Chapter 4

Comparative Advantage and Factor Endowments
Chapter Objectives

- Analyze the factors causing differences in the countries’ comparative advantage
  - Heckscher-Ohlin model

- Present economic models on the impact of trade on income distribution
  - Stolper-Samuelson theorem
  - Specific factors model

- Discuss the results of empirical tests on comparative advantage
Introduction: The Determinants of Comparative Advantage

- There are many factors that determine comparative advantage between countries.
- The reasons why one country might be more productive than another in a particular line of production should be analyzed.
Modern Trade Theory

• Adam Smith and David Ricardo assumed that each country would have its own technology, climate, and resources, and that these differences would give rise to productivity differences (and thus differences in comparative advantage)

• In the 20th century, several economists developed more detailed explanations of trade in which comparative advantage of a country depends on its endowments of inputs (factors of production) to produce goods
Heckscher-Ohlin (HO) Trade Model

- The HO model states that a country’s factors of production (a country’s endowments of inputs) are used to make each good give rise to productivity differences between countries
  - **Factor abundance** versus **factor scarcity**: When a country enjoys a relative abundance of a factor, the factor’s relative cost is less than in countries where the factor is relatively scarce
  - A country’s comparative advantage lies in the production of goods that use relatively abundant factors
TABLE 4.1 An Example of Factor Abundance

<table>
<thead>
<tr>
<th></th>
<th>United States</th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital</td>
<td>50 machines</td>
<td>2 machines</td>
</tr>
<tr>
<td>Labor</td>
<td>150 workers</td>
<td>10 workers</td>
</tr>
</tbody>
</table>

The United States is capital abundant and Canada is labor abundant.

- Canadian capital-labor ratio: $\frac{K_{\text{can}}}{L_{\text{can}}}$ is $2/10$ or $1/5$
- U.S. capital-labor ratio: $\frac{K_{\text{us}}}{L_{\text{us}}}$ is $50/150$ or $1/3$
- Since the U.S.’s capital-labor ratio is higher, it is the relatively capital abundant country: ($\frac{K_{\text{U.S.}}}{L_{\text{U.S.}}} > \frac{K_{\text{Can.}}}{L_{\text{Can.}}}$ or $1/3 > 1/5$)
Heckscher-Ohlin (HO) Trade Model (cont.)

- The U.S. is richly endowed with a wide variety of factors: natural resources, skilled labor, and physical capital
  - Expectation: The U.S. will export agricultural products (particularly those requiring skilled labor and physical capital) and machinery and industrial goods (requiring physical capital and scientific and engineering skills)
  - Result: Major U.S. exports include grain products made with small labor and large capital inputs; and commercial aircraft made with physical capital and skilled labor
Gains from Trade in the HO Model

- **Ricardian model** assumed that each country faced a constant set of tradeoffs (e.g., 2 loaves of bread for 3 tons of steel in the U.S.) because of only one homogeneous input: labor.

- **The HO model** assumes: (1) multiple inputs—labor, capital, land, etc.—and (2) variations in the quality of inputs.

- **Thus, the PPC** cannot be assumed to have constant costs. Under the HO model, each country has a rising opportunity cost for each type of production.
• As with constant costs, the tradeoff between bread and steel is equal to the slope of the PPC; however, since the PPC is curved, tradeoff is different at each point of production.
FIGURE 4.2
Opportunity Costs and the Slope of the PPC

Slope = \(- \frac{\Delta \text{bread}}{\Delta \text{steel}}\) at A
= the opportunity cost of steel at A
• If the U.S. exploits its comparative advantage and increases steel production, the gap between the opportunity cost of production and the trade price narrows
• At B, they are equal: B maximizes U.S. income
Trade and Income Distribution

• The HO model provides a more sophisticated way to analyze gains and losses from trade because it drops unrealistic assumptions
  – Labor can be divided into categories of different skill levels
  – Other types of inputs can be included
  – Industries can require different mixes of various inputs

• There is a systematic relationship between the factor endowments of a country and the winners and losers from trade

• Let’s analyze this claim further…
The Stolper-Samuelson Theorem

- Derived from the HO model
- Assumptions:
  - Labor earns wages proportionate to its skill level
  - Owners of capital earn profits
  - Landowners earn rents
  - The amount of income earned per unit of input depends on both the demand for inputs and the supply of inputs (demand for an input = derived demand)
  - If an output is in high demand, its price is high and the inputs used to produce it receive higher returns
The Stolper-Samuelson Theorem (cont.)

