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Discounting the Future

Author(s): John Broome

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I. INTRODUCTION

Should future goods be discounted? Should benefits that will come in the distant future count for less in our planning than benefits that will come in the present or near future? I am not thinking of the plans made by an individual on her own behalf, but of plans made on behalf of the public as a whole, particularly by governments. Should future goods be discounted by public authorities in their planning?

In cost-benefit analysis and other applications of welfare economics, economists typically do count future goods for less than present goods. To many philosophers this seems a reprehensible practice. How, they ask, can the mere date at which a good occurs make any difference to its value? Discounting seems to these philosophers a device for unjustly promoting our own interests at the expense of our descendants'. On the face of it, then, typical economists and typical philosophers seem to disagree. But actually I think there is more misunderstanding here than disagreement. Some economists do indeed disagree fundamentally with some philosophers, but most economists and most philosophers would be on the same side if they came to understand each other properly. I hope this article will contribute to a mutual understanding. My first purpose is to try and explain to philosophers what economists are doing when they discount the future and why they are doing it.

The basic point is very simple. When economists and philosophers think of discounting, they typically think of discounting different things. Economists typically discount the sorts of goods that are bought and sold in markets, which I shall call *commodities*. Philosophers are typically think-

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ing of a more fundamental good, people's *well-being*. There are sound reasons to discount most commodities, and there may well be sound reasons not to discount well-being. It is perfectly consistent to discount commodities and not well-being.

However, it is also true that economists sometimes go too far in discounting; they discount where they ought not. There is some justice in the complaints of philosophers. A second purpose of this article is to say where economists overstep the mark.

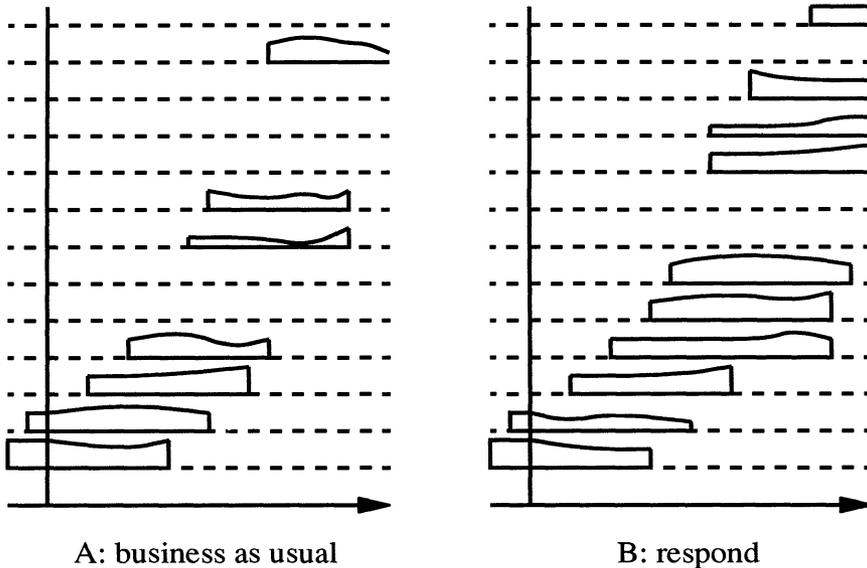
Section II describes the idea of discounting well-being, but only in order to distinguish it from the discounting of commodities. I shall not discuss whether well-being ought or ought not to be discounted; that is not the subject of this article. Sections III–V explain the discounting of commodities and how it fits into the theory of cost-benefit analysis, and they explain what justification there is for it. Sections VI–VIII set limits to the justification.

II. THE PURE METHOD OF EVALUATION

In order to distinguish discounting commodities from discounting well-being, I shall start by explaining the idea of discounting well-being.

Suppose some public authority has to evaluate various alternative actions it might take. For instance, governments these days face a choice between allowing the emission of greenhouse gases to continue unchecked, or doing something to limit it. Let us ignore the uncertainty that in practice always surrounds the results of an action; let us suppose we know what the results of each alternative action will be. So if a particular action is taken, we know how history will then unfold. Particular people will be born, live for a particular time, and die. Each person who lives will have a particular level of well-being at each time in her life. If a different action is taken, history will unfold differently. Figure 1 shows schematically two alternative histories. Each half of the diagram shows one of them. The horizontal axis shows time and the vertical axis possible people. A vertical solid line marks the present. For each person who lives, a little graph shows her well-being from birth to death. Each half of the diagram represents a sort of two-dimensional grid, across which well-being is distributed. Time is one dimension and people the other. Different actions distribute well-being differently across the grid; indeed they may lead to the existence of different people. Alternative A in Figure 1 represents what will happen if

FIGURE 1



greenhouse gases are not controlled; alternative B what will happen if they are. B shows people worse off in the near future than they are in A, because of the cost of controlling the gases. But in the further future it shows more people living, and it shows them better off and longer lived. (I am not predicting that this will definitely be the result of controlling greenhouse gases; the diagram is only an illustration.)

An action, then, leads to a particular distribution of well-being across the two-dimensional grid of people and times. If alternative actions are open to us, we need to compare one distribution with another in order to decide which action is better. So we need to determine the value of each distribution. Well-being distributed across the grid must somehow come together to determine the overall value of the distribution. We need to know how: how is well-being *aggregated* across the grid? How is it aggregated across people and across time? Discounting is one part of this question: does well-being that comes later in time count for less in the aggregate than well-being that comes earlier? If later well-being is discounted, I shall call this *pure* discounting. Pure discounting means discounting well-being. A pure discount rate is the rate at which the value of well-being declines as we look forward in time from the present.

Economists often include pure discount rates in their theoretical work, allowing later well-being to be counted for less than earlier. But not many economists actually defend pure discounting. Often they include discount rates only for the sake of generality. The rate can always be set to zero, so that later well-being is not actually discounted at all. Frank Ramsey, wearing his economist's hat, decried the practice of discounting well-being, but nevertheless included discount factors in his work. He says: "It is assumed that we do not discount later enjoyments in comparison with earlier ones, a practice which is ethically indefensible and arises merely from the weakness of imagination; we shall, however, . . . include such a rate of discount in some of our investigations."¹ So the fact that discount rates appear in their formulas does not show that economists approve of them. Some do, but I think more do not.² Most philosophers are opposed to pure discounting, and I think many economists would be on their side; I do not think this is a major point of disagreement. I shall not consider the arguments for and against pure discounting in this paper. But in order to draw out the contrast with the type of discounting economists do in practice, I shall generally take for granted the majority view that the pure discount rate should be zero: future well-being ought not to be discounted.

Theoretical work is one thing. When they come to assessing real projects in practice, such as new roads or plans to control greenhouse gases, economists rarely deal in well-being at all. The direct way to evaluate a practical project would be to work out the distribution of well-being that would result from it and then find its overall value by aggregating well-being across the two-dimensional grid. I shall call this the pure method of evaluation. In practice it would be very difficult. It would require us, first, to work out how well off each person will be at each time in her life, as a result of the project. Even setting uncertainty aside, there are major difficulties in this. To begin with, there may be a fundamental difficulty in principle. In drawing Figure 1, I took it for granted that the well-being of a person at a time is a measurable quantity that can be compared between people and

1. Frank Ramsey, "A Mathematical Theory of Saving," *Economic Journal* 38 (1928): 543–49, reprinted in his *Foundations: Essays in Philosophy, Logic, Mathematics and Economics*, ed. D. H. Mellor (London: Routledge and Kegan Paul, 1978), p. 261.

