Advanced International Economics

ECON 758

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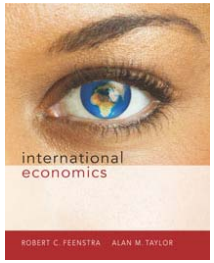
Lecture 3:

- The classical model of International Trade



In This Lecture

- Formal Approach to General Equilibrium Analysis
- The Classical Model:
  - Background: Mercantilism
  - Assumptions
  - Adam Smith's Absolute Advantage
  - Ricardo's Comparative Advantage
  - Specialization in Production
- International Terms of Trade and the Gains from Trade

Formal Approach to General Equilibrium Analysis

- First, we need to specify the Economic Environment, which includes details of the scenario we are looking at.
- These details include:
  - Assumptions we make
  - Production Details:- details of firm's problem (profit maximization); production processes (within each country); constraints faced by firms (resource constraints, technology)
  - Consumer Details:- description of the problem faced by consumers (utility maximization)

Formal Approach to General Equilibrium Analysis

- Second, we need to characterize the equilibrium, which includes providing a description of:
  - Outcome of the firm's problem:- profit maximization
  - Outcome of the consumer's problem:- utility maximization

Example:- Characterization of Autarky Equilibrium

- Economic Environment:
  - 2 countries, 2 consumption goods: X_1,X_2
  - Production technology and resource constraint described by a Production Possibilities Frontier for each country, which shows combinations of goods Y_1,Y_2.
  - Preferences described by indifference curves
  - Perfect competition. Consumption goods are tradeable

Characterization of Autarky Equilibrium

An Autarky Equilibrium is an allocation $\{X_1,X_2,Y_1,Y_2\}$ and a set of prices $\{p_1,p_2\}$ such that:

- Producers maximize profits given the equilibrium prices
- Consumers maximize utility subject to their budget constraint and given equilibrium prices
- Markets clear, i.e. prices $\{p_1,p_2\}$ are such that:
  $X_1 = Y_1$
  $X_2 = Y_2$

Development of Classical Theory of International Trade

- Mercantilism
- Additional assumptions
- Adam Smith's Absolute Advantage Model
- David Ricardo's Comparative Advantage Model

Mercantilism: 1500AD – 1750AD

- Prevailed mostly in England and Europe
- A system of government institutions and policies designed to restrict international trade.
- The source of a country's wealth is gold or money.
- Two means of increasing a country's wealth are colonialism and international trade.
- A country must export more and import less.

Mercantilism: 1500AD – 1750AD

- View was one country gains at the expense of another (- a zero sum game!)
- Practices included:
  - Taxes on imported goods
  - Bans on importation of other goods
  - Special laws and taxes designed to favor certain industries at the expense of others

Adam Smith

- Attacked the mercantilist system
- Advocated free international trade
- Emphasized advantages of specialization and international division of labor whereby nations specialize in the production of only a few goods

Recall Previous Assumptions

1. Rational Behavior
2. Two Country, Two Good World
3. No Money Illusion
4. Fixed Resources and Technology
5. Perfect Competition
6. Perfect Mobility of Resources Within A Country
7. National Indifference Curves

Additional Assumptions

- Assumption 8 — Resources cannot move between countries.
  - Guarantees a nation's PPF does not change shape or location once international trade begins
- Assumption 9 — There are no trade barriers.
  - Rules out things like tariffs and quotas (for the moment)
- Assumption 10 — Transportation Costs are Zero

Assumptions of the Classical Model

- Assumption 11 — Labor is the only relevant resource.
  - Labor Theory of Value states that the pre-trade price of a good is determined by the amount of labor it took to produce it.
- Assumption 12 — Constant returns to scale between labor and output prevails.
  - Constant returns implies a fixed ratio between the labor used and the output level produced.

Absolute Advantage

- Define: The ability of a country to produce a good using fewer productive inputs than is possible anywhere else in the world.
- Adam Smith's principle — countries should specialize in the production of goods in which they have an absolute advantage.

