GTAP Advisory Board Meeting Summary
Virtual Meeting | June 6-7, 2022

Attendance

GTAP Center: Angel Aguiar, Zeynep Akgul, Uris Lantz Baldos, Ginger Batta, Mary Burfisher, Maksym Chepeliev, Erwin Corong, Alla Golub, Thomas Hertel, Holly McIntire, Dominique van der Mensbrugghe

Board Representatives:

- Jayson Beckman (Economic Research Service of the United States Department of Agriculture)
- Eddy Bekkers (World Trade Organization)
- Cecilia Bellora (Centre d'Etudes Prospectives et d'Information Internationales)
- Dileep Birur (KPMG LLP US)
- Antoine Bouët (International Food Policy Research Institute)
- Lurong Chen (Economic Research Institute for ASEAN and East Asia)
- Shenjie Chen (Office of the Chief Economist, Global Affairs Canada)
- Jeffrey Condon (McKinsey & Company, Inc.)
- Laurent Cretegny (KPMG LLP UK)
- Hasan Dudu (The World Bank)
- Joseph Francois (University of Bern, World Trade Institute)
- Paolo Giordano (Inter-American Development Bank)
- Jianwu He (Development Research Center of the State Council)
- Mark Horridge (Centre of Policy Studies, Victoria University)
- Stephen Karingi (United Nations Economic Commission for Africa)
- Kenichi Kawasaki (National Graduate Institute for Policy Studies)
- Marijke Kuiper (Wageningen Economic Research)
- Shantong Li (Development Research Center of the State Council)
- Michael Malakellis (KPMG Australia)
- Catherine Milot (Department for International Trade)
- Mondher Mimouni (International Trade Centre)
- Lars Nilsson (European Commission - DG Trade)
- John Pacilio (KPMG LLP US)
- Sergey Paltsev (MIT Joint Program on the Science and Policy of Global Change)
- Janine Pelikan (Thünen Institute of Market Analysis)
- William Powers (US International Trade Commission)
- Chris Rasmussen (US Department of Commerce)
- Marika Santoro (International Monetary Fund)
- Andrew Schreiber (US Environmental Protection Agency)
- Susumu Suzuki (Economic and Social Research Institute, Cabinet Office, Government of Japan)
- Frank van Tongeren (Organisation for Economic Co-operation and Development)
- Matthias Weitzel (European Commission - Joint Research Centre)
- Jingliang Xiao (Global Affairs Canada)

Guests:

- Alessandro Antimiani (European Commission - DG Trade)

A. Summary of Goals and Accomplishments in the Past Year

2022 Report and Issues Document

B. Summary of Agency Activities in the Past Year

https://www.gtap.agecon.purdue.edu/events/Board_Meetings/2022/index.aspx#agencyreports

C. Overview of Broad Goals for the Center

1. **Data Goal:** To Improve the quality of data products through:
    a. Improving the quality of contributed I-O data
    b. Addition and improvement of other datasets
    c. Monitoring of data quality using comparison programs
    d. Version control and documentation
2. **Research Goal:** To actively participate in quantitative economic analysis of pressing global concern in the areas of Trade and Development and Global Environmental Issues
3. **Model Goal:** To promote further development of GTAP-based models
4. **Education Goal:** To expand and improve education for global economic analysis worldwide
5. **Staffing Goal:** To actively seek and encourage talented staff and graduate students
6. **Collaboration Goal:** To actively seek opportunities for fostering collaboration with institutions around the world
7. **Communication Goal:** To facilitate communication amongst members of the network as well as between the Center and key stakeholders

D. Overview of Priorities and Responsibilities, by Goal Type

1. Data Goal: To Improve the quality of data products

Tasks	Responsibility
Improvement of Datasets used in GTAP Data Base (core)	Aguiar
Primary Priorities	
• Maintain pre-release schedule of GTAP 11 and its extensions	Aguiar
• Work with IO table contributors	Aguiar
• Update energy and CO_2 emissions accounting in GTAP	Chepeliev
• Update GTAP labor (wage and employment) data	Corong
• Mainstreaming AEZ into GTAP	Corong
• Mainstreaming GTAP-BIO Data Base development	Taheripour, Chepeliev, Aguiar, Sajedinia
Secondary Priorities	
• Prepare plan for GTAP 12	Aguiar
• Data / program separation	Corong
• Mainstream/update circular economy database for GTAP 11	Chepeliev
• Develop GTAP nutritional database with detailed representation of food loss and waste flows	Chepeliev
Tertiary Priorities	
• Improving disaggregation module	

