Modelling Methods for Trade Policy I: Simulations Models

Roberta Piermartini

Economic Research and Analysis Division

WTO

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Presentation

1. Why do we need a model for trade policy?
2. Modelling Approaches:
   a. Ex-ante/Ex-post Analysis
   b. Static/Dynamic
   c. Partial/General Equilibrium Models
3. Computable General Equilibrium Model
4. GTAP as a CGE example
5. Evidence on the Effect of the Doha Round

1. Why do we need a model for trade policy?

- to provide a theoretically consistent, rigorous and quantitative way to evaluate different economic policies

- to confirm a policymaker judgement or alert him over unintended consequences

- estimations/simulations and policymaker own insights should be COMPLEMENT in the formation and conduct of policy making

2a. Ex-Ante vs Ex-Post

- *Ex-Ante* analysis: simulate the (future) impact of alternative trade policies

  (simulations using PE/GE model)

- *Ex-Post* analysis: quantify the effects of past trade policies

  (all econometric analysis)

*Both approaches can answer the question: "what if ... ?"*

2b. Static vs Dynamic

- *Comparative Static Analysis*: compare <u>initial</u> and <u>final</u> steady-state
  - more simple (theoretically, computationally)
- *Dynamic Analysis*: also looks at the <u>evolution</u> from the initial to the final equilibrium. They capture:
  - adjustment process
  - capital accumulation
  - technological changes

2c.Partial Equilibrium Models (PE)

- Focus on one sector at time
- Neglect interactions between markets
- Useful if second-order effects are likely to be small
- Advantages:
    - Simple models
    - Transparent (as rely on few key parameters)
    - Add realism in the specific sector

PE Ex.: removal of tariff on wheat

P(wheat) falls

D(wheat) up
(price elasticity)

Q(wheat) down
(supply elasticity)

