



National CGE Workshop 2022

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Abstracts

Keynote Address

Making CGE models track history: an historical simulation with GTAP

Peter B. Dixon, Centre of Policy Studies, Victoria University

In a CGE historical simulation, we set up the model with a database for an historical year t . Then we compile data on movements in a selection of variables from year t to year $t+z$. Next, we treat these variables as exogenous and shock them with their observed movements. The original motivation for these simulations was to update input-output tables with whatever data were available for years beyond the latest published tables.

Many observed variables are naturally endogenous. In historical simulations they must become exogenous so that they can be shocked with their observed movements. Correspondingly, some variables that are naturally exogenous must be endogenized. These are often technology and preference variables. Thus, in addition to being an updating technique, historical simulations produce a major by-product: estimates of changes in technologies and preferences.

These estimates can be used in two main ways: in decomposition studies and in baseline forecasting. Decomposition studies explain changes in the structure of the economy in terms of driving factors such as changes in technologies and preferences. Estimates of these changes from an historical simulation are fed back into the model as exogenous driving factors in a decomposition simulation. In baseline forecasting, trends in preferences and technologies estimated from an historical simulation are projected forward.

This presentation describes an historical simulation with the global GTAP model for the period 2004 to 2014, focusing on data, choices of endogenous and exogenous variables, results and applications.

Presentations

Economywide and Distributional Effects of Targeted Agricultural Commercialization Policies: An Applied Integrated Micro-Macro Approach

**Alhassane Camara, École de Gestion, Université de Sherbrooke, Québec, Canada
(with Luc Savard, Université Mohammed VI Polytechnique, Rabat, Morocco)**

The literature on the effect of smallholder market participation has largely focused on direct impact analysis using partial equilibrium models. Studies that explore general equilibrium effects are sparse and overlook important heterogeneities or idiosyncratic characteristics among farmers. We fill this gap and highlight the critical role of agricultural marketing in the development process. Thus, we develop an integrated framework that coherently combines a farm household market participation model, a computable general equilibrium model, and a survey-based microsimulation. We apply our approach to Malawi, which recently launched an affordable input program to boost smallholder productivity. We show that when this program targets farm households with surplus labor and absent from the cereal market, the first response is to reallocate labor to farming and increase production and sales. This leads to an adjustment of factors and commodity prices, resulting in economy-wide growth that has a more positive effect on the poor.

Keywords: Agricultural Household; Computable General Equilibrium; Microsimulation, Smallholder Market Participation

Issues arising from Murray-Darling Basin economic modelling

Glyn Wittwer, Centre of Policy Studies, Victoria University

During difficult times, it is easy and popular to blame government policy for adversity. The Murray-Darling Basin in the past two decades has endured many difficulties, arising from extreme and prolonged drought, a soaring dollar during the mining boom, trade sanctions on key basin outputs and, more recently, a varroa mite outbreak. The 2007 Water Act was introduced during the millennium drought. It included purchases of water by the Commonwealth for environmental purchases. Despite water sales being voluntary and paid for at market prices, and despite a willingness among irrigators to sell, various lobbyists have railed against the sales and blamed them for difficulties within the basin. The 2007 Act was hijacked, with inefficient and costly water infrastructure upgrades continuing while water sales to the Commonwealth ceased. Now there is momentum to resume water sales, albeit with a far more modest target in mind.

Oil supply shocks and fuel tax policy in Australia: insights from a dynamic CGE framework

**Xianglong (Locky) Liu, Centre of Policy Studies, Victoria University
(with Jason Nassios and James Giesecke, Centre of Policy Studies, Victoria University)**

