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Why unilateral decarbonisation can pay for itself

Diego Känzig, Adrien Bilal / 13 Feb 2025

Anthropogenic greenhouse gas emissions are rapidly warming our planet, with potentially severe economic, social, and health consequences. Conventional estimates of climate damages suggest that while coordinated global efforts are desirable, unilateral action is rarely cost-effective due to a classic free-rider problem. Why should a country bear the costs of reducing emissions when the benefits are shared globally? This column re-evaluates this view in light of new climate damage estimates based on global temperature variation, showing that the economic case for unilateral decarbonisation is far stronger than previously thought.

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Climate change poses a pressing challenge for policymakers worldwide. While most economists agree that coordinated global action is needed to address climate change, achieving such coordination has proven particularly difficult. Global emissions continue to rise despite developments in international negotiations since the 2015 Paris Agreement.

The perceived free-rider problem is a key barrier to coordinated climate action: countries that reduce emissions bear the full costs, while the benefits are shared globally. This 'tragedy of the commons' creates a strong disincentive for unilateral action. Under conventional estimates of climate damages, coordinated global efforts are desirable while unilateral action is rarely cost-effective (e.g. Barrage and Nordhaus 2024). This concern has shaped policy debates for decades, limiting ambitious climate action in many large economies.

New research challenges this presumption. In Bilal and Känzig (2025), we find that when accounting for the broader economic impacts of global temperature changes, unilateral decarbonisation can actually pay for itself for large economies like the US or the EU.

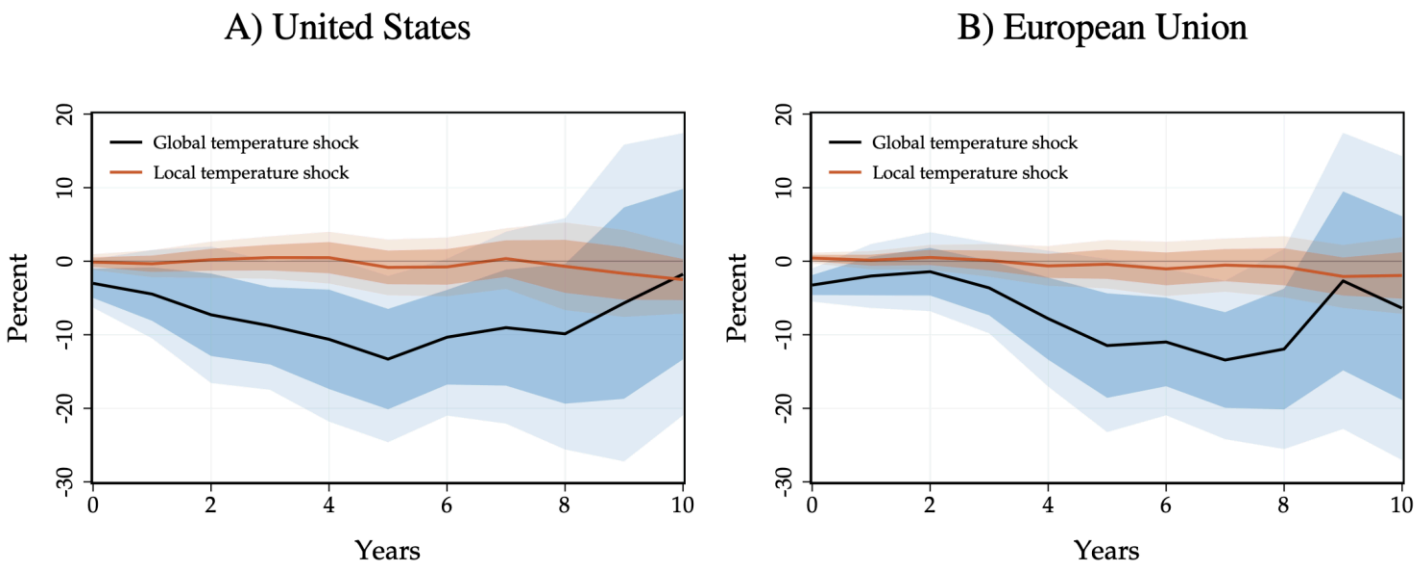
Global versus local temperature effects

Most previous studies have focused on how local temperature changes affect economic output. These analyses typically find relatively modest impacts in the medium run, particularly for advanced economies in temperate regions (Dell et al. 2012, Burke et al. 2015).

