Lecture 7
International Trade, Econ C181, EEP C181
Hecksher Ohlin Model (Long Run Model)

I. Introducing The Hecksher Ohlin Model

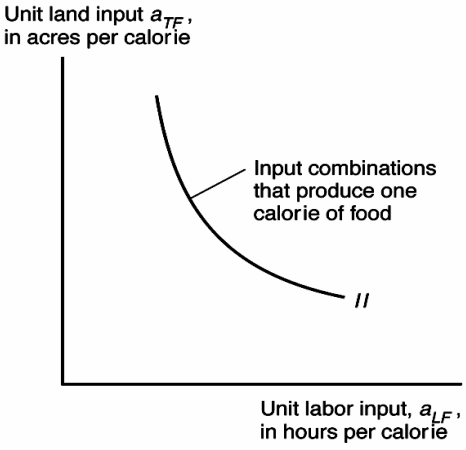
Assumptions:

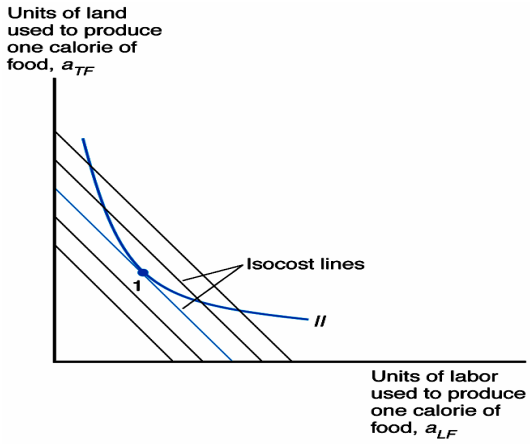
- 2 countries, 2 sectors (food, clothing), two inputs (land and labor). 2X2X2 model.
- perfect competition: MR=MC
- perfectly competitive factor markets
- Firms maximize profits: MR=MC
- People demand both goods, tastes are the same in both countries
- Endowments of land and capital differ across countries.
- No input is fixed (ie devoted to only one good). Both inputs, land and labor, are used to produce both goods and can be quickly reallocated to either sector.
- Constant Returns to Scale (CRS) Production Function, the same in both countries (ie technology the same across countries, similar to specific factor model but opposite of Ricardian framework).

  Qc = Qc(Lc,Tc) where L is labor input and T is land input
  Qf = Qf(Lf,Tf) where L is labor input and T is land input

II. How do profit-maximizing firms in each inudstry decide how much labor and machinery to hire at given wages and return to capital?

Firms choose the combination of land and labor to use to produce food and clothing. How do they choose? Firms will hire workers and make investments to minimize cost. So unit labor and unit land requirements are not fixed, as they were in the Ricardian framework. In each sector, producers face trade-offs like the one illustrated by curve II, which shows alternative input combinations that can be used to produce one calorie of food. A farmer can produce a calorie of food with less land if he or she uses more labor, and vice versa. Curve II is called an **isoquant**: it shows all combinations of land and labor that, given technology, yield the same amount of output





Which combination of land and labor the farmer chooses will depend on the relative cost of land (r) to labor (w). We can show that the slope of curve II is equal to minus the ratio of w to r, w/r:

a_{tf} = acres of land used to produce one calorie of food
a_{lf} = hours of labor used to produce one calorie of food

The cost of purchasing a given amount of labor L is wL
The cost of renting a given amount of land T is rT

So the total cost of producing one unit of food k is:

$K = wa_{lf} + ra_{tf}$

So we can rewrite:

$a_{tf} = K/r - (w/r)a_{lf}$

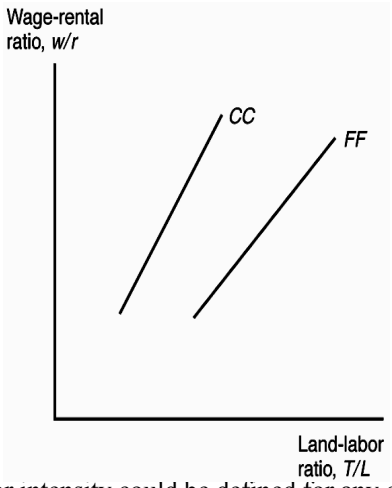
So we have a straight line with slope -w/r. That line is called an **isocost** line: it gives all combinations of labor and land that cost the same amount (K). So the producer will choose to maximize output and minimize costs—leading to the tangency seen above and to the right.