M(wheat) up
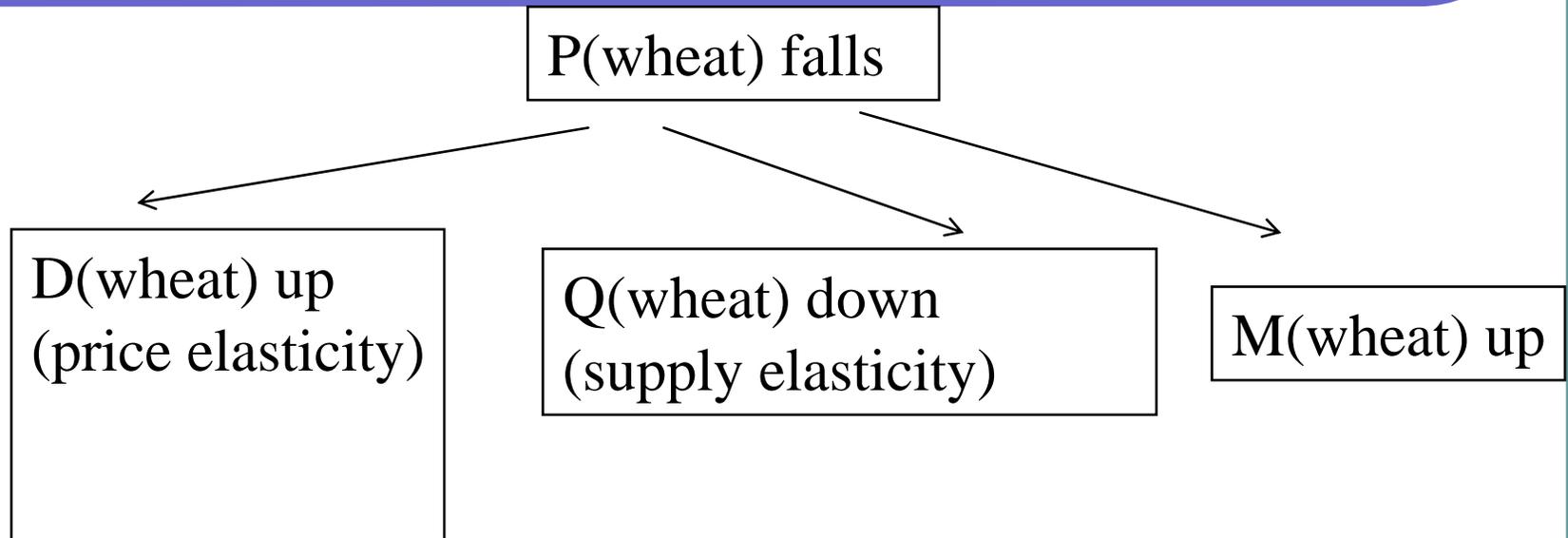
Gains from liberalization: Freeing up resources to employ them more efficiently
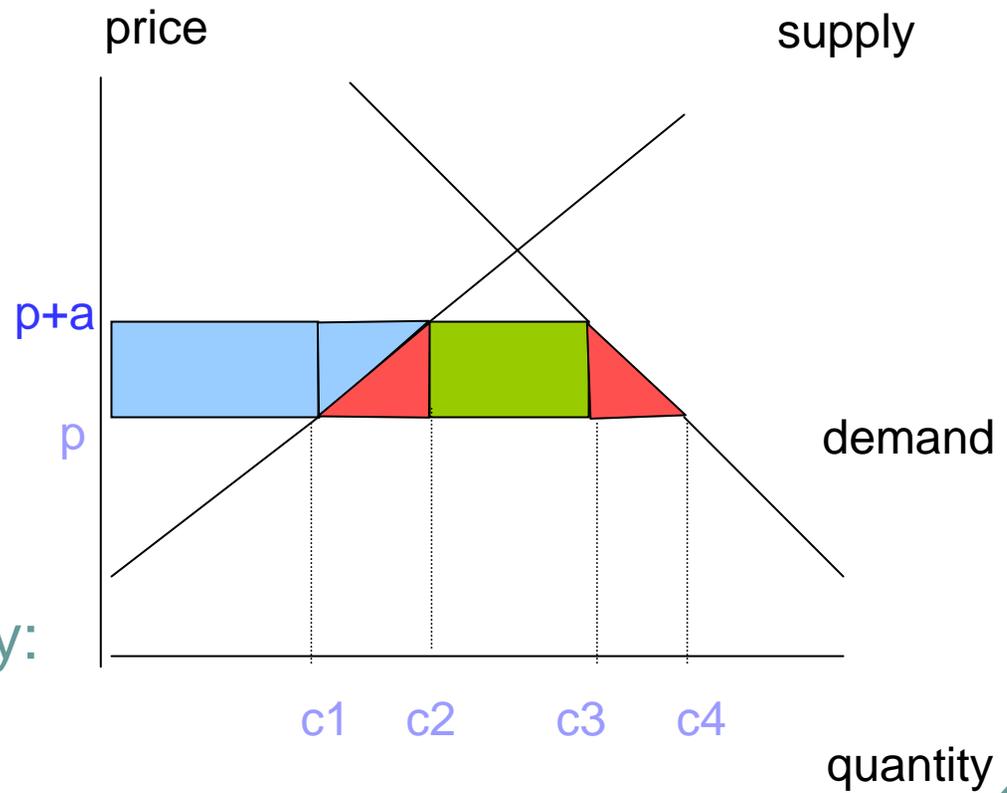
Eg. PE Analysis: Welfare Analysis

- Net gain induced by a tariff of size *a*

- Consumer gains: the entire coloured surface
- Producer lose: the blue surface
- Government revenue: the green surface
- Net gain for the country: the two red triangles !!!

price

supply

p+a

p

demand

c1   c2   c3   c4

quantity

2c. General Equilibrium Models (GE)

IMPORTANT: Imposes income/expenditure and resource constraints.

- Takes into account <u>linkages</u> between markets, both product and factor markets (including feedback to the original market)

- Note: it is possible to have a multiple markets PE model. The essential difference between GE and PE model is in the overall equilibrium condition Income=Expenditure.

