CHAPTER 3

Specific Factors and Income Distribution

Chapter Organization

The Specific Factors Model
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- Production Possibilities
- Prices, Wages, and Labor Allocation
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Summary

Appendix: Further Details on Specific Factors
- Marginal and Total Product
- Relative Prices and the Distribution of Income

Key Themes

The Ricardian model presented in Chapter 2 suggests that all countries gain from trade with each other, and since the single input into production can move to the sector where wage payments are highest, all individuals also benefit from trade. This result may not seem fully plausible to you; in the real world, trade has substantial effects on the distribution of income within a nation. The fact that trade generates both winners and losers is amply demonstrated by frequent attempts by some producers to limit imports of steel, automobiles and textiles.

This observation highlights the importance of the specific factors model presented in Chapter 3. International trade is observed to have strong effects on the distribution of income because: 1) resources cannot move immediately or costlessly from one industry to another; and 2) industries differ in their needs for each factor of production. Trade increases the demand for some of these factors and reduces the demand for other factors. To examine the distributional effects of trade, this chapter introduces models which have factors of production that are used exclusively in the production of a single good.

The first model includes factors of production which are inexorably tied to producing one and only one good. The particular example presented in the text involves winemakers and cheesemakers. The immobility of labor prevents equalization of wages. An equilibrium relative price can be determined when the relative demand curve is specified.

Now, consider the effect of introducing another country which can produce the same bundle of goods. The second economy shares the same production technology, but has different relative amounts of each type of labor. Trade between these two economies benefits each in the aggregate since the possible consumption set of each country expands. However, distributional issues arise when trade is permitted since workers in particular sectors may not gain from trade. There will be no gain for the type of labor in each economy which was relatively scarce prior to trade as compared to after trade. The type of labor relatively abundant in a country will gain from trade. The source of this effect is the movement in relative prices which favors the good which was relatively abundant in each country before trade. The general conclusion is that trade benefits workers in the export sector of each country and hurts workers in the import-competing sector.

Next, a more general model is presented to investigate the distributional effects of trade. The significance of this specific factors model is that it allows you to trace the distributional effects of trade on factors inexorably tied to the production of a specific good as well as on those factors that can be used to produce either good. The three factors in this model include two specific factors, land and capital, as well as one intersectorally mobile factor, labor. The fixed amount of each specific factor results in diminishing returns to labor. The mobility of labor ensures an equal wage in the production of either good, and perfect competition ensures that the wage equals the value marginal product of labor in the production of each good.

It is worth considering the specific factors model in greater depth. It describes an economy where labor can move between sectors, however other factors are specific to particular

sectors. For example, an economy might produce corn using labor and land, while it produces manufactured goods, such as machine tools, using labor and capital. The land and the capital are considered specific factors. Note that labor exhibits decreasing returns to production in these sectors: when a unit of labor is added to the production of corn, his productivity is limited by the fixed amount of land that now must be used by yet another worker. The additional output of this worker is smaller than the added output of the previous worker.

Labor will move across sectors until the value of its marginal product (MPL) is the same across all sectors. In equilibrium the wage rate (or cost of labor) is equal to the value of the worker's marginal revenue product. If food (f) and manufactures (m) are the two goods being produced, in equilibrium $MPL_f \cdot p_f = w = MPL_m \cdot p_m$. Rearranging this expression yields $-MPL_f / MPL_m = -p_m / p_f$, so that at the equilibrium production point the production possibilities frontier is tangent to a line whose slope is minus the price of manufactures divided by the price of food.

Changes in the relative price of the goods produced in an economy have clear distributional effects. Consider what happens when you increase the price of manufactures in the economy described above. Since more workers are demanded, the wage rate of workers increases. Are these workers better off? Clearly their wages will increase, however, at the same time the price of manufactures has also increased. The increase in wages is less than the increase in the price of manufactures, so that the real wage in terms of manufactured goods has declined. However, the real wage measured in terms of food (whose price has not changed) has risen. The overall impact on the welfare of the workers depends on the importance of manufactured goods and food in their consumption bundles.

