Unilateral EU climate action, carbon leakage and CBAM â€“ calculations with GINFORS-E

Topic: Input-Output Modelling: Energy Policies - II
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The GINFORS-E model has been applied in the project â€œClimate Protection Scenarios until 2050 Considering CO2 price Differences and Carbon Leakageâ€• for the German Federal Environment Agency to quantify the socio-economic effects of unilateral EU climate action. Compared to previous modeling work, carbon leakage is considered in great detail under different design options of the EU-ETS.

The papers looks into macroeconomic and sectoral impacts of unilateral climate protection of the EU with regard to carbon leakage, and the design of the EU ETS including a CBAM. In the reference scenario the EU and the other countries do not take any additional climate protection measures. In contrast, the EU targets of 55% GHG reduction by 2030 and 95% by 2050 are met in three alternative scenarios, while nothing changes in the rest of the world. In these three scenarios, the design of the EU ETS, i.e., the allocation of emission allowances, is differentiated. The first assumes free allocation of emission allowances in the EU, the second full auctioning of all ETS sectors, and the third is in line with the EU fitfor55 proposal. It includes full auctioning and a CBAM on direct emissions, both introduced between 2026 and 2035, while compensation for indirect emissions from electricity is phased out until 2035. In further sensitivities, various assumptions such as the Armington elasticities, the design of the CBAM and the stronger participation of other countries in climate mitigation are examined.

GINFORS-E is a global model that it is designed for assessments of economic, energy, climate and environmental policies up to the year 2050. It is a bilateral world trade model based on OECD data, which consistently and coherently models exports and imports of 25 goods groups for 64 countries and one â€˜rest of the world' region. All EU-27 countries, additional European economies and international major trade partners are explicitly modeled. It incorporates a macro-model, consisting of exports and imports, other core components of final demand (private and public sector consumption and investment), markets for goods and the labour market, for each country. The country models are also divided into 36 goods categories in accordance with the OECD internationally harmonized input-output (IO) tables. For every country OECD bilateral trade data on industry level is linked to the IO tables. Each national model is linked to an energy model, which determines energy conversion, energy generation and final demand for energy for 19 energy sources disaggregated by economic sector based on IEA energy balances. Energy-related CO2 emissions are linked to energy use. The model considers technological trends and price dependencies.

In the case of the unilateral EU climate ambition there is a partial shift of production out of the EU in carbon-intensive sectors such as chemicals, basic metals and non-metallic minerals because the costs in the EU increase. These carbon-intensive goods and the goods are subject to high international competition because they differ little in quality. Carbon leakage rates are highest in the case of full auctioning and lowest in the CBAM scenario. However, because these sectors contribute only a small part to value added in the EU, other macroeconomic effects predominate. For example, CO2 reduction leads to a decrease in energy imports, an increase in energy efficiency and structural change, which has a positive impact on the EU economy. Overall, the GDP effects for the EU are slightly positive. Some energy exporting countries are negatively affected. The effects on the long-term growth path are very small, and significantly smaller than the expected negative

macroeconomic effects of climate change. Free allocation of emission allowances is better for the EU economy than auctioning. Full allocation of emission allowances with a CBAM mechanism also performs slightly worse than free allocation. Carbon leakage occurs especially in the carbon-intensive sectors of the EU ETS. Free allocation of emission allowances and a CBAM can reduce carbon leakage.

Further sensitivity calculations show that the assumption of higher Armington elasticities slightly worsens the macroeconomic effects for the EU, as carbon leakage effects get larger. Elasticities of substitution between domestic and imported goods are important for carbon leakage. The design of the CBAM plays only a minor role for the economic impacts. With stronger climate ambition of other countries, the effects on EU GDP worsen slightly.

The policy conclusion can be summarized as follows: There is a risk of carbon leakage if the EU acts unilaterally. However, the effects are limited and can be further reduced by appropriate design of the EU ETS. They are not an argument against achieving the climate targets in the EU.