The Hecksher-Ohlin (HO) Model

1 Motivation

- Similar to Ricardian model tarde occurs because of comparative advantage.

- The Ricardian model only assumed one factor of production, i.e. labor, so that comparative advantage arises from differences in labor productivity.

- Look at the differences arising from factor endowments across countries as well as relative factor productivity. Hence we can answer questions relating to income distribution between owners of labor and capital. What can we say about income distribution across countries, in addition to distribution within a country?

- HO model allows us to study international trade with two factors, namely labor and capital.

- HO model is elegant. International trade economists take it seriously.

- HO model is convenient for introducing some important results, like the Rybczynski theorem, Stolper-Samuelson theorem, and factor-price equalization theorem.

2 The Model

2.1 Assumptions

We retain assumptions A1-A10, and add new ones.

- Two countries, (A and B), two goods (food and cloth), two factors (labor, (L) and capital (K)).

- A13. Two factors, L and K. L receives wage payment, W and K receives rent, R.
• A14. The countries have identical technology. Note that this theory implies that if factor prices are identical in each country then exactly the same production process for any given industry will be employed in both countries. As long as factor payments are different then the choice of technology will be different.

• A15. In both countries cloth (C) is the labor intensive good and food (F) is the capital intensive good. Mathematically:

\[ \frac{L_C}{K_C} > \frac{L_F}{K_F} \]

, where \( L_i \) is the amount of labor employed in industry \( i=C,F \), and \( K_i \) is the amount of capital employed in industry \( i \). Also, the production of both goods in each country is subject to CRS. This means that the proportionate changes in in the use of K and L lead to equiproportionate changes in output.

• A16. Assume that A is relatively capital abundant, while B is labor abundant. Labor or capital abundance means: A country is relatively labor abundant if the total workforce is relative to total capital stock is greater than in the other country. Mathematically:

\[ \frac{K_A}{L_A} > \frac{K_B}{L_B} \]

, where \( L_k \) is the size of the total workforce in country \( k \), while \( K_k \) is the total amount of capital goods-say machines- available in country \( k \).

• Since the two goods differ in factor intensity in both countries, the PPFs of each country will exhibit IOCs.
• A17. Tastes in the two countries are identical. This assumption implies CICs in both countries are identical.

• Note that capital or labor intensity is a relative concept. This simply means that total amount of labor or capital used in the production of a particular good is not important. Instead we need to look at the amount of labor used per machine.

• Factor abundance is also a relative concept. Mathematically, if one country is relatively capital abundant then in a two country world the other need to be labor abundant.

• Since the CICs for both countries are assumed to be identical, when the two countries faced with the same relative prices and income they will choose the same consumption bundle. This means that directions of trade will be determined solely by production conditions.

3 The HO Theorem

A country will have comparative advantage in, and therefore will export, that good whose production is relatively intensive in the factor with which that country is relatively well endowed.

This theorem says that country A which is relatively capital abundant will have comparative advantage in F (as F is the capital intensive good) and country B which is relatively labor abundant, will have comparative advantage in C (as C is relatively labor intensive). With trade, A will export F and import C while B will export C and import F.

3.1 Proof of HO theorem

We can prove HO theorem graphically as follows;
4 Equilibrium in the HO Model

What happens when trade is allowed? Recall that once trade is allowed between A and B, differences in relative prices will not persist. With trade the price of $F$ will begin to rise in A (where it was low in autarky) and fall in B (where it was high in autarky). As the relative price of $F$ in terms of $C$ ($P_F/P_C$ rises, i.e., terms of trade for $F$), the production of $C$ falls, and factors are released to the $F$ industry. Hence as TOT for $F$ increases A will produce more $F$ and less $C$. A can export amount of $F$ that is excess of domestic consumption in turn pay for the import of $C$ from B. A’s trade triangle will give us the amount of $F$ that A is willing to export at a given TOT and amount of $C$ A wants to import from B. As TOT for $F$ increases further A’s trade triangle becomes larger meaning that A will increase production of $F$ more and more and cut production of $C$, hence being able to export more $F$ and import more $C$. As you can imagine this process can not last indefinitely. As the TOT for $F$ rises in A TOT for $C$ rises in B, causing country B to expand its production of $C$ and shrink its production of $F$. Market forces, demand and supply will lead a trade equilibrium in which the amount of $F$, A is willing to export will be equal to the amount of $F$, B is willing to import. Also, the amount of $C$, that B is willing to export will be equal to the amount of $C$, A is willing to import. That is:

$$X^A_F = M^B_F$$

and

$$X^B_C = M^B_C$$

Geometrically this means that in trade equilibrium trade triangles of A and B need to be identical.

4.1 Differences between Ricardian Model and HO Model

- In Ricardian model countries specializes completely in the production of good in which they have comparative advantage while in the trade equilibrium of HO
model this is not necessarily the case. Incomplete specialization is the case in HO model. This means that in each country even after trade some of each product is produced. This is much more reasonable if we think the real world economies. Incomplete specialization in HO model is a consequence of IOCs. Because of IOCs as production of say F increases in A so does the OC of F in terms of C.

- In Ricardian model in trade equilibrium each country specializes in the production good in which they have comparative advantage. Hence production is fixed at that point. Hence given the output level demand in international markets determine the trade equilibrium prices. On the other hand in HO model Supply is not fixed and production of say F increases as long as relative price of F increases in the international markets. Hence Supply curve is upward sloping in HO model while it is horizontal for some portion and then becomes vertical in the Ricardian model. Thus in HO model both Supply and Demand interacts with each other.