Other distributional effects are experienced by the owners of labor and capital. Capital owners now pay lower real wages in terms of manufactures, implying that their income rises by more than their expenses and their spending power rises. Landowners, on the other hand, are made worse off since the price of food is unchanged while wage costs have increased. This squeezes their profits and lowers their income in terms of both goods.

Differences in the endowments of resources can affect the relative supplies of goods produced in different countries. In the absence of trade, this is reflected in differences in relative prices of the goods produced. When two countries are permitted to trade, the relative prices of the goods are equalized across markets and an aggregate supply of goods meets

aggregated world demand. If, for example, Japan is better endowed with capital relative to its endowment of labor and is not well-endowed with land, food will be expensive compared to manufactures. The opposite would be true in the relatively land rich United States. It is straightforward to show that Japan will export the good which is initially relatively cheaper, manufactures, while the United States exports food. Both countries are made better off through trade. You should spend some time going over the graphical approach in the text. Make certain that you understand which production and consumption points will arise with trade.

There are still the distributional effects of trade to consider. Trade benefits the factor of production that is specific to the export sector of each country but hurts the factor specific to the import-competing sector. As mentioned above, the effects of trade on the mobile factor of production will be ambiguous. You should make sure that you understand these arguments about who benefits and who loses from trade. Only with such insights can you begin to understand why some groups fights so hard for protectionism. Despite this distributional argument. it is quite clear that the losses to these individuals are far outweighed by the gains from trade to the rest of the population. This will be illustrated more vividly in later chapters.

It can be discouraging to realize that economic arguments do not have the final say in the formation of economic policy. When some groups that stand to lose from trade lobby their governments to protect their earning by restricting trade, their voices are often louder, and pockets deeper, than the groups that stand to gain from trade. The political economy of trade theory is introduced at the end of Chapter 3 and discusses the motives of these groups and the way in which they interact with the political process. The text returns to these ideas in Chapter 9.

Key Terms

Define the following terms:

1. The Specific Factors Model_____
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2. Mobile Factor_____
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3. Marginal Product of Labor_____
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4. Diminishing Returns_____
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5. Budget Constraint_____
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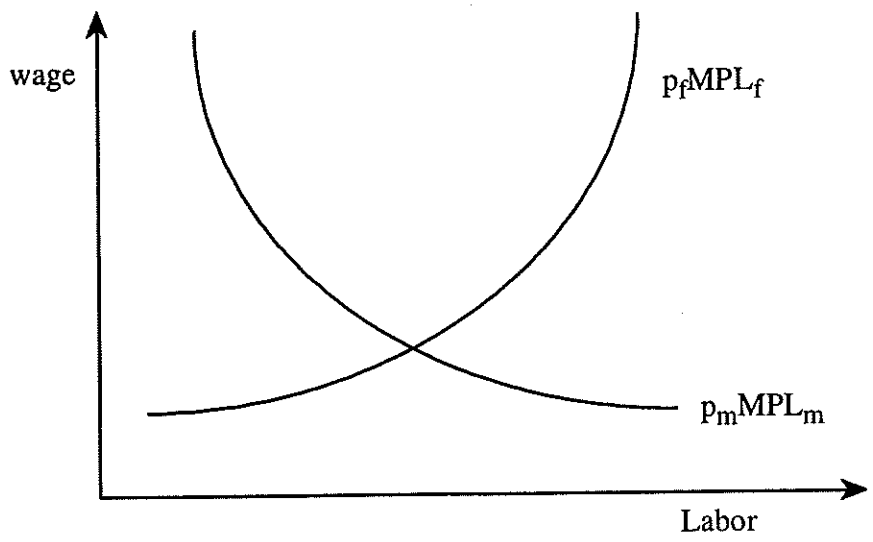
Review Questions

1. Assume that the United States has two sectors: the food sector has land as a specific factor and the manufacturing sector uses capital as a specific factor. Labor is mobile across sectors. Suppose that exceptionally good weather enables several states to enjoy "bumper" crops which lead to an 8 percent decline in the price of food.

a. In the figure below, graphically illustrate the effect on the labor demand curves for food and manufactured goods.



b. What is the impact on wages?