Our research takes a different approach: we examine directly how global temperature changes impact national economies, building on Bilal and Känzig (2024). Using natural variability in global mean temperature, we find substantially larger effects than those identified through local temperature changes alone.

Figure 1 displays the effects of a global temperature shock of 1°C. We can see that such warming reduces output per capita by more than 10% at peak in both the US and the EU. These effects are an order of magnitude larger than those estimated using local temperature variation alone.

Figure 1 The effect of global temperature shocks on GDP per capita



***Notes*: Impulse responses of US and EU real GDP per capita to global and local temperature shocks each normalised to 1°C. Sample period: 1960-2019. Solid lines: point estimates. Dark and light shaded areas: 68 and 90% confidence bands.**

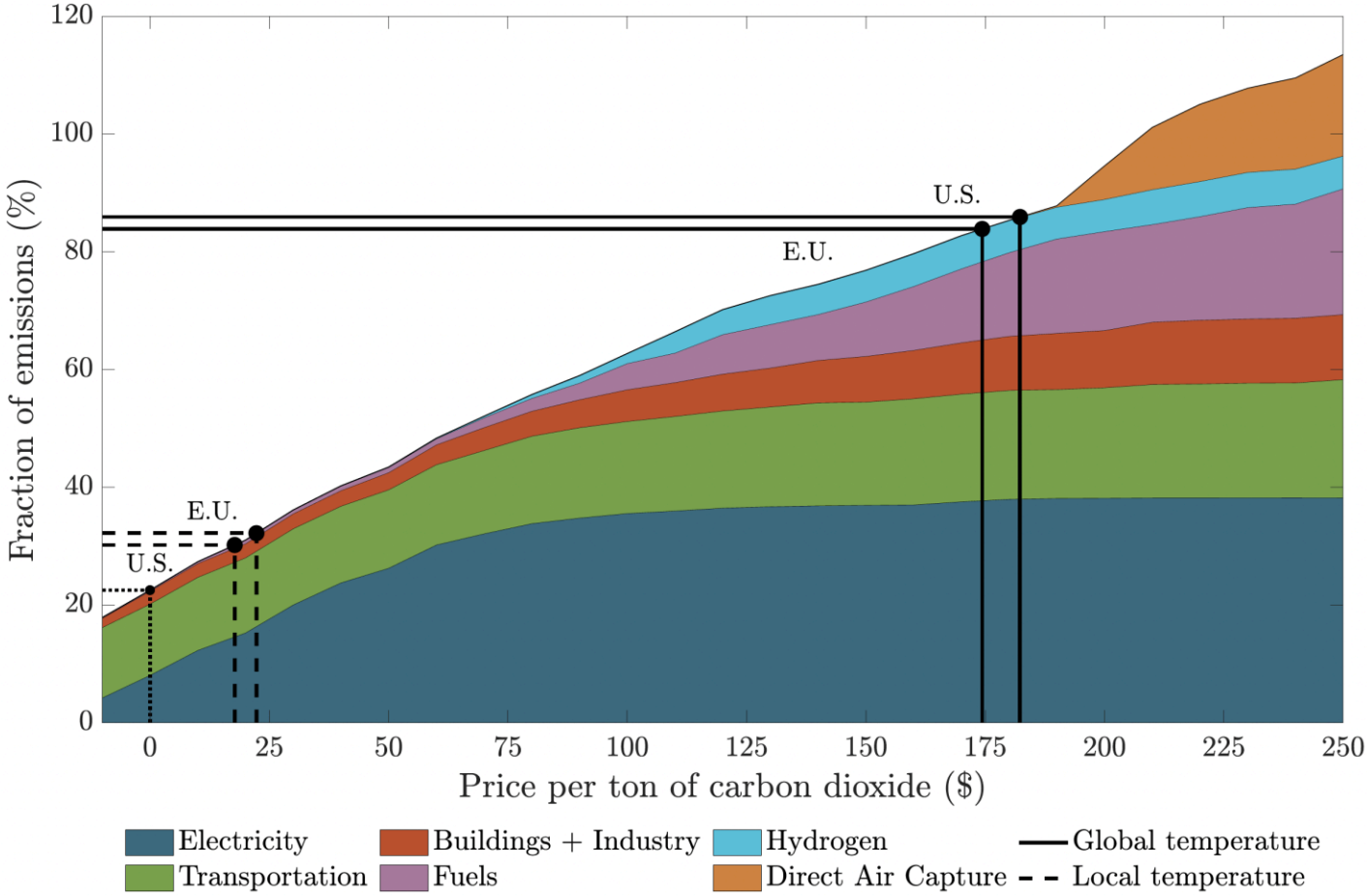
Why such a large difference? Global temperature changes are strongly correlated with extreme weather events like heat waves, droughts, and storms that can severely disrupt economic activity. Local temperature variations, by contrast, have much weaker connections to these damaging events (Bilal and Känzig 2024).

