, his proposed "extension" is a *just savings principle*: justice between generations requires that there is

[19] One of the reasons that the Trump Administration presented to lower the SCC in US is that damages for foreigners living outside US shouldn't be included (Kelleher, 2018).
[20] Of course, we are not claiming that economists always engage in this type of debate.

a minimum of resources that the one generation owes to the next one, so as to allow future citizens to conserve the basic structure of just institutions and to pursue their own conceptions of the good.

This supposedly avoids the *long-termist* demandingness ascribed to prescriptivists, and the arbitrariness associated with pure time preference. However, this model of a "succession of discrete generations" is sometimes found wanting, and it is highly artificial: "generations" are merely conceptual artifacts, formed by a succession of individuals, rather than *group agents* with boundaries like political communities. And, as we will see soon, it is not clear that this helps solving the argument over climate policies – which involves great uncertainty over future distributions of population, economic growth and risks.

A possibly more promising approach to this problem would be aggregating different opinions on discounting. For instance, we could hold democratic deliberations and vote on the SDR, as suggested by Sen (2007) and Campos (forthcoming in 2024) – giving it an adequate democratic "pedigree" – or aggregate experts' opinions according to something like the declining discount rates approach (Arrow et al., 2014). Actually, though philosophers and economists have deep theoretical disagreements about the SDR, a recent expert survey shows great convergence on its value, around 2%, despite incompatible rationales (Nesje et al., 2023).

Indeed, it is hard to think of a better response to the objection from public reason, and it would be adequate to adopt aggregation procedures for SDRs in general; however, in cases of great uncertainty and irreversible harm, this might still be inadequate, as we will argue in the following section.

4.2 Different economic frameworks: strong sustainability and the particularities of environmental goods[21]

So far, we have framed the discussion about discount rates for carbon pricing as a debate within the dominant neoclassical / welfarist / utilitarian economics, particularly based on the literature on optimal growth. This paradigm has been criticized by ecological economists for focusing on the "efficiency aspects of the problem, rather than the

[21] I am particularly grateful to an anonymous referee for driving my attention towards the subject of this section.

sustainability aspects" (Gerlagh & van der Zwaan, 2002). In this section, we see a few challenges to this assumption, based on the notion of strong sustainability.

Weak sustainability implies that the sum of man-made capital and natural capital should at least be kept constant, assuming perfect substitutability between both types of capital; that is usually the framework implicit in the notion of "inclusive wealth" in Dasgupta (2019) or of intergenerational equity explored by Llavador, Roemer and Silvestre (2015). Under this framework, "an increase in the stock of man-made capital can compensate for the deterioration of the environment, then present generations, while causing environmental losses, are still able to leave a positive net inheritance to future generations" (Gerlagh & van der Zwaan, 2002, p. 330). On the other hand, *strong sustainability* implies that they are poor substitutes for each other; in that case, economic growth (and higher standards of living) can hardly justify leaving a smaller bundle of natural goods to future generations, and so environmental preservation is required[22].

This problem goes beyond the usual criticism to economists using GDP as the main proxy for welfare; and, of course, it does not imply an objection against economic growth. In fact, as societies become richer and provide for the basic needs of their members, they are willing to pay more for environmental goods; indeed, Ritchie (2024) points out that today Londoners breathe a cleaner air than 150 years ago precisely because individuals in developed countries have pushed for costly policies to reduce air pollution. This effect is predicted by Gerlagh & van der Zwaan (2002), who see it as analogous to "Baumol's disease", the observed increase in the price of public services in comparison to manufactured goods, explained as a consequence of unbalanced growth productivity. Intuitively, one can see that productivity has significantly grown for man-made goods, but not so for natural goods; as they are poor substitutes for each other in the long run, we should be willing to pay more for the latter. Some authors defend that this would

[22] Notice that one needs to distinguish between stocks of natural *consumption* goods provided by nature (e.g., fish stocks for fishermen), often called "market environmental goods", and natural goods that are not consumed, such as biodiversity – that, like public goods, are usually non-rival and non-excludable. The Ramsey's formula is appropriate if we consider natural goods of the first type:
"A profit-maximizing resource owner will harvest the resource to the point where the rate of return on the resource stock, which is the growth rate of the biological stock, is equal to the rate of return on alternative investments, which is the market interest rate. […] For slow-growing species for which the natural growth rate is less than the market interest rate, Clark showed that the profit-maximizing solution was to harvest the resource stock to extinction. Such optimal extinction outcomes do not occur if the market interest rate is near zero or if there is value in maintaining the biological stock (e.g., existence value)." (Polasky & Dampha, 2021, 697).

justify using a different *dual-rate discounting* – i.e., a lower SDR for environmental goods.

