Chapter 1

Introduction

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This volume honors the extraordinary career of Thomas Hertel (hereinafter “Tom”). It also celebrates the 25th anniversary of the founding of the Global Trade Analysis Project (GTAP) by Tom. All of those contributing to this volume have benefitted in some way from the selfless professional generosity and dedication to scientific public goods that have been hallmarks of Tom’s career. The contributors include both Tom’s students and colleagues.

The first chapters in this volume focus directly on the dimensions of Tom’s academic career. In Chapter 2, Russell Hillberry and David Hummels provide a broad overview of Tom’s research career, developing metrics to quantify the (high) impact of Tom’s work on academic productivity. They demonstrate that, though Tom’s direct research has been focused on international economics, there is clear evidence of his influence further afield, especially in the physical and biological sciences. This reflects Tom’s successful efforts at institution and resource building. In Chapter 3, Frank van Tongeren, Robert Koopman, Stephen Karingi, John Reilly, and Joseph Francois focus specifically on the history of the GTAP and its achievements and influence over that last 25 years. The GTAP project, founded by Tom, has grown into a sustained (and so far sustainable) public good-based platform for collaboration on global economic policy modeling. Its legacy includes important, fundamental

contributions to better informed public debates in the areas of global economic governance and environmental policy.

The discussion in Chapter 3 identifies future research challenges relevant for the GTAP consortium Tom founded. The remaining chapters in this volume, broadly speaking, address many of these challenges, building on GTAP-based resources that are a legacy of Tom's research career. In Chapter 4, Lionel Fontagné and Jean Fouré combine a fully-fledged macro-econometric growth model with a Computable General Equilibrium Model (MIRAGE-e) to examine the determinants of world trade flows in long-term baseline modeling. They use the resulting historical simulation exercise to highlight the importance of structural model features for baseline modeling, such as the implementation of Shared Socioeconomic Pathways (SSPs) narratives in forward-looking projection models. Such forward projections are an important aspect of climate policy modeling.

Eddy Bekkers and Robert Teh turn to the impact of trade policy conflict (aka "trade wars") and resulting policy uncertainty on the volume of world trade in Chapter 5. While trade policy modeling was largely about trade liberalization and regional integration in the first years of the GTAP project, as stressed in Chapter 3, noncooperative policy and resulting import protection pose future challenges. Bekkers and Teh model trade policy uncertainty as an increase in the discount rate of exporting firms, using the firm heterogeneity module of the WTO Global Trade Model (GTM) (The WTO's GTM is itself an adaption of the GTAP database and model). They find that the macroeconomic effects of uncertainty regarding trade policy globally are considerable, whereas the effects are much more limited if the hike in uncertainty is constrained to uncertainty about trade policy between the United States and its trading partners. Additionally, the effects of a trade war itself are in general an order of magnitude larger than the effects of uncertainty alone.

Like Chapter 5, Chapter 6 is also focused on the unwinding of economic integration and trade liberalization, with an emphasis on Global Value Chains (GVCs) and the North-American Free Trade Agreement (NAFTA). Since the NAFTA entered into force in 1994, extensive regional supply chains for producing motor vehicles, chemicals, wearing apparel, among other commodities have emerged. Using a GTM (and the GTAP database) tailored to include supply chains, Terrie L. Walmsley and Peter

J. Minor examine the impact of the United States extricating itself from the NAFTA. They estimate that reversal of NAFTA would lead to a decline in real GDP, trade, and investment in the United States, Canada, and Mexico, with most of the losses resulting from Canada and Mexico's reciprocation. The losses in low-skilled employment would be most significant in all three economies. Overall, their results point to the benefits of regional value chains, and the cost of limiting future cross-border production.

In Chapter 7, Zeynep Akgul, Caitlyn Carrico, and Marinios Tsigas turn to another challenge identified in Chapter 3, the integration of recent developments in trade theory into GTAP-type applied models. Working with a firm heterogeneity extension of the GTAP model (known as GTAP-HET), they investigate the effect of reductions in fixed trade costs on the U.S. labor market, distinguishing between those labor types that are employed to cover fixed cost as opposed to those that cover variable costs. They find that trade policy can have significant effects on the demand for labor, where the drivers differ between fixed and variable labor costs. Moreover, fixed and variable labor costs may respond in opposite ways in certain occupations.

Kym Anderson and Glyn Wittwer focus on detailed agricultural product modeling in Chapter 8, combining sector-level data on production and trade in wine with macroeconomic projections. They focus on the importance of alternative baselines (including Brexit and the evolution of exchange rates) for understanding potential future developments in the market for wine.

In Chapter 9, Edward J. Balistreri and Russell H. Hillberry offer another assessment of trade wars, this time using the GTAP-in-GAMS framework to model optimal bilateral tariffs and responses between the United States and China, and between the United States and Mexico, respectively. This includes modeled responses that fit within WTO disciplines (and others that do not). In contrast to the Bekkers and Teh assessment in Chapter 5, where uncertainty is a central feature, Balistreri and Hillberry focus more on the strategic aspects of trade wars.

