

Cooperation and Paradoxes in Climate Economics

av

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AKADEMISK AVHANDLING

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Abstract

Paper I: Strategic Carbon Taxation and Energy Pricing: The Role of Innovation

This paper uses a dynamic game to investigate the strategic interactions between carbon taxation by a coalition of resource consumers and (wellhead) energy pricing by a producers' cartel under the possibility of innovation in a cheap carbon-free technology. The timing of innovation is uncertain, but can be affected by the amount spent on R&D. The results show that the expectation of possible innovation decreases both the initial carbon tax and producer price, resulting in higher initial resource extraction and carbon emissions. Though this 'green paradox' effect triggered by possible innovation also will appear in the cooperative case (without strategic interactions), the presence of strategic interactions between resource producers and consumers can somewhat restrain such an effect. For both the resource consumers and a global planner, the optimal R&D to stimulate innovation is an increasing function of the initial CO₂ concentration. However, the resource consumers can over-invest in R&D relative to the investment level that a global planner would choose.

Paper II: The Harrington Paradox Squared

Harrington (1988) shows that state-dependent enforcement based on past compliance records provides an explanation to the seemingly contradictory observation that firms' compliance with environmental regulations is high despite the fact that inspections occur infrequently and fines are rare and small. This result has been labeled in the literature as the "Harrington paradox." In this paper, we propose an improved transition structure for the audit framework, in which targeting is based not only on firms' past compliance record but also on adoption of environmentally superior technologies. We show that this transition structure would not only foster the adoption of new technology but also increase deterrence by changing the composition of firms in the industry toward an increased fraction of cleaner firms that pollute and violate less.

Paper III: The Benefits of International Cooperation under Climate Uncertainty: A Dynamic Game Analysis

This paper investigates the benefits of international cooperation under uncertainty about global warming through a stochastic dynamic game. We analyze the benefits of cooperation both for the case of symmetric and asymmetric players. It is shown that the players' combined expected payoffs decrease as climate uncertainty becomes larger, whether or not they cooperate. However, the benefits from cooperation increase with climate uncertainty. In other words, it is more important to cooperate when facing higher uncertainty. At the same time, more transfers will be needed to ensure stable cooperation among asymmetric players.

Keywords: Carbon taxation, innovation, uncertainty, dynamic game, imperfect compliance, state-dependent targeted enforcement, technology adoption, emission standards, climate change; cooperation

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