2. Research Goal: To actively participate in quantitative economic analysis of pressing global issues

Tasks	Responsibility
Trade and Development	
Primary Priorities	
• Continue to publish papers on trade, poverty, migration/labor and global supply chains	Staff and Graduate Students
• Competitive FTA Scenarios, "Natural" Trading Levels, and the Role of Trade in Climate Change and Environmental Shocks	Golub
Global Energy and Environmental Issues	
Primary Priorities	
• Continue to publish papers on energy and environmental issues with a special focus on the land-water-energy-climate nexus	Staff and Graduate Students
• Using GTAP-BIO-W model supported by a hydrology model (WBM) to analyze transboundary waters conflicts and potential collaborative actions in the Middle East: Cases of Euphrates and Tigris rivers and Saq-Ram Aquifer System	Golub, Haqiqi, Taheripour

3. **Model Goal:** To promote further development of GTAP-based models

Tasks	Responsibility
Primary Priorities	
• GTAP-HS-TRQ - Implementation of TRQs using "*ntuples*" to limit complementarity to only bilateral trade notes subject to TRQs.	Golub
• GTAP-IAM: GTAP Integrated Assessment Model	Corong, Chepeliev, van der Mensbrugghe
• GTAPWiNDC: embedded WiNDC subnational data and model for the U.S. within global CGE GTAP framework.	Corong, Golub, van der Mensbrugghe

4. **Education Goal:** To expand and improve global economic analysis education worldwide

Tasks	Responsibility
Education Plan	**Various**
Primary Priorities	
• GTAP 101 Courses	Countryman, Batta, Akgul
• GTAP PTA Course	Walmsley, Strutt, Batta, Akgul
• GTAP Short Course	Keeney, Batta, Akgul
• GTAP-HET Course	Akgul, Batta
• GTAP for Non-Economists Course	Akgul, van der Mensbrugghe
• Continue implementing action items from strategic planning meeting and investigating additional special topic online mini-courses	Akgul, Batta

5. **Staffing Goal:** To actively seek and encourage talented staff and graduate students

Tasks	Responsibility

Primary Priorities

6. **Collaboration Goal:** Actively seek opportunities for fostering collaboration with institutions around the world.

Tasks	Responsibility
GTAP Conferences and Board Meetings	
Primary Priorities	
• 2023 Conference (Bordeaux, France)	Batta, van der Mensbrugghe, Bouët
• 2024 Conference (Fort Collins, Colorado, USA)	Batta, van der Mensbrugghe, Countryman
• 2025 Conference (Kigali, Rwanda)	Batta, van der Mensbrugghe, UNECA

7. **Communication Goal:** To facilitate communication amongst members of the network as well as between the Center and key stakeholders**.**

Tasks	Responsibility
Improve user support system	
Primary Priorities	
• GTAP-L, gtapsupport, contactgtap: continue offering support	Batta, Chepeliev
• Website redesign/redevelopment	Douglas

E. Summary of Discussions

1. **Welcome and Overview**
   a. **<u>Meeting Overview</u>**

      Dominique van der Mensbrugghe (GTAP) opened the meeting welcoming everyone, introducing new consortium members, and reviewing the agenda-the Center's goals, agency reports, and network growth updates. Janine Pelikan (Thünen Institute of Market Analysis) was named the Alan A. Powell Award recipient for 2022 for outstanding service of a representative currently serving on the GTAP Advisory Board.

   b. **<u>GTAP Data Base</u>**

      Angel Aguiar (GTAP) reviewed the features of the GTAP v11 cycle, in particular the third pre-release of GTAP v11, which include energy subsidies as a standard feature. Relative to v10, there will be 18 new and 31 updated IO tables, many from the Africa region, which has led us to reduce the number of aggregate regions by 1.

      As we began planning GTAP v12, 2019 was identified as a potential new reference year. Years 2020 and 2021 were unusual due to the COVID-19 pandemic. The Board largely concurred with having a 2019 reference year and discussion on a future reference year would be delayed until the next board meeting.

      Frank van Tongeren (OECD) flagged issues with negative savings and trade in gas. Also, he indicated that the OECD also compiles data on fossil fuel subsidies that is complementary to IEA but different from the IMF.

Dominique van der Mensbrugghe (GTAP) explained that the issue with savings is mostly due to the simplified computation of savings in GTAP but that the Center is looking at disaggregating components of the balance of payments to better represent savings. The discussion eventually returned to this topic, without a fix, this could become a modelling issue depending on what assumptions are taken.