Peter J. Minor, Terrie L. Walmsley, and Anna Strutt offer an assessment of dynamic aspects of a regionalism, focusing in Chapter 10 on the dynamic impact of regional agreements on Vietnam. They work with another extension of the basic GTAP modeling framework, the dynamic GTAP model

known as GDyn, to model a Vietnamese economy projected to the year 2035. Using this 2035 baseline, they then examine both the effects of both Trans-Pacific Partnership (TPP) agreement, along with a wider Free Trade Area of Asia and the Pacific (FTAAP), on Vietnam.

While Chapter 5 is focused on the unwinding of regional integration in North America, Chapter 11 is focused instead on European (dis)integration. In Chapter 11, Christine Arriola, Donal Smith, and Frank van Tongeren concentrate on spillovers linked to trade, with emphasis on the possible impact on Brexit on the Irish economy. They use a multi-country CGE model built around the GTAP database to investigate the sectoral effects of a scenario where the UK trade relations with the European Union would be subject to a set of new Most Favoured Nation (MFN) tariffs and increases in trade costs related to non-tariff measures on goods and services. Their analysis shows that total exports from Ireland to the United Kingdom could drop by as much as 17%, with agriculture and food most severely affected. Other sectors with a more diversified portfolio of export destinations, such as pharmaceutical and chemicals, would be able to compensate for the loss of trade with the United Kingdom to some extent, but overall the Irish economy would see a contraction of output and concomitant employment effects. Like the earlier chapter on NAFTA, this chapter provides further evidence of the potential costs associated with unwinding cross-border value chains and rolling back the depth of regional commitments to cross-border integration.

Chapter 12 documents the increased importance of GTAP-style modeling exercises in ex ante assessment of trade agreements. In the chapter, Hugo Rojas-Romagosa provides a comprehensive overview of the analytical underpinning to European assessments of trade agreements. These assessments, known as Sustainability Impact Assessments (SIAs), have evolved into a process that provides analysis more or less in real time of the possible impact, going strictly beyond economic impacts, of trade and investment agreements during the public policy debate that surrounds negotiation and ratification. Essentially, since 2002, CGE-type models have been at the core of quantitative parts of SIAs, while the indirect assessments (of factors like social impacts, resource strains, and human rights) have been more qualitative. There has been an increased focus in

the Non-Trade Policy Objectives (NPTOs) and related outcomes of trade agreements in public policy debates surrounding recent agreements. This points to a need to better link non-economic objectives and outcomes to core GTAP-type analysis in future.

The next chapters focus on climate and land use modeling. In Chapter 13, Joaquim Bento de Souza Ferreira Filho and Mark Horridge evaluate Brazil's commitments under the United Nations Conference on Climate Change in Paris (COP21), with a particular focus on deforestation and land use targets. The trade-off between deforestation in the Amazon versus the Cerrado biomes is central to their discussion. Their chapter brings new information from satellite imagery to the analysis, in order to highlight the role of deforestation in the Cerrado biome in the adjustment process. They work with satellite imagery data on deforestation by biome, as well as on private versus public land to perform their analysis.

In Chapter 14, Ehsanreza Sajedinia and Wallace E. Tyner examine the impact of biofuels, with an emphasis on land use. As they note, GTAP-type models have been used to assess the impacts of biofuels and their related policy effects on induced land use changes and its associated greenhouse gas emission changes; the impact of biofuels production on crop and food production and prices; the broader economic and welfare effects of biofuels; and other impacts of biofuels production. In their chapter they describe various attempts to understand the implications of a growing biofuel industry, including the evolution of different techniques and methods used in implementing CGE models in the biofuel area.

Like Chapter 14, the emphasis in Chapter 15 by Xin Zhao, Dominique Y van der Mensbrugghe, Roman M. Keeney, and Wallace E. Tyner is also on land use. However, while the emphasis in Chapter 13 is on current methods for modeling land use, the emphasis in Chapter 14 is on a proposed alternative approach that builds on the additive form of the Constant Elasticity of Transformation (CET) approach to resource allocation. They demonstrate that the framework could (1) directly provide traceable physical land use results, (2) flexibly handle land productivity differences based on biophysical information, (3) explicitly introduce land conversion cost, and (4) provide welfare decomposition in light of land heterogeneity and conversion costs. The work with an example of hypothetical changes in US grain consumption to demonstrate improvements over existing

methods in tracking welfare gains and losses linked to induced land use changes.

Finally, Chapter 16 is focused on the applied modeling of migration. In this last chapter, Peter B. Dixon and Maureen T. Rimmer work with a general equilibrium model that includes explicit representation of inter-sectoral labor flows, the role of vacancies in determining occupational choices, and various macroeconomic relationships. The model they develop allows them to examine alternatively agricultural guest-worker and legalization programs. They find that both are likely to have similar effects on the agricultural sector, while causing a gradual welfare-enhancing transformation of the occupational mix of incumbent employment away from agriculture. Both are also shown to have small (and possibly negative) effects on farm income, as well as positive effects on aggregate capital, employment, and GDP.

The academic contributions of Tom have been many. Beyond his own research output, his contributions include the building of institutions (the GTAP consortium and related network activities); public research goods (the GTAP databases, associated land use and other satellite databases etc.); and human capital (through his own students, and the various GTAP courses). The papers in this volume not only provide an overview of Tom's own work, but also provide testament to the type of relevant policy research made possible by his broader contributions in support of the research community.