2. One economist who comes down firmly against pure discounting is Robert Solow in "The Economics of Resources or the Resources of Economics," *American Economic Review Papers and Proceedings* 64 (1974): 1–14. On the other hand, there is a sustained argument in favor of pure discounting in Partha Dasgupta and Geoffrey Heal, *Economic Theory and Exhaustible Resources* (Cambridge: Cambridge University Press, 1979), pp. 255–82.

across times. This assumption is open to serious doubts that economists know well. Besides, there is in any case the great practical difficulty that information about people's well-being is hard to come by. A special problem is that the parts of a modern economy are so tightly interconnected that the effects of any economic action will be propagated to everyone throughout the economy. Remember that any economic project will have to be financed, perhaps by loans or taxes, and the financing will have its own complex repercussions. It would be impossible in practice to calculate all the effects on everyone.

Working out everyone's well-being at every time would only be the beginning of a pure evaluation. We would next have to aggregate all these amounts to arrive at the overall value of a project. To do so, we would need a theory of how this aggregation should be done. This would be an ethical theory, and it would not be easy to arrive at. One component of it would be the question of pure discounting: should future well-being be discounted? This alone is hard to settle.

Because of all these difficulties, economists have sensibly looked for a more practical method for evaluating projects. They want a shortcut through some of the difficulties. In particular, they want to avoid the need for difficult judgments about well-being and how to aggregate it. It is only a shortcut they are after. I think most economists would agree that the pure method would give the right answer if it could be applied.³ The shortcut is not meant to supersede the pure method, but only to arrive at the right answer more easily. The eminent economist Joseph Stiglitz says as much:

Any project can be viewed as a perturbation of the economy from what it would have been had some other project been undertaken instead. To determine whether the project should be undertaken, we first need to look at the levels of consumption of all commodities by all individuals at all dates under the two different situations. If all individuals are better off with the project than without it, then clearly it should be adopted (if we adopt an individualistic social welfare function). If all individuals are worse off, then clearly it should not be adopted. If some individuals are better off and others are worse off, whether we should adopt it or not depends critically on how we weight the gains and losses of different individuals. Although this is obviously the "correct" procedure to follow in evaluating projects, it is not a practical one; the problem of benefit-

3. Stephen Marglin is one exception. See the quotation in Section VII.

cost analysis is simply whether we can find reasonable shortcuts. In particular, we are presumed to have good information concerning the direct costs and benefits of a project, that is, its inputs and outputs. The question is, is there any simple way of relating the total effects, that is, the total changes in the vectors of consumption, to the direct effects?⁴

Economists have ended up taking a shortcut that leads them to deal in commodities rather than well-being. It leads them to discount future commodities, but not necessarily future well-being.

III. THE MARKET PRICE METHOD OF EVALUATION

In making an evaluation, the instinct of economists is to draw the information they need from the market. In this section, I shall explain the thinking that supports this instinct at a general level. I shall apply it to discounting in Section V.⁵

The market—specifically prices—provides us with information about the values people attach to different commodities. Take the two commodities labor and wine, for instance. Suppose labor is paid \$10 per hour, and wine costs \$5 per bottle. Each Sunday, in planning your week, you have to decide how much work to do that week and how much wine to buy. Having decided, you could always change your mind. For instance, you could work one hour more and buy two more bottles of wine, or you could work one hour less and buy two bottles fewer. But suppose you do not make these changes; you are in *equilibrium*—happy with your plans. This shows that two bottles are worth just as much to you as an hour of labor (or—as it appears from your point of view—an hour of leisure). More precisely, if your purchases were to change by two bottles, given what you are already planning to buy, that would be worth just as much to you as a change of one hour in your leisure time. Economists say two bottles of wine are worth as much to you as one hour of leisure *at the margin*. This expression means that an extra two bottles of wine, added to the bottles you already plan

4. Joseph Stiglitz, “The Rate of Discount for Benefit-Cost Analysis and the Theory of Second Best,” in Robert Lind, et al., *Discounting for Time and Risk in Energy Policy* (Washington: Resources for the Future, 1982), p. 156.

5. I shall ignore several complications. In particular, I shall ignore the difference between the interest rates faced by consumers and producers, which is caused by taxation. There is a more detailed treatment in my *Counting the Cost of Global Warming* (Cambridge, UK: White Horse Press, 1992), chap. 3.

to buy, are worth an extra hour of leisure added to your planned leisure time.

I have explained, then, that the relative price prevailing in the market between wine and leisure must be exactly the same as the relative value to you of the two commodities at the margin. If it was any different, you would change your plans; you would work less and buy less wine, or else you would work more and buy more wine. When you are in equilibrium, the relative price must match the relative value to you.

For the same reason, the relative price of wine and labor must be the same as the relative value at the margin to anyone, and not just to you. But how can the relative value of wine and leisure be the same for everyone? Surely people differ in the values they attach to these things. The answer is that the prices are the same for everyone, and everyone adjusts themselves to the prices. Suppose you happen to value two bottles of wine above an hour of leisure. Then you will sign up for more work, earn some more money, and buy some more wine. If you still value two bottles of wine above an hour of leisure, you will sign up for more work still. But eventually, as you work longer and longer hours, the labor will begin to exhaust you, and you will have so much wine that its pleasures begin to pall. The value you attach to wine will fall, and the value you attach to leisure will rise. In saying this, I am assuming that wine and leisure have “diminishing marginal value” to you: the more of them you have the less you will value an extra unit. Economists generally make the plausible assumption that commodities have diminishing marginal value, and I adopt this assumption. You will reach an equilibrium where two bottles of wine are worth one hour of leisure to you at the margin. That is how your relative values at the margin come to match the relative prices in equilibrium. By the same process, so will everyone else’s.

Relative prices, then, measure people’s relative values. What do I mean by relative *values*? If a person’s aim in life is to maximize her well-being, the value to her of a commodity is the well-being she derives from it. In that case, prices measure the relative amounts of well-being that commodities bring her at the margin. This means they provide data for evaluations of just the sort we are looking for; as I described pure evaluations, the data needed are people’s well-being, and we are looking for a shortcut to a pure evaluation. But suppose a person’s aim is not to maximize her well-being. In that case, the value to her of a commodity will not be the well-being she derives from it. But no matter, many economists would say: people should

be free to choose their own aims in life. If they happen not to pursue their own well-being, that is their business. When it evaluates a project, a public authority should use the values people attach to commodities, whatever the aims that underlie these values may be.

There is a complication. Many of the things that concern public authorities when they evaluate projects are not bought and sold on the market, so they do not have a price.⁶ Examples are public goods such as street lighting and safety equipment installed in nuclear power stations. (Even though they are not marketed, I shall call these “commodities.”) How can we find the value to people of a nonmarketed commodity? We can use the price that people would be willing to pay for it if they had to, instead of its actual price. A person might be willing to pay something to have street lighting or safety equipment installed. The amount she is willing to pay for a commodity measures its value to her, compared with the value of other things she buys. It can be used as a measure of value to her in place of market price. People’s willingness to pay for a commodity is not as easy to find as a market price, but in practice it can be worked out by various means.