Recent surges in global crude oil prices, caused by supply disruptions from Russia's invasion of Ukraine and associated sanctions, have increased the cost of living. In response, in the recent Australian Federal budget, the government announced a halving of Australia's fuel excise from 44 cents per litre to 22 cents per litre for six months. This paper explores the impact of the oil supply shock on the Australian economy, and the effectiveness of the federal government's fuel excise policy response. We adopt a

single-country dynamic computable general equilibrium (CGE) framework. Because Australia is a net oil-importing economy, *ceteris paribus*, the rise in world oil prices puts downward pressure on the terms of trade and household consumption. The impact at the macro level on real GDP is damped by a rise in net exports and world LNG prices, a key Australian export. Our analysis unpacks the role played by the linkage between world oil and gas prices. While this linkage attenuates the macroeconomic effects of an oil price rise, its capacity to mitigate the economic damage in Australia is muted because of the LNG sector's low labour intensity, high foreign ownership, and the fact that higher LNG export prices drive up domestic gas prices and hurt domestic gas users. We find a 50 percent reduction in fuel excise can help damp the overall fall in real GDP and employment by about 30 percent, relative to a scenario where world oil and LNG prices rise but fuel tax excises are not reduced. From the perspective of allocative efficiency, we find the merit of the fuel excise tax cut is compromised by higher oil prices because it is a specific tax, mitigating its capability to reduce tax distortions. Finally, we study an alternative policy response: a UK-style energy profits levy on LNG producers. We find that such a policy could effectively promote household consumption without costing the budget.

JEL classification: C68; E62; H25; Q43

Keywords: Taxation policy; CGE modelling; Dynamics; Oil prices.

Declining demand for Australia's fossil fuel exports, potential economic impacts and policy responses

Cedric Hodges, Deloitte Access Economics

Fossil fuels account for over one-quarter of Australia's merchandise exports, and the global shift to decarbonisation could see demand contract considerably (Kemp et al., 2021). Given the majority of our fossil fuel production is exported and limited opportunities to use them domestically, the decline in foreign demand will flow through to sectoral output and employment. It will also impact the broader economy as national income, and government taxation are affected and as factor markets react. The impacts are unlikely to be homogenous, with some sectors, workers, and regions affected disproportionately. These questions are pertinent for policymakers as the change is outside of their control, and community angst builds on what policies will be enacted to ameliorate the impacts.

This work develops a Computable General Equilibrium (CGE) model of the Australian economy tailored to include fossil-fuel sectors, workers, households and regions so that the impact on these distinct agents can be evaluated alongside those not directly impacted. The model includes differential rates of labour mobility by occupation and industry, enabling a richer understanding of how shocks work through factor markets and have heterogeneous spillovers by sector.

Adjusting Net Zero Emissions Pledges Under Global Permit Trade – Implications to Welfare and Consumption-based Emissions Pledges

Shenghao Feng, Research Institute of Global Value Chains, University of International Business and Economics

(with Yang Zhou, Research Institute of Global Value Chains, University of International Business and Economics and Xiujian Peng and Philip Adams, Centre of Policy Studies, Victoria University)

Many countries have made net zero emissions pledges (NZEPs). Who have made the most stringent pledges, and how to improve equity and efficiency of global mitigation efforts? We developed a dynamic

computable general equilibrium (CGE) model to analyze these questions. We fitted the model with a new, endogenous CCS modelling mechanism, a new renewable power generation nesting structure, and an energy specific base case. Using this model, we build three scenarios up to 2050, namely 1) a 'business as usual' scenario, 2) a 'net zero emissions pledges' scenario (with two variants: with and without global permit trade) and 3) an 'adjusted emissions pledges' scenario, in which the existing NZEPs are adjusted in pursuit of improved equity under global permit trade. Our results show that without global permit trade, the developed regions would suffer more economically and import more emissions for their final use. By forming global permit trade, the world would enjoy higher mitigation efficiency, with the developed regions yielding most of these benefits, leaving some less developed regions to be worse off, while hurting global welfare (when higher inequality reduces global welfare). We demonstrated that, by making the more developed regions to pledge to even stronger abatement targets, it is possible to achieve a Pareto Improvement condition, in which no region is worse off because of permit trade. This would not only improve global welfare but also reduce the net transfer of carbon from developing to developed regions through trade. Our results lead to one important policy recommendation. Countries should work together to facilitate global permit trade and to ask the more developed regions to pledge to even lower, if not negative, emissions levels than their current NZEPs.

Multilateral Context for EU-Australia Economic Cooperation

Paul Gretton, Crawford School of Public Policy, Australian National University

Following the GFC, growth in global trade has been sluggish with recent trade tension providing doubt as to whether these trends will change any time soon. This poster looks at possible alternative future trade growth scenarios and the implications of economic convergence between regions for primary energy demand, and what these may mean for trade policy formation at the national, regional and global levels.