So, even if we expect that future generations will have higher income, they may lament that we did not privilege maintaining natural capital. This is worsened by the asymmetric implications of irreversibility in environmental damages – as stressed by Fischer and Krutilla (1975, p. 366 and ff.) in their seminal paper on discount rates for projects with environmental impact. As for global warming, GHG emissions might remain in the atmosphere for centuries, while climate tipping points and depleted biodiversity cannot be easily returned to their previous *status quo*. So, in fact, our stock of natural goods is not being held constant; it is diminishing, and it cannot be easily replaced by other types of consumption.

Thus, what is at stake is not solely the distribution of benefits among individuals in different periods, but the fact that our present actions will *cause* the environment where future people will exist; this raises the issue of what Spash (1993) has called "compensatory transfers" – i.e., the necessity to take actions to mitigate and compensate the harm being caused. Global warming will cause future disasters and deaths; thus, a high SDR cannot be an excuse to harm future people (Revesz, 1999). This is a reason for the members of a generation to see themselves as stewards of the environment that they will pass to future people, resulting in an obligation to avoid reducing their prospects through either conservation of environmental resources or compensatory measures (Howarth, 2007).

We cannot further explore rights-based approaches here without facing the *non-identity problem* we briefly exposed in Section 3.2 (while citing Broome, 2012) – according to which I could not complain that facts previous to my conception violated my rights if, *had these facts not happened, I would not exist* (as such facts have not made me worse-off than I would otherwise have been). But this subject deserves its own investigation. It is enough for now to recognize that, as we consider the particularities of intergenerational environmental goods, it is unlikely that our duties towards future generations could be assessed through standard cost-benefit analysis.

4.3 The challenge from uncertainty

So far, we assumed that the uncertainty over the values of future economic development (the parameters η and g) and harm (the damage function) were not particularly relevant for our normative discussion regarding the SDR – which so focused on the pure time preference rate. Time to "throw this ladder away".

First, notice that calculating the SCC implies *endogenous uncertainty*: when a government uses a high SCC in climate policies (e.g., to impose a carbon tax, or to use in cost-benefit analysis), it will result in a lower emissions scenario – but this *decreases future expected damages*. This is particularly true in the case of carbon taxes and emissions trading systems where the corresponding revenue is used to fund adaptation efforts and the green transition. In a nutshell, people want the government to adopt *higher* carbon prices because they believe this will *prevent higher costs*.

Second, besides *endogenous effects*, there is straightforward uncertainty about climate sensitivity and systemic risks. This is shown by how IAMs in general are highly sensitive to any change in their corresponding parameters – including *ad hoc* choices about the form of the damage function or the probability of different socioeconomic trajectories. There is often enormous variance *within the same study*[23], as reflected in large confidence intervals. In addition, some climate models use excessively simplifying assumptions; e.g., DICE models usually ignore possible changes in precipitation, and assume that the economic impact will follow a relatively simple quadratic function (as criticized by Keen, 2021), thus underestimating climate risks associated with 2 to 4.3°C warming – in contrast with the scientific literature. Some extensions of the DICE do assess future mortality and so return higher SCC values (e.g., Bressler, 2021)[24].

Another framework to analyze climate change regards what carbon price would be required to preserve the world's boundaries, or its "safeguarding space" – taking into account *Earth systems processes* (ESPs), i.e., "biogeochemical flows, ocean acidification, freshwater use, land-use change, biodiversity loss, atmospheric aerosol loading, ozone depletion, and chemical pollution" (Engström et al., 2020, 2). Moreover, most climate

[23] It also depends on the scenario the study is based on; in one study that calculates country-level SCC (Ricke et al., 2018), the lowest estimate corresponded to the scenario SSP1/RCP60, with a value of **305 USD/tCO_2** (with a confidence interval of 66.7% ranging between 4114 and $593); the highest estimate for scenario SSP3/RCP85 reached **1454 USD/tCO_2** [CI: 675 - 3171].

[24] Newman and Noy (2023) estimate that extreme events caused by global warming are causing losses of $143 billion per year; 63% of this value is due to deaths. They so conclude that IAMs greatly underestimate the costs of climate change.

risk pertains to the fact that global warming will have cascading systemic effects, precipitating other hazards – what some scholars currently call a “polycrisis”. Luke Kemp and others (2022) have pointed out how such scenarios could result in civilizational collapse. For instance, though the speculative “runaway global warming” scenarios with warming above 8ºC in the average global temperature are correctly seen as unlikely, they are not yet proven to be *impossible.* Richards, Gauch and Allwood (2023) simulated the impacts of such a scenario for food production, concluding that it would imply 6 billion deaths (by starvation *only*) by 2100.

