The Cost of Reducting Greenhouse Gas Emissions

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How much does it cost to reduce greenhouse gas emissions in the United States? In his talk in Monday's energy policy seminar, Harvard economics professor James Stock presented a review of economic literature on policies and technologies ranging from gasoline taxes to livestock management to concentrated solar power. He and his co-author, Ken Gillingham, found that "we're not neglecting a lot of free and negative-cost options," and that, in fact "some popular options are very high cost." However, Stock noted that the literature reviewed tended to focus on immediate, short-term costs and benefits and may be condemning some policies as high cost that will tend to lower costs in the long run.

Stock and his co-author assembled cost findings for twenty-two actual policies aimed at carbon reduction from thirty-two peer-reviewed econometric studies. Policy costs per ton of averted CO2 emissions varied tremendously—from a *savings* of $190 per ton in the case of behavioral interventions to promote energy efficiency to a cost of up to $2,900 per ton for low carbon fuel standards.

Despite some low-cost or even negative-cost policies, optimistic predictions of forests of low-hanging fruit were not supported in the studies reviewed, Stock said. Energy efficiency measures, in particular, either were able to impact very small quantities of demand (as in behavioral interventions), or proved to be quite expensive in practice. A few technologies, such as the use of corn starch ethanol in gasoline, do both save money and cut carbon emissions, Stock acknowleged—but in these cases, he said, "a lot of the cheapest stuff has already happened"--for example, the market has already adopted ethanol in concentrations up to 10%.

Of the remaining technology policies, Stock recognized some (such as carbon allowance trading under the now-abandoned Clean Power Plan, as well as measures to reduce fugitive methane emissions) that did offer large-scale impacts at relatively low cost. At the same time, he noted, some popular measures, such as support for biodiesel, the "cash for clunkers" program, and some solar PV subsidies, were notably expensive, costing hundreds or even thousands of dollars per ton of CO2 emissions avoided.

Finally, Stock noted that all of the studies reviewed shared a common failing—the focus on "static" costs rather than "dymanic" costs. Some policies, such as support for battery electric vehicles, solar PV, and wind energy, Stock said, might look expensive at a given point in time, but, over the lifetime of the policy, lead to cost reductions. A "dynamic" analysis would take account of potential savings associated with a number of factors. For example, policies that promote a particular technology might result in research and development and learning-by-doing benefits that would not occur without such policies. They might also result in the development of networks (for example, charging infrastructure for battery electric vehicles) that allow future policies to have greater benefits. Finally, they may address "path" challenges, in which the way to the most cost-effective long-run end outcome leads through short-term cost increases. In general, Stock said, the environmental econometric literature is not addressing these questions, as it "overwhelmingly" focuses only on static costs. In effect, "The economics literature is spending too much time looking under the lamp post" on these issues.

Stock spoke as part of the Kennedy School's Energy Policy Seminar Series, which is sponsored by the Consortium for Energy Policy Research of the Mossavar-Rahmani Center on Business and Government and by the Belfer Center for Science and International Affairs.