Lecture #8
Economics 181: International Trade
The Heckscher-Ohlin Framework, Part II

I. Recap from last class, distribution of gains and losses

Recap:

* Edgeworth Box diagrams: what happens when the endowment of one factor increases?
* If land endowment rises, then production of good that uses land intensively (food) increases by more and production of cloth falls (Rybczynski Theorem)
* Endowment differences predict the pattern of trade (HO Theorem)

Distributional Consequences of Trade:

Trade between Argentina and Mexico increases the relative price of food in Argentina. Let's think of this as an increase in the price of food and no change in the price of clothing. What happens to wages, and returns to land-owners?

The Stolper –Samuelson Theorem: Trade leads to an increase in the return to a country's abundant factor and a fall in the return to its scarce factor.

So Argentine land-owners gain with trade, and labor loses.
(Mexican labor gains with trade, and land-owners lose)

Question: If the US's abundant factor is skilled labor, and its scarce factor is unskilled labor, what will it export with trade? What will happen to the returns to skilled versus unskilled labor?

Question: If Mexico's abundant factor is unskilled labor, and its scarce factor is skilled labor, what will happen to inequality with increased globalization?

Does trade equalize wages, returns to other factors (land, labor) across countries even when factors cannot cross borders?

The answer is yes **if the following conditions hold** for the countries trading with each other:

- Same technology across countries
- Prices of goods are the same across countries (ie free trade, no trade barriers)
- Countries continue to produce both goods when they start trading and no factor intensity reversals

This result is known as the Factor-Price equalization (FPE) theorem. It claims that trade leads to equalization of returns to factors across countries. So with trade, wages should become equal across countries and the returns to other factors (land, capital) as well. This is a strong conclusion, which depends on the assumptions above.

Intuition: One can either move factors across countries to equalize returns (migration, capital movements) OR goods which "embody" these factors.

II. Summary: Four key insights of HO

(1) All countries have the <u>same</u> technology

(2) Countries differ only in their relative abundance of factors of production--such as capital, skilled labor, and unskilled labor. This approach is also known as the "factor proportions" theory.
(3) Factors of production move costlessly and quickly from one sector to another

INSIGHT # 1: The Heckscher-Ohlin Theorem: A country exports those goods that use intensively the factors in which the country is abundantly supplied. So a skill-intensive country like the USA will export skill-intensive goods, such as scientific instruments. A labor-intensive country (China) exports labor-intensive goods like apparel.

INSIGHT #2: The Stolper-Samuelson Theorem: Trade leads to an increase in the return to a country's abundant factor (ie capital and skilled labor in the USA) and a fall in the return to its scarce factor (ie unskilled labor in the USA).

INSIGHT # 3: Factor-Price Equalization (FPE): Trade leads to equalization of returns to factors across countries. So with trade, wages should become equal across countries and the returns to capital as well. This is a strong conclusion, which depends on equal technology across countries, no transport costs or protection.

Intuition: One can either move factors across countries to equalize returns (migration, or capital movements) OR goods which "embody" these factors.

INSIGHT # 4: Rybczynski Theorem: An increase in the endowment of one factor (such as skilled labor) without increasing other factors leads to a more than proportionate increase in the output of the sector that uses it intensively and reduces the output of the other sector. This suggests, for example, that a 5 percent increase in skilled labor in the USA would lead to a more than 5 percent increase in the production of electronic equipment and a fall in the production of apparel.

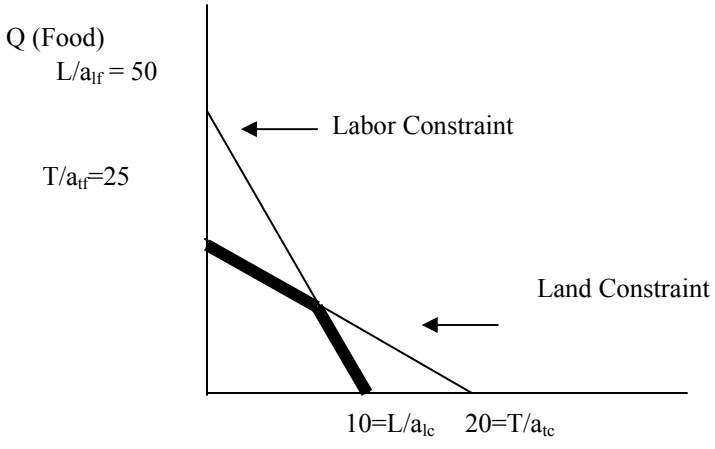
Why is the HO framework interesting? It is probably most interesting for what it implies about the changes in the distribution of income arising from trade (insights 2 and 3)

