CHAPTER 7 - INTERNATIONAL TRADE THEORY

In the first chapter of the book, we examined the nature of the global economy. We saw that the nations of the world are becoming more economically interdependent. Arguably, the important means by which this is occurring is international trade. The insert from the international trade text in Chapter 1 provided numerous tables detailing trading patterns. In this chapter, we will derive several economic models in an attempt to explain these patterns. Once you master the concepts in this chapter, you should be able to predict the outcome of current and future changes in the conduct of international trade.

Global trade patterns can be summarized in Table 1. It shows the amount of trade both in absolute (billions $) and percentage terms that occurs between the industrial nations, between industrial and developing nations, and among developing nations.

<table>
<thead>
<tr>
<th>Source of exports</th>
<th>Direction of trade 1998</th>
<th>Source of Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Industrial Countries</td>
<td>Developing Countries</td>
</tr>
<tr>
<td>Industrial Countries</td>
<td>58.5%</td>
<td>17.3%</td>
</tr>
<tr>
<td>Developing Countries</td>
<td>17.0%</td>
<td>7.1%</td>
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We see that there are two distinct trade flows, those between the various industrial countries (58.5%), and those between the industrial and developing countries (34.3%=17.3%+17%). The nature of these two trade flows is very different. The trade that occurs between industrial nations tends to be dominated by similar goods. For example, the US exports and imports automobiles to and from other industrial nations. Trade that occurs between industrial and developing nations reflects the exchange of fairly different goods. Generally, the industrial nations export advanced manufactured goods in exchange for primary products or less complicated manufactures. For example, the US exports aircraft and computers to developing nations, while importing oil and other natural resources or goods which require a lot of labor such as clothing and toys.
We will develop economic models to explain each of these trade flows separately. The goal of the models will be to show the patterns of trade, as well as, the winners and losers as a result of international trade.

INTER-INDUSTRY TRADE - HECKSCHER-OHLIN TRADE MODEL

We start with explaining industrial/developing country trade flows. These flows are marked by the exchange of different goods. We call this type of trade inter-industry trade, that is the goods traded are from different industries.

The model best suited for these trade flows is the Heckscher-Ohlin Trade Model. The basis for this model is that countries differ in their endowment of resources. Industrial countries are endowed with relatively large amounts of capital and skilled labor, whereas developing nations are primarily characterized as having large amounts of unskilled labor. These resource endowment differences lead to different countries being most efficient in producing certain types of goods. That is to say, countries would specialize in the production of those goods for which they have a comparative advantage.

In order to develop the Heckscher-Ohlin Trade Model, we must first make simplifying assumptions. This model is a 2 good by 2 input by 2 country model. In our presentation, we have two different goods (clothing and planes), two inputs (labor {L} and capital {K}), and lastly two countries, the US and Mexico.

As is usual, we need to initially establish a vocabulary. The two goods are different from each other because they use relatively different amounts of labor and capital used in their production. We define clothing as labor intensive meaning that its production uses relatively more labor than capital in its production as compared to the production of planes. On the other hand, planes are termed capital intensive because relatively more capital is used in their production than in clothing.

Clothing - Labor Intensive
Planes - Capital Intensive

The two countries, the US and Mexico, differ from each other in their relative endowments of labor and capital. We assume that the two countries are identical in every other way, in particular that they have access to the same technologies and that consumers have identical preferences. These assumptions allow us to base our analysis solely on the difference in resource endowments.

We define the US as being capital abundant. This means that the US has relatively more capital than labor compared to Mexico. Mexico would then be labor abundant, since it has relatively more labor than capital compared to the US.

Note that goods are defined in terms of intensities, while countries in terms of abundances. Students many times get these reversed. With this definition, it makes no sense that a country is intensive in a particular resource or that production of a good is resource abundant.

The difference in the countries' resource endowments gives rise to different shaped PPFs. The US being capital abundant can produce relatively more planes than clothing.

