CGE Models for Economic Policy Research

David Roland-Holst, UC Berkeley
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2. Examples of CGE applications
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5. Proposed timetables for implementation
Policy analyst’s balancing act

Modeling
technique
computing
parameters
data
etc

Policy making
trade-offs
timing
balancing interests
The GE Modeling Offers

- Linkages and Indirect (and otherwise invisible) effects
- Effects of resource and other constraints
- Substitution patterns
The process of policy analysis

Preliminary steps

- Understand the problem and how it has been addressed in the past
- Understand the things that most concern the policy maker
The process of policy analysis

The modeling

- Think about the GE aspects of the problem
  - Why are we using a GE model for this issue?
- Get the modeling right
  - Make sure the problem is represented in the model
    - eg must have base tariffs if they are to be removed
- Understand and explore the results
  - What key parameters or data drive the results
  - How do changes in these change the results
The process of policy analysis

The communication

- Explain without any technical detail
- Cover policy makers concerns
- Repeat all the steps as necessary
Examples of CGE Applications
Some examples

- Agricultural Policy
- Trade policy
- Tax policy
- Environmental regulation and reform
- Poverty and Inequality
Agricultural Policy

- The issue
  - What does agriculture contribute to the economy and what does the (domestic and international) economy contribute to agriculture?
  - What are the detailed effects of agriculture policy?

- Why a CGE model?
  - Agriculture remains a dominant sector in China, the most important source of income for the poor, and will experience many transitions in the next generation.

- Key insights
  - Agriculture can be a main driver for growth and poverty alleviation, but the composition of this growth will be very complex.
  - Big contrast with partial equilibrium analysis.
Trade policy

- The issue
  - Effect of changes in tariffs and other forms of industry assistance

- Why a CGE model?
  - Trade policy is the classic GE problem

- Key insights
  - For complex sectors like agriculture, it is a rich story about how the benefits and costs of trade policy are distributed.
Tax policy

- The issue
  - Effect of replacing wholesale sales tax with goods and services value added tax

- Why a CGE model?
  - Very complicated initial structure of taxes

- Key insights
  - Overall gains very small and
  - very sensitive to some key assumptions
Environmental regulation

- The issue
  - Effects of regulations such as:
    - pollution
    - Resource (water, fisheries, forestry) policy

- Why a CGE model?
  - Still emerging in a live policy debate
  - Energy and water, for example, key inputs to all production processes

- Key insights
  - Environmental policies have many indirect effects
Poverty and Inequality

- The issue
  - What is the real composition of income and growth effects?

- Why a CGE model?
  - Institutional detail is essential
  - Relative incomes are determined by relative prices
  - Constraints play a major role in incidence and distribution

- Key insights
  - Who are the winners and how can they be enlisted to support policy?
  - Who are the losers and how can they be compensated?
IPALP Modeling Strategy
Basic Tenets of Modeling Strategy

Policy makers need visibility about trends and linkages. Economic models make a lasting contribution to this under three conditions:

1. They must incorporate advanced data and methods.
2. Their results must be transparent.
3. They should be locally implemented.

In order to achieve these three goals, we propose a three tier modeling facility.
Two Model Archetypes

1. National research prototype model – A state-of-the-art single country CGE model.
A Generic Modeling Facility

- Analytical Economic Model
- Social Accounting Matrix
- Satellite Accounts
- Aggregation
- CGE Forecasting Model
Analytical Economic Model

- Supply – Firm-level production technology with Leontief intermediate use.
- Demand – Domestic consumption functions by household and commodity type.
- Dynamic specification of factor growth and demographic transitions.
- Extensive accounting for transfer relationships between institutions (fiscal, capital flows, remittances, etc.).
Forward-looking Policy Analysis

Policy Scenarios

CGE Forecasting Model

Baseline Economic Conditions

Projections for Senegal/Region to 2020
Single Region Model: A Schematic View

Development

- Social Accounting Matrix
- Econometric Parameter Estimates
- Policy Scenarios
- CGE Model
- Baseline Calibration Data

Simulation

Analysis

Numerical Results
GIS Mapping

Box Color Key to Software Implementation:
Green – Microsoft Excel
Yellow – GAMS
Model Structure
Model structure I—Overview

- Multi-sectoral and possibly multi-regional
- Constant-returns-to-scale and perfect competition
- (Recursive) dynamic
- Single representative household per region
- Government and investment activities
- Linked bilateral trade flows.
Model structure II—Production

- Three production archetypes:
  - Crops (extensive vs. intensive)
  - Livestock (range-fed vs. ranch-fed)
  - Other (standard capital-labor substitution)

- Crop sectors include land, energy and agricultural chemicals as substitutable inputs
- Livestock includes land and feed as substitutable inputs
- Energy is a substitutable input in other sectors
- Fossil fuels also rely on sector-specific resource.
Model structure III—Factor markets

- Labor is perfectly mobile across sectors and there is a single market-clearing wage rate.
- ‘New’ capital is mobile across sectors, installed capital is partially mobile.
- All factor income accrues to single representative household
- Extended linear expenditure system for consumer demand
Model structure IV—Imports

- Aggregate demand is the sum of demand across industries, households, government and investment.
- Aggregate demand is composed of domestic and imported goods.
- Dual nested CES structure. Top nest allocates aggregate demand between domestic goods and an aggregate import bundle.
- Second nest allocates aggregate import demand across regions of origin.
Model structure V—Bilateral trade

- Output is modeled symmetrically with a dual nested CET structure. (Standard model assumes infinite transformation.)
- A single domestic price equilibrates demand and supply of the domestic good.
- Each trade node clears with a market-clearing price. The model therefore has $(N \times R) \times (R+1)$ equilibrium goods prices.
Model structure VI—Trade wedges

- Each traded commodity has four prices—pre-FOB (export subsidy excluded), FOB, CIF, and post-CIF (tariff inclusive).
- FOB/CIF wedge modeled using international trade and transport services.
- Model also includes trade friction parameter (so-called iceberg parameter).
Model structure VII—Closure

- Taxes on intermediate inputs and final demand, factors of production, output, trade, and households.
- All taxes are exogenous save household direct taxes. The latter are endogenous to hit a given fiscal balance.
- Investment is savings (private, public and foreign) driven.
- Net foreign savings are exogenous.
- Model numeraire is manufacturing value added
Model structure VIII—Dynamics

- Labor force and population growth are exogenous.
- Capital stock is driven by past investments (and depreciation).
- Productivity is calibrated in baseline to achieve a GDP growth target.
- Productivity is typically exogenous (i.e. fixed) in policy scenarios, though some scenarios link sectoral productivity to export/output ratio.
Model structure IX—Variations

- Segmented labor markets (e.g. rural vs. urban) with or without migration.
- Minimum wage (with endogenous regime switch).
- Tariff rate quotas (TRQs).
- International capital mobility (driven by changes in relative rates of return).
- Increasing returns to scale with contestable markets
Discussion