


Chapter 3 Specific Factors and Income Distribution



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To Accompany
International Economics: Theory and Policy, **Sixth Edition**
by **Paul R. Krugman and Maurice Obstfeld**

Chapter Organization

- Introduction
- The Specific Factors Model
- International Trade in the Specific Factors Model
- Income Distribution and the Gains from Trade
- The Political Economy of Trade: A Preliminary View
- Summary
- Appendix: Further Details on Specific Factors

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Introduction

- Trade has substantial effects on the income distribution within each trading nation.
- There are two main reasons why international trade has strong effects on the distribution of income:
 - Resources cannot move immediately or costlessly from one industry to another.
 - Industries differ in the factors of production they demand.
- The **specific factors model** allows trade to affect income distribution.

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The Specific Factors Model

- **Assumptions of the Model**
 - Assume that we are dealing with one economy that can produce two goods, manufactures and food.
 - There are three factors of production; labor (L), capital (K) and land (T for terrain).
 - Manufactures are produced using capital and labor (but not land).
 - Food is produced using land and labor (but not capital).
 - Labor is therefore a mobile factor that can be used in either sector.
 - Land and capital are both specific factors that can be used only in the production of one good.
 - Perfect Competition prevails in all markets.

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The Specific Factors Model

- How much of each good does the economy produce?
 - The economy's output of manufactures depends on how much capital and labor are used in that sector.
- This relationship is summarized by a production function.
- The production function for good X gives the maximum quantities of good X that a firm can produce with various amounts of factor inputs.
 - For instance, the production function for manufactures (food) tells us the quantity of manufactures (food) that can be produced given any input of labor and capital (land).

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The Specific Factors Model

- The production function for manufactures is given by

$$Q_M = Q_M(K, L_M) \quad (3-1)$$
 where:
 - Q_M is the economy's output of manufactures
 - K is the economy's capital stock
 - L_M is the labor force employed in manufactures
- The production function for food is given by

$$Q_F = Q_F(T, L_F) \quad (3-2)$$
 where:
 - Q_F is the economy's output of food
 - T is the economy's supply of land
 - L_F is the labor force employed in food

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The Specific Factors Model

- The full employment of labor condition requires that the economy-wide supply of labor must equal the labor employed in food plus the labor employed in manufactures:

$$L_M + L_F = L \quad (3-3)$$

- We can use these equations and derive the **production possibilities frontier** of the economy.

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The Specific Factors Model

Production Possibilities

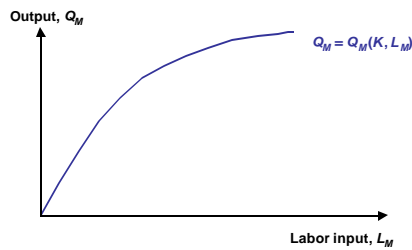
- To analyze the economy's production possibilities, we need only to ask how the economy's mix of output changes as labor is shifted from one sector to the other.
- Figure 3-1 illustrates the production function for manufactures.

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The Specific Factors Model

Figure 3-1: The Production Function for Manufactures



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The Specific Factors Model

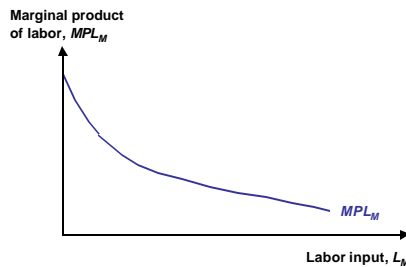
- The shape of the production function reflects the law of **diminishing marginal returns**.
 - Adding one worker to the production process (without increasing the amount of capital) means that each worker has less capital to work with.
 - Therefore, each additional unit of labor will add less to the production of output than the last.
- Figure 3-2 shows the **marginal product of labor**, which is the increase in output that corresponds to an extra unit of labor.