The reverse would be true for Mexico. Figure 1 shows the US and Mexican PPFs. The US PPF stretches over the horizontal axis, whereas Mexico PPF stretches along the vertical axis.

Since both countries have identical preferences, they would have the same family of indifference curves. Therefore, we can portray their preferences with the same set of indifference curves. We start the analysis where both the US and Mexico are
simultaneously in autarkic general equilibria. The US, closed economy, could do no better than point A in Figure 2. Mexico’s autarkic equilibrium is achieved at point B. We have scaled the graph so that the US and Mexico achieve the same social utility level. This does not necessarily have to be the case, but it makes the graphs simpler to understand.

These general equilibria are achieved by the autarkic prices \( Pa \) and \( Pb \), for the US and Mexico, respectively.

Now, the two countries open up to trade. In order for trade to occur, we will need to fulfill an important condition. The terms of trade (the prices at which the US and Mexico will exchange goods) will necessarily be in between the two countries’ autarkic prices. Since in autarky \( Pb \) is steeper than \( Pa \), Mexicans have a higher relative price for planes in terms of clothing than does the US. Therefore, in order to exchange airplanes for clothing, the relative price must be higher than the US’s autarkic price, but lower than Mexico’s relative price. Explicitly,

\[
Pb > P^* > Pa,
\]

where \( P^* \) is the terms of trade (price planes / price clothing) between the two countries.
We also allow efficient production by allowing producers in both countries to respond to the new set of prices, $P^*$. In order to maximize profits, production will shift along each country’s PPF to where $P^*$ equals its MRT. Figure 3 illustrates these conditions. The first condition is met. $P_b$ is steeper than $P^*$ which in turn is steeper than $P_a$. Thus $P_b > P^* > P_a$. Profit maximization is also shown because $P^*$ is tangent to both PPFs at $A@$ and $B@$. These tendencies suggest that producers in both countries are maximizing their profits.

Note that production shifts in both countries. The US moves from point A to $A@$ or increases plane production and decreases clothing output. The opposite is true for Mexico as it moves production from B to $B@$. This shift in production represents each country specializing in the production of a particular good, planes in the US and clothing in Mexico. This is an important result that we will address shortly.

Now that production occurs at $A@$ and $B@$ the next topic to address is consumption. Unlike autarky, countries A and B are now able to trade with each other and by definition of the terms of trade exchange goods along the $P^*$ price line. Utility maximization occurs at the commodity bundle whose indifference curve is tangent to $P^*$. This occurs at point C in Figure 4.

With consumption at point C (note: for both countries) we can show each country’s imports and exports trade patterns by the use of a trade triangle along $P^*$ from the point of production to the point of consumption. When production exceeds consumption, the excess is exported. If consumption exceeds production, it must be the case that the good is being imported. For the US, the height of the triangle represents clothing imports and its
length represents plane exports. Note that for Mexico the opposite is true. The height of its trade triangle represents its exports while the length represents its imports.

The patterns of trade show that the US specializes in and exports planes and Mexico specializes in and exports clothing. This unsurprising but important result is called the Heckscher-Ohlin Theorem. Formally, this theorem states that a country specializes in the production and export of that good which uses its abundant input intensively.

Also note that both countries are better off. The social indifference curve passing through point C is at a higher utility level than in autarky.

Winners and Losers

Any change in economic policy will have winners and losers. Change provides opportunity but also adversely affects those whose interests are to maintain the status quo. Opening up to international trade is a dramatic change in policy. In the presentation of the Heckscher-Ohlin model, we glibly moved along Mexico= and the US= PPFS. But, moving from one point to another along a PPF is neither instantaneous nor painless. There are short-term adjustments as the import-competing industry suffers losses resulting in bankruptcies and unemployment. The decline of this industry is an obvious short-term cost. Over the course of time, labor is reabsorbed into the workplace. Capital is reinvested. And, as we saw above, the country as a whole is better off. But, a closer analysis will show that even in the long run, after this readjustment takes place, there are still those who stand to lose.