Table 1:Illustration of Absolute Advantage

	Country	
	America	Britain
Soybeans	3	12
Toys	6	4

- Table 1: Table of unit labor requirements for two goods:
  - Shows how many labor hours it takes to produce one unit of a good

Table 1: Illustration of Absolute Advantage

	Country	
	America	Britain
Soybeans	3	12
Toys	6	4

Conclusions:

- America is more efficient at producing Soybeans (require less workers to produce a unit's worth), hence has an absolute advantage in Soybeans
- Britain is more efficient at producing Toys, hence has an absolute advantage in Toys

Recall…

- Adam Smith's principle — countries should specialize in the production of goods in which they have an absolute advantage.
- Rather than in autarky (no trade), suppose each country specializes in the production of the good where they have an absolute advantage, i.e.
  - America produces Soybeans
  - Britain produces Toys

Table 2: World Gains From Trade

	Per Unit Gain	
	In Soybeans	In Toys
Change In America	+2	-1
Change In Britain	-1	+3
Change In World	+1	+2

- Note: World output rises!

What Causes Each Country to Follow Its Absolute Advantage?

- Market forces combined with free trade
- Given that the labor cost equals the wage rate (W) times the amount of labor input:

$$P_S = W_A \times \text{hours}_{SA} = W_A \times 3$$
$$P_T = W_A \times \text{hours}_{TA} = W_A \times 6$$

Then,

$$P_S / P_T \text{ in A} = (W_A \times 3)/(W_A \times 6) = 3/6 = 1/2$$

- Hence, opportunity cost of S (in terms of T) is ½!

Absolute Advantage (cont.)

- In country B:

$$P_S / P_T \text{ in B} = (W_B \times 12)/(W_B \times 4) = 12/4 = 3$$

- Since P_S / P_T in A < P_S / P_T in B,

  A is the lower (opportunity) cost producer of Soybeans and has an absolute advantage in Soybeans

Summary of Smith's Principle

- For various reasons such as different technologies and climate, countries will produce different goods.
- World output will increase if countries specialize in their absolute advantage products.
- This situation is the natural outcome of market forces combined with free trade. A good is cheapest in the country that has absolute advantage in its production.

Question …

Unit Labor Requirements — Table 4: Country

	France	Germany
Bread	4	1
Cheese	2	1

- Consider the table 3 above.
- Which country has an absolute advantage in Bread?
- Which country has an absolute advantage in Cheese?
- Can these countries benefit from trade?...

What If One Country Has Absolute Advantage in Both Goods?

- Answer:-
  - Yes! David Ricardo in the early 1800's concluded that **both countries gain** from trade
- David Ricardo's Law of Comparative Advantage :—
  - countries should specialize where they have their *greatest absolute advantage* (if they have absolute advantage in *both* goods) or in their *least absolute disadvantage* (if they have absolute advantage in *neither* good).

Comparative Advantage

Unit Labor Requirements — Table 4: Country

	France	Germany
Bread	4	1
Cheese	2	1

- Germany has an absolute advantage in production of both goods!
- Germany has a comparative advantage in bread
- Why?...

Comparative Advantage: Question

Unit Labor Requirements — Table 5: Country

	America	Britain
Soybeans	3	12
Toys	6	8

- Do any of the countries have an absolute advantage in the production of Soybeans and Textiles?
- Do any of the countries have a comparative advantage in either good? If so, which?

Gains From Trade Based On Comparative Advantage

Unit Labor Requirements — Table 6: Per Unit Gain

	In Soybeans	In Toys
Change In America	+2	-1
Change In Britain	-1	+1.5
Change in World	+1	+0.5

- Once again, world production increases, despite one country having an absolute advantage in both goods!
- Specialization leads to a greater number of products.