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The Specific Factors Model

Figure 3-2: The Marginal Product of Labor

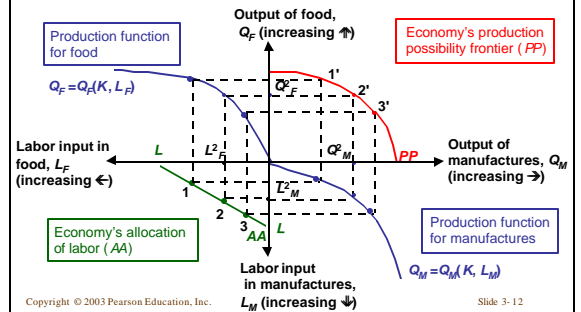


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The Specific Factors Model

Figure 3-3: The Production Possibility Frontier in the Specific Factors Model



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The Specific Factors Model

- **Prices, Wages, and Labor Allocation**
 - How much labor will be employed in each sector?
 - To answer the above question we need to look at supply and demand in the labor market.
 - Demand for labor:
 - In each sector, profit-maximizing employers will demand labor up to the point where the value produced by an additional person-hour equals the cost of employing that hour.

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The Specific Factors Model

- The demand curve for labor in the manufacturing sector can be written:

$$MPL_M \times P_M = w \quad (3-4)$$
 - The wage equals the value of the marginal product of labor in manufacturing.
- The demand curve for labor in the food sector can be written:

$$MPL_F \times P_F = w \quad (3-5)$$
 - The wage rate equals the value of the marginal product of labor in food.

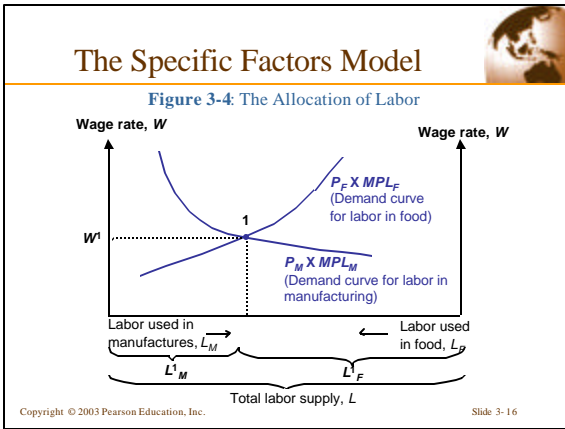
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The Specific Factors Model

- The wage rate must be the same in both sectors, because of the assumption that labor is freely mobile between sectors.
- The wage rate is determined by the requirement that total labor demand equal total labor supply:

$$L_M + L_F = L \quad (3-6)$$

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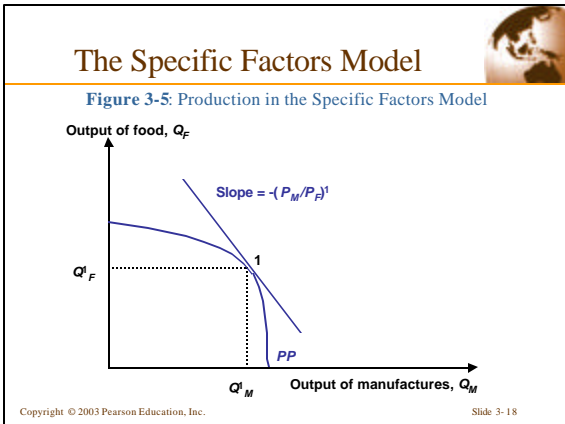


The Specific Factors Model

- At the production point the production possibility frontier must be tangent to a line whose slope is minus the price of manufactures divided by that of food.
- Relationship between relative prices and output:

$$-MPL_F / MPL_M = -P_M / P_F \quad (3-7)$$

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The Specific Factors Model

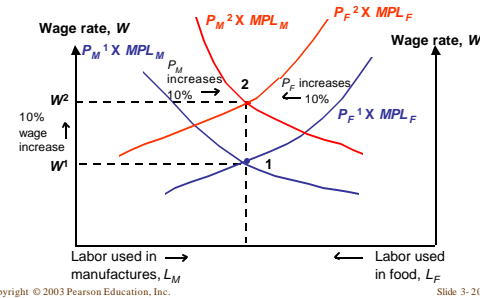
- What happens to the allocation of labor and the distribution of income when the prices of food and manufactures change?
- Two cases:
 - An equal proportional change in prices
 - A change in relative prices

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The Specific Factors Model

Figure 3-6: An Equal Proportional Increase in the Prices of Manufactures and Food



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The Specific Factors Model

- When both prices change in the same proportion, no real changes occur.
 - The wage rate (w) rises in the same proportion as the prices, so real wages (i.e. the ratios of the wage rate to the prices of goods) are unaffected.
 - The real incomes of capital owners and landowners also remain the same.