How can prices, or willingness to pay, be used in evaluating a project? A project uses some commodities as inputs and produces others as outputs. Think of one that uses labor as input and produces wine as output. Suppose this project is profitable at market prices. That is to say, if prices are \$10 for labor and \$5 for wine, the project produces more than two bottles of wine as output for every hour of labor used as input. Now, everyone assigns the same value to two bottles as to one hour of labor at the margin. So everyone values the output of this project more than its input. Surely, then, the project is beneficial.

This simple thought is the basis of cost-benefit analysis. To decide whether a project is a good idea (by which I mean it is better to do it than not), first list all the commodities the project will use as inputs and all those it will produce as outputs. Value them all at market prices or, failing that, at people’s willingness to pay for them. Call the value of an output a “benefit”

6. A smaller complication is this. I argued that the relative prices of commodities will measure their relative values to a person, at the margin. But the argument only works if the person buys or sells some amount of each commodity. If she chooses not to buy any of some commodity (and if she has none to sell), that commodity’s price does not indicate its value to her. Evidently, its value to her is not more than its price, or else she would buy some, but it may be less than its price. Like the complication of nonmarketed commodities, this complication can also be dealt with by using the person’s willingness to pay for the commodity in place of its price.

and the value of an input a “cost.” If benefits exceed the costs, the project is profitable at market prices. In that case declare it a good idea. I shall call this the *market price method* for evaluating a project.

It seems plausible, but there is a snag. We need to ask how the project will be operated. Who will supply the inputs and who will get the outputs? One possibility is that the costs are borne by the same people as receive the benefits. In the example, the labor might be done by the people who eventually receive the output of wine. Each of these people might be employed on the project and paid for her labor in wine. The pay could be more than two bottles per hour, since the project produces more than two bottles per hour. Since each person values two bottles more than one hour of leisure, each would be benefited by the exchange. (Assume each person works only a little time on the project, so that the change is marginal.) All these people would benefit, and no one would be harmed. Undoubtedly, the project operated this way would be a good idea. If it were operated this way, we could sidestep all the theoretical problems of aggregating well-being across a grid like Figure 1. Since the project would make everyone better off, there would be no need to worry about aggregating well-being across people and time.

But in practice the benefits of a project often come to people who have not borne the costs, or all of the costs. When a road is built, some people have to suffer the noise it makes, while other people benefit. I can only fit this possibility into my simple example by making an exaggerated assumption. Assume the labor is coerced, without pay, and the wine produced is distributed to people who have not done the work. Have we any reason to suppose that the benefit to these people is greater than the cost to the workers? No. We know how each person individually values wine compared with leisure; that information is given us by the market prices. It happens that everyone values two bottles of wine equally with one hour of leisure. But we do not know how one person values wine compared with how another person values leisure; market prices do not convey that information. It may be that the workers value their sacrificed leisure more than the beneficiaries value their extra wine. In general, if some people bear the costs of a project and others get the benefits, we cannot tell from market prices whether the project is a good idea or not.

This is a fundamental difficulty in cost-benefit analysis. So long as a project harms some people and benefits others, valuing commodities by their market prices, or by willingness to pay, is not a reliable way to check whether the project is a good idea. The problem will be most severe if the

people who are benefited are much better off, or much worse off, than the people who are harmed. When a person is in equilibrium, the price in money she pays for a commodity is the value of the commodity to her at the margin, divided by the value of money to her. For a given value of money, the price of a commodity is therefore a measure of the commodity's value to the person. Among people who are about equally well off, it is reasonable to assume the value of money to each of them is approximately the same. So among such people, prices may be reasonably good measures of values. On the other hand, money to a poor person is probably worth much more than money to a rich person. Between rich and poor, then, the prices of commodities are not good measures of their values. Of course, economists have ways of coping with this problem, which I shall not go into here.

This article is concerned with the distribution of resources between the present and the future. For the sorts of projects I am interested in, the people who benefit will often not in practice be the ones who bear the costs; they may well be in different generations. Furthermore, they may not be equally well off, because future generations may be much richer, or much poorer, than us. So one might expect the problem I have mentioned to be particularly acute for projects that cross generations. But actually it is not. The reason is that, in a way, the market price method ignores future generations. Their well-being is only taken into account to the extent that it is valued by the present generation. This is a major weakness in the method, which I shall discuss in Section VII. But it does happen to cancel out the fundamental weakness I have been describing. When the market price method deals with intertemporal questions, it treats them as questions about how the present generation values future commodities compared with present commodities, not as questions about how the values of the present generation compare with the values of future generations. Distribution between rich and poor generations is not really at issue. Consequently, I think it is reasonable to set aside this most fundamental problem with the market price method, and concentrate on difficulties that are specific to discounting.

IV. THE PRESENT PRICES OF FUTURE COMMODITIES

Before I can explain how to apply the market price method to discounting, I need to introduce a useful theoretical device: the idea of dated commodities and their prices. Suppose I have \$100. I can use it to buy twenty bottles of wine at \$5 each. Alternatively, I can put it in the bank. After a year I can get

the money out, with interest. If the interest rate is 10%, I will have \$110. If wine has meanwhile gone up to \$5.25, I can then buy twenty-one bottles of wine. So \$100 now will, in effect, buy me twenty-one bottles of wine in a year's time. We can think of wine in one year's time as a commodity on its own, separate from wine now, and its present price is \$4.75 ($\$100/21$, that is). This is what, in effect, I have to pay now in order to acquire a bottle of wine in a year's time. Since \$4.75 is less than \$5, the present price of future wine is less than the present price of present wine. In general, a commodity at any date—a *dated commodity*—has a present price. From now on, when I speak of the price of a future commodity, I mean its present price unless I say otherwise. The percentage difference between the present price of a present commodity and the present price of the same commodity next year (I mean, for instance, the 1994 price of the commodity in 1995, not the 1995 price of it) is called the commodity's *own interest rate*. In my example the own interest rate of wine is 5%.

Commodities typically have positive own interest rates. That is to say, future commodities are typically cheaper in the present than present commodities. If you have a particular sum of money, you can generally buy more of a future commodity with it than you can of a present commodity, by keeping the money in a bank and earning interest. The only exceptions are commodities whose current price (for instance, the 1995 price of the commodity in 1995) increases through time as fast as, or faster than, the rate of interest at the bank. These commodities have own interest rates that are zero or negative.

The relative price of commodities indicates the relative value people place on them. This is true among present commodities and also between present commodities and future commodities. In my example, the price of future wine, one year from now, is 5% below the price of present wine. Therefore, once people are in equilibrium—have made their plans, bought the amount of present wine they want, and set aside what they want in order to buy future wine—each person values present wine 5% above future wine at the margin.

How can this be? Future commodities are generally cheaper than present commodities, which implies that most people value future commodities less than present ones. But why should a person value a commodity less just because she will possess it in 1995 rather than 1994?

The answer to this question has two parts. The first is to explain why future commodities are generally cheaper than present ones anyway.

