Closing the gap? Top-down versus bottom-up projections of China's regional energy use and CO₂ emissions

As the world's largest CO₂ emitter, China is a prominent case study for scenario analysis. This study uses two newly developed global top-down and bottom-up models with a regional China focus to compare China's future energy and CO₂ emission pathways toward 2050. By harmonizing the economic and demographic trends as well as a carbon tax pathway, we explore how both models respond to these identical exogenous inputs. Then a soft-linking methodology is applied to "narrow the gap" between the results computed by these models. We find for example that without soft-linking, China's baseline CO₂ emissions might range from 15-20Gt in 2050, while soft-linking models results in 17Gt. Reasons for the results gap between the models are discussed subsequently, such as model structure and statistical inputs. At a sectoral level, the gap can be mainly traced to China's future coal use in electricity production. The study finds that it is beneficial to soft-link complex global models under harmonized assumptions. Although this study fails to "close the gap" between the two models completely, the experiences and insights shared here will be beneficial for researchers and policy makers that are drawing conclusions from the results of China and global scenario studies.