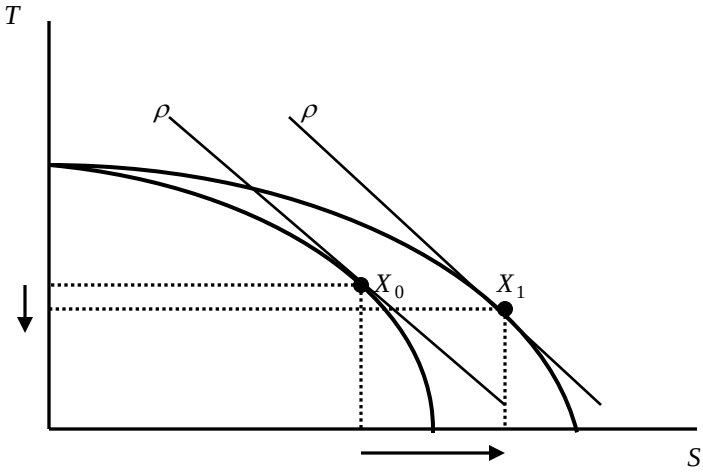
[Lecture 5A] Some New H-O Theorems

In addition to the HO theorem, which predicts the direction of comparative advantage, the HO model offers several other important theorems about the economic behavior in an economy engaged in international trade. These theorems refer to issues such as the effect of economic growth on trade and the impact trade has on the distribution of income in a society. The first of these is known as the Rybczynski theorem.

1. Rybczynski Theorem (Ch. 10, pp. 285-286)

At constant world prices, if a country experiences an increase in the supply of one factor, it will produce more of the product intensive in that factor and less of the other.

Accordingly, if country A were to increase its capital stock above its initial endowment, everything else held constant, it would produce more S than before and less T. This example can be illustrated in the diagram below:



Growth in A's capital stock leads to an outward shift in its PPF. Most of the shift occurs along the S axis, because S is in the capital-intensive industry. The new production point is given by point X_1, the point on the new PPF where its slope is equal to the (fixed) world price $\boldsymbol{\rho}$.

Because S is country A's export good, an increase in the size of A's capital stock would lead producers in A to try to expand their exports.

Conversely, if A's labor force were to increase, holding all other things constant, including world prices and the size of A's capital stock, A would want to produce more T relative to S and trade less.

The intuition of Rybczynski theorem is very straightforward. It basically says that the way in which a country grows has an impact on the production and trade mixes on that country. Countries with low savings rates that invest little in new plants and equipment will tend to produce and trade goods with high labor content. Countries with high savings and investment rates will tend to produce and trade more capital-intensive goods (We will discuss more in "Trade and Economic Growth," Chapter 10).

2. Factor Price Equalization Theorem (H-O-S Theorem)

Perhaps the most controversial theorem of the H-O model is concerned with the effect of international trade on factor prices. This theorem is known as the ***factor price equalization (FPE)*** theorem. Given all the assumptions of the H-O model, free international trade will lead to the international equalization of individual factor prices (if all the factor prices are measured in the same currency). In other words, international trade will bring about equalization in the relative and absolute returns to homogeneous factors across nations.

In our example, country A (capital-abundant, labor scarce) will have (relatively) high wages and low rents. And country B (labor-abundant, capital scarce) will have low wages and high rents. Now, let's make trade occur. Country A will increase S (capital-intensive) products and contract T. The S industry will employ more capital per worker than the T industry does. Consequently, there will be an initial mismatch between S's increased demand for factors and the factors that

actually become available to the S industry as the T industry contracts. In particular, we would expect that T would idle more labor and less capital than S initially desires. Hence, in the factor markets there are an excess supply of ( ) at the initial wage and an excess demand for ( ) at the existing rental rate. For equilibrium to return, we would expect that wages would fall in A, while rents would rise. Now, what will happen in country B? The trade leads to an expansion in the output of T. The resources required to facilitate this expansion must come from S. Industry S uses relatively more capital per worker than T; hence, as it cuts back production, industry S releases to T relatively more capital per worker than T would like to hire at the existing factor prices. What is required for equilibrium here? Rents must fall and wages must rise.

We see from this discussion that there is a tendency for wages (rents) to fall when they are initially high and to rise when they are initially low. But, **how do we know that they will equalize?** International trade leads to a common (product) price worldwide. We have assumed that markets are competitive and that technology is identical. Since each country will continue to produce some of both goods, and these goods will be produced at the same price using the same technology, it is straightforward to conclude that factor prices will equalize.

Here, we have to understand how strict the conditions are for H-O-S theorem to work. In particular, all of the assumptions of the H-O model must hold perfectly. Two of the most important of these are the assumptions of **no barriers to trade** and of **access to identical technology**. If workers everywhere have the same productivity, then free trade guarantees that they earn the same wage. However, if there are restrictions on the ability to trade, then some workers may earn more than their equally productive foreign counterparts. Since neither assumption is perfectly satisfied in the real world, we should not expect complete factor price equalization.

There is some support, however, for the main predictions of the theorem. A study by Dan Ben-David has examined how lowering trade barriers between countries has affected income levels in different countries[1]. His analysis focused on the effect of lowering trade barriers in Western Europe following the formation of the EU. He shows that trade liberalization leads to a marked reduction in the dispersion of incomes across countries. Since the technologies available to each of the countries in the study are quite similar, Ben-David's findings are in line with the model.

The FPE theorem predicts that some factor payments will rise and others fall with the introduction of trade. International trade is a good substitute for the international factor mobility (immigration).

3. Stolper-Samuelson Theorem(S-S Theorem)

The next H-O theorem spells out in some more detail the winners and losers from trade. The S-S theorem postulates that an increase in the relative price of a commodity raises the returns or earnings of the factor used intensively in the production of that commodity.

In country A, the wages will fall (rents rise) because A is labor-scarce country, while rents will rise (wages fall) because B is capital-scarce one. According to S-S theorem, abundant factor enjoys an increase in its payment for productive efforts, while the scarce factor loses. The intuition behind this result is quite straightforward.

Let's get started the question "why are wages high initially in country A?" Labor is relatively scarce and hence can exploit its scarcity power in the factor markets (so wage is initially high). The international trade means that manufacturers using scarce labor in A must now compete with manufacturers in B using abundant labor. So, international competitive pressures tend to force

[1] Dan Ben-David, "Equalizing Exchange: A Study of the Effects of Trade Liberalization," Quarterly Journal of Economics (1993)

down wages in A. Thus, even though labor is immobile between countries, its price is equalized through competitive bidding for its services, embodied in the production of goods.

Now, what do you think are the implications of S-S theorem?

First, in classical theory, scarce factors must agree to a cut in their compensation in order to remain employed. The S-S model provides insights into why government may impose barriers to trade. Clearly, workers who expect their wages to fall because of trade should be opposed to trade. Similarly, so should capitalists in capital-scarce countries. Consequently, we would expect that scarce factors lobby their respective government for measures to restrict the amounts of international trade that could occur (abundant factors are apt to lobby for free-trade policies). But we can't accomplish reasonable welfare distribution unless we have proper government intervention in trade.

Secondly, it's important to remember that even though some in society lose from international trade, the country overall gains from trade relative to autarky.