Oddly enough, this has little to do with the values of the people who buy present and future commodities. It has to do with the economy's productive technology, not with its consumption. Technology is, in a particular sense, *fertile*. It is a fact of technology that, to speak roughly, present commodities can be converted into a greater quantity of future commodities, if we choose.⁷ Trees grow, for instance. If I fell my forests now, I shall harvest a particular quantity of timber. If I fell them next year, I shall harvest more. Let us say I shall harvest 5% more. The nature of my production process, then, gives me a choice between timber now and 5% more timber next year. This means that, when the economy is in equilibrium, the present price of next year's timber must be 5% below the price of this year's. If it were any higher, I would leave all my harvest to next year, and so would all my landowning colleagues. No timber would be put on the market this year. That would quickly drive up the price of this year's timber until it is 5% above the price of next year's. At that point I would begin harvesting again. Likewise, if the price of this year's timber rose higher than 5% above the price of next year's, the opposite would happen. The economy will only be in equilibrium when the price difference is 5%.

On the scale of a whole economy, things are much the same. Each year, some of the goods produced by the economy are consumed and some are reinvested, and the division between investment and consumption can be varied. If fewer commodities are consumed this year, more can be invested. The result will be more commodities produced next year, and next year's increase will exceed the decrease in consumption this year. Just as timber this year can, in effect, be converted by the production process into a greater quantity of timber next year, commodities in general this year can be converted into a greater quantity of commodities next year. This is what I mean when I say technology is fertile. A consequence is that next year's commodities must be cheaper than this year's. If they were not, producers would increase their investment this year, in effect switching their production to next year's commodities instead of this year's. This would increase the price of this year's commodities relative to next year's, until an equilibrium is reached with future commodities cheaper than present ones. Most commodities will therefore have positive own interest rates. This is a necessary consequence of the fertility of technology.

7. There is a fuller account of technological fertility in my *The Microeconomics of Capitalism* (London: Academic Press, 1983), particularly pp. 36–37.

Not every commodity will have a positive own rate of interest, though; I shall mention exceptions in Section VI. Nor need it always be true that most commodities will have a positive rate. Our technology may not always be fertile. If, for example, runaway global warming damages our productive abilities, or our resources are exhausted, future commodities may become more expensive than present ones. Own rates of interest may become generally negative. Still, with our present fertile technology, they are generally positive.

An economy's fertility may be affected to some extent by the decisions of consumers about saving. Suppose people decide to increase their savings, delaying some of their consumption to the future. In effect, they buy more future commodities in preference to present ones. This could raise the prices of future commodities compared with present ones, thereby reducing own interest rates. How could this happen? Only by causing a switch in the technical methods employed in the economy, to less-fertile methods. Here is a simple example. The change in consumers' behavior might induce the owners of forests to fell their trees at a more advanced age. But trees grow more slowly as they get older. So the change would cause the fertility of forestry to decline, and the equilibrium own interest rate of timber would be reduced. In ways like this, consumers might influence the fertility of technology. But for reasons I shall not go into here, I think their influence is small.⁸ It is a fair approximation to think of fertility, and hence interest rates, as given independently of decisions about saving.

Tyler Cowen and Derek Parfit, on the other hand, stress the influence of savings on interest rates and suggest it is crucial to the argument about discounting.⁹ I think not. My approximation is helpful for thinking about the problem, but it is not essential for the argument. We are concerned with interest rates established in the market, because these rates indicate the relative values people attach to present and future commodities. The important question is whether or not these rates are generally positive, because a positive rate implies that future commodities have a lower value than present ones. Insofar as savings influence interest rates, interest rates in the market will be determined by the mutual interaction of technology on the one hand and consumers' decisions about saving on the other.

8. *Ibid.*

9. Tyler Cowen and Derek Parfit, "Against the Social Discount Rate," in Peter Laslett and James S. Fishkin, ed., *Justice Between Age Groups and Generations* (New Haven: Yale University Press, 1992), pp. 144–61, esp. 151.

In present conditions, own interest rates will certainly emerge from this interaction generally positive. That is all that matters.¹⁰

If interest rates are positive, people attach less value to future commodities than to present ones. The second part of the answer to the question I posed earlier is to explain how this can happen. The explanation is that people must adjust themselves to the prices they face. Suppose next year's wine is as valuable to you as present wine. If it is cheaper than present wine, you will save your money and buy next year's wine rather than this year's. As you do this, and so find yourself with less wine this year, you will find you value this year's wine more and are less keen on buying yet more future wine. When you are in equilibrium, the relative values you attach to present and future wine at the margin must match their relative prices. Everyone will be in the same position. We shall all adjust our relative values, at the margin, to each commodity's own rate of interest. The process is exactly the same as the one I described in Section III for undated commodities.

This may still be mysterious. Even after adjustment, how can future wine be less valuable to you than present wine? Just because it comes in the future, how can that make it less valuable? I can think of three possible explanations. One is that the benefit you expect to get from wine declines with your advancing years: for any given quantity of wine, you expect to enjoy it less the older you are. I shall ignore this possibility in order to concentrate on the other two explanations, which I think are more impor-

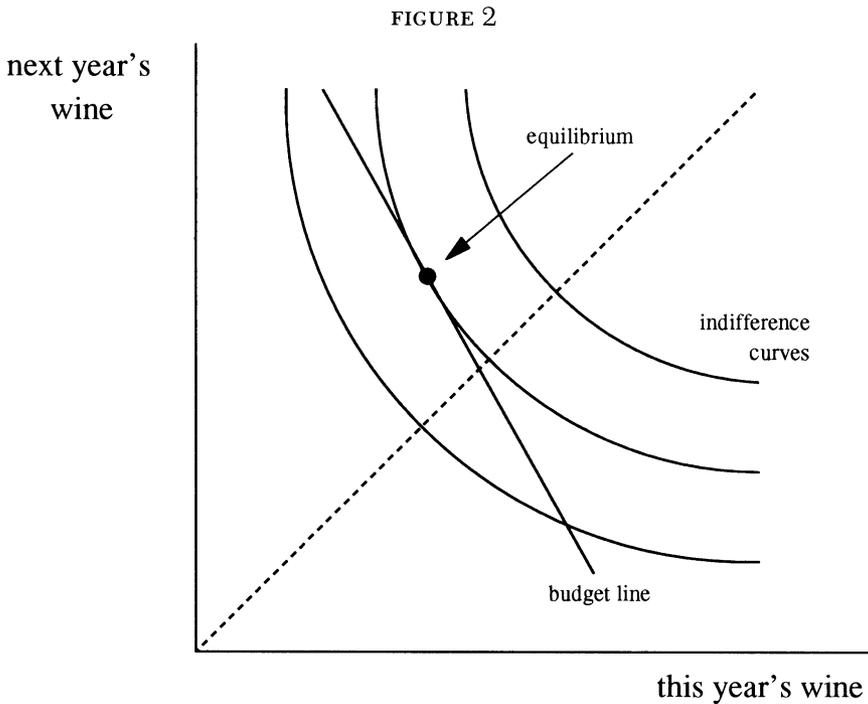
10. Cowen and Parfit do not suggest market rates will be zero, but they do claim interest rates will be zero at the "optimum," when savings in the society are at the level they should be at. This is because they do not believe in discounting future commodities; they take present and future commodities to have the same value. So long as future commodities are cheaper than present commodities, they think savings are not as high as they should be. Savings should be increased, which means that more future commodities should be consumed instead of present ones. They think that increasing savings should eventually bring the price of future commodities up to the level of present ones. That is to say, interest rates should be brought down to zero. But this is mistaken. Under present environmental conditions, interest rates cannot generally be zero at the optimum. Suppose we grant that savings are at present too low. If they are increased, this will increase the rate of growth of the world economy. Long before interest rates are driven down to zero, the increased savings will bring about a positive rate of growth in per capita income: people will be getting richer as time passes. (Indeed, that may well be so already, even with savings at their present low level.) Consequently, the marginal value of commodities to people will be declining; as people get richer, they attach less value to extra commodities. Future commodities will be less valuable than present ones, then. Commodities ought to be discounted, that is to say, even at the optimum. Cowen and Parfit cannot legitimately take it for granted that they should not be.

tant. I shall assume that, at any time in your life, a particular quantity of wine will bring you the same well-being as it would at any other time.

