

GTAP Board Report 2022

European Commission

The European Commission and its various services are active users of the GTAP database and model as well as other products provided by the GTAP Centre. This report highlights GTAP-related activities for the period 2021-2022 and identifies priority areas for future developments in respect to the GTAP model and databases.

GTAP-related activities

The Joint Research Centre (JRC) uses the GTAP database to run global CGE models like MAGNET for agricultural issues, JRC-GEM-E3 for analyses of climate mitigation, energy and air pollution, CAGE for climate impacts and adaptation, RHOMOLO for regional analysis and uses the GTAP global and bilateral Migration Database for the assessments of impacts of migration in conjunction with the GTAP Global Migration model (GMig). A main focus was on the analysis of agricultural and climate policies.

The global CGE model MAGNET model is calibrated on an extended version of the GTAP database. With MAGNET, the JRC conducts medium to long-term foresight analyses of EU bio-based sectors, agricultural policy, international trade (EU FTAs and African CFTA), SDGs and food security. We are also carrying out analysis on the impact of soil erosion, and economic analysis of food waste and loss as well as changes in dietary habits. The unit is engaged in the process of linking economic models to other economic simulation models with agricultural focus (e.g., CAPRI and AGLINK) and to biophysical models (e.g., hydrological, forest, and crop models) to provide comprehensive and integrated analysis.

The JRC-GEM-E3 model was mainly applied to analyse EU and global climate policies and the model makes use of the GTAP-Power data disaggregation. A focus was the analysis of policy initiatives under the “Fit for 55”, including detailed assessments of the European Commission for a carbon border adjustment mechanism (CBAM) and a revised energy taxation directive (ETD). Here, the JRC engaged in further developing the PIRAMID framework. It allows building dynamically consistent input output tables that maintain exogenous assumptions (e.g. energy balances obtained from an energy system model). These input output tables then allow calibration of dynamic baselines for the analysis of long-term environmental impact which are shared publically.

DG TRADE uses the GTAP database and the standard and dynamic versions of the GTAP model as tools for analysis of EU trade policy (e.g., the impact of the EU free trade agreements, the impact of various sanction packages, etc.). Apart from using the GTAP database in combination with the static and dynamic GTAP model, DG TRADE also uses the GTAP database while operating the MIRAGE model.

Priority areas

The European Commission services actively using the GTAP database as an input to their daily impact assessment and analytical activities have highlighted some priority areas for future improvements.

The GTAP database and the accompanying CGE modelling framework has been constantly improved and extended to cover a broad range of policy issues. Several additional improvements are deemed important by the GTAP users at the European Commission.

- For the upcoming years to come, exploring the **trade and climate change nexus** will be one of the priorities of DG TRADE along with many other Commission services. Further developments on the GTAP-EP-RD model towards including GHG emissions and land use data in one suite would be a priority.
- The role of (international) transport could be improved in several dimensions.

A continued improvement of the **data on trade margins and transportation** would be welcome in view of increasing number of analyses looking at the issues related to value chains.

In the GTAP model, an updated code to include flexibility in introducing transport service shocks would be strategic. Transport modalities are crucial for trade analysis. Since transport margins are included in the trade data flows as residual, i.e. difference between imports and exports, it is hard to shock transport services. Simulating productivity shocks, transport facilities increase, or a change in transport modalities, is impossible at this stage.

The JRC has started to look into disaggregating transport sectors (land, air, water) into passenger and freight transport. We are currently looking at several sources of external data, facilitating such a split for EU regions and main world regions (using SBS - Eurostat Structure Business Statistics; BPM6 – Eurostat International Trade in Services; and the outcomes of bottom-up technology models, We should note that this activity is still in its early stages.