GE Ex.: removal of tariff on wheat

P(wheat) falls

D(wheat) up
(price elasticity)

D(butter) up
(degree of complementarity)

D(rice) down
(elasticity of substitution)

Q(wheat) down
(elasticity of
supply)

M(wheat)
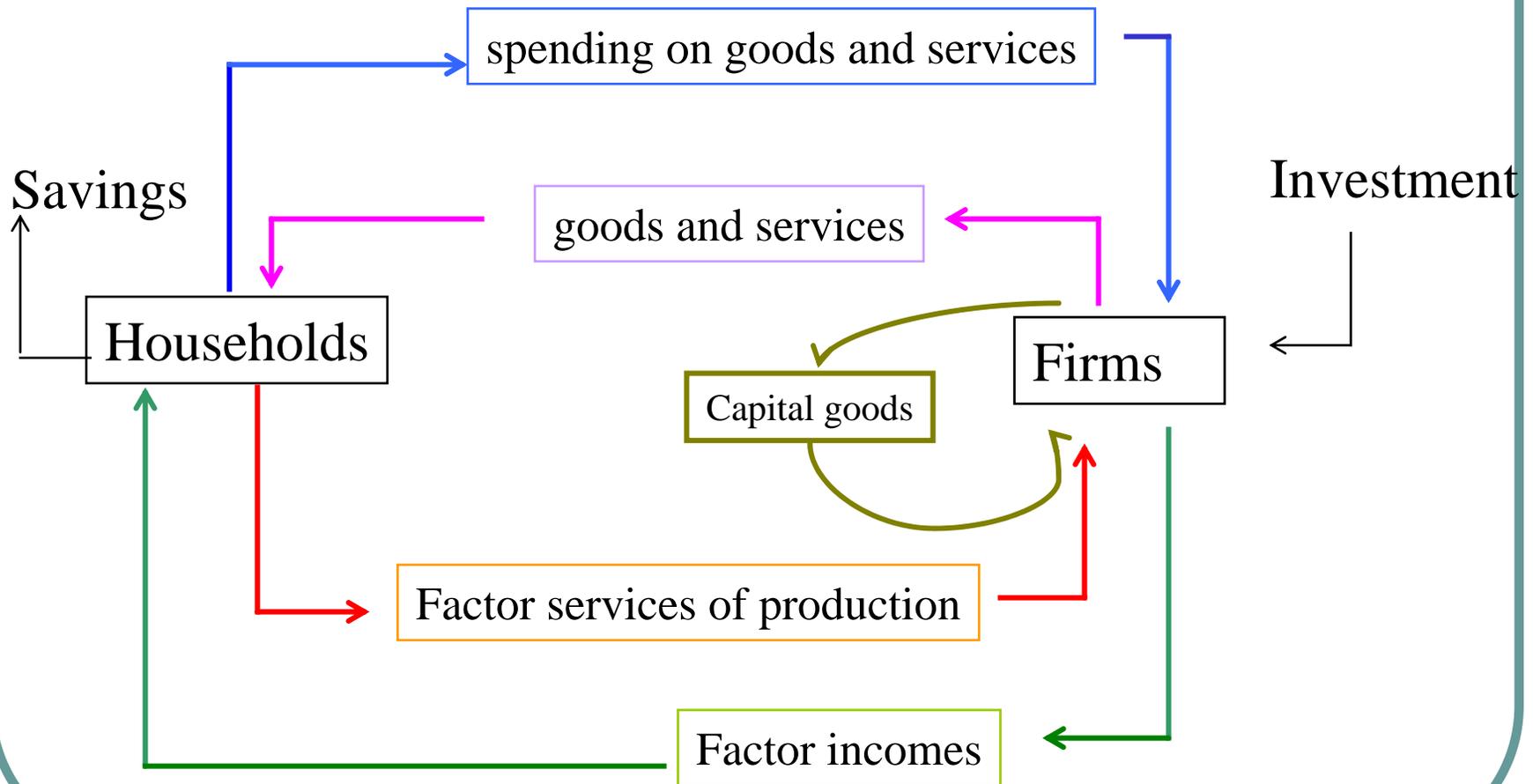up

Land, capital, labour out of wheat into butter

Price* demand= wage*employment across all products in the economy

Total demand for factor employment = total factor endowment
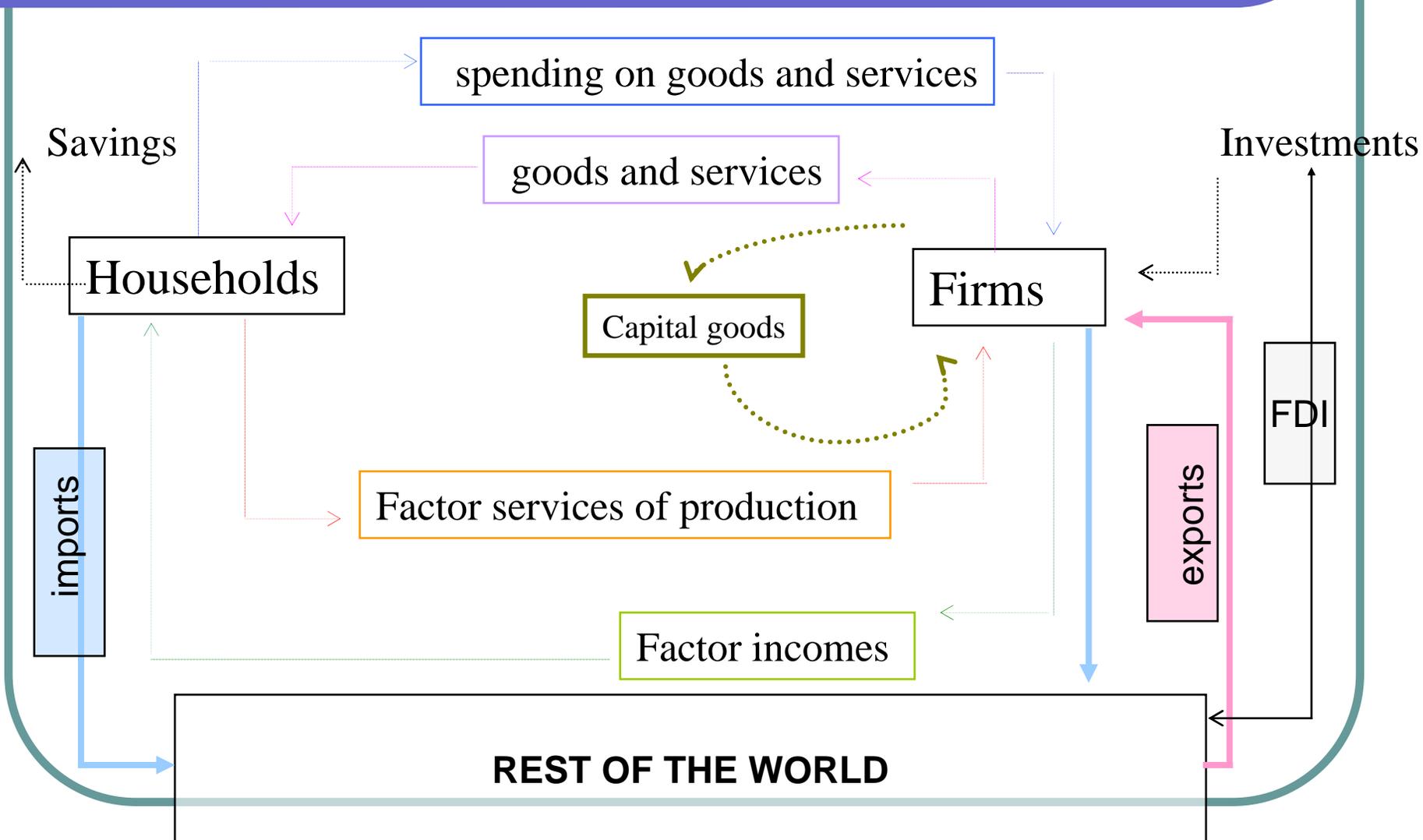
GE equilibrium assumptions

1. Underlying optimazing behaviour of economic agents (households and firms) generate demand and supply curves

2. In each market: demand=domestic supply + foreign supply

3. Overall, total receipts= total payments

Circular Flow:closed economy

spending on goods and services

Savings

Investment

goods and services

Households

Firms

Capital goods

Factor services of production

Factor incomes

Circular Flow: open economy

spending on goods and services

Savings

Investments

goods and services

Households

Firms

Capital goods

FDI

imports

Factor services of production

exports

Factor incomes

REST OF THE WORLD

3a. Computable General Equilibrium Models (CGE)...what are they for?