With respect to the treatment of gas and its distribution, Dominique van der Mensbrugghe (GTAP) suggested these be aggregated as is his practice. Others like Sergei Paltsev (MIT) do the same aggregation. Sergei suggested the use of the BP trade data.

Maksym Chepeliev (GTAP) acknowledged that we are pursuing another dataset to complement IEA data and welcomes the availability of OECD energy subsidies.

Matthias Weitzel (JRC) indicated that he complements EU data with EUROSTAT, but needs to look at the bilateral trade data. He also indicated that the JRC is interested in contributing FIGARO 2019 EU tables to GTAP.

Cecilia Bellora (CEPII) praised GTAP's use of IEA data for energy trade, which is not a well-known feature.

Sergei Paltsev (MIT) was glad that subsidies are being incorporated in the data but that it would be good to clarify how these are handled (e.g., electric car subsidies in Norway). Maksym Chepeliev (GTAP) indicated that subsidies for private households are captured but the data requires additional verification. Dominique van der Mensbrugghe (GTAP) reminded all that we get country-specific data for some countries (e.g., EU); but that this is hard to replicate at the global level.

2. GTAP Data Base: Component Updates

a. CO_2 Emissions

Maksym Chepeliev (GTAP) presented recent developments on accounting fossil fuel combustion CO_2 emissions in GTAP. These updates would be incorporated to the GTAP v11 Data Base release and would provide a more consistent accounting of emissions, as well as better comparability with available international data sources, such as the IEA and EDGAR databases. A revised emissions' accounting framework based on the Tier 1 method of the 2006 IPCC Guidelines has been implemented. The revised approach includes estimation of emission factors at a more granular commodity level than implemented in the standard GTAP 10A Data Base. Two additional refinements include an updated accounting of emissions from blast furnaces and other recovered gases, as well as a more transparent treatment of CO_2 emissions from flaring.

Sergey Paltsev (MIT) welcomed the emissions' accounting framework development and the fact that this brings GTAP closer to other international data sources. He also asked whether GTAP accounts for the emission from industrial processes, such as cement production.

Maksym Chepeliev (GTAP) responded that CO_2 emissions from industrial processes, including cement and fertilizer production, are reported in the non-CO_2 GTAP Data Base. Corresponding emission flows are based on the EDGAR database.

Matthias Weitzel (JRC) asked whether newly introduced emissions from blast furnaces are accounted in the iron and steel or electricity generation sector? He also asked whether any changes to the treatment of international marine bunkers have been introduced in the recent releases of GTAP and how the current treatment impacts the comparability of GTAP emissions with other international data sources?

Maksym Chepeliev (GTAP) clarified that the current revision has not introduced any updates to the treatment of international marine and aviation bunkers and that the most recent approach is documented in McDougall and van Leeuwen (2010). The corresponding treatment, however, does impact the comparability of emission flows between GTAP and other international data sources, since, for instance, in EDGAR emissions from international transportation are reported as a separate category, while in GTAP they are attributed to the corresponding transportation sectors and distributed across countries.

As for the emissions from blast furnaces, in the current treatment, they are mapped to the self-consumption of energy by the iron and steel sector. However, considering that a large share of these gases is used for electricity and heat generation, mapping them to the latter category is another alternative, which would be considered.

Cecilia Bellora (CEPII) welcomed the effort and indicated their support considering that this is a very hot topic within the ongoing policy debate.

b. Labor, Income, and Factor Taxes

Erwin Corong (GTAP) presented updates to the labor, income and factor tax flows in the GTAP v11 Data Base. He confirmed that income and factor tax rates will be updated for all v11 data reference years, based on the most recent IMF Government Finance Statistics (NB: In GTAP v10 data, year 2011 tax rates were used for 2014 reference year as the latter was not available at the time of v10 data construction). Erwin Corong (GTAP) also mentioned ongoing collaboration with Marinos Tsigas to update the underlying wage and employment data for the GTAP v11 data cycle, which was last updated in 2012. Finally, Erwin Corong (GTAP) announced that a new GTAP-Labor satellite data containing labor flows by occupation, gender and education (the latter two based on data from the World Bank's Gender Disaggregated Labor Database) will be made available during the GTAP v11 data cycle.

c. Trade in Services

Angel Aguiar (GTAP) presented the treatment of new data sources used in GTAP. As part of the presentation, each of the new data sets was briefly described and how their sector classification was related to GTAP's sectoral classification on services. We are on the lookout for issues arising with the changes of Balance of Payments (BOP) versions 5 to 6.