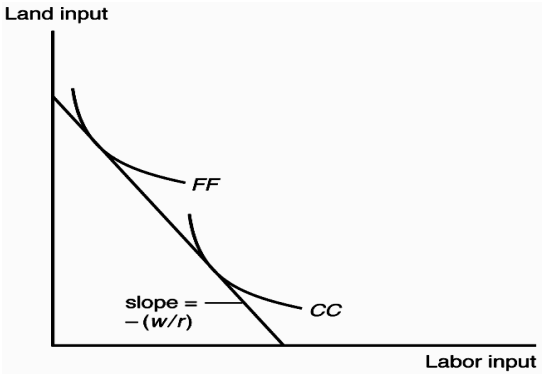
III. What do we mean by factor intensity?

The production of food is relatively land-intensive if at a given wage to return to land ratio, w/r, it is true that:

$$T_f/L_f > T_c/L_c$$

We can show graphically that the production of food is relatively more land intensive relative to clothing with the two diagrams below. The diagram on the left shows two curves, the CC and the FF curve. They are upward sloping because they indicate that at a higher ratio of wage costs to land costs, producers will use more land and less labor (T/L rises as w/r rises). The FF curve is to the right of the CC curve because at any given w/r ratio, food uses a higher ratio of land to labor. So food is land-intensive and cloth is labor-intensive. The diagram at right, called a Lerner diagram, also shows that food production is land-intensive relative to cloth. This diagram shows, with the two curves FF and CC, the combinations of inputs required to produce a dollar amount of both goods. The slope is again –w/r. As shown, to produce a dollar amount of food uses a higher ratio of land to labor relative to cloth. So food is land-intensive and cloth is labor-intensive.





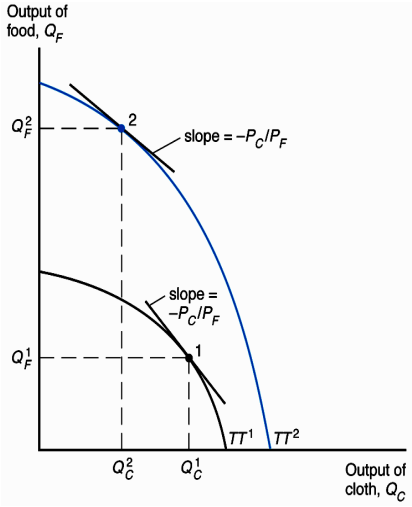
Factor intensity could be defined for any combinations of inputs. For example, if our model had instead of land and labor, capital and labor, we could try to identify the capital-intensive versus labor-intensive goods. Or we could identify skilled labor-intensive versus unskilled-labor intensive. Below, we see different factor-intensities for some US-produced goods in 1994:

	Capital/Labor ($/Worker)	Skilled Labor/Unskilled Labor
Clothing	12,000	.2
Chemicals	200,000	.75
Food Processing	85,000	.4

IV. What determines comparative advantage and the pattern of trade in this framework?

Consider Argentina and Mexico. Let us suppose that tastes and technology are the same across Argentina and Mexico. However, Argentina is a relatively more land-abundant country than Mexico, ie TA/LA > TM/LM. This implies that Mexico is relatively labor abundant. The figure below shows us how differences in relative endowments affect autarky output. The curve TT1 shows the production possibility frontier for a country before an increase in the endowment of land. At world relative prices of clothing to food of Pc/Pf, the economy initially produces at point 1. An increase in arable land (say brought about by clearing of forests) in Argentina leads to an outward shift in the production possibility frontier to TT2. Now the economy can produce more of both food and clothing.

