Exploiting Synergy of Carbon Pricing and other Policy Instruments for Deep Decarbonization

Mathias Kirchner[a,*], Johannes Schmidt[b], Sebastian Wehrle[b,c]

[a] *Center for Global Change and Sustainability, University of Natural Resources and Life Sciences, Dänenstraße 4, 1190 Vienna, Austria*
[b] *Institute for Sustainable Economic Development, University of Natural Resources and Life Sciences, Feistmantelstrasse 4, 1180 Vienna, Austria*
[c] *Wiener Netze GmbH, Erdbergstrasse 236, 1110 Vienna, Austria*

March 12, 2019

Recently, it has been questioned whether carbon pricing is an efficient and effective tool to foster deep decarbonization, culminating in the claim that carbon pricing actually hinders the achievement of such a transformation(Patt and Lilliestam, 2018; Ball, 2018). This criticism disregards what we believe has been the consensus for many years now, namely that the deep decarbonisation of our economies essentially requires a comprehensive and disruptive policy package that includes carbon pricing amongst other measures, such as technology-specific support schemes. Here, we emphasize that carbon pricing could and should be part of any effective policy mix, and that some of the arguments against carbon pricing are flawed.

First, one argument often put forward is that carbon pricing and technology specific instruments differ in the way carbon emission reductions are delivered (Patt and Lilliestam, 2018). Carbon prices at socially acceptable levels trigger emission reductions by the cheapest currently available low(er)-carbon technologies, e.g. by inducing a switch from lignite and coal to natural gas in electricity production. In contrast, technology specific instruments can be tailored in a way to support technologies that are currently very expensive but which, due to technological and institutional learning, may become cheaper in the long-term, thus lowering long-term mitigation costs (Sandén

[*] Corresponding author

Email addresses: `mathias.kirchner@boku.ac.at` (Mathias Kirchner), `johannes.schmidt@boku.ac.at` (Johannes Schmidt), `sebastian.wehrle@boku.ac.at` (Sebastian Wehrle)

and Azar, 2005). Neo-classical economics has taken this discussion into account by acknowledging the role of technological and institutional learning in their models for a long time (Nordhaus, 2009). A practical example of technological learning is solar PV in Germany, where costs decreased by a factor of 10 in less than 20 years as a result of support policies. Yet, success of technology-specific support schemes is far from certain. Expectations on emission reductions from EU biofuel mandates, for example, were far too optimistic (Overmars et al., 2011). In our view, targeted technology support alone therefore is no panacea.

A second argument against carbon pricing is that it is ineffective, inter alia, because prices are currently too low (Ball, 2018). Setting prices higher, however, allegedly won't work due to a lack of social and political acceptance – one of the reasons being that carbon pricing may hit poorer households more than richer ones. While we agree that distributional impacts of policies matter, we want to emphasize that any decarbonisation policy will have distributional impacts, and mostly these are going to affect low-income households particularly – as they spend a larger share of their income on energy than richer households. As an example, banning internal combustion engines, a measure proposed by some (Ball, 2018), would hit low-income rural households hard, as the currently high costs for electric vehicles prohibit substitution. Also, it remains unclear to us why the acceptance of such policies would be higher than that of increasing carbon prices to effective levels. Importantly, recent events such as the Yellow Vest protests in France show that climate policies may trigger strong protests if they are not accompanied by significant compensation mechanisms. However, a recent empirical analysis (Berry, 2019) highlights in detail how substantial and targeted compensation measures could have been implemented in the case of the French carbon tax. Theoretically, the distributional consequences of virtually any policy can be counteracted by introducing appropriate compensation measures for losers, such as flat lump-sum transfers or targeted transfers to e.g. rural households or low-income households (Kirchner et al., 2019). The acceptance of carbon pricing policies will be further affected by other factors than distributional issues, such as political economy constraints, e.g. lobbying by those heavily affected, political trust, and behavioural biases due to different perceptions, values and beliefs (Klenert et al., 2018; Tvinnereim and Mehling, 2018). In real-world carbon pricing schemes - e.g. British Columbia, Switzerland or coal producing Alberta - this has led to the implementation of a diverse mix of compensation measures, such as tax cuts, green investments, flat transfers and/or targeted transfers. The need for compensation mechanisms in case of carbon pricing has thus been widely recognized both in the real-world and by economists and should be extended to other decarbonisation policies, such as targeted technology support and command and control instruments.

Third, we see several positive effects of carbon pricing which are not achieved by other policies: it allows harvesting "low hanging fruits". While a deep decarbonization requires to pick "high hanging fruits" as well1, we also see the benefits of carbon pricing in affected sectors such as power generation. While the carbon price in the European Union quadrupled from 2016 to 2018 to hover around 20 €/t, German power generation from hard coal and lignite fell by 12.5% compared to 2016. While some of the decline can be attributed to a de facto shut-down of lignite fired power-plants, a higher carbon price, which raises the relative cost of emission intense generators, likely decreases emissions in the power sector too (Wilson and Staffell, 2018). Such reductions in carbon emissions buy us additional time to develop the technologies required for full decarbonisation, thereby increasing the feasibility of climate change mitigation. Moreover, using technology specific subsidies first to trigger technological learning when technologies are still very expensive and subsequently, once these technologies' costs have been significantly reduced, introducing carbon prices is a way of limiting the impacts on total mitigation costs – as first few high cost technologies are supported and after some time, (lower) carbon prices are sufficient to allow the competitive market participation of these technologies (Patt and Lilliestam, 2018). Thus, introducing very high carbon prices can be prevented. In addition, if carbon revenues are recycled, macro-economic impacts will be very low, if not positive, even when one disregards the environmental (co-)benefits from less CO_2 emissions (Kirchner et al., 2019; Freire-González, 2018).

