A Framework for dealing with Baseline Uncertainty: An Analysis of China's Intensity Target

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In climate policy design, emissions intensity targets are being used as alternatives to quantity targets in the presence of so-called baseline uncertainty, i.e. in situations where already the reference emissions destined to be reduced are largely uncertain. Currently, nearly one third of global greenhouse emissions are under indexed control (China, India). We propose a framework to assess to what extent this is a meaningful alternative in terms of preparing the economy for long-term targets. The scientific literature on comparison between intensity and absolute targets in environmental regulation is divided in two main categories: one that deals with economy-wide regulation and one that addresses the issue at the firm/sectoral level. The focus of this work is the first category which can be divided further into 3 subcategories defined as follows, I: analyses of policies for a specific nation and discussion of which target performs better, II: discussions of the implications of the target choice on international bilateral (or broader) agreements in terms of willingness to participate and commit, and III: situations were in multi-stage policy design either choice of target can be implemented.

We use the stochastic version of the energy-economy model REMIND, which solves a very large non-linear programming optimization problem, using the method of Discrete Stochastic Programming. The method takes under consideration any kind of possible probability distributions for the uncertain parameter. By use of this model we are able to derive unique optimal decision paths for several different values of the labor productivity parameter (defining economic growth and subsequently emissions baseline uncertainty), thus deviating from the usual deterministic solution provided by integrated assessment models.

We analyze the Chinese intensity target with respect to categories I and III (see above) and highlight the importance of explicitly accounting for uncertainty in economic growth, as it can lead to substantial amounts of "hot-air" or unexpected costs. We further identify what type of structural transformations leading to decarbonization could be more economic and how target updating and announcement of follow-up targets create risk of stranded assets.