To examine alternative trade growth scenarios, this contribution utilizes the GDyn-FS model, a multi-sector, multi-region recursive dynamic computable general equilibrium model of the global economy. This model combines the economies of individual regions through multi-lateral trade, associated transport services and capital-finance flows. Over the forward period to 2050, projections of population, employment and output are drawn from IMF World Economic Outlook estimates, ILO labour market projections together with long-run projections that follow the medium growth scenario of Shared Socioeconomic Pathway projections (SSP2). Saving and trade balances as a share of GDP are modelled as gradually adjusting to longer-run target measures based on historical trends, empirical analysis and theory. The projections suggest that under such a growth scenario and subject to regional balance of payments constraints based on historical data, global exports could expand to reach around 35 percent of global output by 2050 from the current level of around 30 percent. The projections also suggest a substantial pivot in trade and investment towards economies outside of the Europe-28, China, Japan, USA group.

Accompanying such a pivot is a gradual convergence of per-capita incomes of low and middle income economies towards levels attained by higher income economies. Such convergence would entail substantial increases in primary energy consumption. For example, a comparative analysis indicates an increase in per capita energy consumption in non-OECD countries to OECD rates would imply a more than doubling of global energy demand and use from current levels.

Such an energy transition would place a premium on cooperative research at a global scale on energy supply technologies capable of meeting global demand within global resource constraints and without imposing undue stress on the natural or built environments. It would also place a premium on: (i)

availability of intellectual and physical capital to meet emerging energy demands across regions; (ii) non-discriminatory multi-lateral, plurilateral and open regional institutions that promote cooperation and a non-discriminatory order globally; and (iii) domestic policies that foster productivity and lower costs of trade across all markets.

Economic implications of the Nationally Determined Contributions and goals of the Paris Agreement

Samuel Marginson, Centre of Policy Studies, Victoria University

To assess the economic impacts of emissions reductions commitments made to date for the Paris Agreement, I expand on a global, multi-regional, multi-sectoral, recursive dynamic CGE model with emissions and energy accounts, GDyn-E. After disaggregating the electricity sector and adding coverage of non-CO2 greenhouse gas emissions, I impose emissions reductions commitments made to date. Economic impacts are worst in regions that are heavily reliant on fossil fuel exports for income. Other regions, even those with relatively ambitious emissions reduction targets, are less affected. The majority of changes occur within the electricity generation sectors. Reductions in fossil fuel use outside the electricity sector are limited, with global coal use falling 12%, gas use remaining more or less unchanged and oil use continuing to increase over the decade to 2030. This is because the commitments made to date do not result in any significant reduction in the level of emissions by 2030.

A Bamboo Curtain: The Grim Australian Consequences of China Conflict

**Rodney Tyers, Department of Economics, University of Western Australia
(with Yixiao Zhou, Crawford School of Public Policy, Australian National University)**

As a natural resource exporter, the Australian economy has benefited from several decades of extraordinary Chinese expansion. Slowing growth has diminished these gains at the margin and geopolitical changes have seen mixed effects, including restrictions imposed on Australia's exports to China and a likely short-lived commodity price boom. We use a global economic model to assess, in the first instance, the downside risk facing both Australia and China of restricted bilateral trade and investment exchanges. The effects on Australia emerge as considerable, proportionally much larger than those on China. We then consider the effects of a "bamboo curtain" restricting trade and investment exchanges between Western democracies and the rest of the world. Australia's relative affluence at the outset and substantial trade dependence see its welfare per capita impaired by more than the other regions. The US is least affected because it is less trade-dependent than the other economies identified and so more diversified and robust to trade and investment shocks. Western partial offsets stem from increased economic incentives for manufacturing expansion and some associated recovery in the demand for both skilled and unskilled workers.

