Approaches to Measuring the Effects of Trade Agreements

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“Ask five economists and you'll get five different answers – six if one went to Harvard.”

Edgar R. Fiedler
An Abundance of Answers

• Abundance of economic approaches to measuring effects of trade agreements
• Different approaches often give very different results
• Creates confusion and undermines credibility among policy-makers and the public
Goals of This Presentation

• Lay out criteria for choosing among modeling approaches
• Describe the key approaches to measuring the effects of trade agreements
• Focus on the relative strengths and weaknesses of each approach
Choosing Among Approaches

• Wrong: Which economic approach is the best one?
• Right: Which economic approach is the best one to answer the questions that I have?
No “One Size Fits All” Model

• No single economic model can fully capture all the impacts of a complex trade agreement
• Different models are designed for different purposes
• A model must ultimately be judged on whether it answers the questions it was designed to answer
Extraneous Considerations

• Which approach is my agency (or am I) the most familiar with?
• In which approach have we invested the most resources?
• Which approach is intellectually fashionable at the moment?
Qualitative or Quantitative?

• In some cases a qualitative approach using economic theory and intuition is sufficient
• In other cases only a quantitative approach will suffice
  – “How big” or “how small” questions
  – When economic theory can’t say whether something goes up or down
Models vs. Modeling Approaches

• This presentation focuses on modeling approaches, not on specific models
  – Example: CGE modeling in general, not the GTAP model

• A specific model may or may not show a modeling approach in the best light
Judge Based on Past Performance?

• Modellers can learn from past failures to accurately project effects of trade agreements
  – Erroneous NAFTA projections

• Every model can always be improved

• Each key modeling approach has had enough success to prove its worth
Key Modeling Approaches

• Econometric Modeling

• Simulation Modeling
Common to Both Approaches

• A system of mathematical equations that depict selected relationships in an economy or group of economies

• Parameters in each equation that influence how one economic variable is related to another
  – Positive or negative relationship
  – Strong or weak relationship
Difference Between Approaches

- **Econometric**: parameter values are estimated using statistical techniques
- **Simulation**: parameter values are drawn from a variety of sources
  - Prior econometric studies
  - Other simulation models
  - Intuition and judgment
Hybrid Models

• Econometric models in which some estimated parameters are adjusted based on intuition and judgment

• Simulation models in which some parameters are econometrically estimated
  – Example: estimated Armington elasticities in GTAP model
Benefits of Parameter Estimation

- Parameter estimates come with confidence intervals, so modeller can see precision of estimates.
- Parameters drawn from other studies may not be right for the model at hand.
  - Example: parameters estimated at higher or lower level of product aggregation than in model.
Drawbacks of Parameter Estimation

- Intensive in research resources that could be used elsewhere
- Most parameter estimation methods lock in a particular product/sectoring scheme
- What happens if the parameter estimates are unsatisfactory?
Types of Econometric Models

• Models of trade flows between countries (gravity model)
• Models of the economic impacts of trade
  – Employment and wages
  – Productivity
  – Competition
  – Firm survival and exit
Gravity Model

• Seeks to explain bilateral trade flows between countries
• Trade flows proportional to the product of the national incomes of the two countries
• Trade flows inversely related to either global income or to the distance between the two countries
Distance in the Gravity Model

• Not just physical distance but economic “distance” created by:
  – Trade barriers
  – Presence of absence of customs unions, common borders
  – Economic and political institutions
  – Differences in languages, ethnicities or religions
  – Other factors
Success of the Gravity Model

- One of the great success stories in empirical economics
- Originally thought to have no real theoretical foundation
- Now proven to be consistent with a variety of economic theories of international trade
Models of Economic Impacts of Trade

• Some designed to shed light on short-term costs of trade (unemployment, plant closings)
• Others designed to shed light on longer-term effects of trade on competition and productivity
  – Effects missing from most standard models of trade impacts
Advantages of Econometric Models

- Real data and, assuming a study is methodologically sound, real results
- Provide an opportunity to learn from recent economic history
Drawbacks of Econometric Models

• Results are often specific to one country or one pair of countries
  – Example: How relevant are CUSTA study results for countries other than Canada and the US?

