Chapter 6

Economies of Scale, Imperfect Competition and International Trade

6.1 Introduction

In the previous lectures, we have relied on “comparative advantage” to explain why countries trade. In the Ricardian model, countries trade because they have different relative productivities. In particular, each country exported the goods in which they were relatively more productive. In the Heckscher-Ohlin model, countries trade because they differ in their relative factor endowments. Labor-abundant countries export labor-intensive goods; capital-abundant countries export capital-intensive goods.

These models have been successful in explaining trade between developed and developing countries. In table 6.1 below, for example, we can see that in 1992 the US exported relatively more high skilled products to South Korea while importing relatively more unskilled products.

<table>
<thead>
<tr>
<th>Type of Product</th>
<th>U.S. exports to South Korea</th>
<th>U.S. imports from South Korea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemicals, plastics, pharmaceuticals</td>
<td>1340</td>
<td>105</td>
</tr>
<tr>
<td>Power-generating equipment</td>
<td>705</td>
<td>93</td>
</tr>
<tr>
<td>Professional and scientific instruments</td>
<td>512</td>
<td>96</td>
</tr>
<tr>
<td>Transport equipment other than road vehicles (mainly aircraft)</td>
<td>1531</td>
<td>78</td>
</tr>
<tr>
<td>Clothing and shoes</td>
<td>11</td>
<td>4203</td>
</tr>
</tbody>
</table>

These models perform extremely poorly, however, when explaining trade between developed countries. Many developed countries have very similar relative productivities and relative factor endowments. The Ricardian and Heckscher-Ohlin models thus would predict that developed countries
would not trade a lot with one another. Counter to the predictions of the comparative advantage models, however, these countries trade a lot and especially with other developed countries.

### 6.2 Intra-and inter-industry trade

A closer analysis of trade data sheds some light on this paradox. Let’s start off with dividing trade data into *inter-industry trade* and *intra-industry trade*.

- **Inter-industry trade**: international trade of products between two industries.
- **Intra-industry trade**: international trade of goods within the same industry.

In the comparative advantage models, trade is essentially inter-industry trade. Developed countries export products from capital-intensive industries (computers, machines), while importing products from labor-intensive industries (textiles, agricultural products).

We have no explanation for intra-industry trade yet. This is problematic since the trade data show that approximately a quarter of world trade is intra-industry trade. In addition, it shows that intra-industry trade occurs especially between developed countries. In developed countries, trade in manufactured goods accounts to about 70 percent of trade (Table 6.2).

**Table 6.2: Intraindustry Trade Examples: Selected U.S. Exports and Imports, 2002 (in Billions of Dollars)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Exports</th>
<th>Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Vehicles</td>
<td>60.39</td>
<td>168.1</td>
</tr>
<tr>
<td>Electrical Machinery</td>
<td>82.7</td>
<td>81.2</td>
</tr>
<tr>
<td>Office Machines</td>
<td>39.7</td>
<td>76.9</td>
</tr>
<tr>
<td>Telecommunications Equipment</td>
<td>24.9</td>
<td>66.3</td>
</tr>
<tr>
<td>Power-generating equipment</td>
<td>34.4</td>
<td>34.0</td>
</tr>
<tr>
<td>Industrial Machinery</td>
<td>31.8</td>
<td>35.2</td>
</tr>
<tr>
<td>Scientific Instruments</td>
<td>29.2</td>
<td>20.9</td>
</tr>
<tr>
<td>Transportation Equipment</td>
<td>46.1</td>
<td>20.2</td>
</tr>
<tr>
<td>Chemicals</td>
<td>16.8</td>
<td>30.2</td>
</tr>
<tr>
<td>Apparels and Clothing</td>
<td>8.0</td>
<td>63.8</td>
</tr>
</tbody>
</table>

To be able to explain why intra-industry trade occurs between developed countries, trade economists have built new trade models that incorporate economies of scale and monopolistic competition. In this chapter, I will start off with an overview of the concepts of economies of scale and of monopolistic competition. I then will incorporate these new concepts into a simple trade model. As I will demonstrate, this trade model will be able to explain trade in models that have the same relative productivities and factor endowments.
6.3 Economies of Scale

Economies of scale occur when a firm’s cost per unit decreases as more products are being produced. Economies of scale applies to many manufacturing firms that obtain advantages from large-scale production. It is also often the case for some extractive industries such as mining and petroleum. Economies of scale may also characterize some service industries such as banking, finance and insurance.

We can demonstrate economies of scale by assuming that a firm must incur some large fixed cost in plant or equipment in order to start production but can thereafter produce at a constant marginal cost. Total cost will be given by:

\[ TC = F + cQ \]  

(6.1)  
where \( TC \) is total cost; \( F \) is fixed cost; \( c \) is the constant marginal cost and \( Q \) is output of the firm.

\[ AC = \frac{TC}{Q} = \frac{F}{Q} + c \]

(6.2)

The average cost equation implies that the average cost of producing a unit falls as output goes up. The reason is because the fixed cost is spread over a larger and larger output.

