Encouraging Technological Innovation in Environmental and Energy Law

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Zachary Liscow and Quentin Karpilow, *Innovation Snowballing and Climate Law*, 95 **Wash. U. L. Rev.** 385 (2017), available at SSRN.

Innovation is a critical component of environmental progress. The dramatic reductions in emissions per-mile-travelled from automobiles over the past forty years stem from major breakthroughs like the catalytic converter. Our efforts to switch from fossil-fuel-based energy and reduce greenhouse gas emissions will depend on many different kinds of technological innovation. The dramatic price drops in both wind and solar energy, for instance, are in significant part the result of the development of new technologies.

How can environmental law facilitate the development of new technology to address the challenges of climate change and other environmental problems? The predominant position of economists has been that legal tools that force economic actors to address the full costs of their actions, including the externalities that are the basis of many environmental problems, is the appropriate approach to spur innovation. A carbon tax (or a tradable permit system which requires polluters to purchase their permits) will create incentives for firms and individuals to come up with new technologies that will reduce environmental problems. Liscow and Karpilow's article challenges this dominant paradigm, drawing on recent significant economics research.

Yet policymakers have stubbornly ignored this advice from economists. For instance, in the 2009 stimulus bill instead of levying a carbon tax the Obama Administration put billions of dollars into subsidies and tax credits to support research, development, and deployment of new renewable energy technologies. Is this just a case of elected officials and policymakers ignoring the wisdom of economists, or is there something more going on here?

Recent research in economics has indicated that there may be something more going on. Led by Daron Acemoglu at MIT, a number of economists have concluded that in order to advance real technological progress to address environmental problems, market-based mechanisms like carbon taxes or tradable permit systems have to be paired with other policy tools, such as subsidies for research and development. The reason is that innovation is path dependent – what we research now, and what technologies we develop now, depends in large part on what research has occurred in the past.

Zachary Liscow and Quentin Karpilow spin out the possible implications of this research (what they call "innovation snowballing") for legal efforts to address climate change. As they make clear, the implications extend far beyond the most basic question of whether subsidies in the context of research and development are a good policy choice. As it turns out, we might reconsider a range of policy and legal questions based on this research – for instance, even if we don't use market-based mechanisms, we might nonetheless adjust the kinds of regulatory tools we use to react to climate change. In addition, there are a number of difficult questions about what kinds of research and development we might subsidize, as well as when, and how. For instance, Liscow and Karpilow point out that we might want to focus our subsidy efforts on renewable energy technologies that are unlikely to have positive spillovers for the development of fossil-fuel technology as well. Biomass energy builds on (and can support further research in) related fossil-fuel combustion technologies, so we might not wish to provide significant support for it, as opposed to support for solar energy research, which has little or no overlap with fossil fuel technology.

Liscow and Karpilow are not the only ones who have engaged with these questions. Other scholars (both inside and

outside environmental law) have explored whether market-based mechanisms are the best tool to advance technological innovation in the environmental context. Examples are David Driesen's work and Margaret Taylor's article in the Proceedings of the National Academy of Sciences noting that cap-and-trade programs appear not to boost innovation significantly. If there is a weakness in the Liscow and Karpilow paper, it is that the authors could have engaged more with this prior research. And some of the extensions that Liscow and Karpilow address – for instance, whether innovation snowballing should lead us to think differently about government procurement programs or investment in infrastructure – could have fruitfully engaged with some of the relevant cutting edge work in environmental law, such as Sarah Light's work on military contracting and environmental policy, or Alex Klass's work on energy infrastructure.

But the strength of Liscow and Karpilow's article is the depth with which they explore the follow-on questions that the original innovation snowballing research prompts. That strength makes this article well worth reading for anyone thinking about legal and policy design in the context of climate change.

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