- CGE is a GE model that use the power of today computers to calculate NUMERICALLY the effects of changes in exogenous and/or policy variables, in setting with many goods and factors and countries.

- CGE provide a precise numerical answer to the question "what is the impact of .....(a numerically specified trade policy)?"

3b. Operationalizing a CGE model ...i) assumptions

Introduce <u>assumptions</u> on
- market structure (im/perfect competition)
- production function
- representative household max behaviour
- government behaviour
- substitutability between domestic and foreign products (Armington assumption)
- Investment and dynamics
- Model closure (unemployment?)
- Social Welfare = Welfare of the representative household

3b. Operationalizing a CGE model ...ii) Social accounting matrix

- SAM provide CGE with the data

- SAM builds on the circular flow

- Uses info on I-O tables, national accounts, government fiscal account, trade data

- Need to be collected, standardized (same base year and currency) and combined

3b. Operationalizing a CGE model iii) elasticities

- substitution between factor of productions
- household price elasticities of demand
- Household income elasticity
- substitution between domestic and foreign products (Armington elasticities)

IMPORTANT: PE and GE approach are complementary. In many cases (e.g. in GTAP), CGE models borrows parameter estimates from PE econometric studies

3b. Operationalizing a CGE model iv) calibration

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- Calculate a subset of parameters that together with the SAM and inputed values for the elasticities can replicate the data of the reference year (baseline)

3c. CGE ...desirable features

If policy models need to be used in policy debate, they need:

- policy relevance

- transparency

- timeliness

- validation and evaluation

- diversity of approaches.

4. A CGE Model: GTAP

- **Multi-region model (Policy Relevance)**
  - GATT/WTO multilateral liberalization
  - Regional Trading Blocks
  - Environmental Policy

- **Global database 2001 (Timeless?)**
  - Bilateral trade flow data
  - Bilateral duty collection data
  - 57 commodities in 87 regions

- **Standard modeling framework (Transparency?)**
- **Global network of researchers (Evaluation and Validation, Diversity of Approaches to some extent)**

4a. GTAP ... Standard Structure

- Perfect competition and CRS (resources fully employed)
- Armington assumption: goods are differentiated by country of origin
- Static
- Explicit treatment of international trade and transport margins (global transport sector)
- No direct link between public expenditure and taxes
- Global Banking sector

4b. GTAP…limitations

- Some sectors in some countries could be characterized by imperfect competition and economies of scale

- Armington assumption does not allow for the relocation of firms

- Absence of the variety effect

- The use of a global banking sector is due to the lack of bilateral investment and ownership data
    - No specific treatment of domestic vs. foreign investment
    - Only a small proportion of domestic savings will return to a region as investment

- Not appropriate to look at issues related to the composition of public expenditures

- Labor market issues cannot be dealt with properly However, some of the assumptions can be relaxed/modified (***Diversity of Approaches***)

