

Carbon Emission LEAKAGES: An Analytical General Equilibrium View

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In December 1997, a number of countries - referred to as the Annex 1 countries - signed the Protocol of Kyoto by which they agreed to stabilise their emissions of greenhouse gases (GHGs). This treaty has often been criticised on the ground that such unilateral action by a group of country could be undermined by the existence of a so-called “carbon leakage”. Carbon leakage refers to the possible rise of GHGs emissions in countries that did not signed the Protocol in response to the mitigating efforts made in the Annex 1 countries. The existence of carbon leakage would undermine the environmental effectiveness of any attempt by industrialised countries alone to reduce the threat of climate change. It would also make more problematic to involve the developing world in a global strategy to reduce the concentration of the GHGs in the atmosphere.

The aim of this paper is to provide a discussion of the key factors underlying the size of the carbon leakage. This task is carried out with a two-region, two-final goods simplified CGE framework, incorporating the use of three fossil fuels (coal, oil and a less carbon-intensive fuel) as well as trade and capital mobility. This framework was designed to make extensive sensitivity analysis more tractable, as it can reproduce a wide range of alternative assumptions and parameterisations that otherwise would be difficult or even impossible to simulate with a large CGE model. The results show that, among different determinants of the size of carbon leakage, the degree of product differentiation of manufactured goods and the international capital mobility are relatively less influential. Conversely, the supply elasticity of coal emerges as the critical parameter. A fact that has attracted little attention so far in analytical studies on carbon leakage is that the shape of the production function also matters. Finally, the leakage rates are rather small for the range of parameters provided in the literature and corresponding to the ones embodied, for example, in the OECD’s GREEN model.