ECO 442: Quantitative Trade Models

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Three Modeling Strategies

Trade models mostly fall in three broad categories

- Partial Equilibrium Models
- General Equilibrium Models
- Small Open Economies

We will discuss the differences between them, and what each model type is best suited for.

Partial Equilibrium Models

Partial Equilibrium models examine one sector of the economy, holding other sectors fixed

- (Relative) Supply and Demand Curves are given (can examine effects of “shifters”)
- Goods market clearing usually holds for that industry
- Typically no labor market clearing, wages fixed and given

Partial Equilibrium Models: Strengths and Weaknesses

Strengths

- Simpler and more intuitive due to less moving parts
- Well suited to graphical analysis
- Easier to extend models to allow for more complicated competition/demand structures

Weaknesses

- May not want to assume rest of economy is unaffected
- Measuring relative supply and demand curves is complicated in practice
- Not always clear how policies transform into “shifters”

Partial Equilibrium Models: Strengths and Weaknesses

Best Suited For

- Analysis focused on a single industry
- (Industrial Organization often uses partial equilibrium models)

Worst Suited For

- Welfare analysis
- Studying impact of policies that affect whole economy

General Equilibrium Models

General Equilibrium Models model all sectors of the economy simultaneously

- Market clearing ties together all aspects of the economy
- Wages and prices determined simultaneously in equilibrium
- Policies targeted at one industry can impact other industries

General Equilibrium Models: Strengths and Weaknesses

Strengths

- Links together sectors of the economy in a rigorous fashion.
- Helps us understand complicated and counter intuitive economic interactions.

Weaknesses

- More moving parts, less accessible and intuitive for laypeople.
- More difficult to solve, requires stronger functional form assumptions for quantitative work
- Difficult to get detailed data for all industries

General Equilibrium Models: Strengths and Weaknesses

Best Suited For

- Welfare analysis
- Studying impact of policies that affect whole economy (e.g. inequality or unemployment)
- (Macroeconomics and International Trade often use General Equilibrium Models)

Worst Suited For

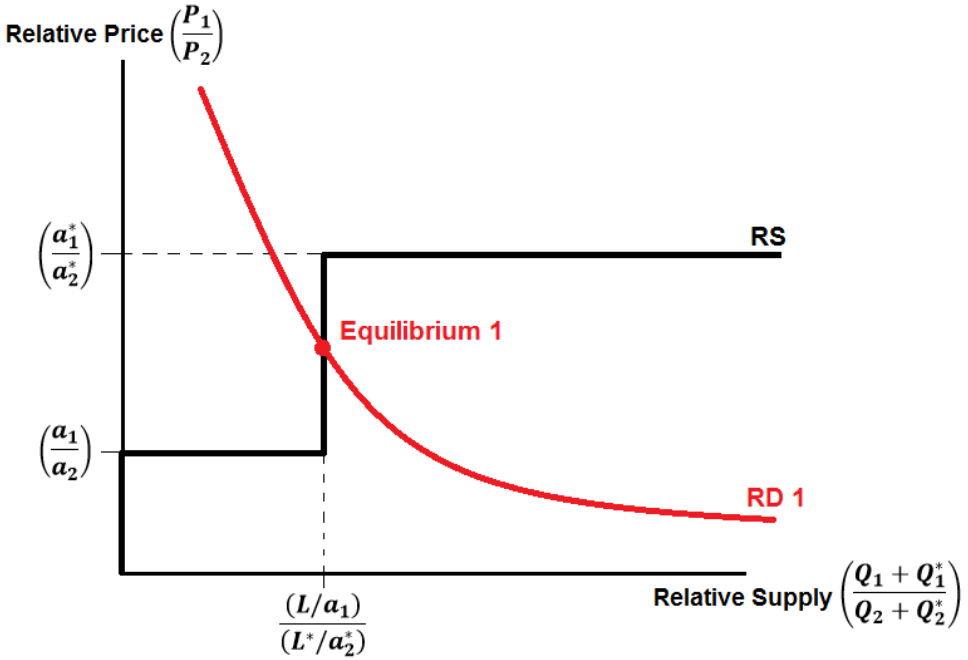
- Studying a single industry, when we aren't interested in effects on other industries
- Models that are overly complicated without General Equilibrium effects

Recap of PE vs GE Approach to Ricardian Model

Partial Equilibrium

- Drew Relative Supply and Relative Demand Curve for range of prices
- Didn’t specify where curves came from, solved model graphically
- Where they intersect was equilibrium

Finding Equilibrium using RS & RD



Partial vs General Equilibrium

General Equilibrium

- Solved model where Consumers Optimize, Firms Optimize, and Markets Clear
- Can't solve model graphically (can solve model then display solution graphically)
- Can see how relative wages and welfare are affected by various policies
- Functional form assumptions may limit potential equilibrium outcomes. For our preferences and production technologies, only complete specialization was possible under trade.