- The need for an **improvement of the quality of data for African countries** by using recent I/O tables and other recent available data sources such as farm and household surveys, etc. should still be considered a priority together with an increase coverage of Africa. The JRC is also engaged in producing SAM database for specific sub-Saharan Africa countries (Kenya, Senegal, Ghana, Cote d'Ivoire, Cameroon and Ethiopia) and JRC would be happy to contribute our single-country SAMs for the improvement of the global database and to liaise between local researchers cooperating with us, and the GTAP centre on development of specific SAMs.
- The JRC supports the current effort to increase the linkage between the GTAP agricultural data and production data of FAO database, which we hope can become public soon. Relatedly, GTAP still lacks some **detail in agricultural commodities**, and especially corn, beef and poultry should be included as separate commodities in future releases.
- DG TRADE is using several databases, e.g., WIOD, FIGARO, TiVA and GTAP, to assess supply chain links and other input-output relations with relevance for trade policy. However, there are regional and sector specific differences in trade flow values across those MRIOs data and several indicators using e.g. TiVA and GTAP data display, sometimes, significant differences. DG TRADE has financed a project to look into the latter. Further work is needed to understand the reasons behind the (large) discrepancies in trade indicators across these databases.
- The JRC contributed the EU domestic support database. We would like to foster a more transparent and comprehensive representation of the changing nature and magnitude of agricultural domestic support.
- We would support more ex-post historical validation exercises of CGE models using the GTAP database. It is often the case that **key parameters** (e.g. energy demand and supply elasticities) of these models are not econometrically estimated, and the performance of the model is not contrasted against historical outcomes. A revision and possibly a new estimation of Armington elasticities at bilateral level to make them more up to date with current economic reality would be relevant. Similarly, the dynamic capital adjustment parameters need to be re-estimated and empirically validated.
- The inclusion of **non-tariff barriers (NTB) trade cost equivalents** in the GTAP database, for goods and services, would be of significant importance for trade policy analysis, as would the incorporation of the Trade in Services data by Mode of Supply (TiSMoS), hosted at the WTO, to improve the bilateral flows of services by mode of supply.

Selected publications and policy documents

Agricultural, food and trade policy analysis

Simola, A.M., Boysen, O., Ferrari, E., Nechifor, V. and Boulanger, P., Potential effects of the African Continental Free Trade Area (AfCFTA) on African agri-food sectors and food security, EUR 30804 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-41023-2, doi:10.2760/740480.

Sanjuan López, A.I., Gracia De Rentería, P., Ferrer Pérez, H., Philippidis, G. and Ferrari, E., Non-Tariff Measures (NTMs) and Intra-African Trade, EUR 30738 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-38678-0, doi:10.2760/11470.

Ferrari, E., Chatzopoulos, T., Perez Dominguez, I., Boulanger, P., Boysen-Urban, K., Himics, M. and M`barek, R., Cumulative economic impact of trade agreements on EU agriculture, EUR 30496 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-27156-7, doi:10.2760/6546.

Sartori, M, Ferrari, E., Boysen-Urban, K., M`Barek, R., Philippidis, G., Borrelli, P., Montanarella, L. and Panagos, P. The long-term effects of soil erosion: a global economic analysis. 2021. Presentation at the 24th Annual Conference on Global Economic Analysis.

Boysen, O., Ferrari, E., Nechifor, V., Tillie, P. The Impacts of the Cocoa Living Income Differential Policy on Ghana. Presented at the 24th Annual Conference on Global Economic Analysis, 2021.

Simola, A.M., Boysen, O., Ferrari, E. and Nechifor, V. African economic integration and its effects on climate change adaptation and hunger prevention. Paper accepted for presentation at the 25th Annual Conference on Global Economic Analysis (June 2022).

Sahoo, A., Nechifor, V., Ferrari, E. and Amany, D.S.D. Economywide impacts of expansion of maritime infrastructure in Senegal. Paper accepted for presentation at the 25th Annual Conference on Global Economic Analysis (June 2022).

Global and EU climate policy analysis

Duscha, V., Kersting, J., Peterson, S., Schleich, J., & Weitzel, M. (2021). Development of low-carbon power technologies and the stability of international climate cooperation. *Climate Change Economics (CCE)*, 12(04), 1-30.

Garaffa, R., Weitzel, M., Vandyck, T., Keramidas, K., et al. (2022). Energy-economy implications of the Glasgow pledges: a global stocktake of COP26. Paper accepted for presentation at the 25th Annual Conference on Global Economic Analysis (June 2022).

Keramidas, K., Fosse, F., Díaz Vázquez, A., Dowling, P., Garaffa, R., Després, J., Russ, P., Schade, B., Schmitz, A., Soria Ramirez, A., Vandyck, T., Weitzel, M., Tchong-Mi ng, S., Diaz Rincon, A., Rey Los Santos, L., Wojtowicz, K.. *Global Energy and Climate Outlook 2021: Advancing towards climate*

neutrality, EUR 30861 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-42314-0, doi:10.2760/410610, JRC126767.

Vandyck, T., Weitzel, M., Wojtowicz, K., Los Santos, L. R., Maftei, A., & Riscado, S. (2021). Climate policy design, competitiveness and income distribution: A macro-micro assessment for 11 EU countries. *Energy Economics*, 103, 105538.