• Results are specific to some trade agreement already in place
  – May not apply to a trade agreement with different terms
Drawbacks of Econometric Models

• Results are historical in nature, and may no longer be relevant
  – A new trade agreement may lead to a new economic environment where historical relationships no longer hold
  – “Economic history is all about structural change and econometrics is all about avoiding it.” (Richard Just)
Types of Simulation Models

- Partial equilibrium (PE) models
- Computable general equilibrium (CGE) models
  - Also known as applied general equilibrium (AGE) models
Partial Equilibrium Models

• Model the agricultural sector or part of it in one country or a group of countries
• Consider the agricultural sector as a closed system that doesn’t have significant effects on the rest of the economy
  – The rest of the economy can still affect the agricultural sector
CGE Models

• Model all goods and services in an economy simultaneously for one country or a group of countries
• Consider the agricultural sector as an open system that can potentially have significant effects on the rest of the economy
PE vs. CGE: Economy-Wide Linkages

• CGE models capture linkages among all sectors of an economy
• The agricultural sector could have significant effects on national income (and in turn food demand), exchange rates, wage rates, and other economy-wide variables
PE vs. CGE: Economy-Wide Linkages

• Economy-wide linkages are important for developing countries where production agriculture is a large percentage of economy
• Also important if studying food processing sectors in any economy
PE vs. CGE: Conceptual Consistency

- CGE models force conceptual consistency by acknowledging a fixed resource base (land, labour, and capital)
- CGE models also include budget constraints for households and the government
- PE models generally lack budget and resource constraints
PE vs. CGE: Consistency with Theory

- CGE models are designed from the ground up to be consistent with economic theory
- Most PE models are not consistent with theory on either supply or demand sides
- CGE models more appropriate for social welfare calculations
PE vs. CGE: Complexity

- CGE models are highly intensive in data and parameters
  - Social accounting matrix (SAM) showing all transactions among sectors of an economy

- This complexity may yield only marginal gains over insights from simpler PE models
PE vs. CGE: Disaggregation

• Disaggregating a model to a fine level of product detail is more feasible in a PE model
• Generally lack the data to disaggregate a SAM to a very fine level of product detail
  – Example: corn disaggregated to GM and non-GM
PE vs. CGE: Policy Representation

- Agricultural policies should be represented in a model:
  - Accurately
  - Tractably
  - Consistently with economic theory

- Agricultural policies are complex

- These three goals often come into conflict
PE vs. CGE: Policy Representation

• CGE models seek consistency with theory, sometimes at the expense of accuracy
  – Price “wedges”

• PE models can sacrifice theoretical purity when essential for accuracy and tractability
PE vs. CGE: Timeliness

• Most SAMs are out of date even before they’re released
  – GTAP’s newly-released (version 6) database is for 2001

• PE models are often used for projections where up-to-date data are essential
PE vs. CGE: Length of Run

• Most CGE models make assumptions that are long-run in nature
  – Perfect factor mobility (labour, capital, materials) among sectors
  – Fairly high substitutability among inputs into production
PE vs. CGE: Length of Run

- Supply elasticities in PE models tend to be much lower than those implied by CGE models.
- CGE models better for long-run analyses, PE models for short-run analyses.
## PE vs. CGE Scorecard

<table>
<thead>
<tr>
<th>Category</th>
<th>CGE</th>
<th>PE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economy-Wide Linkages</td>
<td>✓</td>
<td></td>
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<tr>
<td>Conceptual Consistency</td>
<td>✓</td>
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Studies Comparing PE vs. CGE

• Several studies have attempted to compare PE and CGE results
• Should compare like with like
  – PE model should be similar in structure to the agricultural sectors of a CGE model
• Studies comparing like with like find similar results between the two approaches
The Bottom Line

• Different models are designed for different purposes
• Use the modeling approach best suited to answer the questions that you have
Use econometric models to:

- Help settle debates over existing trade agreements
- Better understand short-run and long-run consequences of trade agreements not included in most existing simulation models
Use CGE models to:
• Analyze developing countries
• Analyze food processing sectors
• Study effects on employment
• Perform aggregate social welfare calculations
• Analyze long-run effects
PE Models: Bottom Line

Use partial equilibrium models to:

- Study products at fine level of detail
- Accurately represent complex agricultural policies
- Meet clients’ needs when up-to-date data are essential
- Analyze short-run effects