The Political Economy of Carbon Pricing

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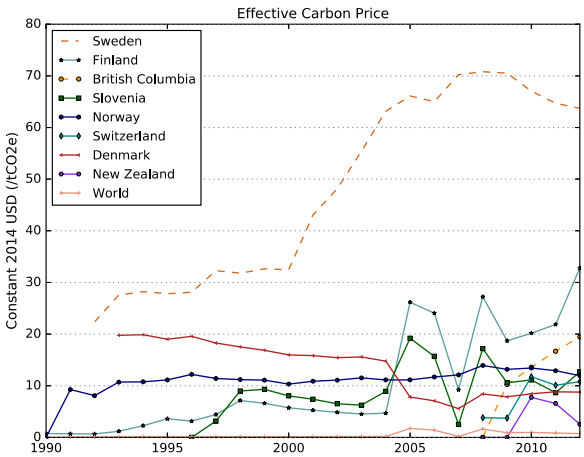
See footnotes at end of text.

By the end of 2015, the concentration of CO_2 in the atmosphere had reached 405 parts per million (Tans and Keeling, 2016). This level, a 40% increase from the pre-industrial era, is the consequence of the techno-economic system chosen since the Industrial Revolution. Yet, if we want a 50% chance of keeping the rise in Global Mean Temperatures below 2°C and avoid the most dramatic effects of climate change, global 2050 emissions levels must be 40 to 70% lower than in 2010 and global 2100 emissions levels must be near zero or below (IPCC, 2014)[1].

To reach this objective in a timely and cost-efficient way, policymakers need a workable strategy. Economists have argued that this strategy should include a credible carbon pricing mechanism. However, we recognize that carbon pricing has been at best a very limited part of any climate change strategy.[2] At the end of 2015, carbon pricing covered only 12% of global GHGs (World Bank, 2015) and in most jurisdictions where they existed, they were modest in their coverage and/or level. As a result, the world emissions-weighted price of carbon is currently around US$ 0.74/tCO_2e, falling a long way short of what is required to internalize the environmental externality arising from GHG emissions.[3] The US EPA figures for 2015 ranged from a low of US$12 - 62/t CO_2 depending on the discount rate.[4]

Reasons for the weakness of carbon pricing regimes abound. The most salient ones, however, are political. Pricing carbon imposes costs on some producers and all energy consumers that triggers opposition. Producers are concerned about decreased profits and capital losses, although some of them often benefitted from massive windfall gains from the free allocation of emissions allowances in emissions trading schemes and hence did not oppose them; consumers worry about higher retail energy prices, especially in liberalized electricity markets where wholesale and retail prices are more sensitive to carbon prices (Pollitt, 2012). Policy makers are, in turn, reluctant to introduce explicit carbon taxes or charges and favour less visible policy tools such as efficiency standards. Given recent developments one may be tempted to think that some of these political barriers have been overcome. Between 2010 and 2015, the share of covered GHGs increased from 5% to 12% and some of the newly created price signals will push average carbon prices up. However, a careful analysis of these developments calls for more cautious conclusions. Progress toward comprehensive carbon pricing requires that we look at the economy-wide coverage and the resulting average price. The emissions-weighted (or effective) price of carbon (ECP), measured by the ratio of the total economy-wide carbon price revenue divided by total GHG emissions, is a better metric to assess progress on carbon pricing. The figure below provides such a metric for selected jurisdictions over the period 1990- 2012.



The figure gives rise to two major observations. First, all jurisdictions except for Sweden and Finland had modest effective carbon prices. Given the Scandinavian high share of zero carbon power (hydro, nuclear, biomass) and the widespread high willingness to tax petroleum in transport use, this is hardly surprising.

Moreover, if the World effective price of carbon is any guide, the current global willingness to pay for carbon emissions remains quite low. Hence, if anything, the ability of jurisdictions to price carbon continues to look constrained. That constraint on effective prices of carbon induces a coverage-price tradeoff: a higher coverage could only be introduced at the cost of a lower price (or vice-versa). This is particularly apparent in the initial stages of introduction of carbon pricing schemes. For instance, Norway managed to introduce a relatively high price (US$28.5/t$CO_2$e) at the cost of a lower, yet not insignificant, coverage (32.5%); Japan on the other hand achieved broad coverage (69%) by 2012 but at a low carbon price (0.91US$/t$CO_2$e), although where Emissions Trading Schemes have been introduced, they typically have much broader coverage and higher prices (at least initially).

