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SCIENCE:

### An Economist Looks at Global Warming

By [Gary S. Becker](#)

*We don't have to sabotage today's thriving economy to insure ourselves against environmental upheaval.*  
By **Gary S. Becker.**

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According to present scientific calculations, environmental damage from global warming at current rates of carbon dioxide emissions will be extensive, especially in the latter half of this century and throughout the next few centuries. Because the effects would take so long to appear, there is great uncertainty about their extent. It is obvious, however, that the size of the discount rate for that future damage—if it is discounted at all—will make an enormous difference to estimates of the total value of the damage.

The main concern expressed about discounting of future utilities in evaluating public policies is that it would give the welfare of future generations much less weight than the welfare of present generations. Even with the "small" discount rate (typically 3 percent) used in policy analysis, the effects of global warming on the utility of generations 50 years from now will be weighted only a bit more than one-fourth as much as the effects on the utility of the present generation. Generations 100 years in the future would be weighted a mere one-sixteenth as much as the present generation. With a 3 percent rate, the weights are cut in half every 24 years, or approximately every generation.

Is this fair to future generations? The well-publicized *Stern Review on the Economics of Climate Change* for the British government thinks not, which is why the calculations in that report generally peg this so-called "social discount rate" close to zero. William Nordhaus of Yale University, who has done substantial research on evaluating the costs of greenhouse warming, uses about a 3 percent social-discount rate. He shows that one should use a significant discount rate to match it with evidence on the long-term return on capital, the growth of consumption, and savings rates.

Where we set the discount rate for future environmental damage—if it is discounted at all—will make an enormous difference in what we spend today.

Suppose the utility damage from global warming to generations 50 years from now is equivalent to about \$2 trillion of their welfare. At a 3 percent discount rate, this major damage would have a value today of about \$500 billion. With a 3 percent discount rate, then, it would not pay to eliminate these harmful effects on future generations if it cost \$800 billion (or, more generally, at least \$500 billion) to ameliorate the harm through steep taxes on emissions, carbon sequestration, and other methods. To be sure, the benefits would exceed the present value of costs of greenhouse warming if damage were discounted at zero percent, 1 percent, or as high as almost 2 percent. When analyzing effects much further into the future, say 150 years, the discount rate used is even more crucial. The main reason for the much larger estimates of damage in the *Stern Review*, compared with the work of Nordhaus and others, is its use of a negligible discount rate.

To illustrate the advantage of using a discount rate that reflects the return on capital, assume that the long-term return on investments in physical capital is 3 percent. Instead of spending \$800 billion on eliminating greenhouse gases, suppose the present generation invested it in physical capital, and that all the income yielded by the investment were also invested at a 3 percent rate of return. Then, the amount saved to generations 50 years from now would be more than \$3 trillion. Hence, future generations would be better off if the present generation, instead of investing the \$800 billion in greenhouse gas-reducing technologies, invested the same amount in capital that would be available to future generations.

One criticism of this argument is that if the resources were not invested in reducing greenhouse gases, they would not be invested in other capital that would accrue to future generations. Perhaps not. But bear in mind that during the past 150 years, more recent generations in the United States and other developed and developing nations have been much better off than earlier generations when measured by income, health, education, and virtually all other important criteria. This rising standard of living across generations has been achieved mainly through advances in technology, and generous savings and investments for children and grandchildren by parents and their elected representatives. Why should this fundamental aspect of family and public behavior change as a result of the accumulation of the harmful greenhouse gases in the atmosphere?

Discounting is sensible behavior. Common sense also suggests that technologies will be much improved in the future, including those that can improve health, income, and the environment.

Put differently, later generations have benefited from large and continuing advances in technologies of all kinds in the past 150 years, including those related to the environment. The rate of technological advance has not slowed down, and may have even sped up, in the past 20 years. Parents and governments have not chosen to offset the benefits to later generations of technological advances by leaving descendants less education or capital—just the opposite has occurred.

Parental behavior toward children and grandchildren illustrates the importance of discounting future benefits and costs. Many parents like their children at least as much as they like themselves, and would be devastated if any serious harm

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came to their descendants, yet they easily discount the benefits they provide them. In evaluating how much they want to give their descendants in the form of bequests or education, they recognize that savings and education have positive rates of return. If they invest \$40,000 in their children's education, for example, the benefit to children would be much greater because of the high return on education—it could be \$80,000. Parents are "costing" that \$80,000 benefit at \$40,000.

Does it make sense to impose steep taxes on emissions and pay for carbon sequestration? It depends on the costs, many years from now, of ameliorating environmental damage.

Using a social-discount rate of 3 percent does not sweep away the greenhouse-gas problem. The latest report by the Intergovernmental Panel on Climate Change strongly suggests that the problem will be quite serious in perhaps 50 or fewer years from now. However, the 3 percent rate does imply that low weight be given to effects on the utility of generations 150 years from now, and even more so 400 years from now. Common sense also dictates that one recognize that technologies will be much improved in the future, including technologies that can improve health, income, and the environment. A positive and non-negligible discount rate is the formal way to recognize the importance of these and related considerations.

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