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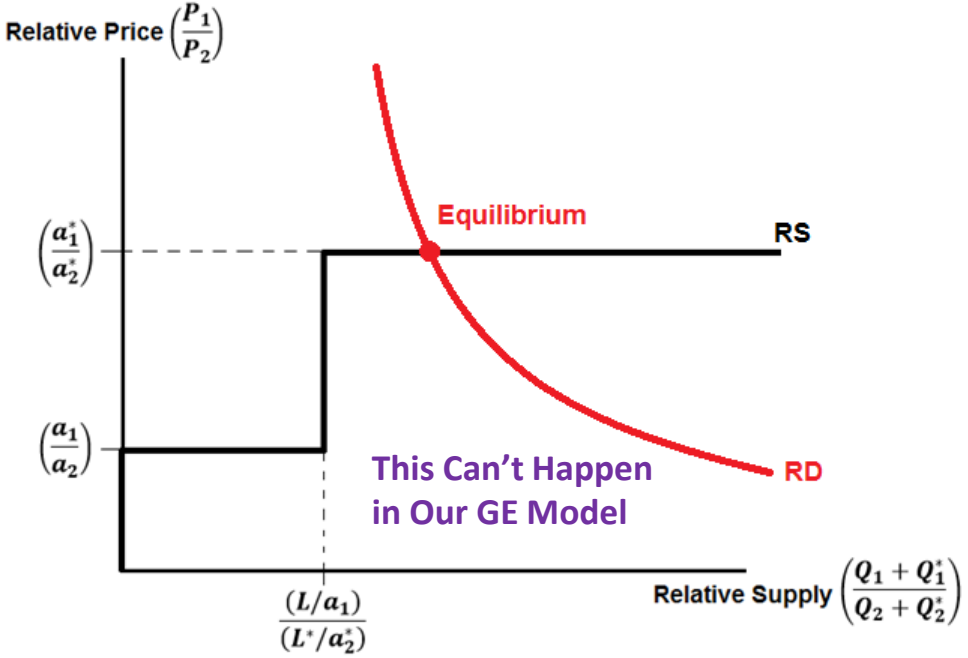

Small Open Economies (SOE)

Assume Home is small and cannot influence World prices

- Mix of Partial and General Equilibrium Models
- Still have consumers and firms optimize in Home
- Don’t worry about optimization in Foreign (Rest of World), it’s irrelevant to Home

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Main Changes

- World Prices are exogenously given.
- No market clearing. ROW will supply/demand unlimited quantity at World Prices.
- Balanced Trade required in eq'm def (not optional; no longer combination of other constraints)

SOE Equilibrium Definition

Given world prices, $\{p_1^W, p_2^W\}$, an equilibrium is

Eq'm Variables: Wages $\{w\}$ and allocations $\{l_m, y_m, c_m\}_{m=1,2}$ for Home, such that

1. Consumers Maximize Utility, subject to Budget Constraint
2. Firms Maximize Profits, subject to Production Function
3. Labor Market Clears
4. Trade is Balanced

$$\text{Net Exports} = \text{Exports} - \text{Imports} = 0$$

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NO GOOD MARKET CLEARING for Small Open Economies!

SOE Equilibrium: Consumer Problem

Assume we have Cobb-Douglas, solution to consumer problem exact same as before

- Remember, with Cobb-Douglas Preferences, optimization yields constant expenditure shares

$$\frac{\text{Expenditure on Good 1}}{\text{Income}} = \frac{p_1 c_1}{wL} = \frac{\theta_1}{\theta_1 + \theta_2}$$

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- Rearrange the above yields solution to consumer problem

$$c_m = \frac{wL}{p_m}\left(\frac{\theta_m}{\theta_1 + \theta_2}\right), \qquad m = 1,2$$

SOE Equilibrium: Firm Optimization

Assume constant marginal labor costs for each good

- Firm optimization is also exactly the same as before; firms that produce $m = 1,2$ solve

$$\max_{\{y_m, l_m\}} p_m y_m - w_m l_m$$

- Subject to their production function:

$$y_m = \frac{1}{a_m} l_m$$

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Yields the standard condition that MR=MC for firms that produce

$$\frac{p_m}{a_m} = w, \qquad \text{if } l_m > 0$$

(notice how nice it is to compartmentalize each part of the equilibrium so we can reuse it)

