

Discounting the Future: Economics and Ethics

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How much do we care about people whose lives won't begin until long after our own have ended? How much *should* we care about them? These questions come up when we contemplate environmental projects that benefit people who are separated by many years or even by generations from those who pay the costs. Whether the interests of future generations will be at all significant in determining how much we should limit carbon emissions, preserve the ozone layer, or protect endangered species depends on whether a dollar's worth of future benefits is worth less than a dollar's worth of present costs—what economists mean by *discounting*.

Much controversy surrounds the practice of discounting. Divisive caricatures of the discounting wars pit economists, who allegedly view the environment as just another capital asset, against ethicists, who look out for the interests of people born in the future, and environmentalists, who advocate the inherent, noneconomic values in sustaining nature. In reality, discounting battles rage even among economists. Two leading experts on the economics of public projects, William Nordhaus of Yale University and Joseph Stiglitz of the president's Council of Economic Advisers, disagree over the appropriate way to discount the future costs and benefits of climate change.

When an issue has defied resolution for so long, perhaps the difficulty is a misunderstanding of the fundamental questions. Indeed, the difficulty may be that *all* the seemingly contrary positions on discounting have some validity. One cannot hope to resolve discounting debates among economists or to allay the intensifying criticisms of discounting

from those outside economics, but reflecting on the central arguments and illuminating the relationships between their economic and ethical sides may add a little light to the heat.

What is discounting?

One way to understand how discounting works is to compare it with the compounding of interest on savings. Most people are familiar with the way compounding interest increases the value of one's savings over time, in an accelerating way. For example, \$100 invested today at 6 percent interest will be worth \$106 in a year. Because the 6 percent interest will be earned on not just the initial \$100 but the added \$6 as well, the gains in the second year will be \$6.36. Over time, these compounding gains become substantial.

While compounding measures how much present-day investments will be worth in the future, discounting measures how much future benefits are worth today.

At 6 percent interest, the \$100 investment will be worth about \$200 in twelve years, \$400 in twenty-four years, and \$800 in thirty-six years. It will be worth around \$3,300 in sixty years and almost \$34,000 in a hundred years. A penny saved is more than a penny earned: after a century, the penny becomes \$3.40. In 1626, Dutch explorers bought Man-

hattan for a mere \$24; if that sum had been invested at just over 6 percent per year, it would have yielded more than \$40 billion in 1990—about the total income generated in Manhattan that year.

Discounting operates in the opposite way. While compounding measures how much present-day investments will be worth in the future, discounting measures how much future benefits are worth today. To figure out this discounted present value, we must first choose a discount rate to transform benefits a year from now into benefits today. If we choose the same discounting rate as the interest rate in the above example of compounding, \$106 a year from now would be equal in value to \$100 today. Discounting the benefits of a project that generates \$200 in twelve years by a discount rate of 6 percent per year would tell us that those benefits are worth \$100 today.

To economists, this is the same as saying that \$100 invested at an interest rate of 6 percent will generate \$200 in twelve years. For this reason, they often use the terms discount rate and interest rate interchangeably, although *discount rate* properly refers to how much we value future benefits today, while *interest rate* properly refers to how much present investments will produce over time.

The paramount consideration in assessing future environmental benefits is the size of the discount rate: The larger the discount rate, the less future benefits will count when compared with current costs. If the discount rate were 10 percent, \$200 in twelve years would be worth only about \$64 today; if the rate were 3 percent, the current value would be \$140. At a zero discount rate, \$1 of benefits in the future would be worth \$1 in cost today. Differences in discount rates become crucial for benefits spanning very long periods.