General Equilibrium Solution of the Classical Trade Model

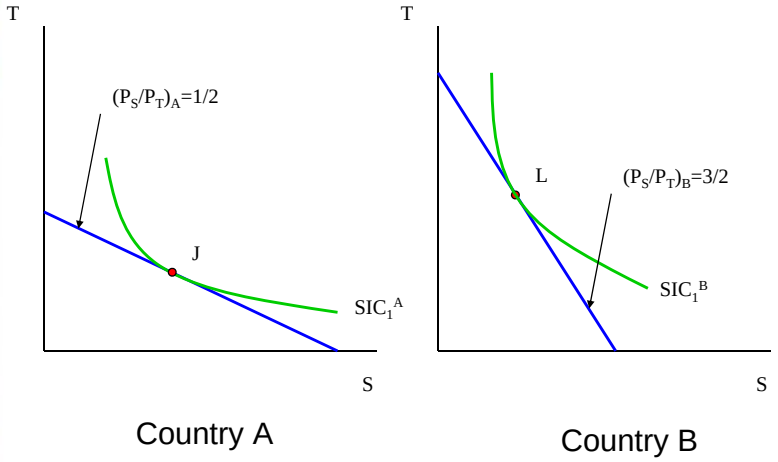
- Assume labor endowments for each country:
  - A has 12,000 labor hours
  - B has 9,600 labor hours
- Straight-line Production Possibilities Frontier (PPF)
  - Slope of PPF = pre-trade relative price (P_S/P_T)
- Autarky or pre-trade equilibrium (consumption and production)
  - Tangency point of PPF and Social Indifference Curve (SIC)

General Equilibrium Solution of the Classical Trade Model

Using the unit labor requirements from table 5:

- Country A: 12000 labor hours
  - If only S produced: Total # S = 12000/3 = 4000
  - If only T produced: Total # T = 12000/6 = 2000
  - Opportunity cost of S (in terms of T) = 1/2
- Country B: 9600 labor hours
  - If only S produced: Total # S = 9600/12 = 800
  - If only T produced: Total # S = 9600/8 = 1200
  - Opportunity cost of S (in terms of T) = 3/2

Pre-trade Equilibria



International Terms of Trade

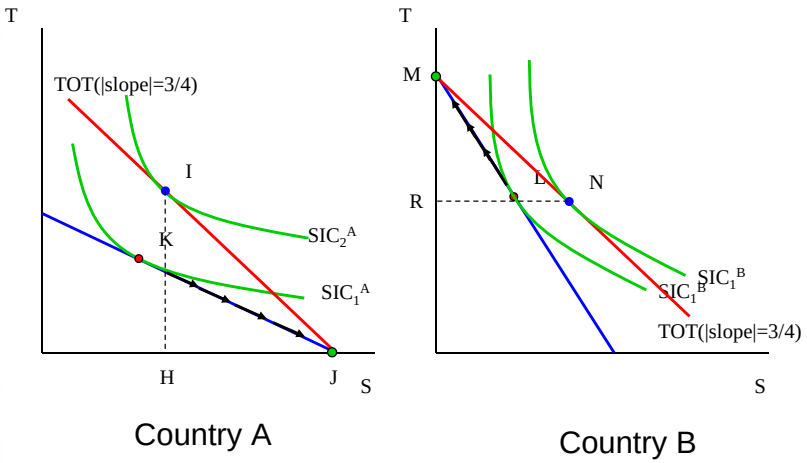
- **Terms of Trade (TOT)** — the relative (world) price at which trade occurs between countries, P_S^W/P_T^W
- The TOT will lie between the autarky prices of the two countries; in our example,

  ½ (A's price) < TOT < 3/2 (B's price)

Post-trade Equilibrium

- The country with a lower autarky price of a good has comparative advantage in that good.
- With constant opportunity cost (straight-line PPF), the country will completely specialize in its comparative advantage product once trade begins.
- With trade, the country will now consume on the TOT line which represents its Consumption Possibility Frontier (to be defined later).