Joe Francois (WTI) mentioned that the updates in BOP also relate to trade in goods. For example, Ireland is now a major exporter of aviation services. Switzerland is now a major exporter of coffee even though no land use for producing coffee within Switzerland. Mode 3 ties into this – GTAP is interested on where things are made and not who owns them and will become an issue moving forward. This is important work and it would be good to look at European data.

Angel Aguiar (GTAP) responded that we are moving in that direction. Working with Mark Gelhar on the merchandise trade data; nothing has come up so far but will be on the look-out.

Lars Nilsson (EC DG Trade) noted this is an important update and wanted clarification if the data will become available after GTAP v11 by mode of supply.

Angel Aguiar (GTAP) clarified that after GTAP v11 is out, we will shift our attention to separately distinguish between mode 1 and mode 2. Mode 3 is more on FDI and FAS. Mode 4 is a tiny aspect but certainly important. If BATIS is maintained and upgraded to include mode of supply, then it would be easier for us to maintain.

Dominique van der Mensbrugghe (GTAP) asked Joe to elaborate a little bit on ownership. Joe Francois (WTI) reported that trade in COMTRADE is a bit of a mix at the moment. Joe Francois (WTI) indicated that Eurostat is also shifting to BOP6 and explained that changes were made by Central Bankers who wanted their numbers to balance and that UNCTAD is aware of this too. The BOP data would not be consistent with trade data. For example, Ireland's GDP increased by 25% due to BOP6. We should be aware of it for trade in goods. (e.g., Irish aircraft exports and Swiss coffee exports). To the extent that COMTRADE is still based on customs declaration, this would not be an issue.

Jeffrey Condon (McKinsey) stated that payments for use of Intellectual Property are important. Angel Aguiar (GTAP) had indicated that in the context of GTAP, these are income flows recorded separately in the IO framework.

d. <u>Nutrition</u>

Maksym Chepeliev (GTAP) presented a joint work with Alessandro Gatto (Wageningen Economic Research) on recent developments regarding construction of the GTAP nutritional database and incorporation of the food loss and waste accounts along the value chain to the accounting framework.

Sergey Paltsev (MIT) pointed out to the difference between out-of-home food supply structure for the U.S. and other countries. In particular, to the fact that the U.S. has a relatively large share of food supplied through recreation and other services, while the share of food supplied through accommodation and food service activities is relatively low.

Maksym Chepeliev (GTAP) confirmed that the structure of the out-of-home food supply in the U.S. is indeed different from other countries, however, it is not clear what is driving such differences. Corresponding volumes of supply across sectors are derived from the U.S. input-output table used in GTAP and one particular reason could be the fact that the currently used U.S. IOT has 2002 reference year. Another possibility is a sectoral misclassification issue. The GTAP v11 Data Base would have a more recent U.S. IOT and it would be interesting to compare whether the same food supply pattern would be observed.

Dominique van der Mensbrugghe (GTAP) suggested that perhaps in the U.S. the large share of food consumed in recreational facilities, such as Disney theme parks, could be driving the observed pattern.

Jayson Beckman (ERS) shared the link to the U.S. input-output table to facilitate the potential data comparison.

Sergey Paltsev (MIT) asked what is driving a relatively large net per capita caloric supply in selected countries, such as Lithuania, Belgium and Brazil.

Maksym Chepeliev (GTAP) responded that they are still exploring country-specific results, verifying whether they make sense. He noted that in general, we see that at the aggregate regional level expected distributional patterns are observed – lower income regions, like SSA, have low caloric supply, while higher income regions, like EU and North America, have higher net supply. At the same time, we also see a substantial variation in supply across countries within the same region, which is largely driven by the composition of food supply within each country. Currently, we apply region-generic shares of food loss and waste, but some country-specific adjustments might be needed in selected cases.

Matthias Weitzel (JRC) asked whether the nutritional database would be a regular GTAP satellite account.

Maksym Chepeliev (GTAP) responded that it would be part of the regular satellite release.

Jeffrey Condon (McKinsey) asked whether there are any recent developments or plans in terms of a more granular representation of fertilizers in the GTAP Data Base.

Tom Hertel (GTAP) suggested to have a look into the work done by the MAGNET team at Wageningen Economic Research.

Tom Hertel (GTAP) indicated that now as the extent of waste and losses has been quantified, the next step will be to estimate the cost of mitigation and incorporate these costs explicitly into the model. Evidence from SSA, for example, suggests that farmers are currently optimizing given current technology and cost of postharvest loss mitigation, i.e., optimal post-harvest loss is not zero. Of course, the same will apply to household food waste in most cases.

