VALUING THE FAR-OFF FUTURE: DISCOUNTING AND ITS ALTERNATIVES

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Abstract

Discounting has a central and controversial role in long-term policy evaluation: *central* because the result frequently turns upon the particular discount rate employed, and *controversial* because exponential discounting can generate recommendations that appear contrary to commonsense. This chapter reviews social discounting, addresses the arguments for and against a zero pure rate of time preference, outlines recent research suggesting that social discount rates should decline over time, and finally considers some alternatives to discounting in social decision-making.

Keywords: discounting, far-distant future, long-term policy, declining discount rates, hyperbolic discounting, climate change

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Table of Contents

1. Introduction

The challenges of climate change, biodiversity protection, declining fish stocks and nuclear waste management mean that policy makers now have to take important decisions with impacts decades, if not centuries, into the future. The way we value the future is crucial in determining what action to take in response to such challenges.

Whenever economists think about intertemporal decisions, whether concerning trade-offs between today and tomorrow or between the present generation and our distant descendents, we reach almost instinctively for the discount rate. This instinct is not without good reason — the practice of discounting, embedded in social cost benefit analysis, has served us extremely well in formulating policy over the short to medium term. For longer term decisions, however, results from this trusty tool can appear increasingly contrary to intergenerational equity and sustainable development. In response, some have advocated jettisoning the tool altogether and turning to alternative methods of valuing the future. Others take the view that these long term challenges bring trade-offs between intergenerational efficiency and equity into sharp focus and it is no surprise that social cost benefit analysis, which generally ignores distributional considerations, supports efficient but unsustainable projects. They conclude that the tool is functioning properly, but must be employed in a framework that guarantees intergenerational equity. A third hypothesis is that although the tool works correctly for short-term decisions, it needs repairing and refinement for long-term decisions. We will see that if future economic conditions are assumed to be uncertain — a reasonable assumption when looking decades or centuries into the future — using a constant discount rate is approximately correct over shorter time periods (up to about 30 years), but is increasingly incorrect thereafter. The more accurate procedure is to employ a declining discount rate over time.

This chapter reviews social discounting (section 2), addresses the arguments for and against a zero discount rate (section 3), outlines the research on declining social discount rates (section 4), and considers some alternatives to discounting in social decision-making (section 5).

2. Exponential discounting and its implications

2.1 Cost-benefit analysis, efficiency and equity

Economics has a long tradition of separating efficiency from equity, and social cost-benefit analysis is no exception, where the Kaldor-Hicks criterion is relied upon to justify projects that are efficient.[1] Distributional effects are ignored, which is legitimate when the decision maker also controls the tax system and can redistribute income to achieve equity. In practice, of course, the distributional effects of some projects are important, and cost benefit analysis should be employed as a *guide* for decision making rather than a substitute for judgment (Lind, 1982). It can be a very useful guide because, when done properly, it focuses our attention on the valuation of the most important impacts of a decision.

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[1] Recall that a change passes the Kaldor (1939) criterion if the gainers could compensate the losers, and the Hicks (1940) criterion if the losers could not pay the gainers to prevent the change. Compensation is not actually required.

For intergenerational investments, distributional effects are often especially important because there is no intergenerational tax system available to redistribute wealth (Lind, 1995; 1999). Although economic instruments can create wealth transfers between generations (such as certain changes to tax law and fiscal policy), there is no guarantee that the transfer will reach the intended recipients when there are many intervening generations. Drèze and Stern (1990) note that "hypothetical transfers of the Hicks-Kaldor variety…are not relevant when such transfers will not take place". In such circumstances, explicit consideration of intergenerational equity appears to be necessary.

2.2 Estimating the social discount rate

In social cost benefit analysis, the social discount function, *D(t)*, is used to convert flows of future cost and benefits into their present equivalents. If the net present value of the investment exceeds zero, the project is efficient. The social discount rate, *s(t)*, measures the annual rate of decline in the discount function, *D(t)*. In continuous time, the two are connected by the equation:

$$D(t) = \exp\left[-\int_0^t s(\tau)d\tau\right] \tag{1}$$

A constant social discount rate implies that the discount function declines exponentially, *D(t)* = $\exp(-st)$.[2]

[2] The discrete time analogue of the discount function is the discount *factor*, given by: $D(t) = 1/(1+s)^t$.