The next possibility is illustrated by the indifference-curve diagram in Figure 2. Here I assume your aim is to maximize your own well-being. This means, among other things, that you do not discount your own future well-being compared with your present well-being; both count the same in your present values. Since I have already assumed that a particular quantity of wine brings you the same well-being in the future as in the present, your indifference curves must be symmetrical about the 45° line—the dotted line in the diagram. Your “budget line” in the diagram shows the options that are available to you, given whatever you have available to spend on wine. Your options are not symmetrical, because future wine is cheaper than present wine. This means the budget line is steeper than 45° . Out of all the options available to you on the budget line, you choose the one that puts you on the highest possible indifference curve. This is where an indifference curve touches the budget line. The diagram shows you will buy more future wine than present wine. This is how you end up valuing future wine less at the margin than present wine. All along, I have been assuming wine has a diminishing marginal value: the more of it you have, the less well-being an extra bottle will bring you. Since you have more future wine, you value extra bottles of it less.

Wine will presumably have a positive own interest rate throughout your life. Consequently, wine at later dates must always be less valuable to you at the margin than wine at earlier dates. If the explanation I have just given of how this happens is the right one, you must buy progressively more and more wine as your life continues. This point will become important in Section VIII.

The third possible explanation is illustrated in Figure 3. Here you yourself discount your future well-being; you value it less than your present well-being. Let us call this *imprudence* on your part. Imprudence skews your indifference curves toward present wine; the curves are not symmetrical about the 45° line, but steeper. Your budget line still has the same slope as before. In equilibrium you must value future wine less than present wine, since its price is less. If you are imprudent, that may happen even if you buy the same amounts of present and future wine. That is what the diagram shows: the point of tangency between the budget line and the highest indifference curve you can reach lies on the 45° line. This will

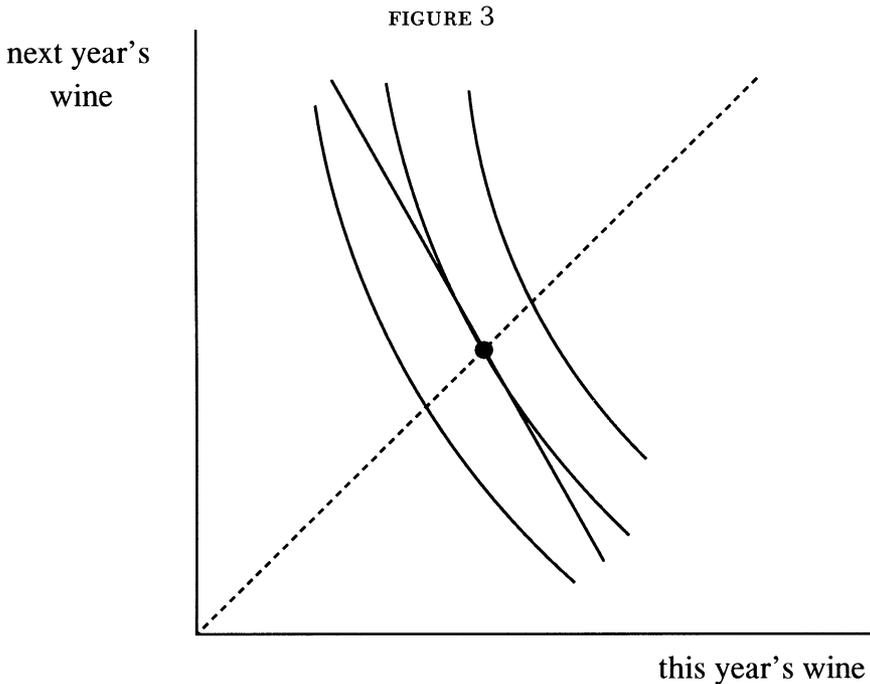


happen only by coincidence, because your degree of imprudence happens to match the own interest rate of wine. But it certainly can happen.

V. DISCOUNTING IN THE MARKET PRICE METHOD

Now back to cost-benefit analysis. In Section III, I described how the prices of commodities can be used in cost-benefit analysis. To evaluate a project, list the commodities it uses as inputs and the commodities it produces as outputs and evaluate them all at their market prices. Since market prices indicate their relative values to people, this seems a good basis for judging whether or not the project is a good idea.

Exactly the same idea extends to projects that have inputs and outputs at different dates. All the inputs and outputs can be evaluated at their market prices. In this case, these are the present prices of dated commodities. They measure the relative values of the dated commodities to people, so



they seem a good basis for cost-benefit analysis. Generally, future commodities have lower present prices than present commodities. This process consequently discounts future commodities; it values them less than present commodities. This method provides a basis for discounting, then. The discount is applied to commodities, and not to well-being.

This is just the market price method of evaluation applied to the present and the future. Its great advantage is that the information it needs comes from the market. I said in Section II that economists were looking for a shortcut through the difficulties of the pure method. This is it. There is no need to inquire how much well-being each person derives from the project. Nor is there any need to engage in philosophical analysis to work out appropriate discount factors for future well-being. The market price method cuts through all that. Its discount factors come from the market like any other prices; they are simply the prices of future commodities compared with present ones. It may well be that future well-being ought not to be discounted at all. Even so, the market will value future commodi-

ties below present ones. So, if we are going to calculate with commodities at all, future commodities ought to be discounted.

There are, to be sure, some major, valid objections to the market price method. I shall come to them soon. But I think it is a mistake to object to the general idea of using this shortcut to evaluate projects. In his discussion of discounting in *Reasons and Persons*, Derek Parfit raises several accurate objections to the market price method,¹¹ but I think he underestimates the method's value. He says:

It may be in several ways more convenient, or elegant, to calculate opportunity costs using a Social Discount Rate. But the conclusions that are established by such calculations could be re-expressed in a temporally neutral way. When describing the effects of future policies, economists could state what future benefits and costs there would be, at different times, in a way that used no discount rate. The arguments that appeal to opportunity costs could be fully stated in these terms. I believe that, on any important questions that we need to decide, this would be a better, because less misleading, description of the alternatives.¹²

Before responding to this remark, let me explain the idea of an “opportunity cost.” The opportunity cost of something is what we could have instead, if we choose not to have this thing. The opportunity cost of timber today is the timber we could have next year if the trees were not felled today. Because trees grow, this opportunity cost is a greater amount of timber next year. That is why today's timber is more expensive than next year's timber; you have to give up a greater amount of next year's timber to get it. In general, because technology is fertile, the opportunity cost of commodities today is a greater quantity of commodities next year. That is why commodities today are more expensive than commodities next year—why next year's commodities are discounted, that is.

