

The Marginal Abatement Cost of Carbon Emissions in China

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Executive Summary

Countries are increasingly considering market based instruments such as pollution taxes or tradable permits to tackle environmental problems. One of the major challenges governments face is the lack of adequate knowledge about the cost (and its heterogeneity) to industry of pollution abatement activities. Such cost estimates are either unavailable or highly uncertain. In the case of China, for example, empirical estimates of the marginal abatement cost (MAC) of carbon mitigation obtained using distance function approaches vary widely from merely a few US dollars into the hundreds and thousands of US dollars per metric tonne. This variability in the magnitude of MAC estimates may undermine the scientific support for policies aimed at curbing carbon emission. In the literature, there has been very limited work that could shed light on this variability to help governments make sense of the wide gaps between estimates and also between these estimates and real-world prices for carbon.

In this study, we estimate China's MAC for carbon using China's provincial data from 2001 to 2010 and distance functions with different specifications. We show that the variability in cost can be partially explained by the differences in the input/output coverage of estimated models and by whether the MAC estimated is conditional on simultaneous reduction of non-carbon emissions. The paper also argues that the substantial heterogeneity in cost estimates can be explained in terms of inherent differences in the nature (i.e. economic interpretation) of the estimates from different studies. In particular, we argue that radial measures imply little change in the input or output mix and thus reflect short-run MACs while non-radial measures are evaluated at input/output mixes that are a transformation of observed values and therefore are more akin to long-run MACs. Finally, we obtain a mean estimate of short-run MAC for carbon (20 US\$ per tone) that is very close to the carbon prices observed in China's recently launched pilot markets.

The findings in our study suggest that a promising avenue for future research would be a careful investigation of the economic interpretations of abatement cost estimates generated using different methods or mapping schemes (radial, directional, etc.). Such an exercise would facilitate comparisons across different estimates and help policymakers get a better sense of the cost to industry of pollution reduction.