The obvious cases for and against discounting

The close relationship between interest rates and discount rates is the basis for

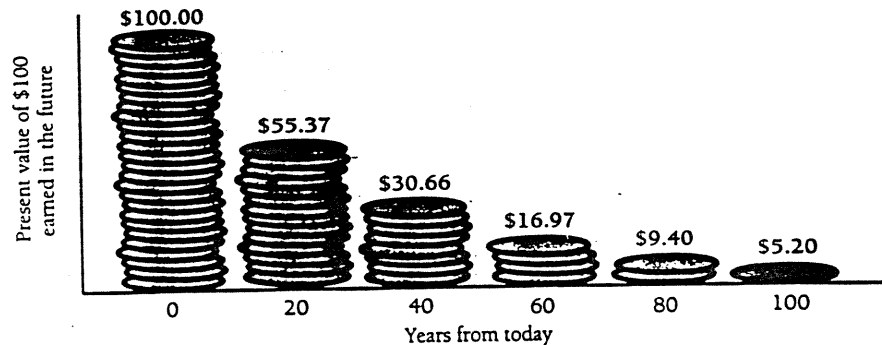
the obvious case in favor of discounting. Suppose that an environmental program costing \$100 today would bring \$150 in benefits twelve years from now. If other public or business projects yield 6 percent per year, however, those future benefits of \$150 would be "worth" only about \$75 today after discounting. By investing the \$100 today in one of these alternative projects, we could produce \$200 in benefits in twelve years, leaving \$50 more for the future.

Whether we view the environmental investment in terms of the present value of benefits (\$75 as compared with \$100) or in terms of an alternative investment that produces benefits of greater value (\$200 as compared with \$150), it fails the test of the market. Using a bit of economic jargon, we can call this market test the *opportunity-cost rationale* for discounting. Here, opportunity cost refers to the most value we can get by investing \$100 in something other than the environment. According to the opportunity-cost rationale, we should discount future benefits from a current project to see if these benefits are worth *at least* as much to people in the future as the benefits they would have if we invested current dollars in medical research, education, more productive technology, and so on.

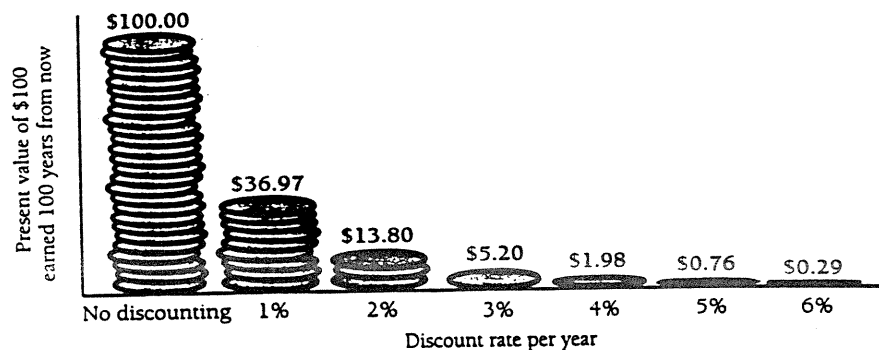
In effect, the opportunity-cost rationale tells us that our discount rate should be the market interest rate. Consequently, looking at the four factors that produce the interest rates that we see in financial markets will help explain what lies behind discount rates. The first factor is the level of economic activity. If investors want a lot of money for a lot of projects, they will have to pay a higher interest rate for loans; during slow economic times, investors will require fewer loans, leading to a lower interest rate. The second factor is inflation. Future dollars will be discounted if one cannot buy as much with them in the future as one can today. The third factor is risk: a guaranteed bird in the present hand may be worth a chancy two in the future bush. The fourth factor, and the most controversial one in environmental assessments, is what econo-

How much we value future dollars today: The effect of time and the discount rate

Discounting operates in the reverse direction of compounding. While compounding measures how much present-day investments will be worth in the future, discounting measures how much future benefits are worth today. The figure below shows how the discounted present value of future benefits can shrink to very small amounts as time goes on. Specifically, it shows how much \$100 earned now and in 20, 40, 60, 80, and 100 years is worth today when a 3 percent discount rate is applied.



Along with the passage of time, increases in the discount rate also can dramatically shrink the discounted present value of future benefits. The figure below shows how much \$100 in benefits 100 years from now would be worth today at discount rates ranging from 0 to 6 percent.



When we see how small variations in the timing or discounting of future benefits can make large differences in deciding how much the benefits are worth today, it's easy to understand why discounting can lead to such heated policy debates.

mists call *pure time preference*. This preference refers to the apparent fact that people require more than \$1 in promised future benefits in order to be willing to give up \$1 in goods today.