The opportunity costs of commodities are embedded in their prices. A cost-benefit analyst would simply value next year's timber below this year's in her calculations, next year's concrete below this year's, and so on, taking her valuations from market prices. What would Parfit have her do instead? He would have her trace through the economy all the effects on people's

11. Derek Parfit, *Reasons and Persons* (Oxford: Oxford University Press, 1984), pp. 480–86.

12. *Ibid.*, p. 484.

well-being, at each time in the future, of using timber and concrete at particular dates. He would then have her add up these amounts of well-being, without discounting future well-being. Parfit, in fact, would like the economist to use the pure method of evaluation, without discounting well-being. But this would be a tremendously difficult operation, and normally pointless. The point of using prices is that, in a sense, they encapsulate all that information about the effects on people's well-being in an easily manageable and observable form. The market price method is a shortcut to the pure method, and it is a hundred times more practical.

In his discussion, Parfit concentrates on difficult cases where a cost-benefit analyst would be wrong to discount a particular future commodity. The existence of a stretch of beautiful countryside is one of his examples of a commodity, and Parfit is right that this one ought not to be discounted. I shall mention these cases in Section VI. The difficult cases lead Parfit to forget all the mundane cases where the discounting of future commodities is legitimate, and the only practical way of proceeding. Furthermore, as I shall explain in Section VI, even in these difficult cases the market price method would get the right answer if it was properly applied. This method actually tells us not to discount the future existence of a stretch of beautiful countryside.

Parfit raises a related point. He mentions, as a legitimate reason for valuing future commodities below present ones, that our successors will be better off than us. Being better off, they will derive less well-being from extra commodities than we will; this is the law of diminishing marginal value. So it is better, at the margin, for commodities to come to us than to them. However, says Parfit, the reason future commodities are less valuable is not that they exist in the future. It is that they are coming to people who are better off. It is deceptive to say we are discounting for time.¹³

In the theory I have developed so far, I have not yet mentioned our successors. Nevertheless, the situation depicted in Figure 2 allows me to say something about Parfit's point. That figure shows a person who consumes more wine next year than this year, because next year's wine is cheaper than this year's. Since most commodities are cheaper next year than this, she will consume more of most commodities next year than this. In a sense, she is better off next year because she has a greater consumption then. Consequently, the marginal value to her of all these commodities

13. *Ibid.*

is less next year than this. Her situation mimics within her single life the relation between us and our successors that Parfit talks about. So we can use this example to examine Parfit's point.

Future commodities are discounted compared with present ones: they have a lower present price. Correspondingly, the value to people of future commodities is less than the value of present ones. Is the discount a discount for time? Parfit says no: since future commodities are discounted because people have more future commodities than present ones, it is misleading to say the discount is for time. But I do not think it is misleading. It is commodities we are discounting, not well-being. Dated commodities are identified by their dates, and it happens that future commodities are cheaper than present ones. This can reasonably be called a discount for time. What *causes* future commodities to be cheaper than present ones is another matter. Evening phone calls are discounted compared with daytime phone calls. The cause of this discount is that fewer people use the phone in the evening; there is less pressure on the phone company's resources, so each call costs less to provide. Nevertheless, the discount is for the time you make the call. It is evening calls that the phone company markets at a discount, not calls when fewer people are using the phone.

As I explained in Section IV, the fertility of the economy's productive system is the chief cause of why future commodities are cheaper. The fact that people, like the person in Figure 2, end up assigning a lower value to future commodities than present ones is more an effect than a cause. People arrange their affairs so as to consume more in the future, and consequently they end up assigning less value to future commodities at the margin. But even if it was a cause, the discount would still be for time. Commodities are discounted by their own interest rates, and an interest rate is a discount for time.

VI. COMMODITIES THAT SHOULD NOT BE DISCOUNTED

I have explained the thinking that underlies the market price method and said what is right about it. Now I come to what is wrong with it. A lot of sound objections have been raised, but I shall only mention three here.¹⁴

The first objection is not to the theory of the market price method, but to

14. There is a fuller catalog in my *Counting the Cost of Global Warming*, pp. 60–92.

the way the method is applied. I explained that a commodity in the future normally has a lower price than in the present. It is discounted, that is to say, and the appropriate discount is given by its own interest rate. According to the theory, each commodity should be discounted at its own rate. But in practice all commodities are generally lumped together and discounted at the same rate. Normally, they are all discounted at something called the “real” interest rate, which is a weighted average of the own interest rates of various commodities.

This may be an acceptable approximation for most commodities. Most commodities are produced within the economic system, and most have similar own interest rates, determined principally by the fertility of the technology. But some commodities have quite different rates. These include nonreproducible scarce resources, which are not produced at all. I explained in Section IV that most present commodities can, in a sense, be converted into a greater quantity of future commodities. That is why future commodities are generally cheaper than present ones. But this is true only of commodities that are produced within the economic system. Scarce resources cannot be converted into a greater quantity of future resources, and they therefore have own interest rates of zero or thereabouts.¹⁵ It follows that they ought not to be discounted, even according to the theory of the market price method. Derek Parfit gives an example: a stretch of beautiful countryside that might be destroyed to build an airport.¹⁶ The value of this scarce resource will remain the same through time; it will not decline like the value of produced commodities. It ought not to be discounted, and the theory underlying the market price method says it ought not to be discounted.

Parfit mentions another type of commodity that ought not to be discounted. Some industrial plants cause congenital deformities among people born in their neighborhoods. In valuing the plants, cost-benefit analysts often discount deformities that will happen in the distant future; they give them less significance than present ones. But Parfit says that is a mistake. A deformity caused at one time is just as bad as a deformity caused at another. It leads to the same loss of well-being, and since Parfit believes

15. This is known among economists as the “Hotelling rule,” because it appears in H. Hotelling, “The Economics of Exhaustible Resources,” *Journal of Political Economy* 39 (1931): 137–75.

16. Parfit, *Reasons and Persons*, p. 483.

well-being ought not to be discounted, he believes deformities ought not to be discounted either.¹⁷

Let us grant the premise that well-being ought not to be discounted. Then I am sure Parfit is right that deformities ought not to be discounted. But this example is theoretically tricky, and more needs to be said about it. Some commodities represent a constant quantity of well-being whenever they occur; let us call them constant-well-being commodities. Deformities are a negative constant-well-being commodity. For theoretical purposes, it is easier to work with positive commodities, so let us work with the converse of deformities: the positive commodity of saving people from deformities. Saving people's lives is plausibly another example of a constant-well-being commodity; on average, saving one person's life in one hundred years will presumably add just as much well-being to the world as saving one person's life now. Granted that well-being ought not to be discounted, constant-well-being commodities ought not to be discounted.

