Testing simple parameterisations of economic impacts of climate policies in ambitious mitigation scenarios

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Parameterising the global mean surface temperature (GMST) response to emissions by fitting simple climate models to the output of complex Earth System Models (ESMs) is a well-developed practice, and critical parameters such as Equilibrium Climate Sensitivity, Transient Climate Response and CO_2 Airborne Fraction are all well known. Parameterising global and regional economic impacts of climate change in terms of GMST is also widely used, but there is less agreement on the appropriate structural form. Percentage losses in GDP are often parameterised as polynomial function of GMST change that can be fitted to the output of global Integrated Assessment Models (IAMs), but there is no consensus on how these impact functions evolve over time, and how to incorporate impacts that depend on warming rates rather than warming level. Parameterising mitigation costs and fitting simple abatement cost models to IAMs is even less well developed, but the availability of new, more coherent ensembles of IAM simulations provides an opportunity to revisit the question of how well they can all be characterised with parametric variations on a structurally simple abatement cost model. Using the same tools developed for fitting simple climate models to ESMs, here we assess marginal and total abatement costs in the newly-available IAM database of ambitious mitigation scenarios compiled for the IPCC Special Report on 1.5°C to assess how well these can be represented with a simple cost model that is structurally independent of the underlying IAM, and identify key parameters governing the behaviour of abatement costs over time.