[Lecture 5] The Heckscher-Ohlin Model

Heckscher and Ohlin argued that a country will be able to produce at lower cost (and therefore have comparative advantage in) those products whose production requires relatively large amounts of the factors of production (a.k.a. ***factor endowments***, e.g., labor, land, capital, natural resources) with which that country is relatively well endowed.

By now, we should be familiar with the way economists construct a theory; first, they establish framework by spelling out a series of assumptions; second, once assumptions are made, the model can be solved; and finally, experiments can be performed with the model.

1. Assumptions

1) We drop the assumption that labor is only relevant input.
2) We also drop the assumption that technology in each country can be completely described with knowledge of unit of labor.

Now we add five more.

3) Two factors of production; L and K
4) The technology sets available to each country are identical (most crucial assumption of H-O model).
5) In both countries, T is more labor-intensive industry, while S is more capital-intensive industry. And the production of both goods in both countries is subject to CRS.
6) Countries differ in their endowments of factors of production, L and K. In our presentation we will assume that A is relatively capital abundant, while B is relatively labor abundant.
7) Tastes in those countries are identical.

From 5), we can build up the model. For any level of production and in either country, the amount of labor used per machine is higher in the T industry than in S industry. Mathematically,

$$\frac{L_T}{K_T} > \frac{L_S}{K_S} \quad \text{or} \quad \frac{K_T}{L_T} < \frac{K_S}{L_S}$$

Note that the choice of T as the relatively labor-intensive is purely arbitrary. And in defining labor (or capital) intensity, we emphasize the notion of *relative* labor intensity (it uses more workers per machine, not just more workers).
And the "Constant Returns to Scale" assumption implies that labor and capital will change equiproportionately.

From 6), we can also express them mathematically $\frac{K_A}{L_A} > \frac{K_B}{L_B}$ (or $\frac{w_A}{r_A} \quad \frac{w_B}{r_B}$, why?).

Combining 5) and 6) allows us to develop graphically the shapes of the PPF of the two countries.

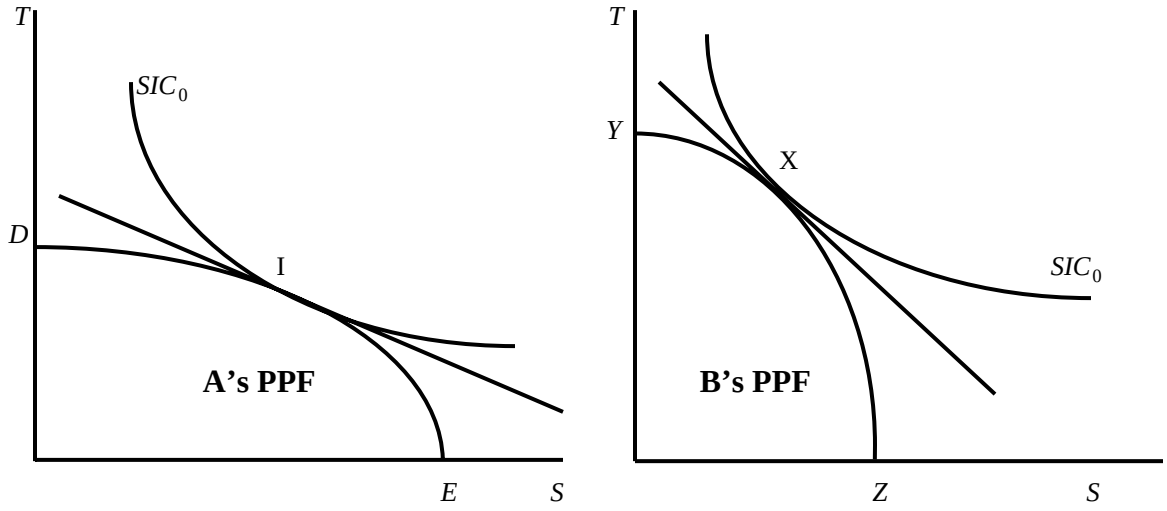
First, since the two goods (T and S) differ in factor intensity in both countries, the PPFs of each country will exhibit increasing opportunity costs. To understand better, consider the following experiment: Suppose that in country B we begin with all of B's capital and labor working in the S industry. This would establish one point on B's PPF, the point on the S axis. Now, imagine that the managers of the S industry are asked to cut back their production by 1 unit of output. The S industry now has excess factors of production, which can be used to produce some of T. How likely is S to contract its output? It would seem that the industry would try to retain as much capital as possible, since the S production requires relatively more ( ). Thus, as it reduces output, this industry is likely to release, at first, mostly ( ), since S requires relatively less of that factor. So initially, at least, it is likely that as S contracts, relatively more ( ) than ( ) is laid off and therefore becomes available to T industry. But T happens to utilize relatively more ( ) than ( ) in its production. Consequently, the release of factors by S to T occurs in precisely the fashion required for T to expand most readily. Hence,

initially, as we move away from point on S axis, the output of T increases greatly, while the output of S contracts only a little (Now, draw your own diagram!).