Some constant-well-being commodities are scarce resources, but some are not. Lifesaving is not, for instance. Lifesaving is actually a produced commodity. People's lives are saved by care in hospitals, by installing safety devices in factories, by propaganda against smoking, and in many other ways; these are all ways in which the commodity of lifesaving is produced by the economy. Furthermore, lifesaving participates in the general fertility of the productive system. It is like timber: a quantity of lifesaving in the present can be converted into a greater quantity in the future. We can, if we

17. Parfit makes a concession he ought not to make. He points out that we can compensate for some deformities by providing the victim with commodities as compensation. We must compensate for present deformities with present commodities. But we can compensate for future deformities by setting up a fund now to buy future commodities. The fund will grow over time with interest. Since the fund will grow, it will be cheaper to compensate for future deformities than present ones. Provided we set up the fund, says Parfit, this is a reason for valuing future deformities less than present ones. But there is a mistake in this reasoning. The fund earns interest because future commodities, in general, are cheaper in the present than present ones. That is what interest is: it is the fact that future commodities are cheaper in the present than present commodities. In equilibrium, they are therefore less *valuable* than present ones; they bring less benefit at the margin. A present deformity will require some quantity of present commodities as compensation. A future deformity will require a greater quantity of future commodities, because the future deformity is just as bad as the present one, but the future commodities are less valuable. The fund earns interest just as quickly as commodities decline in value, so it will just be able to provide compensation to the same value whenever it is spent. Consequently, future deformities can only be compensated for at exactly the same present cost as present deformities.

choose, use fewer resources on lifesaving today, invest them productively, and so have greater resources available next year, which we could use to save more lives next year. Because present timber can be converted into a greater quantity of future timber, future timber must be cheaper than present timber in equilibrium. Timber is therefore discounted. Surely, therefore, the same should be true of lifesaving. Future lifesaving is cheaper than present lifesaving; so lifesaving should be discounted. But this contradicts my earlier remark that it should not be discounted because it is a constant-well-being commodity. So there is a puzzle. Which is right?

The answer is that the earlier remark was right: if lifesaving is a constant-well-being commodity, it should not be discounted. Lifesaving in the future will make the same contribution to well-being as lifesaving in the present. Certainly, future lifesaving is cheaper than present lifesaving, but this is not a reason for valuing it less. The market prices of commodities only have a role in valuations because they measure the relative values of commodities to people. In equilibrium, they will do so, and up to now I have been assuming the economy is in equilibrium. But if lifesaving produces constant well-being and yet is cheaper in the future, we evidently do not have an equilibrium. With ordinary commodities like timber, there is a market that will move to equilibrium if it is working smoothly. But with lifesaving there is no such market. Nor is there one for saving people from deformities. We have no reason to discount these commodities at an interest rate that has been established in the market for marketed commodities.

There is more to the puzzle, though. If we can convert a quantity of lifesaving now into a greater quantity next year, and if lifesaving next year is just as valuable as lifesaving now, the conclusion we have to draw is that lifesaving should be deferred. We should withdraw resources from lifesaving today, and apply them to saving more lives next year. We should also defer lifesaving next year in order to save yet more lives the year after. We should defer lifesaving the year after in order to save still more the year after that, and so on. We will end up postponing all lifesaving to the indefinite future, which never comes. So, we will end up saving no lives at all. If lifesaving produces constant well-being and yet its price declines with time, this is the conclusion we must draw. But it is a ridiculous one. We have a paradox.

Here is one possible solution. Lifesaving may not be a constant-well-being commodity. Undoubtedly, saving some people's lives adds more well-being to the world than saving other people's. Saving a twenty-year-old

with a long and happy future ahead of her adds more to well-being than saving a ninety-year-old with little left to look forward to. We may expect that, by and large, a society will first direct its resources to saving the people with most well-being to gain. As it progresses in its ability to save lives, it will start to save people with less and less to gain. In the future, therefore, where more lives are being saved, life-saving will, by and large, produce less well-being at the margin. Therefore, the more lifesaving is deferred to the future, the less well-being it will produce on average at the margin. Eventually, as lifesaving is deferred, there will come a point where the lower price of future lifesaving is matched by its lower benefit in terms of well-being. After that, it would be wrong to defer any more lifesaving. At that point, future lifesaving is on average genuinely less valuable than present lifesaving. Lifesaving should then be discounted.

It is possible that we are in this position already. If we are, lifesaving is not a constant-well-being commodity, and it should be discounted. But we have no reason to think this is so, because there is no market that can be expected to make it so. We cannot rely on a market interest rate. All we can do is consider directly what well-being will result from lifesaving at different dates. If we conclude that lifesaving will lead to the same amount of well-being at every date, as I assumed earlier, it should not be discounted. The same goes for saving people from deformities.

VII. DISENFRANCHISED GENERATIONS

My second objection to the market price method is that for many projects most of the interested parties are not represented in the market. Many projects will affect future generations for centuries or millennia ahead. Nuclear waste will remain dangerous for many thousands of years, and projects for disposing of it must take account of that. Attempts to control global warming will bring their main benefits more than a century from now. But the only people whose values are registered in market prices are those who are alive now. This is surely a very serious gap.

One thing might lead you to disagree. I suggested in Section IV that the main determinant of interest rates is the economy's technology, specifically its fertility. If this is correct, then interest rates would not be much different even if, in some way, future generations came to be represented in the market. Imagine a trust for future generations was set up, able to borrow money against the potential earnings of future generations and empowered

to buy resources for their use. Once the economy settled down to a new equilibrium, interest rates would not have changed much.

So is the disenfranchisement of future generations a significant fault in the market price method of evaluation, or is it not? If enfranchisement would not make much difference to interest rates, then surely not: the market price method uses interest rates that are about correct. But actually this reasoning is erroneous. Interest rates would be about the same in the new equilibrium, after the economy had settled down. But just after the new trust was set up, the economy would be very far from equilibrium. From the trust's point of view—representing future generations—future commodities would be much more valuable than they seem to us who are participating in the market now. The trust would use its funds to transfer many more resources to the future. It would buy up future commodities, making them more expensive and reducing their own interest rates. When the new equilibrium was achieved, their prices would drop again to their original level, and interest rates would be restored. But in the meantime many resources would have been transferred away from us for the use of future generations. It is only the disenfranchisement of future generations that gives us the share of the world's resources that we have.

With things as they are, then, in our present equilibrium, if we came to take account of the interests of future generations, we would use lower interest rates. We would discount the future less than we do now in the market. If public authorities took account of the interests of future generations, they would use lower interest rates than market rates in their decision making. This would transfer resources forward in time for the use of future people.