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c. How does the distribution of labor across sectors change? How does the output of each sector change?

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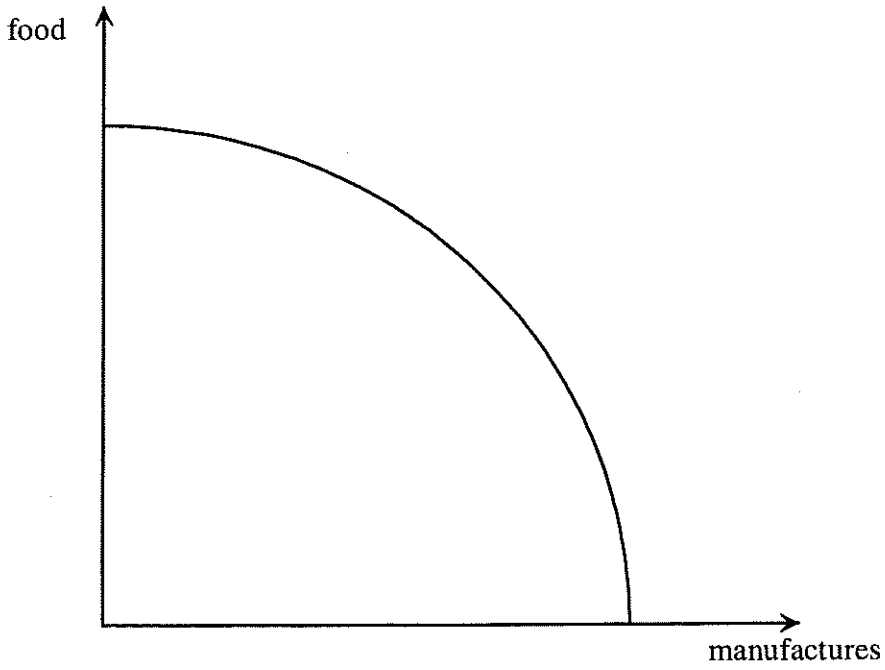
d. How does the change in relative prices affect the economy's production mix? Demonstrate this impact graphically in the figure on the next page.



e. How does the decline in p_f relative to p_m affect the income distribution across capitalists (capital owners) and landowners?

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f. What can be said about the impact on the earnings of workers? Could you provide a more definite response if you were told that food was by far the most important item in a worker's consumption basket?

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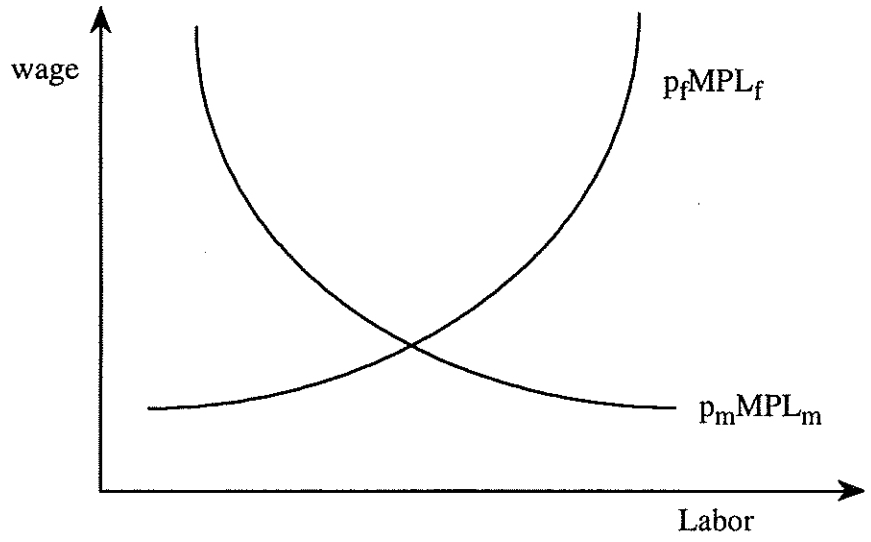
2. Assume that inflation increases prices disproportionately in manufactured goods and food. Manufacturing prices rise by 10 percent while the price of food increases by 5 percent.

a. How does this change in relative prices affect the labor demand curves in each sector? How does the distribution of labor across sectors change? Show this shift in the diagram below.

b. What are the implications for wages paid to labor? What are the implications of this differential inflation for the owners of capital and the owners of land?