As practitioners know, the value of the social discount rate is often critical in determining whether projects pass social cost benefit analysis. As a result, spirited debates have erupted in the past over its correct conceptual foundation. Happily, the debate was largely resolved at a 1977 conference, where Lind (1982, p 89) reported that the recommended approach is to `equate the social rate of discount with the social rate of time preference as determined by consumption rates of interest and estimated on the basis of the returns on market instruments that are available to investors'. Under this approach, the social discount rate, for a given utility function, can be expressed by the well-known accounting relation:

$$s = \delta + \mu g \tag{2}$$

where δ is the utility discount rate (or the rate of pure time preference), μ is the elasticity of marginal utility and g is the rate of growth of consumption per capita. Even if the utility discount rate δ is zero, the social discount rate is positive when consumption growth, g, is positive and $\mu > 0$. Equation (2) shows that in general, the appropriate social discount rate is *not* constant over time, but is a function of the expected future consumption path.

2.4 The discounting dilemma

In recent years, debates about the correct foundation for the social discount rate have been replaced by controversy over discounting and intergenerational equity. To see that evaluation of long-term investments is extremely sensitive to the discount rate, observe that the present value of £100 in 100 years time is £37 at a 1% discount rate, £5.2 at 3%, £2 at 4% and only 12p at 7%. Because small changes in the discount rate have large impacts on long-term policy outcomes, arguments about the 'correct' number have intensified.

For instance, the marginal damage from emissions of carbon dioxide is estimated by the FUND model (Tol, 2005) to be \$58/tC at a 0% utility discount rate, \$11/tC at a 1% utility discount rate, with damages of -\$2.3/tC (i.e. net *benefits*) at a 3% utility discount rate. Indeed, exponential discounting at moderate discount rates implies that costs and benefits in the far future are effectively irrelevant. While this might be entirely appropriate for individuals (who will no longer be alive), many people would argue that this is an unsatisfactory basis for public policy.

3. Zero discounting

Given these difficulties, some people find it tempting to suggest that we should simply not discount the cash flows in social cost-benefit analysis. But not discounting amounts to using a social discount rate of s = 0%, which is extremely dubious given our experience to date with positive consumption growth: $g > 0$ in equation (2). In contrast, a credible argument for employing a zero *utility* discount rate (δ = 0) can be advanced, based upon the ethical position that the weight placed upon a person's utility should not be reduced simply because they live in the future.

Indeed, a string of eminent scholars have famously supported such a position, including Ramsey (1928), Pigou (1932), Harrod (1948) and Solow (1974), and even Koopmans (1965) expressed an \`ethical preference for neutrality as between the welfare of different generations'. Broome (1992) provides a coherent argument for zero discounting based on the presumption of impartiality found both in the utilitarian tradition (Sidgwick, 1907; Harsanyi, 1977) and also in Rawls (1971), who concluded that `there is no reason for the parties [in the original position] to give any weight to mere position in time.'[3]

However, not all philosophers and economists accept the presumption of impartiality. Arrow (1999), for instance, prefers the notion of agent-relative ethics advanced by Scheffler (1982). Even if one does accept a *presumption* of impartiality and zero discounting, there are four counterarguments that might overturn this presumption: the `no optimum' argument, the `excessive sacrifice' argument, the `risk of extinction' argument, and the `political acceptability' argument. We examine all four.

