4. A Generalized Approach to Trade Theory

Learning Objectives

- Become familiar with a generalized approach to trade theory that incorporates many of the elements of previously considered models.

- Explain the full welfare effect of changes in relative prices in terms of income and substitution effects and changes to terms of trade.

- Understand the welfare effects of different kinds of economic growth, and use this understanding to interpret various attitudes toward international trade and globalization.

- Take a first look at two important policy topics: international transfers and tools of protectionism.

Readings


Outline

1. Previously considered trade models (Ricardian, Specific Factors, Heckscher-Ohlin) have highlighted specific sources of comparative advantage which give rise to international trade. A generalized or "standard" (to use Krugman & Obstfeld’s term) trade model incorporates important features of each of these models, assumes differences between countries with the potential to trade with one another. The generalized model presented here emphasizes the effect of trade on a country’s terms of trade, and uses this concept as a vehicle for addressing a wide range of issues such as the welfare and distributional effects of different kinds of economic growth, transfers between nations, and tariffs and subsidies on traded goods.

Basic assumptions / features of the generalized model:

- Two factor, two good model

- Differences in productive capacity, due either to technology or resources, give rise to trade.

- Profit maximizing firms ensure efficient allocation of an economy’s resources.

- Relative supply derives from changes in price ratios.

- Community indifference curves summarize consumer preferences within a trading economy, and these preferences influence the direction of trade.

- Changes in relative prices generate income and substitution effects that are both important to our understanding of the welfare effects of trade liberalization and economic growth.
4. A General Model of Trade

g. Terms of trade (and the effect on terms of trade of changes to relative prices) are an important vehicle for fully understanding the welfare effects that arise from trade liberalization and economic growth.

2. Figure 1 illustrates a production and trading situation for a hypothetical economy, using a production possibilities curve to illustrate technical possibilities and tradeoffs in production, an indifference curve to illustrate preferences and tradeoffs in consumption, and a terms of trade line (also sometimes called an “isovalue” line) to illustrate the role of international relative prices in the determination of supply, demand, and the international flow of goods.

a. The production possibilities curve exhibits non-constant costs (concave with respect to the origin). Its slope at any given point is defined as the marginal rate of transformation (MRT), and shows the amount of one good that must be sacrificed to produce one additional unit of the other good (the opportunity cost of production):

\[ MRT = \frac{\Delta y}{\Delta x} \quad \text{(or} \quad MRT = \frac{dy}{dx} \text{ in calculus terms)} \]

b. The indifference curve is a community indifference curve which depicts the economy’s preferences for the two goods. It is (like all indifference curves) convex with respect to the origin. Its slope at any given point is defined as the marginal rate of substitution (MRS), and shows the amount of one good that consumers are willing to give up to consume one additional unit of the other good (the opportunity cost of consumption):

\[ MRS = \frac{\Delta y}{\Delta x} \quad \text{(or} \quad MRS = \frac{dy}{dx} \text{ in calculus terms)} \]

c. The terms of trade line (or isovalue line) depicts the prevailing relative price ratio, \( \frac{P_x}{P_y} \), in a world market with trade.

Microeconomic production theory assumes that profit-maximizing behavior by producers will lead them to produce where the marginal rate of transformation (the opportunity cost of production) is equal to the output price ratio of the goods:

\[ MRT = \left( \frac{P_x}{P_y} \right) \]

Microeconomic consumer theory assumes that utility-maximizing behavior by consumers will lead them to produce where the marginal rate of substitution (the opportunity cost of consumption) is equal to the output price ratio of the goods:

\[ MRS = \left( \frac{P_x}{P_y} \right) \]
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d. International trade allows an economy to produce and to consume different allocations of the two goods by trading along the isovalue line at the prevailing world relative prices. Community preferences dictate which good will become the economy’s export good and which will become the economy’s import good. In Figure 1, the economy produces at point A, consumes at point B, and good x is the economy’s export good. Therefore, defining terms of trade as

\[ TOT = \frac{P_{EXPORTS}}{P_{IMPORTS}} \]

in this case the slope of the isovalue line is this economy’s terms of trade.

![Figure 1](image)

3. Figure 2 illustrates the welfare effects of a change in relative prices for a country engaged in international trade. Initially the economy faces relative prices given by the isovalue line \( V \). Responding to these relative prices, profit-maximizing firms in competitive markets lead the economy to produce a mix of goods \( x \) and \( y \) represented by point \( A \) on the economy’s production possibility frontier. Consumer preferences in this economy are represented by the community indifference curve \( I \). The economy prefers to consume a mix of the goods.
A General Model of Trade

represented by point $B$, where the marginal rate of substitution (slope of the indifference curve) is equal to the price ratio (slope of the isovalue line). At this point the economy consumes a mix of goods $\{x_0, y_0\}$. This implies that the economy exports good $x$ and imports good $y$.

When relative prices change such that the isovalue line shifts to $V_2$, profit-maximizing firms in competitive markets shift the economy’s production mix of goods $x$ and $y$ to point $A'$ on the economy’s production possibility frontier. As for consumption, point $B$ is no longer an optimal consumption bundle given this economy’s preferences, so consumption shifts to a point such as $B''$, where the economy consumes a mix of goods $\{x_2, y_2\}$. This does not alter the economy’s position as an exporter of good $x$ and an importer of good $y$.