However, the frontier shifts out alot more in the direction of food than in the direction of clothing, that is there is a **biased expansion of production possibilities**. This is because food in Argentina is the land-intensive good. In fact, production of food will rise, but production of cloth will actually fall with the increase in arable land.

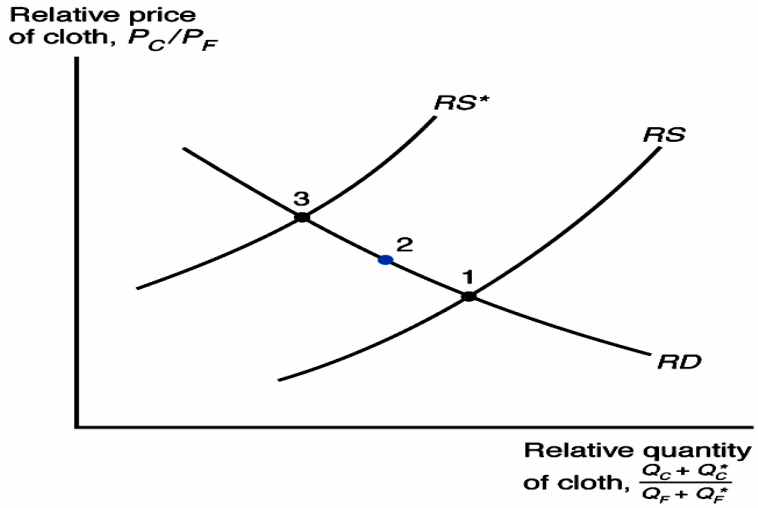


This leads to the first result:

The Rybczynski Theorem. An increase in the supply of a factor (at constant output prices) raises the output of the good which uses this factor relatively more intensively by an even greater proportion, and actually reduces the supply of the other good.

Intuition: The greater quantity of land facilitates the production of the relatively land-intensive good (food) to such an extent that it makes sense to withdraw some labor from the labor-intensive industry (clothing) and reemploy it in the production of the more capital-intensive good.

This helps us explain the comparative advantage of Argentina and Mexico. Since Argentina has relatively more land, it will produce at any level of pf/pc more food and less clothing than Mexico. So as in the figure below, Argentina's relative supply curve for food is to the right of the Mexican relative supply curve for food. Since both countries have the same tastes, they have the same RD curve. Thus,



(Pf/Pc)

Argentina has a comparative advantage in food. Mexico has a comparative advantage in clothing.

Heckscher-Ohlin Theorem: A country exports the good (will have a comparative advantage in the good) that uses its relatively more abundant factor relatively more intensively.

Liberalized trade increases the relative price of the good that uses a country's relatively more abundant factor relatively more intensively:

$(Pf/Pc)^{\text{Argentina, Autarky}} \leq (Pf/Pc)^{\text{Free Trade}} \leq (Pf/Pc)^{\text{Mexico, Autarky}}$

V. Who benefits and who loses from trade based on endowment differences in the long run? How do changes in goods prices due to trade affect wages, returns to land and capital?

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

Intuition: As the price of food (the land-intensive good) increases, the demand for land and labor in the food industry increases. Because the production of food is relatively land-intensive, the food industry demands alot of capital and a little labor. However, the clothing industry, which is labor-intensive, releases a little land and a lot of labor as it contracts. This means the return to land has to increase by alot and the return to labor has to actually decline.

So liberalized trade benefits factors used relatively intensively in the production of a good that the country exports and harms factors used relatively intensively in the production of the import-competing good.

In other words, trade benefits the relatively abundant factor of production and harms the relatively scarce factor of production.

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?

VI. 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 ar ethe same across countries (ie free trade, no trade barriers)
- Countries continue to produce both goods when they start trading

This result is known as the Factor-Price equaliziation (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, whih 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.