5. CGE simulations of the Doha Roun

- Welfare gains range between $2.2 trillion and $117 billion in 1997 dollars
  - Outlier is the study based on the Michigan mode
  - Estimates of the welfare gains concentrate between $170-370 billion
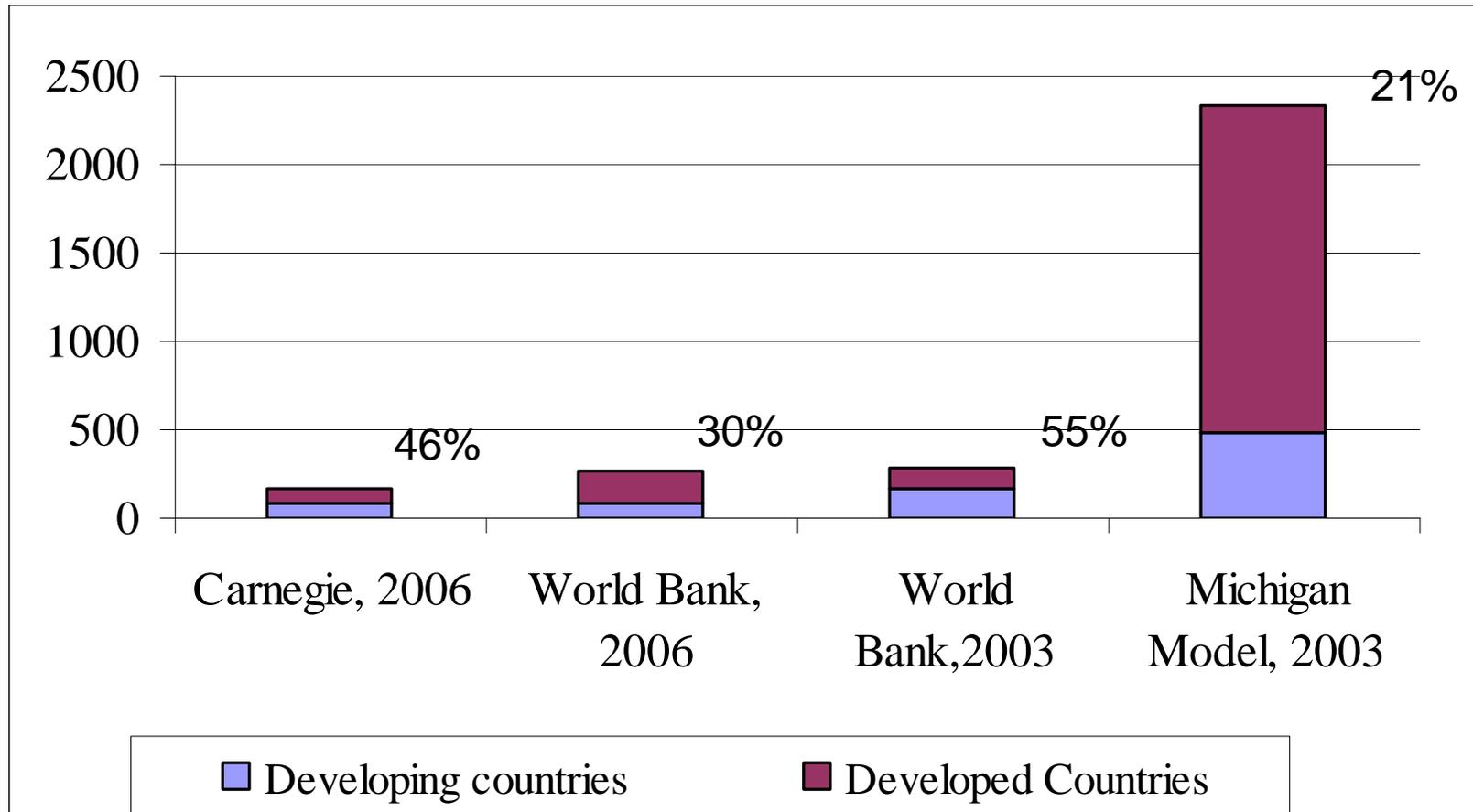
Common Features
- Static Analysis

5. CGE simulations of the Doha Round

Questions:

1) What shares goes to developing countries?

2) What shares comes from agriculture liberalization?

5.1) What are the gains for developing countries?

Full liberalization scenario. Million $ 1997

Chart axis values: 0, 500, 1000, 1500, 2000, 2500

Data labels: 46% (Carnegie, 2006), 30% (World Bank, 2006), 55% (World Bank, 2003), 21% (Michigan Model, 2003)

Categories: Carnegie, 2006 — World Bank, 2006 — World Bank, 2003 — Michigan Model, 2003

