Graduate Trade (II): ECON 8433

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Plan

Week	Topic
Week 1	Introduction to Structural Gravity Equation
Week 2	Calibration and Estimation
Week 3	Mapping Models to the Data
Week 4	Designing Counterfactual Experiments in General Equilibrium
Week 5	Presentations (I) and Catch-up
Week 6	Heterogeneous Firms (I)
Week 7	Heterogeneous Firms (II)
Week 8	Ricardian Models
Week 9	Multi-Sector Models
Week 10	Global Value Chains
Week 11	Presentations (II) and Catch-up
Week 12	Extensions: Demand Side
Week 13	Extensions: Supply Side
Week 14	Extensions: Migration and Geography
Week 15	Presentations (III) and Catch-up

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Heterogeneous Firms and International Trade

Given primitives $\{S, L_i, \sigma, f(\phi), F(\phi), \tau_{ij}, f_{ij}, fe_i\}$, we need to solve:

$$\phi_{ij}^* = \left(w_j f_{ij} \left(\left(\frac{\sigma}{\sigma - 1} w_i \tau_{ij} \right)^{1-\sigma} \frac{1}{\sigma} Y_j P_j^{\sigma-1} \right)^{-1} \right)^{\frac{1}{\sigma-1}} \quad (1)$$

$$Y_j = L_j w_j \quad (2)$$

$$P_j^{1-\sigma} = \sum_{i \in S} N_i \left(\frac{\sigma}{\sigma - 1} \right)^{1-\sigma} w_i^{1-\sigma} \tau_{ij}^{1-\sigma} \int_{\phi_{ij}^*}^{} \phi^{\sigma-1} f(\phi) d\phi \quad (3)$$

$$w_i fe_i = \sum_j (\phi_{ij}^*)^{1-\sigma} w_j f_{ij} \int_{\phi_{ij}^*}^{} \phi^{\sigma-1} f(\phi) d\phi - \sum_j \int_{\phi_{ij}^*}^{} w_j f_{ij} f(\phi) d\phi \quad (4)$$

$$L_i = \sum_{j \in S} N_i (\sigma - 1) \frac{w_j}{w_i} (\phi_{ij}^*)^{1-\sigma} f_{ij} \int_{\phi_{ij}^*}^{} \phi^{\sigma-1} f(\phi) d\phi + \sum_{j \in S} N_j \int_{\phi_{ji}^*}^{} f_{ji} f(\phi) d\phi + \frac{N_i}{1 - F(\min_j \{\phi_{ij}^*\})} fe_i \quad (5)$$

Heterogeneous Firms and International Trade

- So far, we have not taken a stance on the distribution of ϕ
- However, in order to solve the model we have to know the productivity distribution
- It is customary to assume that ϕ follows Pareto

The c.d.f. or Pareto is:

$$F(\phi) = 1 - b_i^{\theta} \phi^{-\theta}$$

The p.d.f. of Pareto is:

$$f(\phi) = \theta b_i^{\theta} \phi^{-\theta-1}$$

Heterogeneous Firms and International Trade

The assumption of Pareto simplifies the system significantly because:

$$\Rightarrow \quad \int_{\phi_{ij}^*} \phi^{\sigma-1} f(\phi) d\phi = \int_{\phi_{ij}^*} \phi^{\sigma-1} (\theta b_i^\theta \phi^{-\theta-1}) d\phi = \theta b_i^\theta \int_{\phi_{ij}^*} \phi^{(\sigma-1)-\theta-1} d\phi$$

$$= \quad \frac{\theta b_i^\theta}{\theta + 1 - \sigma} (\phi_{ij}^*)^{(\sigma-1)-\theta}$$

We can also find explicit expression for the probability of a firm exporting from i to j:

$$1 - F(\phi_{ij}^*) = b_i^\theta (\phi_{ij}^*)^{-\theta}$$

Extensive vs. Intensive Margin

In response to changes in τ_{ij} there are two things happening:

- Firms that have already been exporting before will export more: Intensive Margin Changes
- Due to lower barriers, there will entry of new exporters: Extensive Margin Changes

We can show the following two relations:

$$-\frac{\partial \ln X_{ij}}{\partial \ln \tau_{ij}} = \underbrace{(\sigma - 1)}_{\text{Intensive margin elasticity}} + \underbrace{(\theta - (\sigma - 1))}_{\text{Extensive margin elasticity}}$$

When ϕ follows Pareto, extensive margin dominates intensive margin! Higher θ leads to higher difference between the two margins. What is the intuition for this?

Heterogeneous Firms and International Trade

- Download *melitz data.mat* from D2L
- Solve the model (find equilbrium)
- Calculate equilibrium values:
  - Number of Firms
  - Share of Exporters
  - Real wage
- Suppose variable trade costs decrease by 20%. Calculate the effect on the numbers of firms, exporters and real wage in each country

Tips:

- There are many different ways to solve the model. Sometimes simplifying the system of equations may help!