The United States, after opening up to trade, specialized in its comparative advantage by shifting production from the clothing to the plane industry. The actual time path between points A and Aₜ is not along the surface of the PPF. The importation of Mexican clothing drove the relative price of clothing downwards. US clothing manufacturers who became uncompetitive due to higher opportunity costs had to shut down. This creates pockets of unemployment centered in cities and towns who played home to the US clothing industry. As the factories shut down, so did many small
businesses. Life for those affected is difficult. But, over the course of time people move seeking jobs where employment possibilities exist, the cities and towns where planes are produced. As export demand for planes rises, so does the demand for labor. After awhile readjustment finishes with the US producing at A@.

In Figure 5, the time path described above would follow the curved line under the PPF between A and A@. We see an initial decrease in clothing production followed by an increase in plane production. In the following analysis, we will simplify by assuming that the time path resembles the kinked stair step line between A and A@.

We need to examine the effects of these changes in production on input prices. Thus an examination of input markets is necessary. These markets of course are made up of the demand and supply for labor and capital. The demand for an input changes with changes in production. One thing to note though is that moving from one point to another along a PPF does not change the total amount of resources available. This is illustrated by vertical supply curves for labor and capital at the country endowment.

Initially, clothing production decreases. This results in a decrease in the demands for labor and capital. But, if you recall, clothing production is labor intensive. Therefore the decrease in the demand for labor will be larger than the decrease in the demand for labor.
capital. This is shown in Figure 6 as the downward shifts in the demand curves from D0 to D1. Note that for labor the downward shift is larger. This puts a downward pressure on both wages (w) and the rental rate on capital (w). Initially, before trade the wage rate is w0 and the rental rate on capital r0. Now plane production increases. The demands for labor and capital now both increase. But plane production is capital intensive, and this time the demand for capital will rise by more than the demand for labor. This is shown by upward shifts from D1 to D2. With this increase in the demands for labor and capital there is an upward pressure on input prices. After the adjustment process, wages fall to the equilibrium wage at w2 and the rental rate rises to the equilibrium rental rate at r2. Since w0 > w2, labor wage falls. But, the price paid to capital rises, i.e., r2 > r0. Labor loses and capital owners win.

This result can be generalized into the Stolper-Samuelson Theorem. That is, if the relative price of a commodity increases, then the price paid to the input used intensively in its production will also rise, but the price paid to the other input will fall. This is illustrated in the above example where the relative price of the capital intensive good rose, P* > Pa, leading to higher rental rates on capital but lower wages.

Table 2 is an actual comparison of the resource endowments between the US and Mexico. The last column is the ratio of capital to labor. Since the US K/L is almost three times that of Mexico, clearly the U.S. is capital abundant relative to Mexico.

<table>
<thead>
<tr>
<th>Table 2 Endowments</th>
<th>capital ($)</th>
<th>labor (Thousands of people)</th>
<th>K/L</th>
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<tbody>
<tr>
<td>US</td>
<td>1,020,600</td>
<td>107,150</td>
<td>9.5</td>
</tr>
<tr>
<td>Mexico</td>
<td>72,753</td>
<td>22,066</td>
<td>3.3</td>
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source: Appleyard and Field, page 260
Furthermore, labor can be broken down into skill categories. As one would expect, the US is abundant in skilled labor and Mexico is abundant in unskilled labor. Does the Stopler-Samuelson Theorem explain changes in the US labor markets? During the battle to ratify the North American Free Trade Agreement (NAFTA), a free trade arrangement between the US, Canada and Mexico, business was generally in favor, while labor unions adamantly against the agreement. Do you find this surprising?

INTRA-INDUSTRY TRADE

We started out the chapter with an overview of the patterns of trade in Table 1. As you saw, the majority of world trade is between the industrial countries. Here we are discussing trade patterns between countries with relatively the same endowments of resources; therefore, the Heckscher-Ohlin model is not applicable given, its basis for comparative advantage was the difference in endowments of resources.