SOE Equilibrium: Market Clearing & Balanced Trade

Still have Market Clearing for Labor

$$l_1 + l_2 = L$$

- No Market Clearing for Goods (Foreign will supply/demand unlimited amounts of each good at World Prices)

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Instead, have Balanced Trade condition (these are values, not quantities):

$$\text{Net Exports} \equiv \text{Exports} - \text{Imports} = 0$$

- Which we can write as

$$\overbrace{p_1(y_1 - c_1)}^{\substack{\text{Net Exports} \\ \text{(Value) of Good 1}}} + \overbrace{p_2(y_2 - c_2)}^{\substack{\text{Net Exports} \\ \text{(Value) of Good 2}}} = 0$$

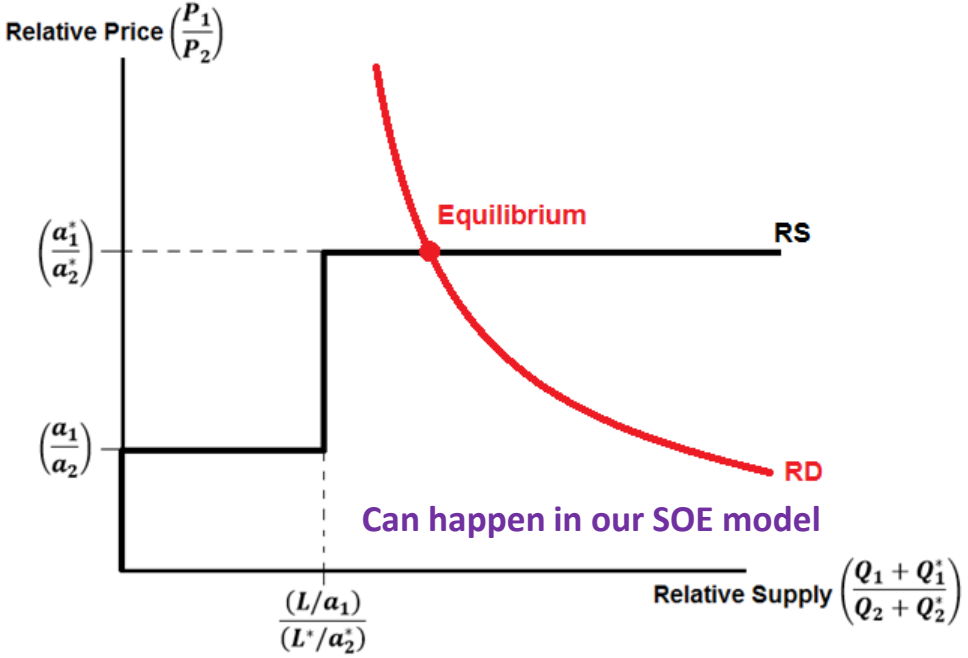
Key Differences from General Equilibrium Models

Two important differences when solving SOE models (vs full-GE models)

1. Can no longer normalize a price.
    - **Only Relative Prices matter**, but World prices are given.
2. Walras' law does not apply
    - Walras' law applies due to markets clearing. We don't have market clearing.
    - Don't have one of our equilibrium equations hold automatically

Still have equal number of equilibrium equations and variables ⇒ unique equilibrium

Finding Equilibrium using RS & RD



Note: For this graph we need two small open economies, and for relative prices to be set by ROW (meaning ROW produces both goods)

Small Open Economy Models: Strengths and Weaknesses

Strengths

- Mix of General Equilibrium and Partial Equilibrium analysis
- Doesn’t require modeling entire world
- Easier to solve, requires less data for quantitative work

Weaknesses

- Can’t think about how world prices are determined/effected
- Can’t think about how national policy effects Foreign Welfare

Small Open Economy Models: Strengths and Weaknesses

Best Suited For

- Welfare and Policy analysis for small countries
- May not want exchange rates/global interest rates determined endogenously in the model

Worst Suited For

- Global Policy and Welfare analysis
- Modeling large countries that influence world prices

What Modeling Strategy Should You Use

No “Best” Modeling Strategy

- Model should be as simple as possible, while still capturing what we need it to

Questions to Ask

- What is our question/goal? What is essential to the problem and what is secondary?

For Quantitative Work

- What data/assumptions do we need to identify each part of the model?