First, Koopmans (1960, 1965) demonstrated that in an infinite horizon model, there is no optimum if a zero rate of time preference is employed. Consider a unit of investment today that yields a tiny but perpetual stream of consumption. Each unit investment causes a finite loss of utility today, but generates a small gain in utility to an infinite number of generations. It follows that no matter how low current consumption, further reductions in consumption are justified by the infinite benefit provided to future generations. The logical implication of zero discounting is the impoverishment of the current generation. Furthermore, the same logic applies to every generation, so that each successive generation would find itself being impoverished in order to further the well-

[3] Broome disagrees with Rawls, but on the grounds that Rawls confuses impartiality with generation neutrality.

being of the next.[4] Broome (1992), however, counters that humanity will not exist forever.[5] Furthermore, Asheim et al. (2001) demonstrate that zero utility discounting (or `equity', as they term it) does not rule out the existence of an optimum under certain reasonable technologies.[6]

Second, even if we suppose a finite but large number of future generations, a zero discount rate is argued to require excessive sacrifice by the current generation, in the form of extremely high savings rates. Arrow (1999) concludes that the ethical requirement to treat all generations alike imposes morally unacceptable and excessively high savings rates on each generation. But Parfit (1984) has argued that the excessive sacrifice problem is not a reason to reject zero utility discounting. Rather, it should be resolved by employing a utility function with a minimum level of well-being below

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[4] Dasgupta and Heal (1979, p 267-8) provide an equivalent example. In an exhaustible resources model with zero discounting, whatever the current rate of extraction, it is always better to lower it.

[5] Broom in fact asserts that `the earth will not exist for ever', but this is not really the point. It is the existence of humanity — on earth or otherwise — that is important in an anthropocentric welfare function.

[6] The technologies must be `immediately productive', meaning that there are negative transfer costs to the future if the future is worse off than the present, and `eventually productive', meaning that there exists a feasible and efficient path with constant utility. A one-sector increasing and concave production function, for instance, satisfies these two requirements.

which no generation should fall.[7] Asheim and Buchholz (2003) point out that the `excessive sacrifice' argument can be circumvented, under plausible technologies, by a utility function which is more concave.

Third, each generation has a non-zero probability of extinction. Suppose that the risk of extinction follows a Poisson process such that the conditional probability of extinction at any given time is constant. Yaari (1965) demonstrated that this is equivalent to a model with an infinite time horizon where utility is discounted at the (constant) Poisson rate. As such, accounting for the risk of extinction is mathematically identical to positive utility discounting. While admitting the strength of this argument, Broome (1992) asserts that extinction risk and the pure rate of time preference `should be accounted for separately'. But extinction risk is clearly not project-specific, so it would be accounted for in the same way across all projects (except projects aimed at reducing an extinction risk). Irrespective of how this is done, the mathematical effect is the same — the well-being of future generations is effectively discounted. Hence Dasgupta and Heal (1979) argue that `one might find it ethically feasible to discount future utilities as positive rates, not because one is myopic, but because there is a positive chance that future generations will

[7] As Dasgupta et al. (1999) point out, this type of constraint does not admit trade-offs between competing goals. Such constraints are therefore frowned upon by economists. If the goals are not competing, the shadow price of the constraint is zero; if they are competing the shadow price is positive.

not exist'. Given that the risk of human extinction is probably (and hopefully) quite low, the appropriate utility discount rate would be very small.[8]

Finally, Harvey (1994) rejects zero utility discounting on the basis that it is so obviously incompatible with the time preference of most people that its use in public policy would be illegitimate. He states that the notion that events occurring in ten thousand years are as important as those occurring now simply does not pass `the laugh test'.

In summary, the `no optimum' argument and the `excessive sacrifice' argument for positive time preference are refutable. In contrast, the `risk of extinction' argument provides a sound conceptual basis for a positive utility discount rate. This is backed up at a practical level by the `political acceptability' argument, or by the more fundamental view that impartiality is an inappropriate ethical standpoint. Overall, the arguments for a very small positive utility discount rate appear persuasive. Zero discounting is not intellectually compelling.

4. Declining discount rates

Over recent years, several persuasive theoretical reasons have been advanced to justify a social discount rate that declines as time passes.[9] Declining discount rates are appealing to people concerned about intergenerational equity, but perhaps more importantly, they

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[8] It is arguable that the appropriate discount rate should be further reduced by excluding extinction risks caused by humans on the basis that future generations should not be penalised for risks created by the actions of present and past generations.

[9] Some of these proposals are considered in section 5.

are likely to be *necessary* for achieving intergenerational efficiency. Groom et al (2005) provide a detailed review of the case for declining discount rates. This section provides an overview of the main arguments.

