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Global Sensitivity Analysis of Optimal Climate Policies

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A major tool that supports climate policy decisions, integrated assessment models are highly vulnerable to their initial assumptions and calibrations. Despite the broad literature rich in both single-model and multi-model sensitivity analyses, universal, well-established practices are still missing in this field. This paper endorses structured global sensitivity analysis (GSA) as an indispensable routine in climate-economic modeling. An application of a high-efficiency GSA method based on polynomial chaos expansions to DICE provides two insights. First, only global and comprehensive—as opposed to local or selective—sensitivity analysis delivers a trustworthy picture of the uncertainty propagated through the model. Second, careful treatment of the model's structure throughout the analysis reconciles the results with established analytical insights—enhancing these insights with more details. The efficient GSA method provides a comprehensive decomposition of the uncertainty in a model's output while minimizing computational costs, and is hence potentially applicable to models of higher complexity.