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Emissions-Adjusted Total Factor Productivity

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Traditional estimates of total factor productivity (TFP) measure the output that a bundle of inputs produces. But production comes with emissions that stay in the atmosphere for decades, which means that productivity does not capture the full effect of today's production on the present value of current and future output. We draw on the climate-macro literature to propose a measure for emissions-adjusted total factor productivity (TFPE) that takes these long-run effects into account. TFPE is a relevant measure of productivity under general assumptions consistent with canonical integrated assessment models and "green national accounts." It is straightforward to calculate and relies only on publicly available data, as well as an estimate of the social cost of carbon. For traditional (small) estimates on the economic effects of climate change, TFPE is approximately equal to TFP. For recent (large) estimates of the social cost of carbon, however, TFPE and TFP growth decouple. In the United States, the rapid decline in emissions over the past 20 years raises annual TFPE growth by 0.4 percentage points. In contrast to traditional productivity measures, growth in TFPE accelerates after the mid-2000s. A back-of-the-envelope calculation furthermore finds that achieving net-zero emissions would raise U.S. TFPE by 27%.