4.1 Evidence on individual time preference

Evidence from experiments over the last couple of decades suggests that humans use a declining discount rate, in the form of a `hyperbolic discounting' function, in making intertemporal choices.[10] In these experiments, people typically choose between different rewards (e.g. money, durable goods, sweets or relief from noise) with different delays, so that an implicit discount function can be constructed.[11] The resulting discount functions suggest that humans employ a higher discount rate for consumption trade-offs in the present than for trade-offs in the future. While other interpretations, such as similarity relations (Rubinstein, 2003) and sub-additive discounting (Read 2001), are possible, the evidence for hyperbolic discounting is relatively strong.

Pearce et al (2003) present the argument that if people's preferences count, and these behavioural results reveal underlying preferences, then declining discount rates ought to be integrated into social policy formulation. Pearce et al recognise, however, that the assumptions in this chain of reasoning might be disputed. First, as hyperbolic discounting provides an explanation for procrastination, drug addiction, undersaving, and organisational failure, the argument that behaviour reflects preferences is weakened. Second, Pearce et al point out that Hume would resist concluding that the

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[10] Interestingly, evidence suggests that some animals do likewise. Green and Myerson (1996) and Mazur (1987) provide summaries of evidence on the behaviour of birds.
[11] See, for instance, Thaler (1981), Cropper et al. (1994), Kirby (1997), Harris and Laibson (2001) and the reviews by Frederick et al (2002) and Ainslie (1992).

government *should* discount the future hyperbolically because individual citizens *do*. The recent literature on `optimal paternalism' suggests, amongst other things, that governments may be justified in intervening not only to correct externalities, but also to correct `internalities' — behaviour that is damaging to the actor.[12] Whether or not one supports a paternalistic role for government, one might question the wisdom of adopting a schedule of discount rates that explains procrastination, addiction and potentially the unforeseen collapses in renewable resource stocks (Hepburn, 2003).

4.2 Pessimism about the future

Equation (2) makes it clear that the consumption rate of interest— and thus also the social rate of time preference in a representative agent economy — is a function of consumption growth. If consumption growth, g, will fall in the future, and the utility discount rate, δ, and aversion to fluctuations, μ, are constant, it follows from equation (2) that the social discount rate also declines through time. Furthermore, if decreases in the *level* of consumption are expected — so that consumption growth is negative — the appropriate social rate of time preference could be negative. Declines in the level of consumption are impossible in an optimal growth model in an idealised economy with productive capital. For the social discount rate to be negative, either capital must be unproductive or a distortion, such as an environmental externality, must have driven a wedge between the market return to capital and the consumption rate of interest (Weitzman, 1994).

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[12] Recent work on sin taxes by O'Donoghue and Rabin (2003) provides an example of this type of approach. See also Feldstein (1964), who asks whether the government should act in the best interests of the public, or do what the public wants.

4.3 Uncertainty

It is an understatement to say that we can have little confidence in economic forecasts several decades into the future. In the face of such uncertainty, the most appropriate response is to incorporate it into our economic models. Suppose that the future comprises two equally likely states with social discount rate either 2% or 6%. Discount *factors* corresponding to these two *rates* are shown in Table 1. The average of those discount factors is called the `certainty-equivalent discount factor', and working backwards from this we can find the `certainty-equivalent discount rate', which starts at 4% and declines asymptotically to 2% as time passes.[13] In this uncertain world, a project is efficient if it passes social cost-benefit analysis using the certainty-equivalent discount rate, which declines through time.

Table 1: Numerical example of a declining certainty-equivalent discount rate

Time (years from present)	**1**	**10**	**50**	**100**	**200**	**400**
Discount factor for 2% rate	0.98	0.82	0.37	0.14	0.02	0.00
Discount factor for 6% rate	0.94	0.56	0.05	0.00	0.00	0.00
Certainty-equivalent discount factor	0.96	0.69	0.21	0.07	0.01	0.00
Certainty-equivalent (average) discount rate	4.0%	3.8%	3.1%	2.7%	2.4%	2.2%

The two key assumptions in this example are that the discount rate is uncertain and *persistent*, so that the expected discount rate in one period is correlated with the discount rate the period before. If these two assumptions hold, intergenerational efficiency requires a declining social discount rate (Weitzman 1998, 2001).

