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Modern trade theory for CGE modellers: the Armington, Krugman and Melitz models

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Trade in CGE modelling

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Pre 1970s Heckscher-Ohlin - imports and domestic products identical, constant returns to scale, perfect competition
→ big gains from trade but unrealistic specialization

1970s- Armington - import/domestic imperfect substitution (variety at country level), constant returns to scale, perfect competition
→ big negative terms-of-trade effects from cutting tariffs even for small countries, often dominate positive efficiency gain

1980s- Krugman - variety at firm level rather than country level, increasing returns to scale, monopolistic competition among identical firms
→ still get big negative terms-of-trade effects but potential extra welfare from additional variety and increasing returns to scale

2003- Melitz - variety at firm level, increasing returns to scale, monopolistic competition among firms with different productivity
→ still get big negative terms-of-trade effects but potential extra welfare from additional variety, increasing returns to scale, and pro-trade productivity effect

Introduction

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- Derive the Armington, Krugman and Melitz models of trade as special cases of a general model.
- Examine optimality properties of Melitz
- Look at the Balistreri-Rutherford decomposition algorithm: solves Melitz general equilibrium by iterating between Melitz sectoral models and an Armington general equilibrium model
- Set up numerical Melitz model
- Demonstrate that Melitz welfare results can be decomposed into Armington effects
- Show that Melitz results look like Armington results with a higher substitution elasticity

Encompassing model: demand

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Country j's demand for varieties of widgets from all countries

People in country j choose Q_{sj} and Q_{ksj} to minimize:

$$\sum_s \sum_{k \in S(s,j)} Q_{ksj} P_{ksj}$$

subject to

$$Q_{sj} = \left(\sum_{k \in S(s,j)} \gamma_{ksj} Q_{ksj}^{-\rho} \right)^{-1/\rho} \qquad (4)$$

and

$$Q_j = \left(\sum_s \delta_{sj} Q_{sj}^{-\rho} \right)^{-1/\rho}$$

Encompassing model: demand functions

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$$\mathbf{Q_{ksj} = Q_j \left(\delta_{sj}\gamma_{ksj}\right)^{\sigma} \left(\frac{P_j}{P_{ksj}}\right)^{\sigma}} \quad \textbf{and} \qquad \textbf{(3)}$$

$$\mathbf{P_j = \left(\sum_s \sum_{k \in S(s,j)} \left(\delta_{sj}\gamma_{ksj}\right)^{\sigma} P_{ksj}^{1-\sigma} \right)^{1/(1-\sigma)}} \qquad \textbf{(2)}$$

Encompassing model: profits

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Contribution to profits of firm k,s from sales to j

$$\Pi_{ksj} = P_{ksj} Q_{ksj} - \left(\frac{W_s T_{sj}}{\Phi_{ks}} \right) Q_{ksj} - F_{sj} W_s \qquad (5)$$

Industry profits in country s

$$\Pi_s = \sum_j \sum_{k \in S(s,j)} \Pi_{ksj} - N_s H_s W_s \qquad (6)$$

Encompassing model: prices

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$$\mathbf{P_{ksj}} = \left(\frac{\mathbf{W_s} \mathrm{T}_{\mathbf{sj}}}{\Phi_{\mathbf{ks}}} \right) \left(\frac{\eta}{1+\eta} \right) \;, \quad \eta < -1 \qquad \mathbf{(1)}$$

Lerner mark-up rule: η is the perceived elasticity of demand

mpassing model: widget
ployment in country s

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$$\frac{\ _{sj}}{\ _{sj}} + \sum_{j} N_{sj} F_{sj} + N_s H_s \qquad (7)$$