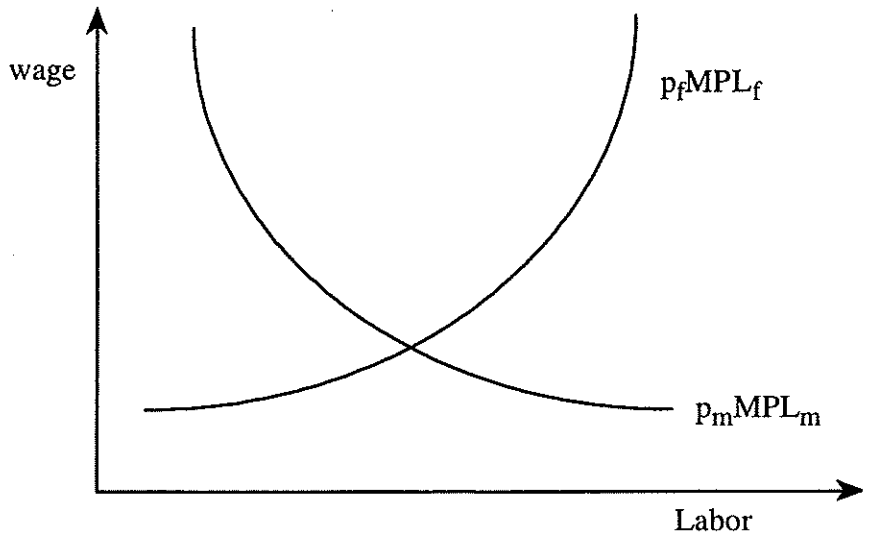


c. How does the output mix of the country change?

3. Suppose that a hurricane destroys many acres of arable land in Jamaica. This temporarily reduces the country's endowment of land, an important specific factor in the production of food. Jamaica's output of food and of manufactured goods will be affected by this change.

a. All else equal, what are the implications of this change in resources for the marginal productivity of labor in each sector? What will happen to the demand for labor in each sector? Use graphical analysis to illustrate your response.

b. What is the impact on wages paid to workers in food and manufacturing production? How will the distribution of workers across sectors of the economy change?



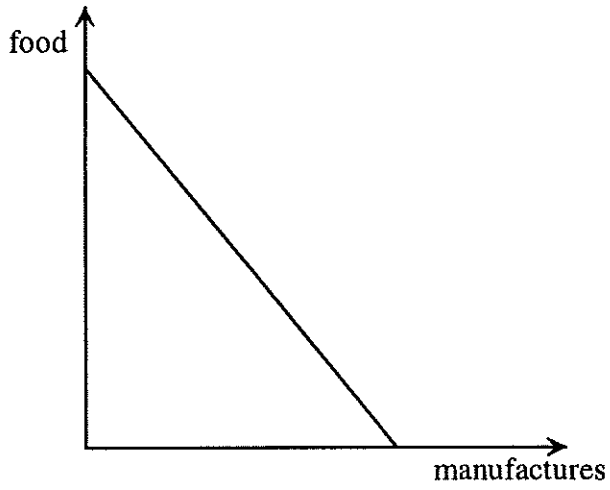
c. What is the affect on the output of each sector? Discuss the intuition behind this result.