Post-trade Equilibrium



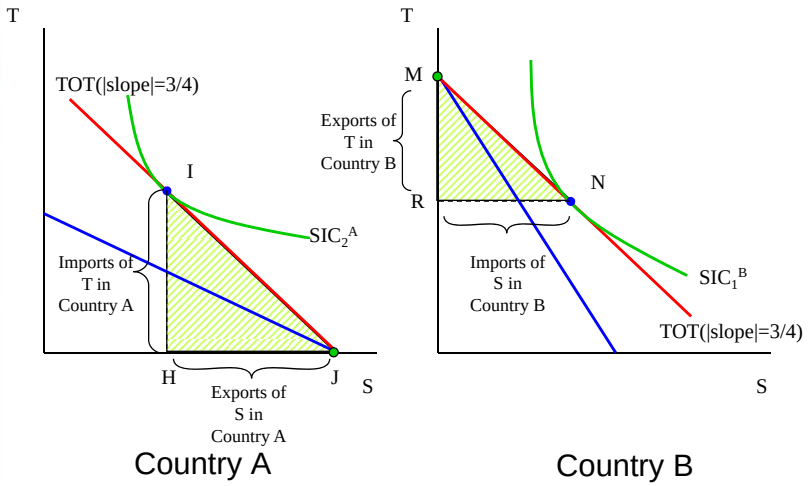
Economic Intuition

- Country A: pre-trade relative price, $(P_S/P_T)_A=1/2$
- Country B: pre-trade relative price, $(P_S/P_T)_B=3/2$
- Autarky price of S is lower in A than B. Thus, demand for S will rise in A and fall in B, leading to a rise in $(P_S/P_T)_A$ in country A.
- Autarky price of T is lower in B than A. Thus demand for T will fall in A and rise in B, leading to a decline in $(P_S/P_T)_B$ in country B.
- This occurs until $(P_S/P_T)_A=(P_S/P_T)_B=P_S^W/P_T^W$

Some Definitions…

- **Consumption Possibilities Frontier**:- refers to the various combinations of goods that a country can obtain by taking advantage of international trade.
- **Trade Triangle** — a geometric device that shows the amounts a country is willing to trade at a particular world price.
  - The trade triangle shows the desired exports and imports of a country given the terms of trade.

Post-trade Equilibrium



Trade Triangle

- In the international trade equilibrium, the countries' trade triangles are congruent (i.e. identical).
- **Walras Law** — states that if there are *n* markets in the world and any *n-1* of these markets are in equilibrium, then so too will be the *n*th market.

How Can Trading Equilibrium Be Attained?

- **Reciprocal demand** — the process of interaction of international demand and supply necessary to produce an equilibrium world price.
- In a country where there is an excess demand for a product, it's price will rise
- In a country where there is an excess supply for a product, it's price will fall.

Summary of Ricardo's Model

- It is not necessary for a country to possess absolute advantage in order to participate in trade. What is required is comparative advantage in production.
- A country will specialize in and export that good in which its has comparative advantage, i.e., has a lower pre-trade relative price than in the other country.
- The terms of trade or world price will settle between the autarky prices of the two countries and is determined by reciprocal demand.

Gains from Trade

- Who benefits from international trade?
- Do both countries gain from trade?... Or is one country made better off at the expense of the other?

Gains from Trade

1. Production Gain:
   - Free international trade leads to specialization of production in each country's comparative advantage good
   - In many cases, this amounts to an increase in total world output
2. Consumption Gain:
   - Points I and N on the post-trade graph are up and to the right of K and L respectively
   - Thus they depict consumption bundles that contain more of S and T than under autarky

Terms of Trade and Gains from Trade

A couple of points to note:

- The closer the terms of trade are to one country's pre-trade price ratio, the greater the gain for the other country.
- Importance of being unimportant — when small countries trade with big countries, the small countries are likely to enjoy most of the mutual gains from trade.

Relationship Between Trade and Wages

- What does the classical theory say about the relationship between international trade and factor payments?
- Recall that we have assumed:
  - perfect competition in both industries
  - labor is the only factor of production

Relationship Between Trade and Wages

- With these assumptions, wages must be equal in both industries within a country (although not necessarily equal across countries).
- Given the following pre-trade relationships:

$$\begin{aligned} P_{SA} &= W_A \times \text{hours}_{SA} = W_A \times 3 \\ P_{TA} &= W_A \times \text{hours}_{TA} = W_A \times 6 \\ P_{SB} &= W_B \times \text{hours}_{SB} = W_B \times 12 \\ P_{TB} &= W_B \times \text{hours}_{TB} = W_B \times 8 \end{aligned} \qquad (3.1)$$

Trade and Wages (cont.)

