

Carbon pricing and financial transfers: Small changes can have a huge effect on climate equity

December 9 2020



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Global greenhouse-gas emission reductions could be achieved in a fair and thrifty way by surprisingly small variations of well-known policies. This is shown by a team of economists in a quantitative study now published in *Nature*. Differentiated CO₂ prices in different countries combined with moderate financial transfers from advanced to developing countries would do the job. These changes would be most efficient in achieving fair burden sharing and at the same time keep overall costs in check, the researchers find. This could solve the epic trilemma to unite cost-efficiency, national sovereignty and fair effort-sharing.

"While the [emission reductions](#) necessary to meet the climate objective of the international Paris Agreement are clear, the way how to share this immense burden is not," says Nico Bauer from the Potsdam Institute for Climate Impact Research, lead-author of the study. "The tricky question is: how to achieve a climate target while respecting equitable burden sharing? This translates into a trade-off between economic efficiency and sovereignty, as an either-or solution turns out to be quite expensive: either huge international transfers or [higher costs](#) for all."

"Now, our calculations show that surprisingly moderate deviations from uniform [carbon](#) pricing can strongly reduce the money transfers needed," says Bauer. "And moderate financial transfers can strongly reduce inefficiencies of differentiated carbon pricing. Both policy instruments turn out to have non-linear effects: small changes can make a big difference."

National sovereignty and economic efficiency

Though uniform CO₂ pricing and international trading of emissions allowances would reach the climate stabilization target at the lowest

absolute cost, it could be a substantial burden for developing countries. To support them in their efforts, advanced countries would need to pay—which is often perceived as hurting national sovereignty. Alternatively, wealthy countries would need to implement stricter domestic policies to reduce overall emissions, which increases economic costs. The new study shows how this trade-off can be mediated.

The researchers ran computer simulations of energy-economy-land systems to analyze alternative policies. If greenhouse gas reduction efforts to limit [global warming](#) to well below 2°C are to be distributed in an equitable way, without financial transfers carbon prices in industrialized countries would need to exceed those in developing countries by more than 100 times.

If for instance in 2030 a ton of CO₂ would cost 19 US Dollars in India, it would need to be nearly 2500 US-Dollars in Europe to deliver the necessary emissions reductions. This would lead to efficiency losses of more than 2000 billion US Dollars worldwide within our century. If, in contrast, there would be an internationally uniform carbon price—reaching 56 US Dollar per ton CO₂ in 2030 -, financial transfers of more than 4000 billion US Dollars would be necessary in our century to equalize efforts between rich and poor countries. These transfers balance the differences of relative income losses from an assumed uniform carbon pricing that amount to 3% in India but only 0.3% in Europe.

Equity is defined here as an equal distribution of relative income losses across countries due to the climate policy measures.

Why mitigation costs differ so strongly between rich and poor countries

"The mitigation costs differ so strongly at uniform carbon prices because [advanced economies](#) already have a more efficient and cleaner energy use and are less dependent on fossil energy than developing economies. Therefore, in developing countries more low-cost opportunities for emissions reductions can be found, but implementing the emission reduction also incurs more severe income losses," explains Bauer. "A uniform carbon price delivering global emission reductions at the lowest cost, therefore, hits less developed countries harder. To establish equity, advanced countries would have to compensate developing countries financially to neutralize the differences in income losses."

"If advanced countries for the sake of sovereignty refuse this kind of financial transfers, to maintain equity their national CO₂ prices would need to be very high to achieve stronger emission reductions themselves," explains Bauer. "In the more advanced countries, this would require more investments because in their already technologically advanced economies further accelerating fossil fuel phase-out is more complicated and expensive. So, differentiating carbon prices drives up the overall global costs."

Thus, either of these common procedures leads to costly solutions, which are of course major obstacles to implementing the relevant climate policies. Yet the calculations by the Potsdam researchers show that with only a quarter of the global transfer volume more than half of the additional inefficiency in global mitigation costs could be saved. Also, the spread of carbon prices between different countries shrinks by three quarters. Hence, the trade-off between efficiency and sovereignty is non-linear. The extreme consequences of insisting on principles of either economic efficiency or sovereignty can be strongly reduced. Allowing for transfers reduces inefficiency, whereas deviating from uniform carbon pricing reduces the need for transfers.

"Future prosperity can only be assured if we succeed

to reduce climate risks"

"Now, there is no perfect solution. If we honor socioeconomic and technological differences as well as well-established political principles, differentiated carbon prices combined with moderate transfers are fundamental for an effective and fair future climate policy," says Ottmar Edenhofer, director of the Potsdam Institute for Climate Impact Research and co-author of the study. "Any ambitious international greenhouse gas reduction policy has to meet three criteria to become acceptable to governments worldwide: it must secure fair effort-sharing, cost-efficiency, and national sovereignty—which means limiting financial transfers. Our approach explores the wiggle room to find an acceptable compromise for this trilemma, especially if it is complemented with specific energy policies and international technology transfers."

"We aim at securing international prosperity both in the short and long term," adds Edenhofer, who also leads the Mercator Research Institute on Global Commons and Climate Change and is a professor at Technische Universität Berlin. "In the short term, the financial transfers—that are reduced but of course are still substantial—would not ruin the rich countries. They might infringe national sovereignty to some extent but not run counter national welfare, if they help to agree on [emission](#) limitations. Future prosperity can only be assured if we succeed to reduce climate risks and damages by rapidly stabilizing our [climate](#)."

More information: Quantification of an efficiency–sovereignty trade-off in climate policy, *Nature* (2020). [DOI: 10.1038/s41586-020-2982-5](https://doi.org/10.1038/s41586-020-2982-5) , www.nature.com/articles/s41586-020-2982-5

Provided by Potsdam Institute for Climate Impact Research

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