4. When an economy is prohibited from trading, the consumption possibilities of its' citizens are constrained by the amount of domestic production. When trade is permitted, a fundamental gain which occurs is the expansion of the consumption choices available to a nation. Now, assume that a nation is land scarce and capital abundant (and cannot borrow resources from other countries!) . It produces 100 units

of food and 300 units of manufactured goods. Regardless of the price of manufactured goods, demand for manufactures is inelastic at 150 units.

a. Using the open economy budget constraint, determine the amount of food which is imported at a relative price of manufactured goods (p_m/p_f) equal to 2.

b. Using graphical analysis, show the country's budget constraint, output and consumption choices when the equilibrium price is equal to $p_m/p_f=2$.



c. How are the results of part b are altered when the equilibrium relative price shifts to $p_m/p_f=4$. Discuss the intuition behind these results.

d. How are the results of part b are altered when the equilibrium relative price shifts to 1? Compare the intuition with that of part c.

Answers to Odd-Numbered Textbook Problems

1. Texas and Louisiana are states with large oil-producing sectors. The real wage of oil-producing factors of production in terms of other goods falls when the price of oil falls relative to the price of other goods. This was the source of economic decline in these states in 1986.

3. a. To solve this problem, one can graph the demand curve for labor in sector 1, represented by $w = MPL_1 \cdot p_1 = \text{demand for } L_1$ and the demand curve for labor in sector 2, represented by $w = MPL_2 \cdot p_2 = \text{demand for } L_2$. Since the total supply of labor is given by the horizontal axis, the labor allocation between the sectors is approximately L_1=27 and L_2=73. The wage rate is approximately \$0.98.

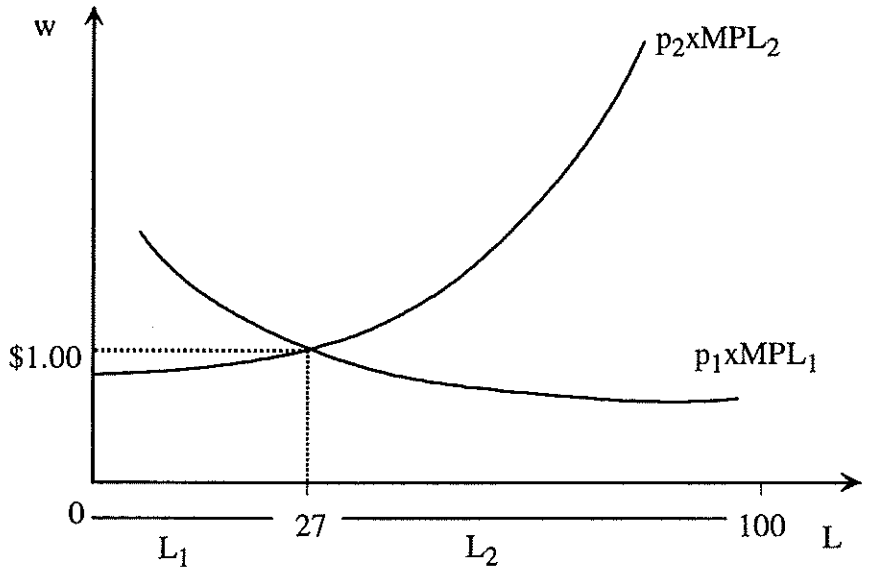


Figure 3-2

b. Use the same type of graph as in problem 2b to show that sectoral output is Q_1=44 and Q_2=90. (This involves combining the production function diagrams with the economy's allocation of labor in a four quadrant diagram. The economy's PPF is in the upper right hand corner, as illustrated in the text.)

c. Use a graph of labor demands, as in part a, to show that the intersection of the demand curves for labor occurs at a wage rate approximately equal to \$0.74. The relative

decline in the price of good 2 caused labor to be reallocated: labor is drawn out of production of good 2 and enters production of good 1 (L_1=62, L_2=38). This also leads to an output adjustment, whereby production of good 2 falls to 68 units and production of good 1 rises to 76 units.

d. With the relative price change from p_2/p_1=2 to p_2/p_1=1, the price of good 2 has fallen by 50 percent, while the price of good 1 has stayed the same. Wages have fallen, but by less than the fall in p_2 (wages fell approximately 25 percent). Thus, the real wage relative to p_2 actually rises while to real wage relative to p_1 falls. Hence, to determine the welfare consequences for workers, information is needed about their consumption shares of good 1 and good 2.