

A joint macroeconomic analysis of the ramp-up of the CBAM and the reduction of emission allowances using the ThreeME CGE

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This paper develops a computable general equilibrium analysis framework coupled with a global Multi-Regional Input-Output model to analyse the effect of implementing the Carbon Border Adjustment Mechanism (CBAM) on the European economy and its emissions trajectory. In May 2023, the European Union decided to introduce a carbon tariff mechanism as part of the Fit-for-55 package to reinforce the ambition of the Green Deal. This instrument introduces customs duties on certain products imported into the EU based on their carbon content. It aims to reduce the distortion to competitiveness caused by the carbon-pricing differential between the EU (through the EU Emissions Trading System) and the rest of the world. It primarily strengthens the domestic carbon price signal by allowing a gradual phasing out of free allowances by 2034 for sectors at high risk of carbon leakage. What would be the effect of implementing a CBAM tool on the European economy and the dynamics of imported emissions and those from domestic activities?

We are developing a specific version of the ThreeME model, calibrated at the European level, which integrates a modelling of the emissions quota system for the 33 identified economic sectors, as well as a carbon pricing mechanism on imports of 6 products (iron and steel, cement, aluminium, fertilisers, hydrogen, and electricity) out of 25 products. The ThreeME model is a neo-Keynesian-inspired computable general equilibrium model that incorporates viscosity effects in price formation, enabling it to represent the temporal dynamics of the spread of a shock over a given period (for a full description, see ThreeME.org).

This version of the model also incorporates a representation of the EU ETS emissions quota system and the European Commission's volume changes for companies subject to this mechanism. The CBAM instrument is also represented as a tax on imports of targeted products based on the emissions generated in the upstream value chain.

To calculate these, we incorporate an international trade model that breaks down imports from different regions of the world. We also identify the carbon flows associated with these imports, which form the basis for CBAM pricing. To identify these carbon flows, we used an input-output analysis model based on Exiobase data, which was then bridged to the model's nomenclature. This also allows us to separate direct imported emissions from those emitted throughout the upstream chain.

The model is calibrated using national accounting data in NACE 64 format provided by Eurostat and, for sectors associated with the MACF, additional data from Eurostat's Structural Business Statistics. ETS allowance volumes are calibrated at the sector level using data from the European Union Transaction Log (EUTL).

This analytical framework allows us to construct complex scenarios that combine several elements specific to carbon pricing mechanisms, the distribution of ETS allowances to companies, and the rest of the world's reaction under symmetrical customs duties.

Our first scenario is the implementation of the emissions cap defined by the "Fit for 55"™ package, the phasing out of free allowances for exposed sectors without a carbon border adjustment mechanism, and the target trajectory for the ETS allowance price.

The second scenario incorporates a CBAM mechanism in which imports of the six targeted products are taxed at the same price as the ETS tonne in our simulations, with several variations in the terms of revenue redistribution.

Finally, a last scenario also incorporates a symmetrical response of customs tariffs on EU exports.

This work provides a macroeconomic analysis of one of the main elements of the European Fit-for-55 decarbonisation strategy, combining both the dynamics of reducing free allowances with those of increasing the pricing of imported emissions.