Maksym Chepeliev (GTAP) recognized that the development of the food loss and waste abatement curves would be an important contribution, but it appears to be very challenging on the data side.

Tom Hertel (GTAP) advised to be opportunistic and incorporate these where available and use them to look at carefully targeted policies. Jake Ricker-Gilbert in our department is the world's expert on post-harvest loss in Africa.

Frank van Tongeren (OECD) welcomed this important contribution and indicated that making food loss and waste data more compatible between countries is very important for the policy debate. He also echoed Tom's comment that the optimal loss is non-zero.

3. Education and Outreach

a. **GTAP-U Update**

Zeynep Akgul (GTAP) introduced the education plan for the second year of GTAP-U providing an overview of goals and current curriculum. She summarized the course participation data between September 2021 and August 2022. She informed the Board about the upcoming online portal for new course proposal submissions, where in addition to internal instructors, external instructors can also apply with their course ideas to teach at GTAP-U. This new feature will be available in 2022.

Zeynep Akgul (GTAP) updated the Board about the virtual delivery of the Short Course and summarized the highlights in GTAP-U. All the online courses have been migrated from the GTAP website to Brightspace - the Learning Management System of Purdue. All course materials have been undergoing a quality check and have been categorized to be included in the module repository where instructors will be able to borrow materials to be used as complementary tools in their courses. Future directions of GTAP-U were also discussed. The goals of the rest of 2022 include operationalizing module repository and exploring new course possibilities such as GTAP Integrated Assessments Course and GTAP for non-economists Course.

Frank van Tongeren (OECD) suggested offering a GTAP for non-scientists course to target policymakers and lawyers as audience in addition to a GTAP for non-economists course that targets scientists from other disciplines. Catherine Milot (DIT) also agreed that government institutions will benefit from this and will be sending the Center some questions raised by her

colleagues regarding CGE modeling. Bill Powers (US ITC) and Lars Nilsson (EC DG Trade) mentioned that such an education module would be beneficial to the lawyers in their institutions. Hasan Dudu (WB) also commented that the World Bank receives many applications from lawyers to the CGE modeler positions.

Stephen Karingi (UNECA) asked about GTAP-U course enrollment rates from low-income countries and suggested an African forecast course could be beneficial given the disaggregated data of African countries in the GTAP Data Base.

b. GLASSNET

Tom Hertel (GTAP) presented an update on GLASSNET, the NSF-funded, network of networks project aimed at enhancing global sustainability analysis of the food, energy, land and water systems. The project is in its second year and a conference was held on the Purdue campus in early April exploring various dimensions of the Global-to-Local-to-Global theme underpinning GLASSNET. Conference participants are preparing papers for a special issue of the interdisciplinary journal: Environmental Research Letters.

The Center also hosted a SIMPLE-G course in multiscale analysis of sustainability in early May. This gridded modeling approach is complementary to GTAP and we have been experimenting with linking the two models for some applications.

This summer, GLASSNET is hosting several Use Case workshops in which selected GLASSNET use cases will be presented with discussants drawn from the partner networks. The goal is to advance collaboration across networks and enrich the Use Cases.

For more information on GLASSNET, visit https://mygeohub.org/groups/glassnet.

c. Journal of Global Economic Analysis

Tom Hertel (GTAP) reported that the JGEA is now entering its seventh year. The June issue has just been published and includes papers on a new GTAP nutritional database, one on disaggregating the agricultural sectors into fine detail. And a paper on modeling changes in capital utilization in CGE models. The journal is keen to solicit additional, foundational contributions involving extensions to theory, methods, data, parameters and pedagogy.

d. CGTA PhD Students

Tom Hertel (GTAP) shared information on the Center's graduate students (see linked PPT for more detail). One student graduated this May and is working for McKinsey & Company on climate related issues. Two more PhD students plan to graduate in a year's time. Tom Hertel (GTAP) emphasized the value of engaging with students early on in their program and involving them in projects. This has the advantage of allowing consortium members to build a relationship with the student. Such projects can often shape a student's choice of dissertation topic as well. We do anticipate an increase in students numbers this year as we emerge from the COVID-19 pandemic.