Second, initial constraints on pricing persist over time. Hence no jurisdiction (except Sweden) showed a

coherent pattern of increase in its effective carbon price (Finland's ECP only changed after the introduction of the EU-ETS and British Columbia froze the level of its carbon tax in 2012), as theory would prescribe and carbon pricing enthusiasts had hoped. Consequently, the policy gap, i.e. the difference between actual price signals and any plausible estimate of the Social Cost of Carbon has widened over time.

These two observations suggest that, despite positive developments, there appears to be an upper limit on the *stringency* of carbon pricing schemes. Our analysis (Dolphin et al. 2016) has examined the political economy barriers that continue to hamper their development. On the consumption side, the willingness to pay for carbon remains limited and well below the central estimates of the Social Cost of Carbon, even in richer countries.[5] On the production side, we find evidence of the negative impact of the coal-intensity of the electricity generation sector and the relative size of the industrial sector. Our regression analysis of 138 jurisdictions estimates that moving from a 25% coal share to a 75% coal share in electricity is associated with a US\$2/tCO_2e reduction in the effective carbon price. The relative share of industry in the whole economy affects the stringency of a scheme in a similar fashion.

From a policy-making perspective, these findings raise at least two sets of questions. First, what are the preconditions that make a positive price of carbon politically feasible and, crucially, how do they constrain its evolution over time? Second, since the stringency of carbon pricing policies is likely to remain bounded above at socially sub-optimal levels, is it still worth keeping it in the policy mix? Let us address each question in turn. First, the evidence suggests that the level of economic development positively influences the existence and stringency of carbon pricing mechanisms. In fact, a thousand US\$ increase in GDP per capita is associated with a rise in the effective carbon price of 25 US cents/tCO_2e on average. This result may, however, be driven by the fact that richer Annex-I countries to the Kyoto Protocol had to take GHG emissions reduction actions. Second, it appears that introducing carbon-pricing policies becomes easier once the electricity sector (and the economy in a broader sense) has already been partially "de-carbonized", possibly by means of other policies or favourable changes in technology and fuel prices. This supports the design of a climate change mitigation strategy that comprises a mix of complementary tools, particularly those that improve energy efficiency and so lower total energy use and hence GHG emissions. It also suggests that carbon pricing may not be the first policy to introduce when designing a climate change mitigation strategy. This is in line with the rationale behind the development of some carbon pricing schemes, such as the California cap-and-trade program, which have been introduced after renewable energy support policies and serve as a backstop to those – and other – GHGs abatement policies.

The above discussion does not, however, imply that we should refrain from introducing carbon-pricing mechanisms, even at a sub-optimal level. Both static and dynamic arguments support a positive price of carbon. From a static perspective, pricing carbon, even at relatively modest levels, helps internalize at least some of the environmental externality and makes some contribution to GHG emissions reduction. From a dynamic perspective, a positive (albeit sub-optimal) price of carbon may in itself contribute to the creation of a "clean" path dependency and foster the political acceptability of socially optimal prices in later periods. It also signals a commitment to decarbonize that may influence the expectations of those making durable investment decisions in e.g. generation assets. However, as the data presented above suggest, evidence of a willingness to embrace more significant levels of carbon pricing has yet to materialize. There are, however, encouraging signs in the gradual extension of the coverage of carbon pricing at the global level.

Footnotes

[1] Based on IPCC mitigation scenarios reaching 450 ppm CO_2-eq by 2100.

[2] Moreover, policymakers have meanwhile continued to subsidise the consumption of fossil fuels: consumption subsidies worldwide amounted to $493 billion in 2014 (IEA, 2015).

[3] All figures expressed in 2014 US$. This figure does not account for taxes on other GHGs than CO_2.

[4] EPA's social cost of carbon is from https://www3.epa.gov/climatechange/EPAactivities/economics/scc.html

[5] Evidence of this is provided for the U.S. by Jenkins (2014).

References

Dolphin, G., Pollitt, M. and Newbery, D. (2016). The political economy of carbon pricing: a panel analysis. Mimeo, EPRG, University of Cambridge

IEA (2015). World Energy Outlook. OECD Publishing, Paris.

