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Carbon Markets and Technological Innovation

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This paper examines how considering firm-level innovation in carbon-abatement technologies influences the optimal design choice for carbon pricing. It builds on Weitzman's model (1974) that shows in what instances cap and trade, and in what instances a carbon tax is the best policy instrument in the presence of uncertainty. We show that if the model is expanded to also reflect the choice of firms to invest in innovation, then the benefits and preferred application of cap-and-trade schemes increases. In 1976, Roberts and Spence showed that a hybrid cap-and-trade scheme with price floor and ceiling is preferable to pure tax or cap-and-trade schemes. We show how expanding the framework to incorporate innovation incentives results in an upward shift of the price ceiling in the case of steep damage cost curves.

The paper shows how the original results of the simple model that is often quoted by economists can be altered by the inclusion of additional aspects. This highlights the importance of considering further economic aspects, such as risk aversion of investors, but also political considerations, such as the increased potential for political lobbying where policy instruments have more design parameters.

Given the very limited scope of the analysis of this paper, we do not propose a specific choice of policy instruments, such as cap-and-trade, or carbon tax, but rather suggest that it is important to consider innovation incentives in the design of such schemes. This allows for a commitment to more ambitious emission reductions, reflected in tighter emission caps. As the paper further shows, the equilibrium carbon price, reflecting the cost of the marginal mitigation technology, should be above the marginal damage cost at the respective emission level. This creates additional incentives and opportunities for innovative low-carbon technologies, thus reducing overall mitigation cost.

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