4. New Data and Modeling Developments

a. SSP Database Update

The shared socio-economic pathways (SSPs) database is a set of 5 long-term scenarios of population and GDP growth for the bulk of the world's countries. It is being extensively used by the Integrated Assessment Modeling Community for economic analysis of climate change, but also increasingly by other economic analysts. The SSP database was developed around 10 years ago, with three implications: (1) there have been significant revisions to the national accounts and purchasing power parity (PPP) exchange rates; (2) there have been significant observed deviations between the initial SSPs (with a 2010 reference year) and official statistics through

2021 (that includes the COVID-19 pandemic); and (3) the additional decade of information (and statistical revisions) would be useful in updating the assumptions of the original SSPs. Updating of the database is being done in two phases. The first phase integrates the statistical revisions and official GDP data through 2021 (and IMF projections through 2026) with the original SSPs with assumptions on a transition path to the original SSPs. The second phase will take the data revisions and the longer historical time series to undertake new projections of the SSPs. The latter are expected to be available by the end of 2022.

b. GTAP-IAM

Erwin Corong (GTAP) presented ongoing work to develop GTAP-IAM (Integrated Assessment Model) which will allow GTAP researchers to assess economy-energy-environment interactions within an integrated assessment modeling framework. GTAP-IAM integrates energy and power specification from GTAP-E and Power, land use and land cover from GTAP-AEZ and recursive dynamics from GTAP-RD. The model also incorporates marginal abatement costs (MAC), damage functions, a simple climate module, and integrates satellite datasets such as NCO2, air pollution and biofuels (when data becomes available). Model development will finish by September and will be shared with board members by early 2023. The Center also plans to develop a new GTAP-IAM short course and to use the model for inter-comparison exercises, linking with other specialized models (e.g., Ecosystem services and electricity models), and for carrying out baseline projection that incorporates Nationally Determined Contributions (NDCs), Net Zero targets and Sustainable Development Goals (SDGs).

c. GTAP-SR

Dominique van der Mensbrugghe (GTAP) reported on an ongoing project to develop a GTAP model that incorporates sub-regions for one or more of GTAP's countries. The current project is focused on integrating the WiNDC database into GTAP. WiNDC is a U.S.-based consortium, similar to GTAP, that is hosted at the University of Wisconsin, Madison. The WiNDC database has a state Social Accounting Matrix (SAM) for each of the 50 U.S. states (plus the District of Columbia). The project is working with an existing integrated WiNDC/GTAP database that is being produced by a balancing program. The latter takes as input the full GTAP and WiNDC databases and adjusts the WiNDC sub-regional components holding fixed the remainder of the GTAP Data Base and the aggregate import and export matrices for the U.S. from the GTAP Data Base. After careful evaluation, the two databases have each been aggregated to 33 sectors. The current database has been used to test a sub-regional version of the GTAP model, GTAP-SR. The specification hones as close as possible to the original GTAP code. Inter-regional trade is modeled using a pooled national market specification. Output from any sub-region is allocated to the local market, the pooled national market and exports. Demand in any sub-region is sourced from the local market, the pooled national market and imports. (Import sourcing is done at the border, not by agent.) Next steps include refining the sectoral concordance and the balancing program, further development of the model specification, and translating the existing code to GEMPACK. Other potential uses of GTAP-SR include Brazil, Canada, China, the European Union and the UK.

5. Topical Issues

a. Conflict in Europe (Maksym Chepeliev, Alessandro Antimiani)

Maksym Chepeliev (GTAP) and Alessandro Antimiani (EC – DG Trade) discussed the recently implemented and ongoing efforts on the assessment of the impacts of the war in Ukraine. They covered topics of the impacts of war in Ukraine on Europe and the rest of the world (on trade, GDP, income, investments, energy and agricultural markets), impacts of sanctions imposed by the EU, potential implications of banning Russian energy imports, and, as well, discussed some modelling challenges that have been faced along the way.

Frank van Tongeren (OECD) summarized the two points/questions raised by Alessandro in his presentation. First, lowered trade elasticities combined with a combination of large shocks does not allow the model to solve. Second, what could be an approach to model the restrictions on the

provision of insurance to Russian companies (e.g., for transportation purposes). This opened the floor to discussion.

Dominique van der Mensbrugghe (GTAP) asked for clarification to the first question – whether the model solves with standard elasticities and a full set of shocks, but does not solve when the elasticity values are reduced?

Alessandro Antimiani (EC – DG Trade) confirmed that this is indeed the case and explained that if the trade elasticity values are reduced by more than 10%, the model struggles to find the solution. He also pointed out to the fact that under lower trade elasticities impacts of sanctions on Russian economy are less substantial than under the standard elasticity values and the Russian currency depreciates less under the lower elasticity values. This poses a question of whether we really want to run the model with lower elasticities?