III. A numerical example of the HO Theorem (and Rybczynksi)

(You export the good that uses intensively the factor that you are relatively well endowed with)
Let's assume there are two goods, cloth and food.
We assume two factors of production, labor and land.

	Labor hours to produce one unit	Acres to produce one unit	Labor (L)	Total Land (T)
Cloth	$a_{lc} = 10$	$a_{tc} = 5$	100	100
Food	$a_{lf} = 2$	$a_{tf} = 4$	100	100

So now we draw the PPF (production possibility frontier) with two factors:
Clothing is more labor-intensive, Food is more land-intensive

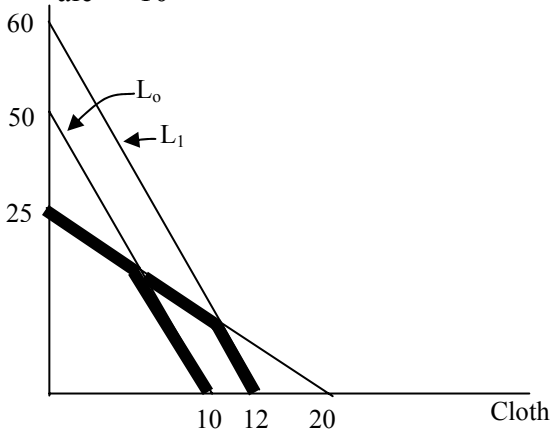


Where is the PPF exactly? Food production is "bounde ement and
cloth production is "bounded" by labor. The PPF is the Q (Cloth) a--it is now
kinked.

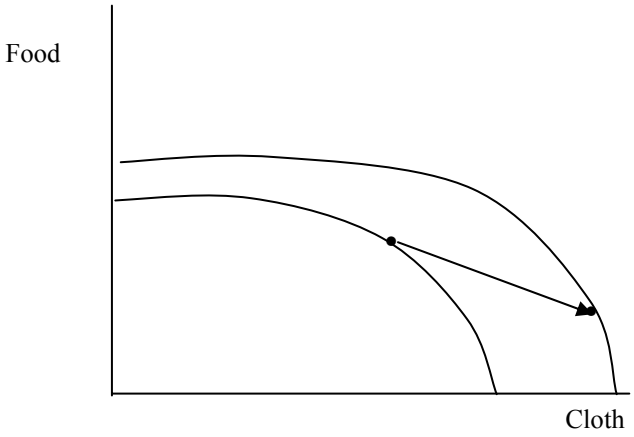
What happens if the endowment of labor expands? According to the Rybczynksi theorem, we would expect the production of cloth to increase by more than the increase in the endowment of labor, and the production of food to fall. Intuition: cloth production was "bounded" before by a lack of labor.
Say labor increases to 120 then we get:

$$\frac{L}{alf} = \frac{120}{2} = 60$$

$$\frac{L}{alc} = \frac{120}{10} = 12$$



Labor Constraint shifts Out:



This provides the intuition for why countries with more labor would produce alot more labor-intensive goods. But why do they export these goods?