Fourth, carbon pricing and technology support instruments differ considerably in their effect on energy consumption. As carbon prices are passed-through to energy prices (Fabra and Reguant, 2014), at least in market-based systems, energy conservation is incentivised. Conversely, depending on their implementation, technology specific policies may even lower costs of energy intensive goods - e.g. by lowering prices on the wholesale markets for electricity, as occurred with renewable energies - effectively increasing demand for them. Such side effects should be considered carefully.

Fifth, the empirical evidence of carbon pricing with respect to short and long-term impacts on CO_2 emissions is questioned by some (Patt and Lilliestam, 2018; Ball, 2018). We believe it is too early to make any definite statements on carbon pricing in general, although sectoral emissions prices have been effective in some cases (Wilson and Staffell, 2018). Most carbon pricing schemes have been introduced only quite recently, at relatively low price levels and they often do not address all domestic CO_2 emissions. Furthermore, the scarce empirical evidence on the effect of carbon prices available does indicate that emissions have been significantly reduced compared to counterfactual scenarios (Tvinnereim and Mehling, 2018). What (relatively low) carbon prices so far clearly failed to deliver has been a deep decarbonization. However, in our view, the lack of a substantial decline in CO_2 emissions in countries that have implemented carbon prices, often at low levels and for limited sectors, does not provide a good case against carbon pricing but rather highlights the importance of (i) identifying and introducing additional measures to realise synergies from a well-designed set of policies to achieve deep decarbonisation, (ii) identifying carbon price paths that are more likely to meet the Paris Agreement goals, and (iii) extending carbon pricing to all sectors. Renouncing carbon pricing limits the scope and impact of climate change mitigation measures. Exploring synergies - and potential trade-offs - with other policies should become a high priority in research on deep decarbonisation as well as the identification of compensation measures that increase the political and social acceptability of a comprehensive and disruptive policy package.

If we are to succeed in limiting global warming, we will need a sensible mix of policies that foster significant technological innovation in the long-run – and an efficient allocation of resources in the short run. We'll therefore need carbon pricing just as much as targeted support for technology diffusion, command & control regulation, institutional reforms or targeted infrastructure investment. To achieve the ambitious Paris Climate goals in time, we'll need them all.

Acknowledgements. We gratefully acknowledge support from the European Research Council ("reFUEL" ERC-2017-STG 758149).

Author contribution. M.K., J.S., and S.W. conceived the idea together at lunch break and subsequently wrote the article with equal contributions together.

References

Ball, J., 2018. Hot Air Won't Fly: The New Climate Consensus That Carbon Pricing Isn't Cutting It. Joule 2, 2491–2494.

Berry, A., 2019. The distributional effects of a carbon tax and its impact on fuel poverty: A microsimulation study in the French context. Energy Policy 124, 81–94.

Fabra, N., Reguant, M., 2014. Pass-Through of Emissions Cost in Electricity Markets. American Economic Review 104, 2872–2899.

Freire-González, J., 2018. Environmental taxation and the double dividend hypothesis in CGE modeling literature: A critical review. Journal of Policy Modeling 40, 194–223.

Kirchner, M., Sommer, M., Kratena, K., Kletzan-Slamanig, D., Kettner-Marx, D., 2019. CO2 taxes, equity and the double dividend – Macroeconomic model simulations for Austria. Energy Policy 126, 295–316.

Klenert, D., Mattauch, L., Combet, E., Edenhofer, O., Hepburn, C., Rafaty, R., Stern, N., 2018. Making carbon pricing work for citizens. Nature Climate Change 8, 669–677.

Nordhaus, W.D., 2009. The Perils of the Learning Model For Modeling Endogenous Technological Change. NBER Working Papers 14638. National Bureau of Economic Research. URL: `https://ideas.repec.org/p/nbr/nberwo/14638.html`.

Overmars, K.P., Stehfest, E., Ros, J.P.M., Prins, A.G., 2011. Indirect land use change emissions related to EU biofuel consumption: an analysis based on historical data. Environmental Science and Policy 14, 248–257.

Patt, A., Lilliestam, J., 2018. The Case against Carbon Prices. Joule 2, 2494–2498.

Sandén, B.A., Azar, C., 2005. Near-term technology policies for long-term climate targets – economy wide versus technology specific approaches. Energy Policy 33, 1557–1576.

Tvinnereim, E., Mehling, M., 2018. Carbon pricing and deep decarbonisation. Energy Policy 121, 185–189.

Wilson, I.A.G., Staffell, I., 2018. Rapid fuel switching from coal to natural gas through effective carbon pricing. Nature Energy 3, 365.