Trade between industrial countries tends to be intra-industry (within the same industry). The goods exchanged tend to be similar. Trade between the industrial nations is dominated by complex manufactured goods, for example transportation equipment, business machines, and pharmaceuticals.

How can these trade patterns be explained? We will discuss two models, the Krugman Model and the Product Cycle Hypothesis.

Krugman Model

The most compelling explanation for this type of trade is the Krugman Model. This explanation takes into account three observations. First, not all consumers in a country have the same preferences or tastes. Second, the nature of the production of manufactured goods exhibits what is called economies of scale. And third, there are a variety of different types of the same manufactured good. For example, a Mercedes is not a perfect substitute for a Ford.
Combining the first and third observation, typically a country's market can be segmented along the lines of different preferences. These different preferences provide incentives to producers to create a variety of manufactured goods with different attributes to service the different market segments.

We will develop the rationale underlying the Krugman model with an example. With the increase in two-working-parents households, kitchen size in homes has been increasing. Why? With more space, fewer trips to the store are required. Consequently, the size of appliances in the US, especially refrigerators, has increased. Thus in the US, the majority of consumers have a preference for large refrigerators. But there is a significant portion of the population who live either in older homes or rent apartments in large cities who do not have room for larger refrigerators.

In Europe, homes tend to be smaller, and food shopping is more convenient. The majority of Europeans, therefore, tend to have stronger preferences for smaller appliances, while a minority want larger ones.

The second observation, economies of scale in manufacturing, means that the larger the firm operations, the more efficient it becomes. Large-scale production leads to a lower cost per unit, as illustrated in Figure 7. As we move from left to right along the average cost curve, the size of the firms operations is increasing. At the same time, the average cost curve height is decreasing, meaning that the cost per unit output is falling. Under these conditions, it is more efficient to have only a handful of large firms producing the good.
These efficiency gains are obtained from specialization of inputs, e.g., assembly lines, or high capital costs in the form of sophisticated equipment best paid for by large production runs.

With strong economies of scale, only large production runs make economic sense. If firms respond primarily to their domestic markets, then in the US we would have only a few firms specializing in the production of large refrigerators. These firms would enjoy low average costs via large volumes. In Europe, there would be only a few firms specializing in small refrigerators. Would it make sense for a US firm to attempt small production runs of small refrigerators to satisfy the minority of US consumers who have a strong preference for them? With economies of scale, the European manufacturers would have a lower cost per unit. The same argument applies to European manufacturing of large refrigerators.

So what we would expect to see is that the US and Europe import and export refrigerators but each with different attributes.

Product Cycle Hypothesis

Another explanation for intra-industry trade rests with the Product Cycle Hypothesis. The essence of this model is that access to technology is not evenly distributed. This model suggests that cross-country differences in technology affect the patterns of international trade.

Some countries, such as the US, lead the world in the production of goods requiring new innovations and technology. Countries that are less innovative specialize in the production of already existing goods.

The life cycle for the production of a good will follow a predictable pattern.
1) The innovative country develops a new technology which is incorporated in the production of some new product. Initially, production tends to be small-scale, targeted
to the innovative country's domestic market. A process of working out problems with design and responding to consumer response improves the product.

2) Then as the product is refined, the industry expands and standardizes production for the domestic market and also for export.

3) With the export of the good, the innovative firm may license its technology abroad to take advantage of lower costs of production.

4) The innovative country's industry begins to lose its competitive advantage, and imports from abroad begin.

5) Domestic production declines as the home market is serviced by imports. As patents expire, technology becomes diffused and the vast majority of production takes place abroad.

During the middle of this product's life cycle, the innovative country is both exporting and importing the good. Examples of product cycles are fairly numerous: pocket calculators, radios, televisions and semi-conductors.