Course on Input-Output and Computational General Equilibrium Models For Trade Policy Modeling

Semester: Spring Semester 2025

Root Number: 506690

ECTS: 4 ECTs

Lecturers: Eddy Bekkers and Patrick Tomberger

Dates: July 7--11 and 14--17, 2025. [40h].

Audience:
The course is intended for PhD students. A limited number of people with relevant professional or academic interest may be also admitted.

Course description

The goal of the course is to familiarize students with the tools employed to conduct applied general modelling experiments and to teach students how to conduct trade policy simulations at an introductory level employing computable general equilibrium (CGE)-models. CGE-models are applied to a wide range of policy questions, in particular trade policy questions. However, they are also the main tool to analyse the economics of climate change policy.

This course contains four parts. The first one focuses on the basics of input-output matrices and their extensions to multi-region/inter-country input-output (MRIO/ICIO) tables. This part will be complemented by a discussion of recent applications of the MRIO framework to measure trade in value added and to construct environmental footprints. It will culminate into a discussion on how introducing different institutional accounts (household, firms, the government, savings/investment, rest of the Word) in the input-output framework can be extended to create a social accounting matrix (SAM), which constitute the data basis for applied, or computable general equilibrium models (AGE/CGE), the subject of the second emphasis of this course.

The second part deals with a general introduction to AGE/CGE models, followed by theoretical and hands-on sessions where we analyze the economic effects of several policy measures such as changes in national or international shocks in such models. We will work with the AGE/CGE model developed and maintained by the global trade analysis project (GTAP).

In the third part, the students will be introduced more intensively into the theoretical structure of GTAP and learn how to implement trade policy shocks in RUNGTAP/GEMPACK and interpret the results. This part will focus on applying the modelling tools to practical policy experiments in trade policy and also development.

The fourth part of the course contains an introduction to recursive dynamic CGE modelling working with the WTO Global Trade Model in the software RunDynam.

The course concludes with a group assignment to calculate the macroeconomic and trade effects of a trade policy experiment.

Lecturers

Eddy Bekkers

Eddy Bekkers is counsellor at the World Trade Organization. He holds a PhD from Erasmus University Rotterdam and Masters in Economics and Econometrics from the University of Amsterdam. He was assistant professor at the Johannes Kepler University in Linz and postdoctoral researcher at the University of Bern. He conducts research on a wide range of topics in international trade: firm heterogeneity, gravity modelling, traded goods prices, food price pass through, foreign affiliate sales and trade in services. He has published in peer-reviewed journals such as Economic Journal, the European Economic Review, the Review of International Economics, Economics Letters, World Economy, the Journal of Global Economic Analysis, the Canadian Journal of Economics. In his current work at the WTO, Eddy is the main economist working with the WTO Global Trade Model, a recursive dynamic CGE model employed to make long-run projections and to conduct policy simulations at the WTO.

Patrick Tomberger

Patrick Tomberger is a postdoc researcher at the University of Innsbruck, Austria. Before that he worked as a predoc researcher at the University of Linz from 2010 to 2015 where he obtained a PhD in Economics. Thereafter, he joined the World Trade Institute of the University of Bern, Switzerland, as a postdoc researcher from 2015 to 2022. He also holds Master degrees in Political Economy and Political Science from the University of Innsbruck. He also worked as consultant for the World Bank and the OECD and has been part of projects funded by the European Union and the Swiss National Science Foundation. His main research interests are international trade, global value chains, input-output analysis and environmental economics. In those fields he published in international peer-reviewed journals such as Applied Economics, The World Economy, Ecological Economics, Economics Letter, Empirical Economics, and Environmental and Resource Economics.

Learning Objectives:

After the course, participants should be able to:

- Understand the basics of input-output matrices and their extensions to multi-region input-output (MRIO) tables.
- Explain the basic structure of applied general equilibrium models used for trade policy experiments.
- Understand the basics of the theory of the standard CGE-model GTAP.
- Work with the RUNGTAP and RunDynam softwares and be able to run basic policy experiments both in the static and recursive dynamic version of the model.
- Map gravity estimates into trade policy shocks by calculating ad valorem equivalents.
- Apply the CGE-model to conduct experiments on trade policy and development, interpret the results and report on the results at a basic level.

Grading:

Grading will be based on a take home assignment in which the participants have to work on an applied simulation project based on the contents discussed in class.

Literature:

The course will rely mainly on the following sources, which the students can find in the ILIAS system:

Aguiar, A., Chepeliev, M., Corong, E. L., McDougall, R., & van der Mensbrugghe, D. (2019). The GTAP Data Base: Version 10. *Journal of Global Economic Analysis*, *4*(1), 1–27. https://doi.org/10.21642/JGEA.040101AF

Antràs, P. and G. Chor (2022): Global value chains, in: Gopinath, G., Helpman, E. and K. Rogoff (eds.): Handbook of International Economics, Vol. 5. Elsevier.