Should public authorities act this way? A. C. Pigou thought they should. He wrote:

But there is wide agreement that the State should protect the interests of the future in some degree against the effects of our irrational discounting and of our preference for ourselves over our descendants. The whole movement for "conservation" in the United States is based on this conviction. It is the clear duty of Government, which is the trustee for unborn generations as well as for its present citizens, to watch over, and, if need be, by legislative enactment, to defend, the exhaustible natural resources of the country from rash and reckless spoliation.¹⁸

18. A. C. Pigou, *The Economics of Welfare*, 4th ed. (London: Macmillan, 1932), pp. 29–30.

On the other hand, some people think a public authority should adopt the values of its constituents. In a democracy, they think, public authorities are responsible to their electorate, which does not include generations not yet born. No doubt the present generation cares about future generations to some extent, and wishes to leave resources for their use. The value the present generation attaches to the well-being of future generations will have been embodied in present interest rates, and it would be wrong to give any further value to future generations. Stephen Marglin takes this view. He says: "I want the government's social welfare function to reflect only the preferences of present individuals. Whatever else democratic theory may or may not imply, I consider it axiomatic that a democratic government reflects only the preferences of the individuals who are presently members of the body politic."¹⁹ Marglin and Pigou are arguing about what the job of a government is—an argument in political philosophy that I do not wish to join. I shall say something else instead.²⁰

Besides the question of what a government ought to do, there is the separate question of which of its actions would have the best results. It is quite possible that the action a government ought to take is not the one that would have the best results. For instance, a government might have a duty to do what its electorate wants, and its electorate might want it to do something that would not have the best results. In this paper I concentrate on the question of what would have the best results. That was the question I posed in Section II. The problem I laid out was to compare alternative distributions of well-being across present and future people, to decide which is better. The market price method of evaluation came up as a possible shortcut toward achieving this aim. It was intended to avoid the very difficult process of comparing people's well-being directly, but was still meant to determine which distribution of well-being is better, weighing together the well-being of different people at different times. Marglin suggests, though, that a government's "social welfare function" should reflect

19. S. A. Marglin, "The Social Rate of Discount and the Optimal Rate of Investment," *Quarterly Journal of Economics* 77 (1963): 97. I would be misrepresenting Marglin if I did not point out that although he thinks the government should base its decisions on the preferences of the present generation, he does not think it should use market interest rates in its calculations. Because of something called the "isolation paradox," he thinks the market rate does not properly measure what the present generation would like to leave to its successors. I cannot go into the details of the isolation paradox here.

20. The point is developed in more detail in my *Weighing Goods* (Oxford: Blackwell, 1991), chap. 7. Parfit makes a similar point in *Reasons and Persons*, pp. 480–81.

only the preferences of the individuals who are presently members of the body politic. He sees the social welfare function as playing a particular role in a democratic political process: helping to determine what a government ought to do. He does not suggest the social welfare function measures the actual value of the alternative distributions. So his aim is different from the one I have been pursuing in this paper. I have been looking for a way of aggregating people's well-being to determine the overall value of alternative distributions, and for that purpose the well-being of future generations needs to be included.

VIII. IMPRUDENCE

Market prices indicate the relative values people set on different commodities. In Section III, I discussed what "values" means in this context. I said that if a person aims to maximize her well-being, the value of a commodity to her is the well-being she will derive from it. If people generally aim to maximize their well-being, then, market prices will indicate what well-being people expect to get from commodities. Prices will be some sort of a measure of well-being, and the market price method of evaluation has some chance of approximating the pure method.

But if people do not aim to maximize their well-being, this will not be so. Imprudence is an important instance. When I say a person is imprudent, I mean she discounts her own future well-being; she does not attach as much value to her future well-being as she does to her present well-being. Figure 3 shows indifference curves for an imprudent person. In the example I used for that diagram, future wine is 5% cheaper than present wine. In equilibrium the person must adjust her relative values to prices. She therefore values future wine 5% less than present wine, at the margin. But that does not mean an extra bottle of wine in the future would bring her 5% less well-being than an extra bottle in the present. As it happens, in the example I assumed it would bring her exactly the same well-being. So although future wine is discounted by 5% on the market, it does not bring 5% less well-being. The discount rate does not measure well-being.

In general, if people are imprudent, the market prices of commodities will not properly represent the commodities' effects on well-being. The market price method of evaluation will therefore not correctly indicate the results that would be reached by the pure method. Market interest rates will discount the future too quickly.

What is to be done about this? In Section III, I said that many economists would say “no matter.” If people are imprudent, that is up to them. It is not the job of a public authority to overrule people’s own decision making in these matters. So imprudence gives no reason to use a lower discount rate on commodities than the market’s rate. Many economists believe that, if people are imprudent, this is a reason for the government to be imprudent too. On the other hand, Pigou thought otherwise. In the passage I quoted in Section VII, he says the government should protect the interests of the future, not only against our preference for ourselves over future generations, but also against our own “irrational discounting.”

Once again, I shall decline to enter an argument about the job of the government; that is a matter for political theory. In this article, I have been asking what action would have the best results. The pure method of evaluation was intended to answer this question, and the market price method was intended as a shortcut to the pure method. If people are imprudent, the market price method will fail as a shortcut, because market prices will not measure people’s well-being. Market interest rates will not correctly indicate which action will have the best results.

The practical importance of this point depends on whether people are typically imprudent. I know of no convincing evidence about that, one way or the other.²¹ But it is theoretically important for the following reason. In Section IV, I explained that, for reasons of technology, future commodities would generally be cheaper in the market than present ones. This implies that consumers, when they are in equilibrium, must value future commodities less than present ones at the margin. I asked how that could happen, and I mentioned only two possible explanations of importance. The first is that the person might plan to consume more commodities in the future than in the present. This makes future commodities less valuable to her at the margin, because of their diminishing marginal value. Extra commodities will bring her less well-being in the future than in the present. So in this case future commodities ought definitely to be discounted in public evaluations; the positive market interest rates constitute a genuine reason for discounting. But this case can only occur if the person is increasing her consumption over time. It can only occur in a society generally if the economy is growing, so that people’s consumption is generally increasing.

21. Mancur Olson and Martin Bailey, in “Positive Time Preference,” *Journal of Political Economy* 89 (1981): 1–25, claim to have evidence that people are imprudent, but their argument is seriously flawed. See my *Counting the Cost of Global Warming*, p. 110n.21.

In a static economy, this cannot be the explanation of why people value future commodities less than present ones. In a static economy, only the second possible explanation is available, and that is imprudence. But if imprudence is the explanation, the fact that interest rates are positive in the market does not indicate that present commodities produce more well-being than future commodities. If well-being ought not to be discounted, market interest rates do not give us a good reason for discounting commodities in public decisions.

When it comes down to it, if well-being ought not to be discounted, the only justification there can be for discounting commodities is that future commodities produce less well-being than present ones. And that will only plausibly be the case if people will be better off in the future. Whatever happens, technology will almost always ensure that interest rates are positive, but these positive rates will justify discounting only if the economy is growing. This is a severe limitation on our right to discount future commodities.

IX. CONCLUSION

Within the market price method of evaluation, there are some good grounds for discounting future commodities. The method itself has its attractions, and it is much more practical than the pure method. But there are also some sound objections to the market price method. The most serious is that it does not take proper account of the well-being of future generations.

We cannot put our faith in the market price method in circumstances where the objections are important. It is certainly unreliable for evaluating long-term projects that have large effects on future generations. For instance, it is useless for projects aimed at mitigating global warming. For these projects, I think we have no alternative but to fall back on the pure method; no shortcut is available. We shall have to do our best to estimate the effects the projects will have on people's well-being. Then we shall have to decide whether future well-being should be discounted. I have avoided that question in this article. The market price method skirts around it, by fixing attention on the discounting of commodities. But it cannot be avoided in the end.²²

22. My own tentative views about it are given in *Counting the Cost of Global Warming*, pp. 94–108.