Nevertheless, IAMs do not incorporate low-probability scenarios (“fat tails”) where global warming entail catastrophic consequences to human civilization – which is precisely what should concern us the most, though (Stern, Stiglitz and Taylor, 2021; Pindyck, 2019). Following this, Méjean et al. (2020) have built an IAM accounting for different climate policies that could affect the (remote) probability of catastrophic outcomes yielding early extinction; they demonstrate that even low probability scenarios of extinction (even in the distant future) end up having a major effect on which mitigation policies we should adopt[25].

The problem is that, as we consider increasingly unlikely scenarios, the values of the expected damages increase starkly. This is a pervasive problem of this type of analysis, and is not restricted to the analysis of prescriptivists, as revealed by the “dismal theorem” of Weitzman (2009)[26] – according to which cost-benefit analysis based on expected utility is inapplicable when there is the possibility of catastrophes in the “long-tail” of the probability distribution. Despite the methodological objections presented against the “dismal theorem” itself[27], the problem of quantifying catastrophic climate risks remains.

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[25] This doesn’t even take into account the so-called “hot models”, disregarded by climate scientists for yielding high climate sensitivity – which make run-away catastrophic climate change much more likely.

[26] Though Weitzman (2007) sides with the descriptivist approach and criticizes Stern (2007) for adopting $\delta = 0$, his precautionary stance leads to low discount rates and high carbon prices– which led him to state that Stern was “right for the wrong reasons”.

[27] Notice that the dismal theorem applies even if we don’t postulate any kind of “black swan” events. Since normal probability distributions are “thin-tailed” (i.e., the upper tail declines to zero faster than exponentially), if we model temperature changes (the main driver of climate risks) according to a normal distribution, an exponential discount rate will be enough to provide a finite expected cost - even if we model the costs of climate change through a utility function with constant relative risk aversion (CRRA) where, as consumption tends to zero, the loss in marginal utility approaches infinity. However, we ignore the variance of the real distribution; thus, to estimate the variance with all available data, with Bayesian updating when new data become available, we must use a *fat-tail* posterior distribution for the temperature, whose upper end declines to zero *slower* than exponentially; so, in that case, the probabilities of large values will be enough to return expected infinite marginal utility (Pyndick, 2011, 259-260).

Nordhaus (2009) objects that it is implausible that we will ever reach those extreme scenarios – because if humans end in such a position, mitigation policies would be promptly adopted, including the use of new technologies for carbon capture and geoengineering[28]. However, it is not clear that we could take that scale of coordination for granted; after all, if we cannot coordinate *now* to follow policies that keep climate change under 2ºC, why should we believe that we would be more likely to achieve successful global coordination (rather than conflict or incautious unilateral solutions) in the future, when the problem becomes urgent? That is the main case that Georg Wagner and Martin Weitzman (2015) present for adopting a high carbon price: it should be such that we would *never* reach something like 6°C warming by 2100 – and, given the Paris Agreement, we should justifiably aim to be consistent with warming below 2ºC (preferentially below 1.5ºC). Moreover, some policies may also lead to a "green paradox": by signaling that polluting activities will be more costly in the future, we encourage agents to profit from them in the near-present (Sinn, 2014). Boyce (2018, 53) argues that only explicit *targets-based measures* that aim to cap emissions are robust against such risks.

This suggests a different perspective to tackle the problem from: it is precisely to avoid extreme scenarios that reducing carbon emissions is so important now, and pricing them should work as a *deterrent* against reckless behavior. The corresponding revenue should fund efforts to prevent catastrophes or mitigate their effects – akin to precautionary insurance, so that discount rates should be very low (Gollier and Weitzman, 2009) or even *negative* (Fleurbaey and Zuber, 2015). In other words, precautionary considerations should trump usual cost-benefit analysis based on expected utility; we should rather aim to reduce catastrophic risks, which demands intergenerational cooperation – and this can hardly be achieved through an SCC based on high SDRs (Steel, 2014, 139).

5 In praise of target-consistent pricing

One of the main recommendations of the Stern (2007) *Review* was that global climate policy should aim to stabilize atmospheric concentration of GHG somewhere in the range of 450 to 550 ppm CO2e (to keep global warming below 2ºC); so, Stern analyses

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Many objections have been presented against this "dismal theorem" (s. Rampa 2020); but, in general, one can deflect it either by avoiding CRRA, or by capping utility in some other way – e.g., Martin and Pyndick (2015) suggest using a function of the value of a statistical life (VSL).