Why does B's PPF become flatter as we near T axis?
Let's think again about the process of expansion and contraction of the two industries. As we approach T axis, the output of S is nearing zero. We would expect that, as output has fallen, the S industry has tried to retain as much capital per remaining workers as possible. However, it should be clear that the closer output S comes to zero, the greater are the amounts of capital being idled by that industry. When the T industry absorbs greater and greater amounts of capital relative to labor, it is able to expand by smaller and smaller amounts. This is due to our assumptions about the underlying technology required to produce T (labor-intensive).

Now how about country A's PPF?
Because B is assumed to be relatively labor abundant and good T is relatively labor intensive, we would expect B's PPF to lie primarily on T axis. That is, given its resources and the technology for making the two goods, country B should be able to make relatively more T than S. By identical reasoning, we would expect A's PPF to lie mainly along the S axis.

2. Proof of the H-O Theorem



Our goal is to find the autarky (pre-trade) price ratios for the two countries to determine the direction of the comparative advantage. To do that, we need to bring demand factors into the story. Recall that we have assumed that the SICs for the two countries are identical. In terms of our diagrams, this means that the SICs for the two should have the same shape and should lie in the same general location in the two graphs (note carefully that even though both SICs have same label, this doesn't mean that the two countries experience equal level of satisfaction in autarky. Why?). Consider now the autarky equilibrium production and consumption points for the two countries. These occur at point I for A and point X for B.

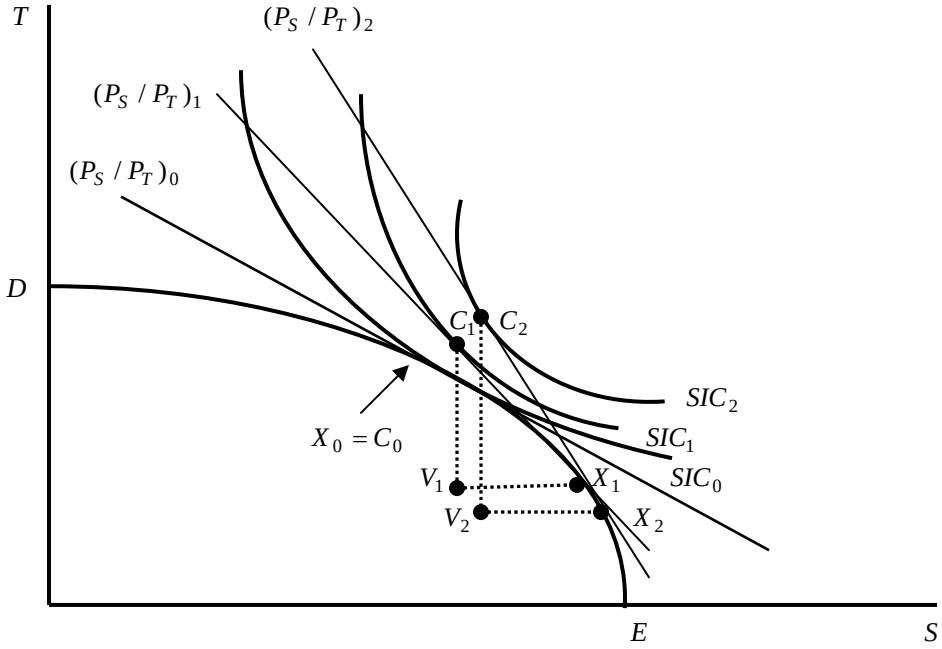
From this diagram, we know that $(P_S / P_T)_A < (P_S / P_T)_B$. This establishes that country A (B) has a comparative advantage in the production of good S (T). S was assumed to be the capital-intensive good and that A was assumed to be the capital-abundant country. So far, we

have shown how comparative advantage is determined in the H-O model. How do we know that trade will flow in the direction of comparative advantage? Namely, in a competitive environment, trade flows are determined by profit-seeking activities of economic agents. If a product is relatively cheap in one country, it will tend to be exported to those places where it is relatively expensive. Consequently, we would expect to see country A export good S. Likewise, exporters in B should want to export T to A, where it is (at first) relatively more expensive.