An important implication of economies of scale is that we cannot rely on the assumption of perfect competition anymore, but have to deal with imperfect competition models. In the next section, we will deal with the simplest form of imperfect competition model, which is monopolistic competition.
6.4 Monopolistic Competition

Monopolistic competition models depend on three key assumptions:

- Each firm faces economies of scale.
- Each firm produces a different variety of a product.
- There is free entry and exit in each industry. This implies that profits equal zero and that prices equal average cost.

Are there any monopolistically competitive industries in the real world? Some industries may be reasonable approximations. For example, the automobile industry in Europe, where a number of major producers (Ford, General Motors, Volkswagen, Renault, Peugeot, Fiat, Volvo) offer substantially different yet nonetheless competing automobiles, may be fairly well described by monopolistically competitive assumptions. Another example might be the airline industry.

6.5 Economies of scale, monopolistic competition and intra-industry trade

We will now incorporate the concepts of economies of scale and monopolistic competition into a trade model. The assumptions of the trade model are the following:

- Two “countries”: United States and Europe. The two countries are identical in every respect. Both countries have the same relative productivities and the same relative factor endowments so that there are no Ricardian or Heckscher-Ohlin incentives to trade.
- Two goods: food and automobiles. Food is labor-intensive and is produced using constant returns to scale and perfect competition. The automobile industry is capital-intensive, monopolistically competitive and firms face economies of scale.

- Two factors: capital and labor.

- In the automobile industry, four varieties are being produced: Volkswagen, Porsche, Chevrolet and Buick.

We will first examine the equilibrium in the absence of trade and then will ask ourselves what will happen if both economies are opened up to trade.

6.5.1 U.S. Autarky

In the absence of trade, the U.S. produces food and all varieties of automobiles — Volkswagen, Porsche, Chevrolet and Buick — itself.

6.5.2 European Autarky

Since the U.S. and Europe are identical in every respect, the European autarky situation is identical to the U.S. autarky situation.

6.5.3 Free Trade

Suppose now that trade is opened up between the United States and Europe. First of all, there will be no incentive for the two countries to trade food for automobiles since they both have the same relative factor endowments. There still is another incentive for trade however. Because of economies of scale, each country has the incentive to specialize in producing a number of products and import the other products from abroad. For example, Europe produces and exports Volkswagen and Porsche, while the United States produces and exports Buick and Chevrolet. Since each product is now sold to consumers in both the United States and Europe, this implies that output for each firm increases. As is shown in the graph below, an increase in output reduces the average cost of production due to economies of scale.

Since under monopolistic competition price equals average cost, free trade has reduced the price of
each variety. As a result, everybody gains from trade.

6.6 Economies of scale and comparative advantage

Let’s now assume that the US has a higher overall capital-labor ratio than Europe, that is, that the US is the capital-abundant country.

We can now infer four points about the pattern of trade:

1. Inter-industry trade (manufactures for food) reflects comparative advantage. The pattern of inter-industry trade is that the US, the capital abundant country, is a net exporter of capital-intensive manufactures and a net importer of labor-intensive food. So comparative advantage continues to be a major part of the trade story.

2. Intra-industry trade (automobiles for automobiles) does not reflect comparative advantage. Even if the countries have the same overall capital-labor ratio, their firms would continue to produce differentiated products and demand of consumers for products made abroad would continue to generate intra-industry trade. It is economies of scale that keeps each country from producing the full range of products for itself; thus economies of scale can be an independent source of international trade.

3. The pattern of intra-industry trade itself is unpredictable. We have not yet said anything about which country produces which goods within the automobile sector because there is nothing in the model to tell us. All we know is that the countries will produce different products.

4. The relative importance of intra- and inter-industry trade depends on how similar countries are. If the US and Europe are similar in their capital-labor ratios, then there will be little inter-industry trade, and intra-industry trade, based ultimately on economies of scale, will be dominant. On the other hand, if the capital-labor ratios are very different, so that, for example, Europe specializes completely in food production, there will be no intra-industry trade based on economies of scale. All trade will be based on comparative advantage.
6.7 Why Intra-industry Trade Matters

A conclusion of this Chapter is that intra-industry trade matters. It can create gains from trade over and above those from comparative advantage, because intraindustry trade allows countries to benefit from larger markets.

In our Heckscher-Ohlin analysis of the distribution of gains from trade, we were pessimistic about the prospects that everyone will benefit from trade, even though international trade could potentially raise everyone’s income.

Suppose, however, that intraindustry trade is the dominant source of gains from trade. This will happen (1) when countries are similar in their relative factor supplies, so that there is not much interindustry trade, and (2) when scale economies and product differentiation are important, so that the gains from larger scale are large. In these circumstances the income distribution effects of trade will be small and there will be substantial extra gains from intraindustry trade.