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[13] The certainty-equivalent average discount rate is given by $s_c(t) = (1/D_c(t))^{1/t} - 1$, where $D_c(t)$ is the certainty-equivalent discount factor.

The particular shape of the decline is determined by the specification of uncertainty in the economy. Newell and Pizer (2003) use data on past US interest rates to estimate a reduced-form time series process which is then employed to forecast future rates. The level of uncertainty and persistence in their forecasts is high enough to generate a relatively rapid decline in the certainty-equivalent discount rate with significant policy implications. While econometric tests reported in Groom et al (2006) suggest that Newell and Pizer (2003) should have employed a state-space or regime-shifting model instead, their key conclusion remains intact — the certainty-equivalent discount rate declines at a rate that is significant for the appraisal of long-term projects.

Gollier (2001, 2002a, b) provides an even more solidly grounded justification for declining discount rates by specifying an underlying utility function and analysing an optimal growth model. He demonstrates that a similar result can hold, for certain types of utility functions. Under uncertainty, the social discount rate in equation (2) needs to be modified to account for an additional prudence effect:

$$s = \delta + \mu g - \frac{1}{2}\mu P \,\mathrm{var}(g) \qquad (3)$$

where P is the measure of relative prudence introduced by Kimball (1990). This prudence effect leads to `precautionary saving', reducing the discount rate. Moreover, if there is no risk of recession and people have decreasing relative risk aversion, the optimal social discount rate is declining over time.

These two sets of results show that employing a declining social discount rate is *necessary* for intergenerational efficiency (Weitzman, 1998) and also for intergenerational optimality under relatively plausible utility functions (Gollier 2002a, b). The theory in this section provides a compelling reason for employing declining discount rates in social cost benefit analysis.

4.4 Intergenerational equity

Not only are declining social discount rates necessary for efficiency, it turns out that they are also necessary for some specifications of intergenerational equity. Chichilnisky (1996, 1997) introduces two axioms for sustainable development requiring that the ranking of consumption paths be sensitive to consumption in both the present and the very long run. Sensitivity to the present means that rankings are not solely determined by the 'tails' of the consumption stream. Sensitivity to the future means that there is no date after which consumption is irrelevant to the rankings. These axioms lead to the following criterion:

$$U = \alpha \int_0^\infty u(c(t))\Delta(t)dt + (1-\alpha)\lim_{t\to\infty} u(c(t)) \tag{3}$$

where $\Delta(t)$ is the utility discount function, and $0 < \alpha < 1$ is the weight placed on the integral part. Heal (2003) notes that the Chilchilnisky criterion has no solution under standard exponential discounting, where $\Delta(t) = \exp(-\delta t)$. It makes sense to initially maximise the integral part, before switching to maximising the asymptotic path. This refuses to yield a solution, however, but it is always optimal to delay the switching point, because this increases the integral part with no reduction in the asymptotic part. Interestingly, however, equation (3) does have a solution provided that the utility discount rate, δ, declines over time, asymptotically approaching zero. In short, a declining utility discount rate is necessary for a solution satisfying Chichilnisky's axioms of sustainable development.

Li and Löfgren (2000) propose a similar model which examines a society of two individuals, a utilitarian and a conservationist. The implication of this model is similarly that the utility discount rate must decline along the optimal path.

4.5 Conclusions

Incorporating uncertainty into social cost benefit analysis leads to the conclusion that a declining social discount rate is necessary for efficient decision-making. Indeed, it was on this basis that the United Kingdom government has incorporated declining social discount rates in its most recent HM Treasury (2003) Green Book, which contains the official guidance on government project and policy appraisal. Pessimistic future projections and, to a lesser extent, the evidence from individual behavioural could further support that conclusion. Finally, the fact that declining discount rates also emerge from specifications of intergenerational equity employed by Chilchilnisky (1996, 1997) and Li and Lofgren (2000) suggests that they are an ideal way to navigate between the demands of intertemporal efficiency and the concerns of intergenerational equity.