[28] Nevertheless, more recently, Nordhaus (2019) has emphasized the risks of geoengineering, as it is "untested, will not offset climate change equally in all regions, will not deal with ocean carbonization, and will have major complications for international cooperation".

what cost of carbon would be *consistent with that goal*. After the publication of the Review, the UK environment department (Defra) incorporated this analysis into its guidelines for evaluating climate impacts, while noticing that such carbon price should not be interpreted as a *social cost of carbon* (Price, Thronton and Nelson, 2007); instead, they called it a *shadow price* – one that, instead of trying to estimate future damages, explicitly aims at a goal (Smith and Braathen 2015, 29). This approach is still in use in UK (Vivid Economics, 2021); a similar methodology is currently adopted by France (GAO, 2020; Quinet, 2019). In recent years, Stern himself, working for the World Bank with J. Stiglitz (Stern et al., 2017), has advocated abandoning the SCC methodology in favor of this *target-consistent pricing* approach - where one seeks to calculate the carbon price compatible with a certain mitigation target, given the marginal abatement costs to achieve this target. This has been adopted by OECD (2018) as a benchmark to calculate the so-called *carbon pricing gap* – i.e., the difference between the effective carbon prices (including carbon taxes and ETS prices) adopted in the corresponding jurisdictions and the price that they should adopt in order to comply with the goals of the Paris Agreement.

What would such a price be? Stiglitz and Stern (Stern et al., 2017) recommended using a global price of $40 - $80 by 2020, and US$50–100/tCO2 in 2030. However, they later recognized (Stern et al., 2022, 12) that those prices where underestimated, and that we better adopt the methodology of *Net zero carbon prices* (NT2NZ) of Kaufman and others (2020) – which achieves a price of $77 - $124 for the US in 2030 (assuming basic mitigation policies are in place, such as cutting fossil fuel subsidies). This leads us closer to the prices of $108 and $295 recommended by the research of regulators in UK and France, respectively (GAO, 2020, 44). IMF researchers have recommended a global carbon price floor of at least $75 – even though their analysis suggest that it is still a low value (Roaf, Black and Parry, 2021).

So, target-consistent pricing implies less uncertainty and disagreement (Stern, Stiglitz e Taylor, 2021). It also offers pragmatic advantages over the very uncertain SCC: it does not make much difference whether, for example, the correct SCC is $250 or $1000, if a lower price could be enough to achieve net zero[29]. It is consistent with a *background induction approach* to climate mitigation, where "getting the price right" is not as important as *getting expectations right* (Dolphin et al., 2023); it reflects, too, the idea that,

[29] On the other hand, by contrasting, e.g., an SCC of $1000 and a target consistent price of $100, we do highlight how unreasonable it is to *not* phase out GHG.

precisely because future effects of global warming are uncertain, "we should take action now as insurance against the possibility of very high costs in the future" (Pyndick, 2022). Finally, it implies allocating greater responsibility to policymakers and authorities – which, at least in the case of democracies, would ensure policy *legitimacy*, as citizens are being represented in designing climate policies.

Instead of referring the rights or the welfare of future people[30], this approach relies on targets we have already committed to, so *replacing* the previous reasons we could have to act otherwise[31]. This marks a contrast between an *efficiency* criterion, where economic analysis determines the ends of climate policy, and a safety criterion, where economists only recommend cost-effective means to reach goals set by climate scientists and diplomats (Boyce, 2018, 52).

Accordingly, by emitting greenhouse gases and causing environmental damage, a polluter misuses our *carbon budget*, so creating a cost for the rest of society, which will have to further reduce its emissions – and that cost is what this price measures. This is more consistent with the idea that climate policies aim to provide an environmental *public good*; consequently, if one fails to comply with climate commitments, one acts like a *free* rider: *besides* causing future harms, one also fails to fulfill a present obligation shared with others. Analogously, if one fails to pay taxes, we don't need to consider what is the marginal impact of this omission on those whose rights and welfare are endangered because of the resulting fiscal constraints and income inequality (which would amount to the "social cost of tax avoidance") to conclude that an obligation was violated[32].

