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## Book reviews

**Stephen J. DeCanio, *Economic Models of Climate Change: A Critique*. Palgrave-Macmillan, 2003, ISBN: 1-4039-6335-5 (hardcover), 1-4039-6336-3 (paperback), 203 pp.**

Economic models have played a central role in debates about climate change, particularly in the U.S. Unfortunately, the underlying assumptions of such models have not been examined with anything like the care and rigor that is appropriate for tools addressing such an important policy question.

Professor Stephen DeCanio, at the Economics Department of the University of California, Santa Barbara, has risen to that challenge with his latest book, which is a wonderful exploration of the limitations of all economic forecasting models, not just those assessing the economics of reducing greenhouse gas emissions. His book analyzes how these models treat consumers, producers, and intergenerational equity in a way that lays bare the myriad assumptions (most not tested empirically) that determine the results. The book brings to bear the latest developments in information economics, agent-based simulation, transaction costs economics, increasing returns to scale, and the theory of the firm, and is enormously helpful for determining when economic results are credible.

DeCanio believes that “current [modeling] practice only hides the essential questions behind a technical facade”. DeCanio also analyzes the accuracy of energy-economic models in predicting prices and quantities, and finds their accuracy to be dismal, a result that will not be surprising to anyone familiar

with this field (Craig et al., 2002). Finally, DeCanio’s conclusions about the biases inherent in current climate modeling are important to note: all current modeling frameworks are biased towards overestimating costs for ameliorating climate change, and DeCanio concludes that economic theory is not currently able to predict with confidence the economic impacts of reducing greenhouse gas emissions.

Of course, Decanio believes (as do I) that economics in general, and energy/economic models in particular, have an important role to play in addressing the climate challenge. For example, economic models are helpful in designing market incentives for pollution-reducing behaviors (such as tradable permit systems). They can also be useful in determining the most efficient ways to allocate investment incentives, and in assessing the implications of different ways of treating intergenerational equity and property rights. What they should not be used to do is create an aura of certainty where it is not justified, but DeCanio argues that this is exactly how economic models are now often used:

“The application of general equilibrium analysis to climate policy has produced a kind of specious precision, a situation in which the assumptions of the analysts masquerade as results that are solidly grounded in theory and the data. This leads to a tremendous amount of confusion and mischief, not least of which is the notion that although the physical science of the climate is plagued by uncertainties, it is possible to know with a high degree of certainty just what the *economic* consequences of alternative policy actions will be” (italics in original).

Decanio describes how the restrictions and abstractions necessary for economic modeling prob-

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lems to be tractable divorce these models from the actual phenomena. For example, economists have for decades assumed constant or decreasing returns to scale, not because that assumption characterizes the vast majority of industries in the economy (it doesn't), but because without it the models will suffer from path dependence and multiple equilibria (Arthur, 1990). So reality has been abandoned for computational convenience. DeCanio identifies similar assumptions related to whether the initial distribution of property rights (i.e. right to pollute) affects the efficiency outcome (it does), whether conventional treatments of the time value of money bias the models towards the current generation and against future generations (they do), and whether real people and institutions in the economy are actually able to optimize in a strict sense of the term (they can't, in many cases).

Decanio is in good company in making such critiques. Joseph Stiglitz, in accepting his Nobel prize in economics in 2001 (along with Spence and Akerlof), identified one driving force for his work on imperfect markets as being the "disparities between the models used and the world that I saw" (<http://www.nobelprize.org/economics/laureates/2001/stiglitz-lecture.html>). DeCanio's conclusions are no more radical than the myriad criticisms Stiglitz and other giants of economics have made against conventional economic theory, and this in itself should give skeptics pause.

It is no longer plausible to dismiss critiques of economic models as the complaints of a few uninformed observers. Instead, these critiques represent the concerns of those in the economics community who take seriously the reconciliation of models with economic reality (not just with economic theory). If economics is to be treated as science, then theory and data must go hand in hand, and that conclusions based on economic models must be validated against the real world and the historical record. Unfortunately, such validation is still all too rare (Kooimey et al., 2003; McCloskey, 2000), and the models themselves often don't even reflect the latest theory, never mind the empirical data.

It is easy to demonstrate that the assumptions built into the models diverge from reality. Fixing those models is another matter, and in many cases it's not yet clear how to do so.

For now, the best that can be hoped is that the models be used in a fashion that recognizes their limitations and doesn't treat the results as having great precision. DeCanio gives clues as to where modelers can make improvements, but the most important contribution of his book is in raising these questions in a comprehensive fashion. The solutions will have to come from the legions of economic modelers attempting to address DeCanio's concerns in the coming years.

You may not agree with every critique put forth by DeCanio, but his book treats issues long ignored by the modeling community, and it is past time to confront these issues head on. If modelers are, as DeCanio claims, conveying a false sense of certainty to policy makers and the public about the economics of climate change, then they ought to be taken to task for that. DeCanio's book is the first I've seen to analyze this issue in a comprehensive way from the perspective of conventional economics. At a minimum, it should spark a healthy and long overdue debate, and I, for one, will be happy to see that debate occur.

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