Topic 5: The Heckscher-Ohlin Theory.

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READ: Chs. 5 (skip 5.5D), 7.2B and 8.4C.

Assumptions:

1. **There are two countries, two goods and two factors of production used to produce these goods.**

   Call these Home (H) and Foreign (F), goods X and Y, and labour (L) and capital (K) respectively.

2. **Both countries use the same technology of production for the same good. But this technology differs between the two goods in both countries.**

   In other words, we will not say that either country's labour or capital is 'better' than the other, but we will say that in both countries, labour is better at one good and capital at the other.

3. **One commodity is relatively *labour intensive*, the other is relatively *capital intensive*.**

   Let's say X is labour intensive.

4. **Both commodities are produced under constant returns to scale.**

5. **Tastes are the same in both countries.**

   In other words, community preferences can be represented by the same CIC map for both nations.

6. **There is perfect mobility of factors between industries in each country, but NO mobility between countries.**

   Thus, the price of labour (wages) and that of capital (the interest rate) must be equal in both industries within a country but not necessarily between countries.

7. All factors are always fully employed in both countries.

Thus, production in each country lies along its PPF.

8. **There is perfect competition in both types of markets (goods and factor) in both nations.**

   Thus, commodity prices equal the per unit costs of producing each commodity.

9. **When trade takes place, it is costless and frictionless.**

   Thus, commodity prices will equalize between the countries.

10. **Trade between the two countries is always balanced.**

11. **Neither country fully specialises in one good as a result of trade.**

12. **The difference between the two countries is that one is *labour abundant* and the other is *capital abundant*.**

    Let's say that H is labour abundant, F is capital abundant.

Main ideas:

The concept of *returns to scale* refers to the proportion by which the output of an industry goes up when its inputs are increased in equal proportions.

- If the output goes up by a smaller proportion, the industry displays decreasing returns to scale (DRS).
- If the output goes up in exactly the same proportion, the industry displays constant returns to scale (CRS).
- If the output goes up by a greater proportion, the industry displays increasing returns to scale (IRS).

It is possible that a given industry will exhibit different returns to scale at different scales of operation. But if it exhibits the same pattern at all (economically relevant) scales then it is globally DRS, CRS or IRS. The H-O model assumes global CRS in both industries.

Graphically, CRS implies that the isoquants for an industry are (i) parallel and (ii) 'evenly spaced'.

The concept of factor intensity relates the ratio in which the two factors are employed between two *industries*. Thus, labour intensity measures the ratio, L/K. Capital intensity measures the inverse, the ratio, K/L.

An industry is *labor intensive* if, facing the same w/r ratio, it employs a higher ratio of L/K than the other industry. The other industry is automatically *capital intensive*.

Graphically, industry X will be labour intensive if its isoquants are 'steeper' (assuming that Labour is measured along the horizontal) than those of industry Y. This suggests that labour is relatively more productive in industry X and capital in industry Y.

In general, the ratio of L/K used in a given industry depends on (i) the ratio of factor prices (w/r) and (ii) the exact amount of that industry's output.

An increase in w/r (keeping output constant) induces firms to lower L/K in both industries. An increase in w/r will cause L/K to rise in both.

With IRS or DRS, a change in scale of operation (keeping w/r constant) will have an unpredictable effect on a given industry's L/K ratio. But with CRS, it will have *no* effect. Stated differently, with CRS, the industry's *output expansion path* is a straight line.

Thus, CRS implies that the ratio of L/K in a given industry is affected only by w/r, not by its scale of operation.

If both X and Y are produced under CRS, then if X is labour intensive at one scale of operation, it remains labour intensive at all scales. It is in the nature of two straight lines that they intersect only once.

But CRS is not enough to rule out the possibility that as w/r varies, X is labour intensive at one value of w/r, but Y becomes labour intensive at another. Should this happen, it is referred to as *factor intensity reversal.*

An additional restriction for ruling out factor intensity reversal is that the isoquants of the two industries intersect no more than once.

The concept of *factor abundance* relates the relative endowments of factors in two *countries*.

A country (let's say H) is relatively labour abundant if its w/r ratio is lower under autarky than in the other country (let's say F).

Given the other assumptions of the H-O model, w/r will be lower in H under autarky if the ratio of L/K in its total factor endowments is greater than in F.

Although two countries share the same technology, the capital abundant country will find it relatively easier to produce the capital intensive good and the labour abundant country will find it easier to produce the labour intensive good. Thus their PPFs will not look alike.

The labour abundant country's PPF will be skewed towards the axis along which the labour intensive good is measured. The capital abundant country's PPF will be skewed towards the capital intensive good.

The Hechscker-Ohlin theorem:

Assuming that the two countries are equivalent in every way except in terms of relative factor abundance and that they have the same CICs, under autarky the labour abundant country will produce the labour intensive commodity at a lower opportunity cost than the capital abundant country. This establishes the pattern of comparative advantage

Intuition: The labour abundant country will have a lower w/r ratio under autarky than the capital abundant one. Thus, it will be comparatively cheaper to produce the good which uses relatively more labour and relatively less capital in that country. Analogous for the capital abundant country.

The H-O theorem: A country will export the commodity which uses more intensively its relatively abundant and cheaper factor and will import the commodity which uses more intensively its relatively scarcer and more expensive factor.

Income Distribution:

The H-O Model may be thought of as a special case of the standard theory. Thus, it predicts that both countries gain on the whole from trade.

(Note, however, that gains from trade may be unequally distributed between the two countries).

But, unlike the classical theory, the H-O theory makes a definite prediction that within each country, some will gain and some will lose.

It is best to study this by looking at some related theorems.

Other theorems:

Note that there is a unique link between commodity prices and factor prices (for a 2×2 economy). The zero profit condition in each industry provides this link. This is summarised in a famous result.