- An increase in the price of a good raises the income earned by factors that are used intensively in its production.
- Conversely, a fall in the price of a good lowers the income of the factors used intensively in its production.
FIGURE 4.4 The Stolper-Samuelson Theorem
The Stolper-Samuelson Theorem (cont.)

- **Note:** Not all factors used in the export industries will be better off, and not all factors used in import competing industries get hurt: Abundant factors will benefit, while scarce ones will be hurt.

- In addition, factors face the **magnification effect**: the change in put prices has a magnified effect on incomes. A 75% decline in the price of bread can lead to a more than 75% decline in the income of labor used in the production of bread.
The Stolper-Samuelson Theorem (cont.)

- Ultimately, the effects on income of an opening of trade depends on the flexibility of the affected factors
  - If labor is stuck in bread production and unable to move to making steel, it will be hurt much worse than when it is flexible and free to move
  - U.S. avocado producers might not oppose Mexican avocado imports as fiercely as they do, if they could easily move to producing other goods
Specific Factors Model

• The HO model assumes that factors are mobile, meaning that they can migrate easily from one sector to another.

• The Specific Factors model assumes that: (1) land and capital are immobile and cannot migrate (specific factors); and (2) labor is fully mobile and can migrate from one sector to another (variable factor).
Specific Factors Model (cont.)

• A country’s endowment of a specific factor plays a more critical role than a factor in the HO model in determining comparative advantage
  – When trade opens, incomes rise for the owners of the abundant specific factor
  – The income distribution effect on labor is indeterminate, as workers can easily move to the expanding sector
# TABLE 4.2 A Specific Factors Model

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Bread</th>
<th>Outputs</th>
<th>Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific factors</td>
<td>Land</td>
<td></td>
<td>Capital</td>
</tr>
<tr>
<td>Variable factors</td>
<td>Labor</td>
<td></td>
<td>Labor</td>
</tr>
</tbody>
</table>

The specific factors of land and capital can be used to produce only one good. The variable factor of labor is used in both bread and steel production.
**Table 4.3 Major Products in U.S.-Mexico Trade**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Exports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemicals, plastics, and related</td>
<td>26.9</td>
<td>446</td>
</tr>
<tr>
<td>Electrical machinery</td>
<td>25.0</td>
<td>142</td>
</tr>
<tr>
<td>Industrial machinery, appliances</td>
<td>22.5</td>
<td>196</td>
</tr>
<tr>
<td>Vehicles and parts</td>
<td>14.0</td>
<td>148</td>
</tr>
<tr>
<td>Grains</td>
<td>4.1</td>
<td>327</td>
</tr>
<tr>
<td>Total exports by United States to Mexico</td>
<td>151</td>
<td>198</td>
</tr>
</tbody>
</table>
Table 4.3 (continued) Major Products in U.S.-Mexico Trade

<table>
<thead>
<tr>
<th>Mexico Exports</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petroleum and related</td>
<td>41.9</td>
<td>720</td>
</tr>
<tr>
<td>Electrical machinery</td>
<td>53.5</td>
<td>272</td>
</tr>
<tr>
<td>Vehicles and parts</td>
<td>32.2</td>
<td>351</td>
</tr>
<tr>
<td>Industrial machinery, appliances</td>
<td>24.8</td>
<td>360</td>
</tr>
<tr>
<td>Beverages</td>
<td>2.5</td>
<td>644</td>
</tr>
<tr>
<td>Total exports by Mexico to United States</td>
<td>215</td>
<td>336</td>
</tr>
</tbody>
</table>

Source: U.S. Department of Commerce, TradeStats Express.
Empirical Tests of the Theory of Comparative Advantage

• Tests of theories based on factor endowments (such as HO) yield mixed results
  - Empirical tests are difficult: how to measure factor endowments or prices in an autarky, for example

• Besides factor endowments, trade is affected by
  – Technological differences
  – Economies of scale
  – Corporate structures
  – Economic policies
Extension of the HO Model: The Product Cycle