IPCC (2014). Summary for policymakers. In Field, C., Barros, V., Dokken, D., Mach, K., Mastran-

drea, M., Bilir, T., Chatterjee, M., Ebi, K., Estrada, Y., Genova, R., Girma, B., Kissel, E., Levy, A., MacCracken, S., Mastrandrea, P., and White, L., editors, Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Cli- mate Change, pages 1–32, Cambridge, United Kingdom and New York, NY, USA. Cambridge University Press.

Jenkins, J. (2014). Political economy constraints on carbon pricing policies: What are the implications for economic efficiency, environmental efficacy, and climate policy design. *Energy Policy*, 69:467–477.

Pollitt, M. (2012). The role of policy in energy transitions: Lessons from the energy liberalisation era. *Energy Policy*, 50:128–137.

Tans, P. and Keeling, R. (2016). *Trends in Atmospheric Carbon Dioxide*. Scripps Institution of Oceanography.

US EPA (2016). *Climate Change Indicators in the United States: Atmospheric Concentrations of Greenhouse Gases*.

World Bank (2015). *State and trends of carbon pricing*. Washington, DC.

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References

Dahl, C. & Erdogan, M., 1994. Econometric Energy Demand and Supply Elasticities: Truth or Fiction. In *Proceedings of the 17th Annual International Energy Conference*. Cleveland.

Fell, H., Hintermann, B. & Vollebergh, H., 2015. Carbon content of electricity futures in phase II of the EU ETS. *Energy Journal*, 36(4), pp.61–83.

Gunkel, D. et al., 2012. Storage Investment or Transmission Expansion : How to Facilitate Renewable Energy Integration in Europe ? *VDE-Kongress 2012*, pp.3–8. Available at: http://conference.vde.com/kongress2012/programm/Seiten/default.aspx.

Keppler, J.H. & Cruciani, M., 2010. Rents in the European power sector due to carbon trading. *Energy Policy*, 38(8), pp.4280–4290. Available at: http://dx.doi.org/10.1016/j.enpol.2010.03.057.

Lise, W., Sijm, J. & Hobbs, B.F., 2010. The impact of the EU ETS on prices, profits and emissions in the power sector: Simulation results with the COMPETES EU20 model. *Environmental and Resource Economics*, 47(1), pp.23–44.

Matthes, F.C., 2008. *Windfall profits of German electricity producers in the second phase of the EU Emissions Trading Scheme (2008-2012)*, Berlin.

Pahle, M., Fan, L. & Schill, W.P., 2011. How emission certificate allocations distort fossil investments: The German example. *Energy Policy*, 39(4), pp.1975–1987. Available at: http://dx.doi.org/10.1016/j.enpol.2011.01.027.

Pettersson, F., Söderholm, P. & Lundmark, R., 2012. Fuel switching and climate and energy policies in the European power generation sector: A generalized Leontief model. *Energy Economics*, 34(4), pp.1064–1073. Available at: http://dx.doi.org/10.1016/j.eneco.2011.09.001.

Sijm, J.P.M. et al., 2008. The impact of the EU ETS on electricity prices. , (December).

Trotignon, R. & Delbosc, A., 2008. *ALLOWANCE TRADING PATTERNS DURING THE EU ETS TRIAL PERIOD : WHAT DOES THE CITL REVEAL ?*, Available at: http://www.caissedesdepots.fr/fileadmin/PDF/finance_carbone/etudes_climat/UK/08-06_climate_report_n13_-_allowance_trading,_what_does_the_citl_reveal.pdf.

Veith, S., Werner, J.R. & Zimmermann, J., 2009. Capital market response to emission rights returns: Evidence from the European power sector. *Energy Economics*, 31(4), pp.605–613. Available at: http://dx.doi.org/10.1016/j.eneco.2009.01.004.

Verbruggen, A., 2008. Windfalls and other profits. *Energy Policy*, 36(9), pp.3249–3251.

Wietschel, M., Fichtner, W. & Rentz, O., 1997. Integration of price-depending demand reactions in an optimising energy emission model for the development of CO_2-mitigation strategies. *European Journal of Operational Research*, 7(102), pp.432–444.

Woerdman, E., Couwenberg, O. & Nentjes, A., 2009. Energy prices and emissions trading: Windfall profits from grandfathering? *European Journal of Law and Economics*, 28(2), pp.185–202.