Bekkers, E. and Rojas-Romagosa, H. (2019). Quantitative Trade Models and the Economic Assessment of TTIP. World Economy.

Bekkers and Cariola (2022). Comparing different approaches to tackle the challenges of global carbon pricing. WTO Staff Working Paper No 2022-10

Bekkers, Corong, Métivier, and Orlov (2023). How will global trade patterns evolve in the long run? WTO Staff Working Paper No 2023-03Burfisher, M. (2016): Introduction to Computable General Equilibrium Models. Second Edition. Cambridge University Press.

Cardenete M.A., Guerra, A-I., and F. Sancho (2017): Applied General Equilibrium -- An Introduction, Second Edition, Springer. Chapter 2.

Corong, E. L., Hertel, T. W., McDougall, R., Tsigas, M. E., & van der Mensbrugghe, D. (2017). The Standard GTAP Model, Version 7. *Journal of Global Economic Analysis*, 2(1), 1–119. https://doi.org/10.21642/JGEA.020101AF

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Dixon, P.B. and D.W. Jorgenson (2013): Handbook of Computable General Equilibrium Modeling, Elsevier. Chapters 1 and 2.

Fontagné, L., Fouré, J., and Keck, A. (2017). Simulating world trade in the decades ahead: driving forces and policy implications. The World Economy, 40(1), 36-55.

Hertel et al. (1997) Global trade analysis. Modelling and applications. Hertel and Tsigas. Chapter 2.

Miller, R.E. and P.D. Blair (2022): Input-Output Analysis – Foundations and Extensions, 3rd edition, Cambridge University Press. Chapters 1 – 3.

Shepherd, Ben (2017). The Gravity Model of International Trade: A User Guide.

Software requirements:

For the exercises in the IO part we encourage the usage of the free software "R" and the, also free, IDE "RStudio". This software is available for download at:

https://www.rstudio.com/

In the AGE part we will work in class and for the project with the software "RunGTAP", which can be downloaded for free at:

https://www.gtap.agecon.purdue.edu/products/rungtap/default.asp

Important: "RunGTAP" will only run on Windows OS out of the box. We strongly encourage the participants to work with that OS in the course.

Course Overview

First week:

Class	Date	Lecturer	Time	Hours	Topic
1	07.07.	Tomberger	14:00-17:00	2.5	Introduction to input-output tables I
2	08.07.	Tomberger	10:00-12:30	2.5	Introduction to input-output tables II
3	08.07.	Tomberger	14:00-17:00	2.5	Introduction to input-output tables III
4	09.07.	Tomberger	10:00-12:30	2.5	Introduction to AGE/CGE models I
5	09.07.	Tomberger	14:00-17:00	2.5	Hand-on session 1

6	10.07.	Tomberger	10:00-12:30	2.5	Introduction to AGE/CGE models II
7	10.07.	Tomberger	14:00-17:00	2.5	Hands-on session 2
8	11.07.	Tomberger	10:00-12:30	2.5	Hands-on session 3, Preparation for take home projects

Second week:

Class	Date	Lecturer	Time	Hours	Topic
1	14 07	Bekkers	10:00-12:30	2.5	Intro. to AGE Models and CGE-Model GTAP Readings: Burfisher (2016, Ch. 3), Hertel et al. (1997, Ch. 2)
2	14 07	Bekkers	13:30-16:00	2.5	Theoretical Structure CGE-Model, Calibration and Data Readings: Hertel et al. (1997, Ch. 2), Aguiar et al. (2016).
3	15 07	Bekkers	10:00-12:30	2.5	Closures and Implementation of Shocks Readings: Burfisher (2016, Ch. 4-6)
4	15.07	Bekkers	13:30-16:00	2.5	Parameter Choices, Policy Shocks and Interpretation of Effects Readings: Burfisher (2016, Ch. 7-8)
5	16.07	Bekkers	10:00-12:30	2.5	Mapping Gravity Estimates into Policy Shocks Readings: Bekkers and Rojas-Romagosa (2019), Shepherd (2017)
6	16.07	Bekkers	13:30-16:00	2.5	Application to Experiments on Trade Policy (first part) Readings: Burfisher (2016) exercises
7	17.07	Bekkers	10:00-12:30	2.5	Application to Experiments on Trade Policy (second part)
8	17.07	Bekkers	13:30-16:00	2.5	Discussion of Exercises, Handing out of group exercise and supervised working on group exercise. Handing out take home exam.