- Following the line of comparative advantage and given an exchange rate E which translates B's currency units into A's:

$$\begin{aligned} P_{SA} &< E \times P_{SB} \\ P_{TA} &> E \times P_{TB} \end{aligned} \qquad (3.2)$$

- Substituting the information from (3.1) into the above inequalities:

$$\begin{aligned} W_A \times 3 &< E \times W_B \times 12 \\ W_A \times 6 &> E \times W_B \times 8 \end{aligned} \qquad (3.3)$$

Trade and Wages (cont.)

- Solving the system of inequalities (3.3) simultaneously, we get:

$$W_A/(E \times W_B) < 4$$
$$W_A/(E \times W_B) > 4/3 \qquad (3.4)$$

or, after combining terms:

$$4/3 < W_A/(E \times W_B) < 4 \qquad (3.5)$$

- The center term is called the relative wage ratio, or A's wage rate divided by B's wage (expressed in terms of A's currency)

Trade and Wages (cont.)

- According to Equation (3.5), in order for trade to occur based on comparative advantage, A's workers must earn more than B's workers.
- Why? Because of differences in labor productivities. A's workers are more productive than B's workers.
- What happens if wages get out of line with productivity levels?

Example…

- Suppose that wages in country A rise to 5 times the wages in country B, i.e.
  $W_A = 5 \times E \times W_B$
- What will be the pattern of pre-trade prices in the two countries?
- Consider prices in country A in terms of wages in country B:

$$P_{SA} = W_A \times 3 = (5 \times E \times W_B) \times 3 = 15 \times E \times W_B$$
$$P_{TA} = W_A \times 6 = (5 \times E \times W_B) \times 6 = 30 \times E \times W_B$$

Example (cont.)…

- Compare that to the level of pre-trade prices in country B (measured in terms of country A's currency):

$$E \times P_{SB} = 12 \times E \times W_B$$
$$E \times P_{TB} = 8 \times E \times W_B$$

- Pre-trade prices are higher for both goods in country A than country B.
  - This is because the true wage differential between both countries exceeds the maximum productivity differential
- Country B has an incentive to sell both goods, and country A – none. Hence:
  - Country B will run a balance of trade surplus (exports > imports)
  - Country A will run a balance of trade deficit (imports > exports)

Two Valuable Lessons

- For trade to occur between countries with different labor productivities, wages must be higher in one country than in the other.
- A country can lose its comparative advantage if wages get out of line with productivity.

Question: World Supply

Unit Labor Requirements — Table 5: Country

	America	Britain
Soybeans	$a_{SA} = 3$	$a_{SB} = 12$
Toys	$a_{TA} = 6$	$a_{TB} = 8$

- Recall the unit labor costs in table 5.
- Once again, assume labor endowments for each country:
  - A has 12,000 labor hours
  - B has 9,600 labor hours
- What does the world PPF look like?

World Supply (cont.)…

- Let P_S^W and P_T^W denote the world prices for S and T
- If $P_S^W/P_T^W < a_{SA}/a_{TA} < a_{SB}/a_{TB}$
  - America specializes in Toys
  - Britain specializes in Toys
- If $P_S^W/P_T^W = a_{SA}/a_{TA} < a_{SB}/a_{TB}$
  - America produces both Soybeans and Toys
  - Britain specializes in Toys
- If $< a_{SA}/a_{TA} < P_S^W/P_T^W < a_{SB}/a_{TB}$
  - America specializes in Soybeans
  - Britain specializes in Toys
- Etc…

Evaluation of the Classical Model

- The model does not explain why differences in productivity levels between countries exist.
- It makes extreme and unrealistic predictions such as countries will completely specialize in the production of exportables only.
- It maintains that the gains from trade are greater between countries of dissimilar production technologies (despite the fact that most trade occurs between Developed Countries with similar technology and income levels).

Evaluation (cont.)

- The classical model is a useful tool because:
  - It provides a motive for trade between developed and developing countries
  - It explains why high-wage countries may still benefit from trade even when faced with low-wage competing countries