The movement from $B$ to $B''$ may be decomposed into a substitution effect and an income effect. Consider first that the change in slope of the isovalue line is consistent with a rise in the magnitude of $\frac{P_x}{P_y}$, which may imply a rise in $P_x$, a fall in $P_y$, or some combination of both. The point $B'$ is a hypothetical consumption point that isolates the substitution effect associated with the change in relative prices. Here the hypothetical consumption bundle $\{x_1, y_1\}$ corresponds to the new relative prices but the old level of welfare. The effect on consumption of either of the goods is in the opposite direction of the price change for that good. Thus the substitution effect isolates the consumer response to the change in relative prices alone, with no increase in purchasing power or improvement to welfare.

The movement from $B'$ to $B''$ isolates the income effect, and represents the increased consumption of both goods in response to an increase in purchasing power. Because the income effect is positive for both goods, we say that both goods are normal goods. This need not be the case. If, instead, the income effect for one of the goods were negative, we would say that good was an inferior good. In a two-good model such as this, at least one of the goods must be normal.

Notice that the overall effect portrayed here is consistent with an increase in the economy’s terms of trade. Good $x$ is the country’s export good; an increase in $P_x$ thus leads to an improvement in welfare. Good $y$ is the country’s import good; a decrease in $P_y$ thus also leads to an improvement in welfare. Either of these effects (or a combination of them) could generate the welfare effects portrayed here.

Notice further that the overall welfare improvement portrayed here is not generated by any expansion of the economy’s productive capacity. The impetus for the changes portrayed here occurs in the trading partners’ productive capacity, or are due to an alteration in the conditions of trade between the economy and its trading partners.
4. Welfare effects of economic growth occur in two ways – the beneficial aspects of growth itself and the associated terms of trade effects:

   a. The beneficial effects of growth itself -- any (per capita) economic growth generates improvements to the welfare of a country.

   b. Terms of trade effects depend on the bias of the growth:

      1) *Import biased growth* improves the terms of trade for the growing country, and may lead to a deterioration of terms of trade for its trading partners.

      2) *Export-biased growth* tends to worsen the terms of trade for the growing country, and may lead to an improvement of terms of trade for its trading partners.

   c. The case of *immiserizing growth* – if export-biased growth significantly worsens terms of trade for a growing country, it may offset the beneficial effects of the growth itself.

5. Preliminary consideration of two issues in international trade:

   a. International transfers of income

   b. Import tariffs and export subsidies
Assignment 4

Discussion Questions

Krugman and Obstfeld (6th ed.), pages 114 – 115: Problems 1, 2, 5, 6, 7, 8

Problem Set

1. Consider the following table of data on export and import price indexes for the United States and Canada for the years 1998 to 2000, and then answer the following questions or follow the instructions.

<table>
<thead>
<tr>
<th>Year</th>
<th>United States</th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$P_{EXTRAWS}$</td>
<td>$P_{IMPORTS}$</td>
</tr>
<tr>
<td>1998</td>
<td>95.9</td>
<td>92.6</td>
</tr>
<tr>
<td>1999</td>
<td>94.7</td>
<td>93.4</td>
</tr>
<tr>
<td>2000</td>
<td>96.2</td>
<td>99.4</td>
</tr>
</tbody>
</table>

a. Complete the table by calculating the terms of trade for each country for the three years; enter these amounts in the appropriate spaces in the table.

b. Based on what you know about terms of trade and the U.S.-Canada trading relationship, do the relative changes in U.S. and Canadian terms of trade over this time period (the direction of the movement of U.S. terms of trade with respect to the direction of Canada’s terms of trade) surprise you or are they about what you would expect? Explain your response.

2. Japan primarily exports manufactured goods, while importing raw materials such as food and oil. Analyze the impact on Japan’s terms of trade of the following events:

a. A war in the Middle Ease that disrupts oil supplies.

b. Korea develops the ability to produce automobiles that it can sell in Canada and the United States.

c. U.S. engineers develop a fusion reactor that replaces fossil fuel electricity plants.

d. A massive harvest failure in Russia.

e. A reduction in Japan’s tariffs on imported beef and citrus fruit.
3. Countries A and B have two factors of production, capital and labor, with which they produce two goods, X and Y. Technology is the same in the two countries. X is capital intensive in production. Country A is capital abundant. Analyze the effects on the terms of trade and the welfare of the two countries of each of the following changes:

a. An increase in A’s capital stock.

b. An increase in A’s labor supply.

c. An increase in B’s capital stock.

d. An increase in B’s labor supply.

4. Suppose that two countries each produce two goods, bread ($B$) and computers ($C$), with two inputs to production, capital ($k$) and labor ($l$). Furthermore, assume that production of bread is capital-intensive and production of computers is labor-intensive. Finally, assume that country 1 is a relatively capital-abundant country and country 2 is a relatively labor-abundant country.

a. What pattern of trade should emerge according to the Hecksher-Ohlin model of trade? (which country will export which good to the other?)

b. If the two countries move toward free trade from initial autarky positions, within each country, who will gain and who will lose in terms of economic welfare?

c. Modify the diagram below to portray country 1’s position after the opening of trade. Your diagram must include an appropriate production possibilities curve (transformation curve), a terms of trade line (an isovalue line), a community indifference curve, and some indication of production output, consumption, and the direction of exports and imports.

d. Modify the diagram a second time to illustrate the effects of growth in country 2’s bread sector. (Remember that this diagram illustrates Country 1’s production and consumption position.)

e. What happens to Country 1’s terms of trade as a result of the change in part (d)?