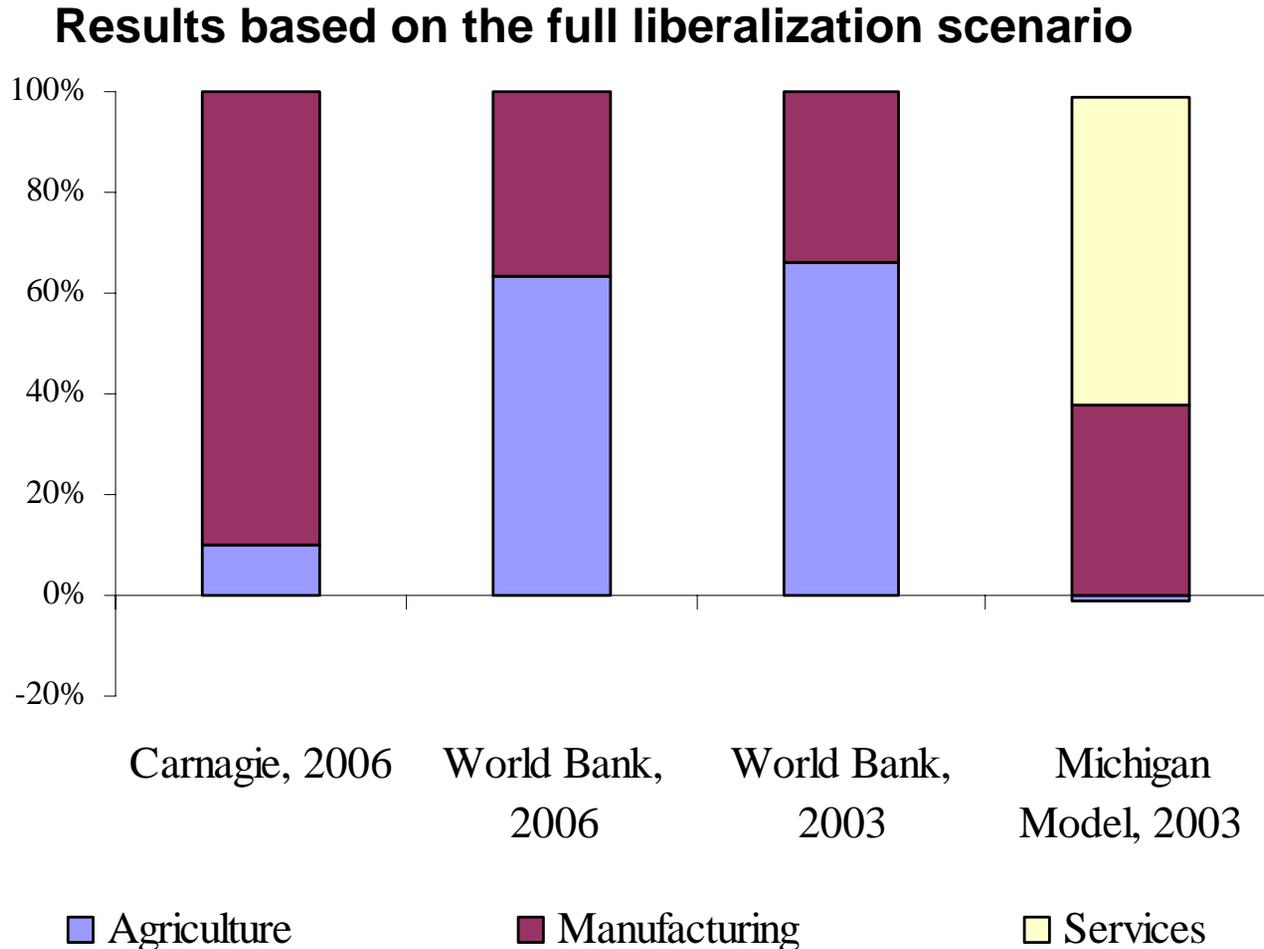Legend: □ Developing countries   ■ Developed Countries

5.1) What explains the differences in results?

Distinguishing features in selected studies:

• Preference erosion (World Bank, 2006 and Carnegie Model, 2006)

• Imperfect competition (Michigan, 2003)

• Unemployment in manufacturing and segmented labour markets between rural and urban workers (Carnegie Model)

• Bound rates (World Bank, 2006) make a difference in the scenarios of partial liberalization

5.2) What shares come from Agriculture liberalization?

Results based on the full liberalization scenario

Legend: Agriculture, Manufacturing, Services

X-axis: Carnagie, 2006 | World Bank, 2006 | World Bank, 2003 | Michigan Model, 2003

What have we learned?

- Looking back at simulation results obtained from CGE models of the Uruguay Round
  - Time schedule of liberlization
  - Bound versus applied rates