Inefficient at any level: A comparative efficiency argument for complete elimination of property transfer duties and insurance taxes

**Jason Nassios, Centre of Policy Studies, Victoria University
(with James Giesecke, Centre of Policy Studies, Victoria University)**

Harberger (1962) coined the term excess burden to emphasise that taxes impose costs in addition to the revenue they collect. Reviews of Australia's tax system have used point estimates of the excess burden for a series of Australian taxes, among other measures, to motivate and prioritise the nation's

reform agenda. In this paper we commence the work needed to elucidate what the optimal tax mix in Australia might look like under alternative revenue raising efforts, by studying how the excess burden of four Australian taxes change as we alter their tax-specific revenue-to-GDP ratios. This is achieved via simulation with a large-scale CGE model with high levels of tax-specific detail. We show that property transfer duties and insurance taxes are highly inefficient even at low levels, strengthening the case for their complete replacement with more efficient taxes.

Keywords: CGE modelling; Immovable property tax; Recurrent property tax; Insurance tax; Value added tax; Excess burden

JEL codes: C68; E62; H2; H71; R38

A CGE Analysis of the Basic Income Scenario in South Korea

Sang-Ho Nam, Korea Institute for Health and Social Affairs

The basic income debate is an important issue in South Korea. This debate was quite hot especially in the national president election campaign in the first quarter of 2022.

Proponents of the basic income argue that basic income is the most efficient policy instrument in reducing inequality and poverty. Empirical results from partial equilibrium analysis, which mostly focus on the distributional and/or poverty issues, advocates basic income.

On the other hand, Opponents of the basic income do not put much credit on the distributional improvements. They emphasize that we need to consider other aspects of the economy.

In this paper, we employed a CGE approach to investigate the pros and cons of the basic income in South Korea. The basic tool for this analysis is the ORANI-type CGE model, which uses the most recent input-output table of the South Korean economy.

We first present national results, and sectoral results follows next. In the summary part of the paper, we present the policy implications for the basic income scenario.

An iterative method for solving CGE models

Xiao-guang Zhang, Productivity Commission

This paper presents a solution method for computable general equilibrium (CGE) models, an alternative to the conventional methods that are based on matrix inversion and mathematical solvers. This alternative method uses iterative price adjustments to equate supplies and demands in markets. It is intuitively simple because it resembles a bargaining process, such as an auction, in which different prices are tried in a structured way until the market clears.

A CGE model solution is a set of equilibrium prices that clear all goods and factor markets. There are many markets in a CGE model, and one might argue, therefore, too many prices to solve for iteratively. But in fact, not all prices need market adjustments. With constant return to scale technologies, goods prices are equal to their costs of production. This property reduces substantially the number of variables that require market clearing conditions to determine their equilibrium value. The solution for the entire model reduces to finding equilibrium values for just a few factor prices, which makes iteration a practical and effective method for solving CGE models.

This paper outlines how to identify those variables that cannot be defined by other variables; these are the variables that require market equilibrium condition to find their equilibrium values. The other values

are derived from the equilibrium values in these markets. The iterative solution method does not rely on any solver. It allows CGE models to be built and solved in any computing programs with a loop function.

Studying the Impact of Foreign Capital Constraints on Indonesian Banks

Arief Rasyid, Centre of Policy Studies, Victoria University

Indonesia's financial system has long made use of foreign capital in their operations. In this paper, I explore the economy-wide impact of changes in financial regulation on capital flows: specifically, via an increase of 100 basis points in the level of the bank net open position (bank NOP) in Indonesia. My analysis is simulation-based, undertaken within a dynamic financial computable general equilibrium (FCGE) framework. This facilitates an analysis of policy implications for the broader financial system and the Indonesian real economy. The paper examines two accommodation channels: (i) banks accommodate the rise by increasing their foreign liabilities, i.e., by borrowing more in foreign markets; and (ii) banks accommodate the rise by reducing foreign lending. In each case, small gains materialise for the Indonesian real economy, measured by increases in real GDP relative to baseline forecasts. Net foreign capital inflows in each case cause exchange rate appreciation, which drives small reductions in the central bank policy rate, as postulated in Mundell-Flemming policy trilemma [Mundell et al. (1963); Fleming (1962)], and described by Ikhsan et al. (2012) and Juhro & Goeltom (2015) in the Indonesian context.

Keywords: capital account relaxation, macroprudential, financial computable general equilibrium model, Indonesia; net open position.

JEL Classification: C68, E17, E44, G17