Developing an open-source MAcroEconomic Sustainability TRajectory model with Input Output (MAESTRIO)

Topic: Input-Output Modelling: Sustainable Production and Consumption policies (2)
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Sustainability transitions require rigorous macroeconomic models that can accurately assess the economic, social, and environmental impacts of new policies and technologies. Traditional economic models used for policy evaluationâ€”such as computable general equilibrium (CGE) modelsâ€”are often constrained by assumptions of perfect markets, supply-side equilibrium, and instantaneous adjustments. These assumptions limit their ability to capture dynamic transitions and the broader economic consequences of policy interventions. As economies move toward sustainable technologies, there is a growing demand for models that can evaluate the macroeconomic ripple effects of technological and policy changes, particularly in demand-driven contexts. Policymakers, industrial associations, and research institutions require scientifically robust tools to assess these transitions, ensuring that policies support economic resilience, social well-being, and environmental sustainability.
Global macro-econometric input-output models, such as E3ME and GINFORS, have a post-Keynesian approach to modelling the economy, allowing for non-equilibrium solutions and uncertainties. Both models have been used by the European Commission for policy analysis alongside more standard CGE models. However, neither E3ME nor GINFORS are open source. We have therefore started to develop an open-source global multi-regional MAcroEconomic Sustainability TRajectory model with Input Output (MAESTRIO).
The model is a final-demand-driven model with supply-and-use tables (SUTs) at its core, complemented with several options for determining the final demand trajectories. The objective is to have a fully modular model, so that the modeler can choose which final demand categories are exogenous and which are endogenous to the model for each individual country. For now, household demand grows exogenously with population or with growth rates taken from published scenarios (e.g. IEA energy scenarios). Household demand can e.g. be endogenized using a more detailed household model. Government consumption development is econometrically estimated depending on population development, time, and possibly other macro-economic variables based on time series data (1970-2023) from the UN SNA. A magnitude of investment models exists. For now, we use a very simple endogenization of investments by letting GFCF grow with last yearâ€™s GDP growth rate. This ensures path dependency of individual scenarios, but at the same time does not lead to model instability. Technology and trade coefficients as well as the structure of final demand can be changed exogenously when defining alternative scenarios. The modelling of price effects is under development (and first thoughts will be presented). Impacts on employment, emissions, and energy are currently calculated using satellite accounts. Note that, the development of employment by industry is linked to the development of value added, while energy and emissions vary with intermediate energy inputs (not with output levels by industry).
During model development, we are currently using two datasets, a 3-region, 4-industry, 5-product dummy dataset and the full FIGARO supply-and-use tables. Using the FIGARO tables as a basis, not only ensures to have the most detailed and highest quality SUTs for the European countries, but also allows for a comparison of modelling approaches and modelling outcomes with the JRCâ€™s FIDELIO model.
With the currently limited functionality, we have developed a baseline and two alternative scenarios. In the â€œsufficiency scenarioâ€•, Western European household consumption patterns change towards more equal consumption patterns that ensure decent living standards for all based on scenarios from the literature. The second scenario assumes a ten-fold increase in offshore wind

electricity capacity of the next decade, thus changing technology of electricity production. Both scenarios are implemented in this trajectory model and compared to the implementation in a static input-output model. In addition, the results show the importance of using a global trade-linked model to analyse the cross-border effects of policies that are implemented in only a subset of the countries. We will then attempt to showcase a live implementation of a new scenario or simply alter an existing scenario together with the audience.