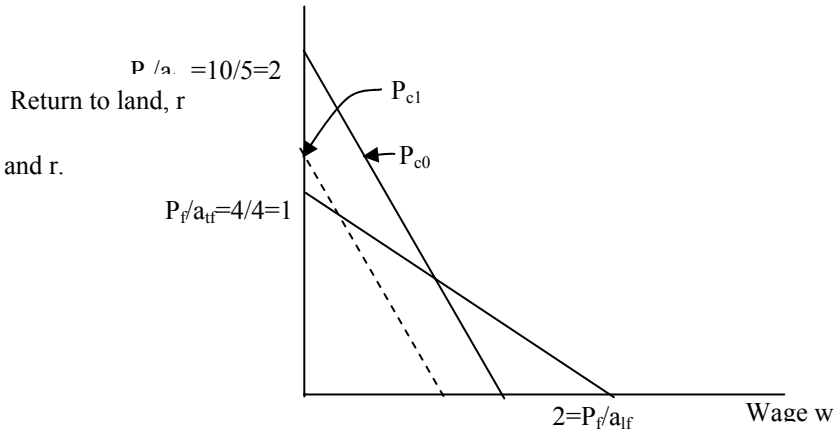
With trade, prices are assumed to equalize across countries. So if our endowment is relatively labor-intensive compared to other countries, we will be willing to supply relatively more of the labor-intensive good. So the relative price with world trade for that good will be higher than in autarky (without trade), just as in the Ricardian framework. If cloth is labor-intensive, we will be willing to export more cloth than others at the world price.

IV. A numerical example of Stolper-Samuelson

Now we will examine the distributional effects of international price changes. This is probably the most important application of this framework. Intuition: Say the price of cloth falls. Then the return to the factor used intensively to produce cloth (labor) will see its wage fall by more, while returns to other factors--such as land--will actually rise. We keep the same framework as before, but now we add prices to the framework. Say that the price of cloth (P_c) equals 10, while the price of food (P_f) equals 4. Then if prices are set equal to marginal costs, we get

$10 = P_c =$ marginal costs $= 10w + 5r$ (input coefficients x labor and land costs)
$4 = P_f =$ marginal costs $= 2w + 4r$

This yields two equations in two unknowns. We can graph this and solve for w and r:
(If you do the math correctly you should get r=2/3 and w=2/3). The intersection yields the equilibrium w



What happens if the price of cloth falls? We show this as an inward shift of the price of cloth (see the doted line). Then at the new intersection, w is much lower and the return to land actually rises. W falls by more than Pc falls. So there is a "magnification effect" of the international price decline on the factor used intensively to produce the good. Not ALL factors gain from trade. As an exercise, you could test whether the graph is correct by allowing Pc to fall to 8 and recalculating the equilibrium. You should get that r = 4/5 and w = 3/5, "proving" that wages fall and the return to land rises.

Some Empirical Evidence

(1) From discussion on Ricardo: wages DO NOT equalize across countries.
(2) Endowments and the pattern of trade.
(a) Leontief paradox (US imports are more capital-intensive than exports).

Factor content of US exports and imports for 1962:

	Imports	Exports
Capital per million dollars	2,132,000	1,876,000
Labor (person-years) per million dollars	119	131
Capital –labor ratio (dollars per workers)	17,916	14,321
Average years of education per worker	9.9	10.1
Proportion of engineers and scientists	.0189	.0255

(b) 20 years of evidence on endowment changes and factor content of trade.

(3) The HO framework makes the following claim: a country which is relatively well endowed in skilled labor exports skilled-labor intensive goods, leading it to shift production towards skill-intensive sectors. This in turn raises the demand for skilled workers and lowers it for unskilled workers, leading to greater wage inequality. But the higher wages of skilled workers will in fact reduce the skilled to unskilled wage ratio across all industries So if our HO theories do explain increasing wage inequality, we would expect the following:

(a) an increase in the employment share of skill-intensive industries.

(b) The ratio of skilled to unskilled employment declining across all industries.

BUT we do not see this. In particular, the ratio of skilled to unskilled employment is increasing across the board--despite the relative wage increase for skilled workers. This suggests that other factors--such as technological change--are responsible for the increasing wage gap.

(4) Rising Wage Inequality: Mexico

- Trade Reform in Mexico reduces tariffs and quotas by enormous amounts between 1984 and 1990 (See Table 1, taken from Gordon Hanson and Ann Harrison, 1999)
- If Mexico is relatively well endowed in unskilled labor, H-O model Predicts what should happen to wage inequality?
- In fact, what actually happened ? (See Table 2)
- Does Table 1 provide any hints as to why or why not?