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The Specific Factors Model

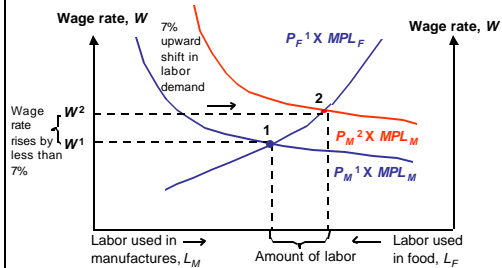
- When only P_M rises, labor shifts from the food sector to the manufacturing sector and the output of manufactures rises while that of food falls.
- The wage rate (w) does not rise as much as P_M since manufacturing employment increases and thus the marginal product of labor in that sector falls.

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The Specific Factors Model

Figure 3-7: A Rise in the Price of Manufactures

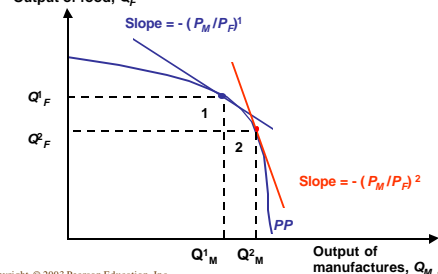


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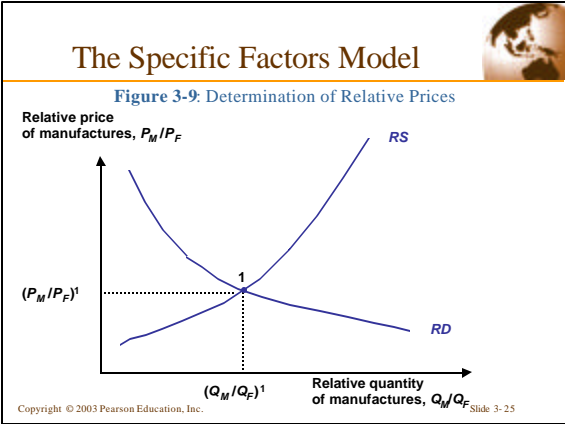
The Specific Factors Model

Figure 3-8: The Response of Output to a Change in the Relative Price of Manufactures



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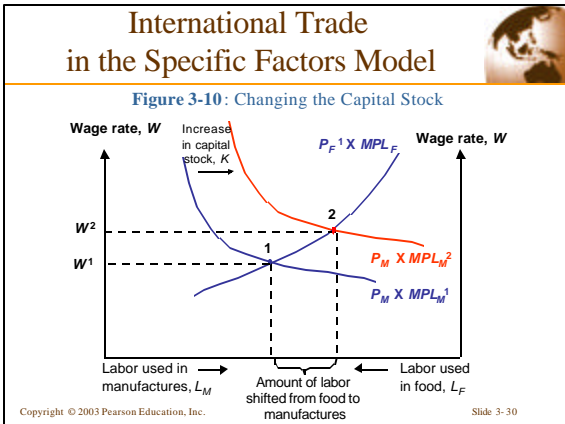