Dominique van der Mensbrugghe (GTAP) responded that he is somewhat surprised that the model cannot solve when elasticities are reduced by more than 10% and noted that he was expecting the model to struggle more under higher rather than lower elasticity values (as it is probably faces a corner solution). Though, on the other hand, considering the large number of shocks, the latter probably have a major impact in the discussed issue.

Alessandro Antimiani (EC – DG Trade) mentioned that he would be glad to follow up on this bilaterally and will be looking closer into this issue.

Hasan Dudu (WB) commented that in terms of the solution issues, at least in GAMS, one option is to cut shocks into pieces and solve the model one sub-shock at a time, then starting from a new reference point. In terms of the insurance impacts, this could be represented through an increase in trade margins. But instead of the direct shocks, which is hard to quantify, one might introduce a restriction on the use of transport services (provided by EU) used by Russian companies. This can give an idea on the magnitude of trade cost increases. He also asked a question regarding second-round effects, which non-ally countries could implement. For instance, China could follow the EU and introduce restrictions on import of electronics to Russia. Have such effects been considered in the presented modelling?

Frank van Tongeren (OECD) followed up on the insurance question, noting that one might come up with insurance shocks, but looking at the discount factor on Russian energy and grains. In the latter case, recent estimates suggest that the corresponding discount is around 10%-15% and this can be interpreted as an insurance premium that importers have to pay. Similar observations are available for oil.

Maksym Chepeliev (GTAP) responded to Hasan's question, noting that in their modelling they have not explicitly represented the second-order effects, but tried to capture impacts on the rest of the world and looking into spillover effect of changing global commodity prices, including energy and grains. He also pointed out that the importance of representing such second-order effects depends on the focus of the modelling exercise. If one is focusing on the impacts on Russian economy, it might indeed be important to capture this. On the other hand, if we are talking about impacts on the rest of the world, then these second-order effects would not probably make any substantial difference, as e.g., the share of Huawei products exported to Russian is very small. Even impacts of energy bans are different by an order of magnitude when we are comparing EU and Russia.

Alessandro Antimiani (EC – DG Trade) responded that in their modelling they also did not explicitly take into account such effects, largely due to the reasons explained by Maksym. Another reason is that since EC is an institutional organization, they try to avoid making speculations regarding potential policies by third countries.

Frank van Tongeren (OECD) noted that the effectiveness of sanctions would largely depend on the market divergence. For instance, if China and India would absorb most of the lost (to EU) Russian exports, the impacts would be very different compared to the case when this would not happen. The reaction from the supply side in the rest of the world, in particular, OPEC, would also play an important role in shaping the outcomes of energy bans.

Erwin Corong (GTAP) suggested that one modelling approach could be to change/halve elasticities for the selected subset of countries and leave the values at a standard level for other countries. He also mentioned that he is open to have a look into Alessandro's simulations, if those could be shared.

Alessandro Antimiani (EC – DG Trade) mentioned that they are open to share the simulations. He also mentioned that in their modelling exercise they assumed a 2% increase in global oil production, as suggested by their energy colleagues.

Stephen Karingi (UNECA) mentioned that, while Nigeria sees an increase in energy exports based on the present simulations, one should also be aware that the country imports almost all of its refined oil. Therefore, one should be taking into account the fiscal pressure from increasing costs of energy imports, under rising global oil prices.

Maksym Chepeliev (GTAP) responded that when one looks into the ratio of imports to exports for the case of Nigeria, the volume of exported crude is around four times larger than the volume of imported petroleum products, so an expansion in the revenue from exports more than compensates the increasing cost of imports. Also, interestingly in the case of Nigeria, most benefits are coming from an increase in oil prices rather than an expansion in oil supply.
He also commented on the price reaction and market diversion issue, earlier mentioned by Frank. One particular issue they have been facing in their modelling is that the short-term price elasticities observed in reality are much higher than suggested by GE models. While Russia supplies around 12% of the global oil, even before the ban global markets have responded by 40%-50% price increase, implying an elasticity of 4-5, much higher than suggested by the model (closer to 1). This could be a short-term market reaction, but also could reflect the specifics of energy markets. The situation is even more elastic for the gas market, which has higher level of segmentation (compared to oil market).

Frank van Tongeren (OECD) suggested that one important role that our modelling plays in the policy debate is that we are able to show the potential substitution and adjustment mechanism following energy ban or price shocks and these are often missed by the policy makers.

