

## Executive summary

Trinks, A. en Hille, E. (2023). Carbon costs and industrial firm performance: Evidence from international microdata, *Discussion Paper*. [link](#).

Firms could be encouraged through policies to reduce the use of fossil energy in order to achieve national and international climate goals. This can be done by explicitly pricing carbon with a carbon tax or emissions trading system, but also through fuel excise taxes, subsidies, standards, and restrictions. All of these policies determine, explicitly or implicitly, how expensive or attractive it is for firms to emit carbon.

Rising carbon costs might potentially harm economic activity and firms' competitive position. Moreover, firms may be able to avoid locally raised carbon costs by relocating their operations to weaker-regulated jurisdictions. This may coincide with an additional increase in carbon emissions elsewhere in the world. Such so-called carbon leakage effects make domestic climate measures less effective.

In our study, we provide first international firm-level evidence on the effect of explicit and implicit carbon costs on economic activity. We combine two unique data sources. We use production data to construct an integral measure of carbon costs. This measure reflects the stringency of the mix of climate and energy policies. The measure has a strong microeconomic basis and allows for objective and consistent international comparisons. We link this measure to comprehensive international data on the production activity and performance of industrial firms. Our dataset covers up to 3.1 million firms from 32 countries and 15 industrial sectors in the period 2000–2019. Robust panel estimation models are used to test how rising carbon costs impact firm performance.

Our research finds little evidence for negative effects on performance, such as profit, productivity and sales growth of an average industrial firm. The study does find a modest reduction in employment in the order of 2% for a USD 50/tCO<sub>2</sub> increase in carbon costs. However, the effects differ considerably between subgroups of firms. Performance effects are most pronounced in sectors sensitive to carbon leakage and in EU countries. Specifically, modest employment reductions are observed in capital-intensive firms and small firms in carbon leakage-prone sectors, mainly in mining, cement and base metals. In leakage-prone sectors, we further see that capital-intensive firms ramped up their investments and that small firms improved their productivity. In all subgroups, profitability and the probability of exit are hardly influenced by carbon costs.

Policymakers can use our results to assess the risk of adverse effects of climate policy and to design their policies efficiently. Our findings show that the adverse effects are limited and, moreover, concentrated in small subgroups of firms. This is consistent with previous evidence on explicit carbon pricing instruments and energy prices.

These results suggest that firms primarily respond to rising carbon costs by *adapting* rather than *relocating* their production process. Still, relocation and carbon leakage could become more important for countries that implement more ambitious climate policies than other countries. This also depends on a large number of factors other than direct carbon prices, including agglomeration benefits, the tax system, policy design, and institutional

factors, among others. Moreover, forward-looking firms anticipate upcoming changes in climate policy and possible changes in consumption behaviors around the world. This study underlines that climate policy, especially internationally, can be tightened with limited economic damage.