Critics of the opportunity-cost rationale often find that discounting leads to a present-day valuation of future environmental benefits that they believe is too low. Threats to life and nature from environmental degradation are notoriously hard to measure and, in the views of many, impossible to compare with the "mere" economic benefits that accrue

from investing in a business project. Moreover, the benefits from a business investment might accrue to the wealthy or be frittered away today, while the benefits from an environmental project are likely to be distributed more widely across society and into the future.

Environmental benefits may or may not be overestimated in policy evaluations, and they may or may not be distributed more equitably than the returns from other investments. Those well-known criticisms, however, apply to cost-benefit tests in any context. The specific case

against discounting fundamentally concerns pure time preference. A principle in most prominent ethical philosophies is that no individual's interests should count more than another's in deciding how social benefits should be distributed. If all men are created equal, as Thomas Jefferson wrote, there can be no justification for regarding the well-being of present generations as more important than that of future generations simply because of the difference in time. Given that principle, are we really justified in refusing to sacrifice \$24 in 1995 if that \$24 would bring "only" \$4 billion—and not \$40 billion—to people living in the year 2359? Substituting lives, or the capacity of wealth to save lives, for dollars makes this question even more vivid and pressing. How could a future life, no matter how distant, be worth less than a present one? Using the language of philosophers and lawyers, we might call the insistence that future lives be valued equally to present ones the *equal standing* argument against discounting future benefits.

Might cases for and against discounting both be valid?

Suppose we ask whether present generations should sacrifice short-run economic growth to undertake a particular program to improve the environment and leave more resources for future generations. Proponents of opportunity cost, who would discount future benefits, might say no, but proponents of equal standing, who would not discount future benefits, might say yes.

When a question has two compelling yet contradictory answers, it may really combine two questions in one. A close look at the question "should we undertake this environmental policy now to benefit future generations?" reveals that it asks a question about obligation (what duty do we have to sacrifice today to benefit future generations?) and a question about description (if we should sacrifice, do we help future generations more by implementing the proposed

environmental policy or by doing something else?).

The economist's opportunity-cost rationale speaks to the question about description. If the goal is to improve the welfare of future generations, we should choose a policy that achieves the largest improvement for a given present cost. Consequently, we should compare the returns to the proposed environmental policy with those to other investments in order to see which are largest. Consider, for example, other investments with the same present-day costs as the environmental policy. If the discounted future benefits from these alternative policies are larger than the those from the environmental policy, we should consider implementing the alternative policies instead. We may be able to do more for future generations by subsidizing basic scientific and medical research or promoting education than by protecting the environment.

An obvious response would be to ask, "Why not invest in environmental protection and medical research?" This response brings us to the question about obligation—whether and how much to sacrifice. Unlike the question that asks us to describe and compare the benefits of one program to another, the obligation question asks us to contemplate our duties to future generations. As such, it fundamentally concerns ethical values rather than economic facts. Accordingly, equal standing is a more appropriate perspective from which to answer this question than is opportunity cost.

Proponents of the equal-standing principle have no problem with discounting for inflation or risk. But they find the pure-time-preference component of discounting to be morally controversial, even though the pure-time-preference discount rate is half the 6 percent discount rate drawn from today's markets. While a 19:1 ratio (present value to future value yielded by a 3 percent discount rate) is less philosophically forbidding than the 340:1 ratio (yielded by a 6 percent discount rate), it still is hard to reconcile with the equal-standing principle.

Violating "Hume's Law"

Separating environmental policy questions into questions about description and about obligation uncovers the root of much of the discounting controversy within economic circles and across disciplinary boundaries. This controversy is a consequence of trying to use facts about how people *do* discount to tell us how policymakers *should* discount. This attempt violates a maxim derived from eighteenth-century British philosopher David Hume, who asserted that facts alone cannot tell us what we should do. Any recommendation for what you, I, or society ought to do embodies some ethical principles as well as factual judgments. For example, to recommend policies if and only if their economic benefits exceed their costs would imply the ethical principle that increasing net economic benefits is the only worthy goal for society.