• Developed by Raymond Vernon

• Production of a good is cyclical
  – When a manufactured good is developed, producers experiment and seek consumers’ reactions
  – When production leaves the early stage, the good begins to be standardized in terms of size, features, and manufacturing process
  – Finally, consumption of the good in a high-income country exceeds its production: production moves where labor costs are lower
FIGURE 4.5 The Product Cycle in High-Income Countries
FIGURE 4.6 The Product Cycle in Low-Income Countries
Table 4.4 Top Ten Chinese Exports to the United States, 2008

<table>
<thead>
<tr>
<th>Item</th>
<th>Value, Millions of $US</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Toys, shooting and sporting goods, and bicycles</td>
<td>29,166</td>
</tr>
<tr>
<td>2. Other household goods (clocks, lamps, cleaning, etc.)</td>
<td>27,502</td>
</tr>
<tr>
<td>3. Computer accessories, peripherals, and parts</td>
<td>27,007</td>
</tr>
<tr>
<td>4. Computers</td>
<td>25,042</td>
</tr>
<tr>
<td>5. Apparel and household goods—other textiles</td>
<td>15,294</td>
</tr>
<tr>
<td>6. Television receivers, DVDs, and other video equipment</td>
<td>15,097</td>
</tr>
<tr>
<td>7. Telecommunications equipment</td>
<td>14,495</td>
</tr>
<tr>
<td>8. Apparel and household goods—cotton</td>
<td>13,381</td>
</tr>
<tr>
<td>9. Furniture, household items, baskets</td>
<td>13,278</td>
</tr>
<tr>
<td>10. Footwear of leather, rubber, or other materials</td>
<td>11,632</td>
</tr>
</tbody>
</table>

China’s labor endowment and the product cycle explain its exports to the United States.
Extension of the HO Model: Foreign Trade versus Foreign Investment

- Much of international trade is driven by foreign investment by multi-national firms
  - Firms prefer to invest abroad and produce there directly, rather than export (they substitute foreign investment for foreign trade)
  - Output produced in the foreign operation can be sold directly to the foreign market or shipped back to the home nation (they engage in **intra-firm** trade to take advantage of advantageous foreign conditions)
Intra-firm Trade

• Reasons for intra-firm trade
  – Firms take advantage of cross-country differences in the price of inputs
  – A firm may reduce distribution costs in a foreign market by operating through an affiliate

• Intra-firm trade is growing in importance
  – In mid-90’s, about 1/3 of US merchandise exports and 2/5 of merchandise imports were intra-firm
OLI Theory

**OLI theory (Ownership-Location-Internalization)**

- Firms investing abroad own an asset that gives them an competitive advantage (Ownership)
- Firms seek a production location that offers them advantages (Location)
- Firms try to internally capture the advantages of foreign asset ownership (Internalization)
Off-shoring and Outsourcing

- **Off-shoring** is defined as the movement of some or all of a firm’s activities to a location outside the home country.

- **Outsourcing** is the reassignment of activities to another firm, either inside or outside the home country.
  - Trade in services is consistent with traditional trade models based on comparative advantage.
  - Fundamental debate is the impact of outsourcing on jobs.
Off-shoring and Outsourcing (cont.)

- All combinations of off-shoring and outsourcing are possibilities and exist in the world economy.

- Some firms off-shore, but do not outsource, choosing to use a foreign affiliate; a foreign-based operation owned by the firm in the home country.
### Table 4.5 U.S. Multinational Corporations and Production Outside the United States

<table>
<thead>
<tr>
<th></th>
<th>1977</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value added</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td>Capital expenditures</td>
<td>21</td>
<td>26</td>
</tr>
<tr>
<td>Employment</td>
<td>22</td>
<td>28</td>
</tr>
</tbody>
</table>

The share of multinational activity outside the United States has not changed dramatically since 1977.

*Source: Bureau of Economic Analysis.*
Migration and Trade

- Three primary factors:
  - **Supply-push factors**: forces inside a nation that cause people inside a nation to think about leaving
  - **Demand-pull factors**: forces that pull a migrant to a particular country or place within a country
  - **Social networks**: ability of migrants to congregate near family or community members to more easily assimilate into new locale
The Impact of Trade on Wages and Jobs

• In the short-run, trade may (1) reduce jobs in an industry that is not competitive vis-à-vis foreign industries and (2) increase jobs in competitive industries

• In the medium- and long-run, trade has very little effect on the number of jobs
  – The abundance or scarcity of jobs is a function of (1) labor market policies, (2) incentives to work, and (3) government macroeconomic policies
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