Carbon pricing's disappointing effect on the pace of technological change

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In order to achieve the goals of the Paris Agreement, the world must reach net-zero carbon emissions by 2050. Carbon pricing is viewed by many governments and experts as the most important climate policy instrument. However, a new study shows that carbon pricing has been

less effective as a driver of technological change than was previously anticipated.

While the introduction of carbon pricing systems has led to emissions reductions in some countries, they have not significantly stimulated technological change. Bringing about the necessary transformation will require sector-specific promotion of climate-friendly technologies, for example changes in electricity market design and a better charging network for electric cars. These changes require significant investment. Carbon pricing has a disappointing track record in this respect, as shown in a new study by scientists Johan Lilliestam (IASS/University of Potsdam), Anthony Patt (ETH Zurich) and Germán Bersalli (IASS Potsdam). They examined empirical studies on the effects of carbon pricing systems in the European Union, New Zealand, the Canadian province of British Columbia, and the Nordic countries.

"The significant reductions in emissions that we are seeing are being driven not by urgently needed investment in zero-carbon technologies but by operational shifts towards less carbon-intensive applications. But the effect of switching from gasoline to diesel or from coal to gas-fired power generation is practically irrelevant when it comes to achieving climate neutrality", says lead author Johan Lilliestam. Achieving net zero emissions will require more sweeping, systemic changes

Higher carbon prices fail to boost investment in zero emissions technologies

Most of the research examined in this study identify an overallocation of emission certificates, leading to low carbon prices, as a key factor in the failure of carbon pricing to drive change. But according to Lilliestam, Patt and Bersalli, this explanation does not tell the whole story. In the Nordic countries, for example, where carbon prices are relatively high,

carbon pricing schemes have had little noticeable effect on the pace of technological change.

Instead, the authors suggest, it is other other policy measures—in particular programs to promote renewable energy generation—that have driven the energy transition in this region. These targeted measures offered investors stronger investment incentives than the carbon pricing systems introduced concurrently, and the growth of renewables triggered by these measures in turn resulted in significant reductions in the cost of wind and solar power. In addition, fluctuations in the price of fossil fuels often exceed the cost of carbon surcharges. Such fluctuations, for example in the price of petrol, undermine the steering effects of carbon pricing schemes

Carbon pricing has its place in the policy toolbox

Despite this disappointing track record, the authors identify two use cases for carbon pricing. "On the one hand, carbon pricing can be used to generate revenue for urgently needed support measures and public investment. On the other hand, in certain sectors, such as coal-fired power generation, it could be used to diminish the competitive advantage of carbon intensive technologies as emerging technologies reach market maturity," explains Lilliestam. While carbon pricing is not suitable as a central policy solution, the authors conclude, it could contribute to efforts to achieve climate goals as one part of a broad package of measures.

More information: Johan Lilliestam et al, The effect of carbon pricing on technological change for full energy decarbonization: A review of empirical ex-post evidence, *WIREs Climate Change* (2020). DOI: 10.1002/wcc.681