



Discounting by committee[☆]

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ABSTRACT

We study a dynamic social choice problem in which a sequence of committees must decide how to consume a public asset. A committee convened at time t decides on consumption at t , accounting for the behaviour of future committees. Committee members disagree about the appropriate value of the pure rate of time preference, but must nevertheless reach a decision. If each committee aggregates its members' preferences in a utilitarian manner, the collective preferences of successive committees will be time inconsistent, and they will implement inefficient consumption plans. If however committees decide on the level of consumption by a majoritarian vote in each period, they may improve on the consumption plans implemented by utilitarian committees. Using a simple model, we show that this occurs in empirically plausible cases. Application to the problem of choosing the social discount rate is discussed.

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1. Introduction

Suppose that a society needs to decide on an intertemporal consumption plan for some public asset. A committee is convened at each point in time, and tasked with determining how much to consume in the current period. The members of each committee have differing opinions about the pure rate of social time preference (PRSTP), or utility discount rate, that should be applied to this problem. Some favour a high discount rate, while others believe that different time periods should be treated more equally, and thus favour a low discount rate. Moreover, the current committee knows that future consumption choices will also be made by committees exhibiting similar disagreements on discount rates. How should such committees proceed, given the heterogeneity in opinions on discount rates?

Although it may seem abstract, this question is inspired by an important practical problem in public economics: how should governments discount future utilities when evaluating public policy decisions? The appropriate normative value of the PRSTP has been

debated at least since Ramsey's (1928) seminal work on optimal national savings. Subsequent commentators have argued the merits of a variety of values for the PRSTP without a clear 'best' value emerging, and different governments have adopted different values for public decision-making. The social time preferences economists prescribe for public decision-making today are still highly heterogeneous (Arrow et al., 2013). This has been highlighted by the long-standing debate about the appropriate value of the PRSTP for the evaluation of climate change policies (Nordhaus, 2008; Stern, 2007). A recent survey of experts on social discounting (Drupp et al., forthcoming) shows significant variation in their prescriptions for the PRSTP (see Fig. 2).

Given the persistent normative disagreements about the PRSTP, it is natural to ask whether methods from social choice theory can be used to obtain a compromise between opposing viewpoints. In this paper, we examine perhaps the most common such methods: utilitarian aggregation and majoritarian voting. Under the utilitarian approach, committees seek to maximize a weighted sum of the time preferences advocated by their members in each period, while under majoritarian voting, committee members vote on the current level of consumption, and a Condorcet winner (if it exists) is implemented.

The utilitarian approach is appealing, as Jackson and Yariv (2015) have shown that any social choice rule that is non-dictatorial

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(i.e. sensitive to the preferences of more than one individual) and respects unanimity (roughly, if everyone prefers consumption stream \mathbf{C} to \mathbf{C}' then \mathbf{C} is socially preferred to \mathbf{C}') is equivalent to utilitarianism in the setting we study. However, while no-dictatorship and unanimity are compelling properties in isolation, they lead to a time inconsistency problem when combined with another assumption: time invariance (i.e. preferences over future consumption streams are identical in all time periods). Millner and Heal (2018) have argued that while time invariance is an excessively strong assumption in intra-group intertemporal decision problems (e.g. allocation between family members), it is plausible when modeling inter-group choices like those facing the successive committees studied in this paper. Thus, if a utilitarian approach to resolving disagreements is adopted, the collective preferences of successive committees will conflict with one another. Rational utilitarian committees will anticipate the actions of future committees, and react optimally to them, inducing a dynamic game between committees. The equilibrium of this game will be seen as inefficient by every committee.

The inefficiency of the consumption path implemented by utilitarian committees means that it is possible that voting could give rise to superior outcomes. If each committee holds a majoritarian vote on the level of current consumption, and members of the current committee rationally anticipate the outcome of future votes, we show that the equilibrium consumption path under voting will correspond to the optimal plan of the median member. Further analysis shows that a majority of committee members will prefer this voting equilibrium to the utilitarian equilibrium, regardless of the choice of aggregation weights in the utilitarian objective function. We extend this result to welfare comparisons, finding conditions on the distribution of PRSTPs under which the voting equilibrium is superior to the utilitarian equilibrium according to utilitarian committees' own objective functions. Using survey data on economists' recommended values for the PRSTP, we show that these conditions are often satisfied in practice. There is thus a sense in which voting may be 'self-stable' (Barbera and Jackson, 2004) relative to utilitarianism: a majoritarian vote between voting and utilitarian aggregation of PRSTPs will always lead to voting being adopted as the aggregation method. By contrast, a utilitarian comparison of voting and utilitarian equilibria will often favour voting.