3. Equilibrium in the H-O Model

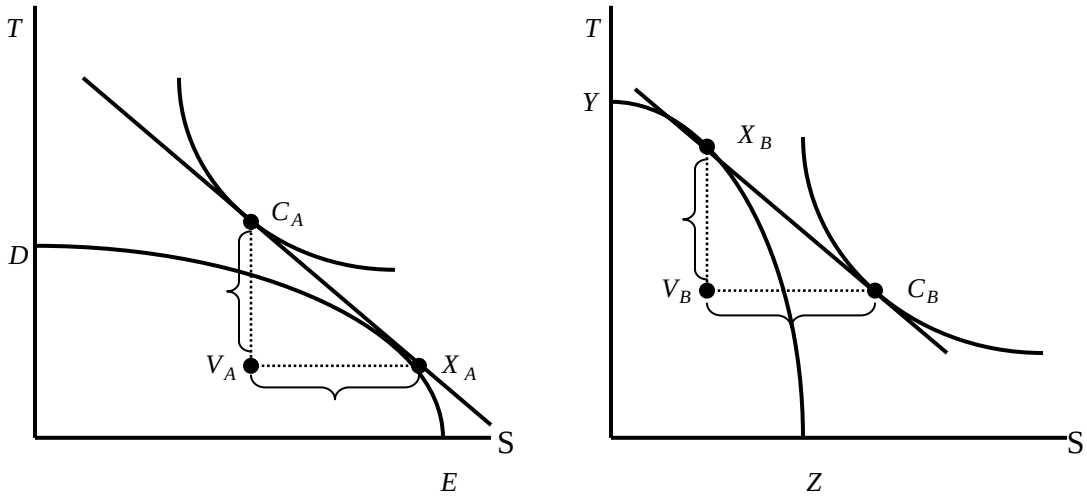
Now consider the effect of the introduction of international trade on the production and consumption decisions of a single country. After that, we turn to an examination of the world trade equilibrium in the H-O model.

We should keep in mind from the previous session that once trade is allowed between two countries, differences in relative prices will not persist. Consequently, the price of S will begin to rise in A and fall in B. For the time being, let's focus our attention on country A.



Once trade begins, price of S in A will start to rise. As the terms of trade rise to $(P_S / P_T)_1$, the production of T declines, and factors are released to the S industry, allowing A's production point to move to point X_1. At that point, the supply of S exceeds the local demand for it, and some can be exported to B in exchange for T. This allows consumption to move off A's PPF to point C_1. How much is traded at price $(P_S / P_T)_1$? This is given in the figure by the triangle $V_1C_1X_1$. We have to know that at any point in time, only one price will prevail in the market. What will be that price, and how is it determined? Again, the answer is the same as with Ricardian model. The terms of trade that will prevail once trade begins are determined by international forces of demand and supply known as reciprocal demand. These forces seek a price that can prevail simultaneously in both countries so that desired trade flows are balanced. After all, if desired trade flows are not balanced, then, by definition, one country wants to trade more than the other, and this will cause the terms of trade to change.

Diagrammatically, the condition for international equilibrium is that the trade triangles of the two countries be congruent. This is the same equilibrium condition before.



Country A **Country B**

4. Conclusions

We need to note one important thing from H-O Model:

Is complete specialization likely in the H-O Model? No, but it can't be ruled out. As we noted earlier, the production point depends on the relative price of exportables. It remains a possibility that the price could rise so much that all of the economy's resources could be attracted to the export industry. A second factor that would make complete specialization more likely would be if the two goods were relatively similar in their use of factor inputs. The more similar the techniques used in producing the two goods, the less additional output of one good is lost as factors are increasingly attracted to the other industry. In other words, as goods become more similar in production, the less bowed out are the PPFs, and the PPFs begin to look more like the straight-line, constant-cost PPFs found in the classical model – where complete specialization always tends to occur. Neither country completely specializes in the production of its comparative advantage goods. In conclusion, *incomplete specialization* is a straightforward result of the presence of *increasing opportunity costs*.