5. Alternatives to discounting

Although declining discount rates provide an appealing solution to the dual problems of intergenerational efficiency and equity, there are other possible solutions. Schelling (1995) proposes an alternative based around ignoring discount rates and specifying a richer utility function. Kopp and Portney (1999) and Page (2003) suggest using voting mechanisms. Finally, discounting reflects a consequentialist ethical position, so alternatives based upon deontological ethics are considered.

5.1 Schelling's utility function approach

Schelling (1995) argues that investments for people in the far-distant future should not be evaluated using the conventional discounted cash flow framework. Instead, such investments should be considered much like foreign aid. For instance, investment now to reduce future greenhouse gas emissions should not be viewed as saving, but rather as a transfer of consumption from ourselves to people living in the distant future, which is similar to making sacrifices now for the benefit of our contemporaries who are distant from us geographically or culturally. The only difference is that the transfer mechanism is no longer the 'leaky bucket' of Okun (1975), but rather an 'incubation bucket', where the gift multiplies in transit. Given that people are generally unwilling to make sacrifices for the benefit of richer people distant in geography or culture, we should not expect such sacrifices for richer people distant in time.

In other words, the 'utility function approach', as Schelling (1995) calls it, would drop the use of a discount rate, and instead present policy makers with an menu of investments and a calculation of the utility increase in each world region (and time period) for each investment. This approach has the merit of insisting on transparency in the weights placed on consumption flows at each point in time and space, which is to be welcomed. However, debate would focus on the appropriate utility function to employ to value consumption increases in different regions at different times. Ultimately, in addition to reflecting marginal utilities at different points in time and space, the weights would also have to reflect the human tendency to discount for unfamiliarity along temporal, spatial and cultural dimensions.

5.2 Voting mechanisms

Many scholars have argued that although discounting is appropriate for short-term policy evaluation, it is stretched to breaking point by complex long-term challenges such as climate change. For instance, global climate policy is likely to have non-marginal effects on the economy, implying that conventional consumption discounting is inappropriate. Consumption discounting rests on the assumption that the project or policy being evaluated is a small perturbation on the business as usual path. If the project is non-marginal, then the consumption discounting 'short cut' is inapplicable, and a full welfare comparison of different paths is necessary instead.[14]

Of course, conducting a full welfare comparison involves a certain amount of complexity. Alternatives to the welfare economics approach include the use of mock referenda, proposed by Kopp and Portney (1999), where a random sample of the population would be presented with a detailed description of the likely effects — across time and space — of the policy being implemented or not. The description would include all relevant information, such as the full costs of the policy and even the likelihood of other countries taking relevant action. Respondents would then vote for or against the policy. By varying the estimate of the costs for different respondents, a willingness to pay locus for the policy would be determined.

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[14] This is the approach adopted in Stern (2006). Further background is in Hepburn (2006).

Their approach has the appeal of valuing the future by asking citizens directly, rather than by examining their behaviour or by reference to particular moral judgments. Problems with this approach, as Kopp and Portney (1999) note, include the usual possible biases in stated preference surveys and the difficulty of providing adequate information for an appropriate decision on such a complex topic.

Page (2003) also proposes that voting should be considered as an alternative to discounted cash flow analysis for important long-term public decisions. In contrast to cost-benefit analysis, with its emphasis on achieving efficiency, he notes that voting mechanisms (with one-person–one-vote) are more likely to produce fair outcomes.

One difficulty with both proposals is that the people affected by the policy — future human being — remain disenfranchised, just as they are on current markets. Unlike Kopp and Portney, Page tackles this problem by proposing to hypothetically extend voting rights to unborn future generations. Under the (unrealistic) assumption that there will be an infinite number of future generations, he concludes that intergenerational voting amounts to an application of the von Weizsäcker (1965) overtaking criterion. This leads to a dictatorship of the future, so `safeguards' protecting the interests of the present would be needed which, Page argues, would be easy to construct given the position of power of the present generation.