- ### The Specific Factors Model
- **Relative Prices and the Distribution of Income**
 - Suppose that P_M increases by 10%. Then, we would expect the wage to rise by less than 10%, say by 5%.
 - What is the economic effect of this price increase on the incomes of the following three groups?
 - Workers
 - Owners of capital
 - Owners of land
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- ### The Specific Factors Model
- **Workers:**
 - We cannot say whether workers are better or worse off; this depends on the relative importance of manufactures and food in workers' consumption.
 - **Owners of capital:**
 - They are definitely better off.
 - **Landowners:**
 - They are definitely worse off.
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- ### International Trade in the Specific Factors Model
- **Assumptions of the model**
 - Assume that both countries (Japan and America) have the same relative demand curve.
 - Therefore, the only source of international trade is the differences in relative supply. The relative supply might differ because the countries could differ in:
 - Technology
 - Factors of production (capital, land, labor)
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- ### International Trade in the Specific Factors Model
- **Resources and Relative Supply**
 - What are the effects of an increase in the supply of capital stock on the outputs of manufactures and food?
 - A country with a lot of capital and not much land will tend to produce a high ratio of manufactures to food at any given prices.
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International Trade in the Specific Factors Model

- An increase in the supply of capital would shift the relative supply curve to the right.
- An increase in the supply of land would shift the relative supply curve to the left.
- What about the effect of an increase in the labor force?
 - The effect on relative output is ambiguous, although both outputs increase.

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International Trade in the Specific Factors Model

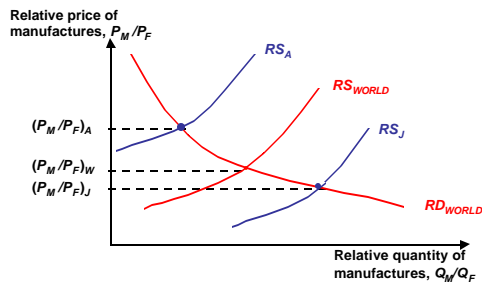
- Trade and Relative Prices
 - Suppose that Japan has more capital per worker than America, while America has more land per worker than Japan.
 - As a result, the pretrade relative price of manufactures in Japan is lower than the pretrade relative price in America.
 - International trade leads to a convergence of relative prices.

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International Trade in the Specific Factors Model

Figure 3-11: Trade and Relative Prices



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International Trade in the Specific Factors Model

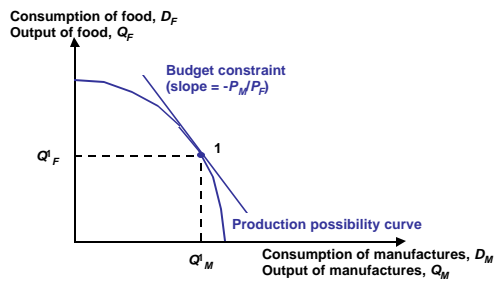
- The Pattern of Trade
 - In a country that cannot trade, the output of a good must equal its consumption.
 - International trade makes it possible for the mix of manufactures and food consumed to differ from the mix produced.
 - A country cannot spend more than it earns.

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International Trade in the Specific Factors Model

Figure 3-12: The Budget Constraint for a Trading Economy

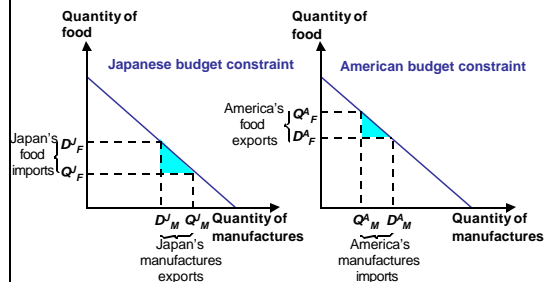


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International Trade in the Specific Factors Model

Figure 3-13: Trading Equilibrium



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Income Distribution and the Gains from Trade



- To assess the effects of trade on particular groups, the key point is that international trade shifts the relative price of manufactures and food.
- Trade benefits the factor that is specific to the export sector of each country, but hurts the factor that is specific to the import-competing sectors.
- Trade has ambiguous effects on mobile factors.

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Income Distribution and the Gains from Trade



- Could those who gain from trade compensate those who lose, and still be better off themselves?
 - If so, then trade is potentially a source of gain to everyone.
- The fundamental reason why trade potentially benefits a country is that it expands the economy's choices.
 - This expansion of choice means that it is always possible to redistribute income in such a way that everyone gains from trade.