Matthias Weitzel (JRC) noted that one particular issue they faced was a potential inconsistency in representation of the expanding trade flows, indicating that in some cases when model was showing an increasing trade volume, in reality there is not enough technical capacity to support such changes. In addition, (non) preservation of the value/volume split might bring up some issues, when the model for instance substitutes $1 of Russian gas by $1 of U.S. gas, treating them as equivalent, while in reality $1 in each of these cases has a different energy content. In terms of the response of carbon markets, Matthias suggested that results presented by Maksym in terms of falling carbon price is consistent with their estimates. At the same time, in reality, at least at the

beginning of 2022, carbon prices have been increasing, reflecting some short-term dynamics of power generation.

Frank van Tongeren (OECD) noted that volume preservation is a long-standing issue in the CGE modelling and that Mark Horridge has recently written a paper on this topic.

b. Natural Capital

Tom Hertel and Uris Lantz Baldos (both GTAP) presented work related to the integration of Natural Capital into GTAP. Alfredo Cisneros Pineda (GTAP) is leading a paper focusing on the linkages between economic growth in various regions of the world and biodiversity losses across the globe. Uris and Justin Johnson completed a project last year in which they sought to assess the global economic benefits of conservation policies to protect biodiversity. This was published by the World Bank in 2021 (see linked slides for summary).

6. GTAP Awards and Conferences

a. GTAP Research Fellows

The Board approved the following to serve as GTAP Research Fellows for June 2022 – May 2025.

- Alessandro Antimiani
- Heleen Bartelings
- Wolfgang Britz
- James Giesecke
- Maros Ivanic

The 2023-2025 research fellows committee was formed and approved during the meeting. Janine Pelikan will remain on the committee as chair and will be joined by Bill Powers (USITC) and Erwin Corong (GTAP).

b. GTAP Conferences

Presentations and subsequent discussions on the current and future GTAP Conferences were held with the following outcomes.

- **2022 Conference Update** – Ginger Batta (GTAP) updated the Board on the 25th Annual Conference on Global Economic Analysis, focusing on the shift to an online format, registration, and demographics.

- **2023 Conference Update** – Antoine Bouët (IFPRI) presented an update on the 2023 conference, which will be held at the University of Bordeaux.

- **2024-25 Conferences** – Ginger Bata (GTAP) reminded the board that in 2021 they approved moving the Colorado State University proposal from 2021 to 2024 and called on the board to vote in favor of doing the same with moving the Kigali proposal from 2022 to 2025. The board approved this move.

7. Center Management

a. Center Finances

Dominque van der Mensbrugghe (GTAP) reported a surplus of $356K for FY22. This is largely due to steady v10 database sales and increased external funding, combined with some (temporary) reduction in staff costs for the Center. A surplus of $680K is projected for FY23 due to the anticipated release of v11. It is expected that revenue will steadily decline each year following the release. The Center is reviewing possible avenues for "reinvesting" some of the surplus funds into the network.

8. Priorities for Forthcoming Year

a. **Data**: (1) Public release of v11 (with satellite accounts); (2) database improvements—GTAP-BIO, labor, and services (3) initiate work on v12; (4) review of build procedures.

b. **Model**: (1) Pursue modularization of GTAP for both comparative static and GTAP-RD—modules include energy, power, BIO, emissions, AEZ and MRIO; (2) continue work on services including FDI/FAS; (3) add non-CO_2 mitigation mechanisms; and (4) continue working on the GTAP-SR (sub-regional) model based on the WiNDC U.S. database.

c. **Research**: (1) Baseline database and back-casting; (2) circular economy including construction; (3) estimation of Armington CDE parameters and NTMs; (4) evolution of global value chains, trade and gender; (5) implementation of the Paris Agreement and net-zero emission targets with a focus on new technologies, non-CO2 abatement, co-benefits; CBAM (6) cross-disciplinary and cross-institution research in the context of the GLASSNET and INFEWS projects; and (7) coupling of GTAP-like model with global bottom-up energy models.

d. **Network**: (1) Pursue web-upgrade—open-source visualization tools, cross discipline integration, instructional tools; (2) Finish modularization of core units for the portfolio of courses; (3) assess possibilities of additional 300-level courses for example GTAP-E/Power, GTAP-HS, GTAP-M(argins), TASTE, GTAP for non-economists (perhaps for diverse audiences); (3) develop proposals for future venues for board meetings and conferences; and (4) pursue financing options for 'open-sourced' GTAP Data Base.