Reassessing costs and benefits

These findings fundamentally alter the cost-benefit analysis of climate action. We estimate an integrated assessment model using our reduced-form evidence on temperature shocks, and find that the domestic cost of carbon – i.e. economic damages *within a given country* from emitting one ton of CO2 – is over $170 per ton for the US and the EU. These values are an order of magnitude larger than estimates based on local temperature effects, which are below $25 per ton.

These economic costs are larger than a wide set of decarbonisation costs under current technologies. Using marginal abatement cost curves from the Environmental Defense Fund (2021), we find that it would be cost-effective for both the US and the EU to unilaterally decarbonise over 80% of their economies by 2050 (see Figure 2). This conclusion includes complete greening of electricity generation and transportation, plus significant progress in building efficiency and industrial processes. By contrast, under conventional damage estimates based on local temperature, optimal unilateral action would achieve only minimal additional decarbonisation beyond what market forces alone would produce.

Figure 2 Cost of carbon versus abatement costs



***Notes*: Marginal abatement cost curve and domestic costs of carbon for the US and the EU. Solid black lines: unilaterally optimal decarbonisation under global temperature damages. Dashed black lines: unilaterally optimal decarbonisation under local temperature damages. Dotted black line: unilateral decarbonisation absent any damages.**

Global temperature impacts thus have profound implications for climate policy. They suggest that major economies may not need to wait for global coordination to take substantial climate action. Domestic benefits alone can justify ambitious decarbonisation efforts.

Concluding remarks

While our findings may reverse conventional unilateral decarbonisation trade-offs, they also come with some qualifications. On the one hand, just as with any empirical estimates, our estimates of temperature impacts necessarily involve uncertainty given the limited time span for which we can study these impacts. However, this uncertainty around sizable point estimates does not lower the incentives to reduce emissions. – quite the contrary. If anything, risk-averse policymakers would undertake broader decarbonisation due to the risk of larger-than-expected damages. Technological progress that improves green technologies would further lower the barriers to broad decarbonisation. On the other hand, equilibrium responses in international fossil fuels prices leading to increased worldwide use could mitigate the effectiveness of unilateral decarbonisation by large economies. We hope that future research will examine and quantify the net effect of these channels.

Regardless of these qualifications, our results do not mean that international coordination is no longer necessary. Smaller economies whose individual emissions influence global temperatures less may still find unilateral action economically unattractive because their domestic cost of carbon scales with the size of their economy. And even for large economies, coordinated action remains more efficient than unilateral efforts. Given new estimates of a worldwide 'social cost of carbon' in excess of $1,300 per ton (Bilal and Känzig 2024), international coordination still has an important role to play.

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