The challenge with this proposal is to make it operational. Without safeguards, the implication is that the present should impoverish itself for future generations. As such, these safeguards would constitute the crux of this proposal. Determining the appropriate safeguards amounts to asking how the interests of the present and the future should be balanced, and this appears to lead us back to where we started, or to employing a different ethical approach altogether.

5.3 Deontological approaches

Sen (1982) argues that the welfare economic framework is insufficiently robust to deal with questions of intergenerational equity because it fails to incorporate concepts of liberty, rights and entitlements as ends in themselves. He considers an episode of torture, where the person tortured (the `heretic') is worse off and the torturer (the `inquisitor') is better off after the torture. Suppose that although the inquisitor benefits from the torture, he is still worse off than the heretic. Then the torture is justified under a utilitarian or Rawlsian social welfare function. Sen (1982) contends that society may want to grant the heretic a right to personal liberty that cannot be violated merely to achieve a net gain in utility or an improvement for the worst-off individual. He adds that an analogy between pollution and torture is `not absurd', and that perhaps the liberty of future generations is unacceptably compromised by the present generation's insouciance about pollution.

If the consequentialist foundations of cost-benefit analysis are deemed inadequate, discounted cash flow analysis must be rejected where it generates results that contravene the rights of future generations. Howarth (2003) lends support for this position, arguing that although cost-benefit analysis is useful to identify potential welfare improvements, it is trumped by the moral duty to ensure that opportunities are sustained from generation to generation. Page (1997) similarly argues that we have a duty — analogous to a constitutional requirement — to ensure intergenerational equity is satisfied before efficiency is considered.

Pigou (1932) agreed that such duties existed, describing the government as the `trustee for unborn generations'. But Schwartz (1978) and Parfit (1983) question whether the notion of a duty to posterity is well-defined, on the grounds that decisions today not only determine the welfare but also the identities of future humans. Every person born, whether wealthy or impoverished, should simply be grateful that, by our actions, we have chosen them from the set of potential persons. Howarth (2003) answers that, at a minimum, we owe well-defined duties to the newly born, thus creating duties for at least an expected lifetime.

Assuming a duty to posterity is conceptually possible, the final step is to specify the content of the duty. Howarth (2003) reviews several different formulations of the duty, which ultimately appear to amount to a duty to ensure either weak or strong sustainability. As such, deontological approaches comprise the claim that intergenerational equity is captured by a (well-defined) duty of sustainability to future generations, and that this duty trumps considerations of efficiency. While these approaches do not reject the use of discounting, they subjugate efficiency considerations to those of rights and/or equity. This is not inconsistent with the view, expressed in section 2.1 above, that cost benefit analysis is a guide for decision making rather than a substitute for judgment (Lind, 1982).

6. Conclusion

This chapter has explained why discounting occupies such an important and controversial place in long-term policy decisions. While intertemporal trade-offs will always be important, the developments reported in this chapter provide reason to hope that discounting may eventually become less controversial. Arguments for a zero social discount rate need not be taken seriously unless they are based upon extremely pessimistic future economic projections. Arguments for zero utility discount rates are more plausible but not ultimately convincing. Indeed, there is a good case for employing a positive, but very low, utility discount rate to reflect extinction risk.

Furthermore, the fact that declining social discount rates are necessary for efficiency reduces the degree of conflict between intergenerational equity and efficiency. Economists detest inefficiency, and it is surely only a matter of time before other governments adopt efficient (declining) social discount rates. If so, the discounting controversies of the future will concern the particular specification of economic uncertainty and the precise shape of the decline, rather than the particular (constant) discount rate.

Finally, even if declining discount rates reduce the tension between intergenerational equity and efficiency, they do not eliminate it. Discounting and cost-benefit analysis provide a useful guide to potential welfare improvements, but unless infallible mechanisms for intergenerational transfers become available, project-specific considerations of intergenerational equity will continue to be important. The ethical arguments, consequentialist and deontological, outlined in this chapter provide some guidance. Ultimately, however, the appropriate trade-off between equity and efficiency, integenerationally or otherwise, raises fundamental issues in political philosophy. Consensus is unlikely, if not impossible. At least the clarification that efficient discount rates should be declining reduces the domain of disagreement.

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