The fact that we *do* have time preferences may not tell us much about how we ought to regard future generations. Imagine a world where generations do not overlap. In this world, people are like long-lived tulips; every eighty years, a new batch comes to life after the previous batch disappears. Suppose the people in one of those generations happen not to care about any subsequent generations. They would then choose to exhaust resources and degrade the environment without regard for how these actions might lower the quality of life of the people who succeed them. The *fact* of this disregard, however, does not invalidate an ethical principle that people born far in the future deserve a good quality of life as much as people already living.

Using market discount rates to examine ethical questions has made the economics of discounting more complicated than it perhaps needs to be. For example, economists have long argued about whether to calculate pure-time-preference discount rates based on the returns that investors receive before they pay taxes or after they pay taxes and, if after, whether to include corporate income

taxes or personal income taxes in the calculation. If pure time preference has only limited ethical relevance in determining how much we should discount, these issues become relatively unimportant.

Divergence between equal-standing and opportunity-cost discount rates would be less important if policies that always did the best from one perspective did the best from the other as well. Unfortunately, this does not always hold. A policy that generates benefits in the short run may have a higher discounted value in an opportunity-cost sense than a policy that produces benefits much later. If we use a lower discount rate—that is, one reflecting more equal standing—the policy with long-term benefits may come out on top. We might need to do more for future generations; moreover, we might be doing the wrong things now. At opportunity-cost discount rates, development of an urban park may be more beneficial than an equally costly plan to reduce greenhouse gas emissions by taxing gasoline. At low or zero discount rates, the gasoline tax may be the more beneficial policy.

Philosopher Mark Sagoff of the University of Maryland suggests that market discount rates may not be a good indicator of the ethical value that people, upon reflection, would place on protecting future generations. Accordingly, we might resolve the discounting issue by having the government set policy based on people's stated ethical views regarding how to weigh current lives and dollars against future lives and dollars. Through a telephone survey of 3,000 U.S. households, Maureen Cropper, Sema Aydede, and Paul R. Portney of RFF determined that the rate at which people apparently discount lives saved is comparable to after-tax returns in financial markets. For example, people discount lives a century from now at about 4 percent per year. Equal-standing advocates can draw scant comfort from such data, which might tell us how a democracy would react if it followed the public's pure time preferences but, according to Hume, don't tell us what the right time preferences are.

Ethically justified discounting

Reconciling discounting with ethics may seem impossible, but there is some hope. To say that present and future generations have equal standing in an ethical sense does not necessarily imply that they have the same claim on present resources, because the general level of wealth or well-being may be changing over time. If we follow the ideas of a recent Nobel Prize winner in economics, John Harsanyi of the University of California–Berkeley, we should sacrifice today for the benefit of future generations only if the average well-being of people in the future goes up by more than we lose on average today. If present trends continue, advances in technology and knowledge will make people

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better off in the future than we are today. In that case, more than a dollar of gains to them would be needed to make up for a dollar lost to us. Any future returns should then be discounted by this difference to ensure that future generations' gains in well-being exceed our losses. According to the view proposed by Harvard University philosopher John Rawls, we might not be justified in making any sacrifice for future generations if they would be better off than we are now. If we expect future generations to be worse off than we are, however, Rawls' framework suggests that we should make present-day sacrifices.

More promising justifications for discounting come from critiques of the

equal-standing idea itself. Philosophers such as Susan Wolf of Johns Hopkins University and Martha Nussbaum of Brown University have pointed out that to say that everyone has equal standing is to say that no one has special standing—including our families, friends, and fellow citizens. Insistence on equal standing denies the value that special interpersonal relationships hold for us and without which we could not be fully human. This argument may provide some support for asserting that generations closer to us should mean more to us than generations far in the future. (Thomas Schelling of the University of Maryland points out the irony of worrying so much about the welfare of future generations while doing so little to improve the welfare of many of the most destitute among us today.)

As long as resource scarcity makes trade-offs between the present generation and future generations inevitable, no consideration of environmental policies to benefit future generations should ignore economic opportunity cost. Ultimately, decisions to implement or not to implement such proposed policies will be the result of political processes, with all their virtues and imperfections. Justifications for the policies, which are tied in large measure to the degree of discounting, unavoidably involve ethical reflection and judgment. An appreciation of the necessary roles of both economics and ethics should clarify the nature of discounting and promote better understanding of our obligations toward future generations and how to meet them.

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