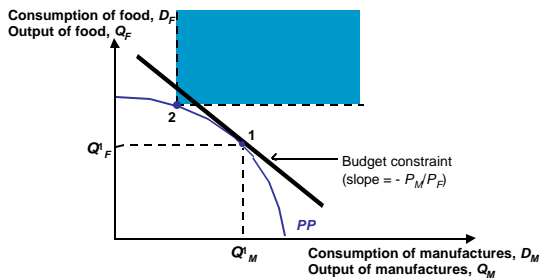
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Income Distribution and the Gains from Trade



Figure 3-14: Trade Expands the Economy's Consumption Possibilities



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The Political Economy of Trade: A Preliminary View



- Trade often produces losers as well as winners.
- Optimal Trade Policy
 - The government must somehow weigh one person's gain against another person's loss.
 - Some groups need special treatment because they are already relatively poor (e.g., shoe and garment workers in the United States).
 - Most economists remain strongly in favor of more or less free trade.
 - Any realistic understanding of how trade policy is determined must look at the actual motivations of policy.

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The Political Economy of Trade: A Preliminary View



- Income Distribution and Trade Politics
 - Those who gain from trade are a much less concentrated, informed, and organized group than those who lose.
 - Example: Consumers and producers in the U.S. sugar industry

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Summary



- International trade often has strong effects on the distribution of income within countries, so that it often produces losers as well as winners.
- Income distribution effects arise for two reasons:
 - Factors of production cannot move instantaneously and costlessly from one industry to another.
 - Changes in an economy's output mix have differential effects on the demand for different factors of production.

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Summary

- A useful model of income distribution effects of international trade is the specific-factors model.
 - In this model, differences in resources can cause countries to have different relative supply curves, and thus cause international trade.
 - In the specific factors model, factors specific to export sectors in each country gain from trade, while factors specific to import-competing sectors lose.
 - Mobile factors that can work in either sector may either gain or lose.

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Summary

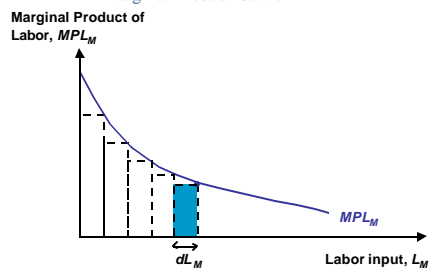
- Trade nonetheless produces overall gains in the sense that those who gain could in principle compensate those who lose while still remaining better off than before.

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Appendix: Further Details on Specific Factors

Figure 3A-1: Showing that Output Is Equal to the Area Under the Marginal Product Curve

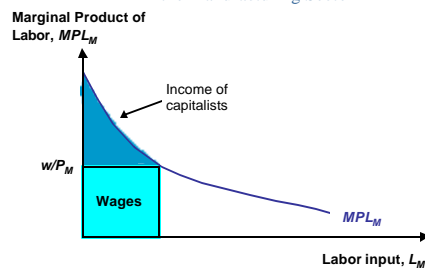


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Appendix: Further Details on Specific Factors

Figure 3A-2: The Distribution of Income Within the Manufacturing Sector

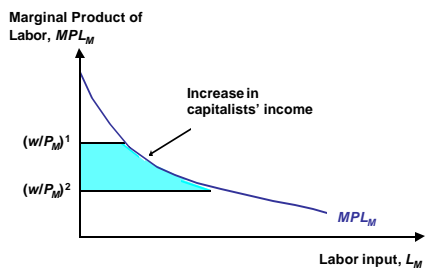


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Appendix: Further Details on Specific Factors

Figure 3A-3: A Rise in P_M Benefits the Owners of Capital

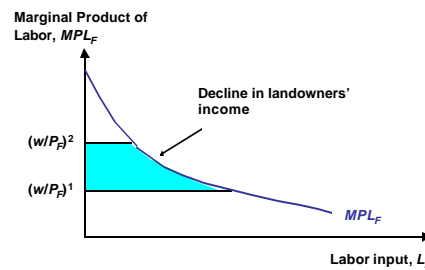


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Appendix: Further Details on Specific Factors

Figure 3A-4: A Rise in P_M Hurts Landowners



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