European Green Deal / Fit for 55 policy documents

European Commission (2021). Impact Assessment Report accompanying the document Proposal for a Council Recommendation on ensuring a fair transition towards climate neutrality. SWD(2021) 452 final

European Commission (2021). Impact Assessment Report accompanying the document Proposal for a Council Directive restructuring the Union framework for the taxation of energy products and electricity (recast). SWD(2021) 641 final

European Commission (2021). Impact Assessment Report Accompanying the document Proposal for a regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism

European Commission (2022). Impact Assessment Report accompanying the document Proposal for a regulation of the European Parliament and the Council on fluorinated greenhouse gases, amending Directive (EU) 2019/1937 and repealing Regulation (EU) No 517/2014. SWD(2022) 96 final

Global sustainability/SDG analysis

Boysen-Urban, K., M`barek, R., Philippidis, G. and Ferrer, H., Exploring changing food attitudes to respect planetary boundaries, EUR 30794 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-40788-1, doi:10.2760/744504

Philippidis, G., Ferrer, H., Gracia De La Renteria, P., M`barek, R. and Sanjuan López, A.I., Eating your greens: A global sustainability assessment, *RESOURCES CONSERVATION AND RECYCLING*, ISSN 0921-3449, 168, 2021, p. 105460

Country-level CGE analyses:

Ramos, M.P., Custodio Cerezales, E., Jimenez Calvo, S., Mainar, A., Boulanger, P. and Ferrari, E., Do agri-food market incentives improve food security and nutrition indicators a microsimulation evaluation for Kenya, *FOOD SECURITY*, ISSN 1876-4517, 14 (1), 2022, p. 209–227

Nechifor, V., Boysen, O., Ferrari, E., Simola, A.M., Nandelenga, M., Laichena, J. and Malot, K., The impacts of the Africa Continental Free Trade Area on the Kenyan economy, EUR 30984 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-47132-5, doi:10.2760/832739

Boulanger, P., Dudu, H., Ferrari, E., Mainar, A. and Ramos, M.P., Effectiveness of fertilizer policy reforms to enhance food security in Kenya: a macro–micro simulation analysis, *APPLIED ECONOMICS*, ISSN 0003-6846, 54 (8), 2022, p. 841-861.

Nechifor, V., Ramos, M.P., Ferrari, E., Laichena, J., Kihui, E., Omanyo, D., Musamali, R. and Kiriga, B., Food security and welfare changes under COVID-19 in Sub-Saharan Africa: impacts and responses in Kenya, *GLOBAL FOOD SECURITY*, ISSN 2211-9124 (online), 28, 2021.

Social Accounting Matrices and Other Data

Jimenez Calvo, S., Mainar-Causape, A.J. and Ferrari, E., Analysis of the Kenyan economy: an input-output approach, *AGREKON*, ISSN 0303-1853, 60 (4), 2021, p. 480-495.

Ferreira, V., Almazán-Gómez, M.Á., Nechifor, V., Ferrari, E. and Diallo, S.S., Social Accounting Matrix for Côte d'Ivoire 2015, EUR 30784 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-36180-0, doi:10.2760/875449.

Ferreira, V., Almazán-Gómez, M.Á., Nechifor, V. and Ferrari, E., Social Accounting Matrix for Ghana 2015, EUR 30720 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-38077-1, doi:10.2760/432014.

Ferreira, V., Almazán-Gómez, M.Á., Nechifor, V. and Ferrari, E., The role of the agricultural sector for Ghanaian development: A multiregional SAM-based analysis. Manuscript on second round of revisions in *Journal of Economic Structures* (May 2022).

El Meligi, A., Ferreira, V., Nechifor, V. and Ferrari, E. Environmental sustainability and job creation. A SAM-based approach for Cameroon. Working paper using GTAP-E and Non-CO2 emissions databases. Paper accepted for presentation at the 25th Annual Conference on Global Economic Analysis (June 2022).

Norman-Lopez, A., Wojtowicz, K., Garaffa, R., & Tamba, M. (2022). Disaggregating air, land and maritime transport sectors in the GTAP database. Paper accepted for presentation at the 25th Annual Conference on Global Economic Analysis (June 2022).

Vandyck, T., Garaffa, R., Weitzel, M., Rey, L., Wojtowicz, K., & Tamba, M. (2021): Baseline GECO 2021. European Commission, Joint Research Centre (JRC) [Dataset] PID: <http://data.europa.eu/89h/721dcbda-7302-40cc-afe4-4adc3654fe1c>