The main objection to this approach is that it only deviates from the difficulties of performing cost-benefit analysis (Aldy et al., 2021), without solving them by answering the question of what weight should be given to future well-being. But then, nothing here implies that we should stop estimating the SCC at all: since we have already defined targets, policymakers should aim at a price that is consistent with achieving this goal; but *when we are choosing a goa*l, decision-makers will need estimates of future damages,

[30] Indeed, the underlying reasoning in support of target-based policies does not even have to appeal to future generations. Carbon emissions and air pollutants are correlated, as both usually originate from the same activities; a reduction in emissions expectedly implies a reduction in air pollution – which makes carbon pricing beneficial for present generations (Boyd, 2018; MacAskill, 2022).
[31] This follows from the *preemption thesis* defended by Raz (1994, 214): decisions issued by a legitimate authority overrule other first-order reasons we have to act.
[32] Of course, this doesn't imply that, unless there is a previous authoritative norm defining climate targets, one doesn't have a duty to reduce emissions, nor that no harm is caused by those emissions.

since the "use of values derived from current […] targets would be circular and meaningless" (Smith & Braathen 2015, 30).

But then, what discount rate should we use? Did we go back full circle? Not necessarily. As we have suggested above, the pull of arguments for $\delta > 0$ comes from the agent-relative considerations, such as problems of partiality and demandingness; but we can adopt $\delta = 0$ to calculate the SDR and the SCC, as an impartial observer would, and still raise those considerations at subsequent points of our decision-making procedures.

Separating *evaluation* and *decision-making* is quite commonsensical: policy-makers are constrained by plans, rights, procedures and heuristics – reflecting the fact that they do not decide alone and that their choices are not made for themselves (Peres, 2021, 116). Our agent-relative considerations are linked to what we are willing or required to sacrifice; they should not influence how an *expert* assesses the value of the future. What evaluators should do is to clarify the true corresponding costs, so decision-makers can duly assume responsibility for their choices.

Conclusion

When we price the negative externalities caused by GHG, how do we bring future expected effects to present value – i.e., to a monetary measure, the social cost of carbon (SCC), that we can compare to present expenses? In the first part of this paper, we investigated two opposite philosophical stances about this: the descriptive approach allows us to include our *pure time preference* δ into our social discount rates (SDR), lest caring for the future becomes too demanding; while the prescriptive approach deems this unethical – it allows us to use only an "existential risk" rate for δ, instead. Moreover, we highlighted that this disagreement might fail a test of public reason: both sides present their arguments in ways that it is hard to expect that every reasonable person (with different moral conceptions) would accept. In addition, we have seen that it is hard to fit important considerations into this framework, such as those regarding ecological economists, or the possibility of global catastrophes.

We have shown ways to evade this problem. We concede that it might be justifiable for policymakers to adopt interest rates for social discount rates to assess short-term projects – as these reflect relevant macroeconomic conditions and provide a good proxy for opportunity costs; in such cases, what we gain with a more complex analysis might well be negligible. This does not apply to projects measured in decades, though – much less to intergenerational projects such as climate change mitigation. Then, we should choose a value for δ and calculate the SDR; we could still make the process more representative, by aggregating the opinions of the experts (adopt declining rates) or holding democratic deliberations. Or, as briefly mentioned in the last section, we can separate the activities of *evaluation* and *decision-making*: the evaluator may assume $\delta = 0$ to calculate the SCC, and leave for the decision-maker the task of trading it off against other considerations, even agent-relative ones – such as the opportunity costs related to economic growth and poverty in the near future, or future catastrophic risks and ecosystems collapse.

For climate change, though, there is an easier way out, as the core of the decision has already been made: 196 states have signed the Paris Agreement, meant to maintain the increase in average global temperature inferior to 2 °C (3.6 °F) above pre-industrial levels – and preferably below 1.5 °C (2.7 °F); this will likely require cutting global GHG emissions in half by 2030, and phasing them out by 2050. Similar to the Montreal Protocol, this is the result of weighing many considerations on global development, precaution against catastrophes, and long-term coordination. So, instead of trying to compute future expected damages of climate change (the SCC), an evaluator can calculate what carbon price would be consistent with achieving that goal (i.e., a target-consistent price). Given the scope of this analysis, the choice of the SDR does not impact the outcome so much; and the corresponding price then will be based on a legal norm – with no need to further discuss, e.g., philosophical considerations concerning the relative moral weight of the future.

Despite already being adopted by major institutions, the target-consistent pricing approach is not well represented in the economics literature, and it is almost ignored by philosophers in general – perhaps precisely because it does not lead to polemical debates. That is unfortunate, since, as we have seen above, it offers interesting perspectives for political economists and philosophers to analyze climate policies.

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