The paper is structured as follows. We discuss related literature next, before developing our simple model of dynamic public choice with disagreements about the PRSTP in Section 2. This section contains the bulk of our analysis. We first derive the equilibrium behaviour of utilitarian committees, and show that they choose inefficient consumption paths. Next, we derive the equilibrium behaviour of committees that vote on consumption. Finally, we contrast these two preference aggregation methods, deriving results on committee members' ordinal preferences between the implemented equilibria, and comparing them from the perspective of utilitarian committees' own collective preferences. Section 3 discusses the results, and draws some lessons for the choice of the PRSTP in social discounting formulae.

1.1. Related literature

The literature on aggregation of opinions about social discount rates stems from the work of Weitzman (1998, 2001), who focuses on aggregation of expert opinions on real (i.e. consumption) discount rates, rather than pure time preferences. Weitzman takes a sample of opinions as to the appropriate (constant) real discount rate for project evaluation, treats these as uncertain estimates of the 'true' underlying rate, and takes expectations of the associated discount factors to derive a declining term structure for the 'certainty equivalent' real discount rate. As Freeman and Groom (2015) observe, opinions

about real discount rates conflate ethical views about welfare parameters such as the PRSTP with empirical estimates of consumption growth rates – they mix tastes and beliefs (see Dasgupta, 2001, pp. 187–190 and Gollier, 2016 for further discussions of Weitzman's approach). This suggests that it is important to pursue approaches that treat preference aggregation as a distinct problem. Our work highlights difficulties that may arise in practice when decision-makers with a distribution of ethical views attempt to form consensus social preferences, and contrasts the equilibrium outcomes that arise from standard preference aggregation methods.

The possibility that utilitarian preference aggregation could lead to time inconsistency when agents favour different values of the PRSTP has been noted by several authors (Marglin, 1963; Feldstein, 1964; Jackson and Yariv, 2015). Millner and Heal (2018) argue that, while this is not a generic feature of utilitarianism as a normative theory (see also e.g. Hammond, 1996), as a positive matter it is likely to occur when distinct groups of agents are tasked with decision-making in each time period, as occurs in the setting we study here. Our work thus falls somewhere on the boundary between normative and positive analysis: we study *positive* properties of the equilibrium consumption choices that would be implemented by sequences of committees that seek to aggregate their members' *normative* views on social time preferences. Alternative approaches to the aggregation of time preferences are pursued by Gollier and Zeckhauser (2005), Jouini et al. (2010), and Millner (2018).

2. The model

We focus on a sequential social choice problem in which a sequence of committees, each composed of $N > 1$ members indexed by $i = 1 \dots N$, must choose how to consume a public asset. For the sake of analytical convenience, we assume that N is odd, and that time is continuous. Each committee exists for a single moment in time, and controls the value of consumption in that moment alone. Committee members are drawn from a stable population at each moment, and their tenure lasts for only that moment. The distribution of members' opinions on the PRSTP is assumed to be independent of time.¹

The public asset committees must manage is modeled as a risk-free asset S that yields a constant (net) rate of return $r \geq 0$. If the asset is consumed at rate C_τ at time τ , the dynamics of S are given by

$$\dot{S} = rS_\tau - C_\tau \quad (1)$$

where $\dot{S} = dS/d\tau$, and the initial value of S at time τ_0 is S_0 . This simple model has many possible interpretations. For example, S could be a stock of environmental quality, a publicly owned natural resource, or the value of a country's sovereign wealth fund.

Member i in a committee constituted at time τ is assumed to have discounted utilitarian preferences over future consumption streams denoted by $V_{i\tau}$, with a PRSTP $\delta_i > 0$:

$$V_{i\tau} = \int_\tau^\infty U_i(C_t) e^{-\delta_i(t-\tau)} dt. \quad (2)$$

Committee members have heterogeneous opinions on the appropriate value of the PRSTP, i.e. there exist indices i, j such that $\delta_i \neq \delta_j$. We will interpret δ_i as i 's *normative* opinion on the appropriate rate of social impatience. Thus, the preferences (Eq. (2)) do *not* represent members' private preferences over their own consumption, but rather

¹ If N is reasonably large, this is a mild assumption, as sampling variation in members' preferred values of the PRSTP will be small. All the results below can be easily extended to the case of a continuum of committee members (i.e. zero sampling variation) by taking the limit as $N \rightarrow \infty$.

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