

Global Fossil Energy Markets and Climate Change Mitigation – an analysis with ReMIND

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We use the global Energy-Economy-Climate model ReMIND to analyze the dynamics of global fossil resource markets under different assumptions on costs and availability of fossil resources, socio-economic development pathways, and climate policy settings.

Resource markets, in particular the oil market, are characterized by a large discrepancy between costs of resource extraction and commodity prices on international markets. This can be explained by (a) the intertemporal scarcity rent, (b) regional price differentials arising from trade and transport costs, (c) inertias in the extraction sector, and (d) strategic behavior of resource owners. We integrate the first three elements into the model structure of ReMIND to improve the modeling of coal, oil and gas markets and thus provide a more reliable assessment of the economic effects of climate change mitigation policies.

For crude oil we find a global oil price of 70\$US per barrel in 2010 for the reference case without climate policies. The rent, i.e. the global net present value over the 21st century of oil in the ground, is 25tril.\$US. This value is most sensitive to uncertainties in fossil fuel availability with lower resources implying higher rents. Assumptions about economic growth and climate mitigation policies have a smaller impact. For the prices of coal and gas we also find generally good agreement with observed prices. The rent of gas is 11tril.\$US and of coal it is less than 4tril.\$US. Both are more sensitive to climate policies than to resource availability and economic growth assumptions. Since global climate change mitigation is mainly about reducing the emissions from cheap and abundant coal, the loss of coal rent income is relatively modest.