The Stolper-Samuelson Theorem: An increase in the relative price of one good increase the absolute return to the factor used intensively in the production of that good and reduces the absolute return to the other factor. (See p. 258 of the textbook.)

Note, for example, that an increase in the *relative* price of a labour intensive good causes the wage to increase in *absolute* terms. This means that a worker can buy more of *both* goods with one hour of labour.

Intuition: Suppose P_X/P_Y rises. At the existing w/r ratio, firms producing X will make profits.
Thus the output of X will increase and that of Y will decrease.
But as X expands and Y shrinks, *unless and until* factor prices change, X will expand demanding a higher L/K ratio than will be supplied given cutbacks in Y.
Thus, an excess demand for L and an excess supply of K will arise.
This will make w rise and r fall. Thus w/r rises.
As a result, firms in both industries will be willing to raise their optimum L/K ratios (although X will still have a higher L/K ratio).
The increase in L/K in both industries will eliminate the (incipient) shortage of L and slack in K.
Because L/K rises in both industries, each unit of labour combines with more capital than before.
Thus, the marginal product of labour rises in both industries, and so does the real wage.

Under autarky, wages are lower in the labour abundant country and interest rates are lower in the capital abundant country. This is why the labour intensive good has a lower relative price in the labour abundant country.

Opening up to trade, commodity prices equalise. Thus, the relative price of the labour intensive good rises in the labour abundant country and falls in the capital abundant one.

According to the S-S Theorem, wages will rise in the labour abundant country and interest rates will rise in the capital abundant one.

Thus, the distribution of factor income will move in favour of each country's abundant factor. But what about the distribution of household income?

A household's income depends on how much it owns of each factor.

In reality, working class households own negligible shares in a country's capital stock and derive most of their income from labour. Capitalist households derive most of their income from owning shares, bonds, real estate and other assets. Middle class households fall in between.

Income distribution effects: Trade raises the incomes of the owners of a country's abundant factor and lowers the income of the owners of a country's scarce factor.

If every household owned an equal share of each of a country's productive factors, then trade would have no effect on the distribution of household income.

But in a world where factor ownership is unequal, trade is likely to benefit capitalists and hurt workers in capital abundant countries and benefit workers and hurt capitalists in labour abundant ones.

But, according to the H-O model, in each country the winners gain more than the losers lose. A lump sum redistributive tax would allow everyone to share in the benefits of free trade.

The H-O model goes on to predict that trade will lead to the equalisation of factor prices, not just in terms of w/r but in terms of w and r separately (in real terms).

The FPE Theorem: International trade brings about the equality of relative and absolute returns to homogeneous factors across nations.

Thus, international trade in commodities is a substitute for international trade in factors.

With no international factor mobility, a country cannot export its abundant factor. But with free trade, it can export the *services* of that factor.

The main assumptions of H-O that allow for FPE are:

1. Perfect competition.
2. CRS in each industry.
3. Incomplete specialisation.

4. **No factor intensity reversal.**

5. **Identical technology.**

6. **No barriers to trade.**

A factor intensity reversal is said to take place if one good is labour intensive at some ratios of w/r and the other good becomes labor intensive at other ratios of w/r.

This is implicitly ruled out by assumption 3 of the H-O model.

Assumptions 1-4 imply a unique relationship between factor prices and commodity prices.
Assumption 5 implies that this relationship is the same in both countries.
Assumption 6 implies that trade leads to the equalisation of relative commodity prices.
Thus, the same relative commodity prices will lead to the same factor prices in each country.

Do factor prices equalise in practise?

No, but this could be because

- **labour is not homogeneous across countries;**
- **commodity prices do not completely equalise anyway;**
- **countries might not have access to the same production technologies;**
- **CRS and perfect competition do not hold everywhere;**
- **to some extent specialisation does take place.**

What these exceptions show is that FPE is a useful benchmark in terms of understanding the effects of trade on the direction of factor price movements, but it should not be taken literally.

Another result of the H-O model deals with economic growth in a small, open economy.

Rybzcynski Theorem: At *constant commodity prices*, an increase in an economy's endowment of one factor will increase the output of the commodity which uses that factor intensively and reduce the output of the other factor.

Note that the theorem applies only to production and also that it applies only in a situation where commodity prices are constant. If a large country's endowment of one factor increases, it would most probably affect equilibrium commodity prices.

Leontief Paradox: One of the first empirical tests of the main H-O theorem was carried out by Wassily Leontief in 1951.

Leontief interpreted the H-O theorem in a multi-commodity world as predicting that the ratio of K/L in a capital abundant country's exports should exceed that in its imports.

He applied this hypothesis to US manufacturing data, by measuring the K/L ratio of various goods that were produced in the US. Some of these were exported and others were 'import substitutes'.

An import substitute (or import competing good) is a good which is produced domestically, but also imported.

He found that the K/L ratio in import substitutes *exceeded* that in its exports.

This was unexpected, since the US was (and is) considered one of the most capital rich countries in the world. Thus this finding has been termed the 'Leontief Paradox'.

The Leontief Paradox has attracted a large literature and a lot of explanations which try to reconcile it with H-O theory:

- **Since US labour is more productive than other countries, it's effective labour force is much larger than its population, so it is in fact a labour abundant country.**
- **US tastes are strongly biased towards capital intensive products; this invalidates the main H-O theorem.**
- **The definition of capital should be broad enough to include human capital.**
- **The US pattern of trade was distorted by the presence of official measures which protected mainly its labour intensive industries at the expense of capital intensive ones. This could artificially alter the competitive balance between the two types of industries.**
- **Natural resources (NR) might be an important factor of production, neglected by the L-K dichotomy. The US is a NR abundant country.**