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CHAPTER 2
*(Core Chapter)

THE LAW OF COMPARATIVE ADVANTAGE

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Key Terms

Basis for trade
Gains from trade
Pattern of trade
Mercantilism
Absolute advantage
Laissez-faire
Law of comparative advantage
Labor theory of value
Opportunity cost theory
Production possibility frontier
Constant opportunity cost
Relative commodity prices
Complete specialization
Small country case

Lecture Guide

1. This is a long and crucial core chapter and may require four classes to cover a adequately. In the first lecture, I would present Sections 1, 2, and 3. These are short s sections and set the stage for the crucial law of comparative advantage.

2. In the second lecture of Chapter 2, I would concentrate on Section 4 and carefully explain the law of comparative advantage using simple numerical examples as in the text. The crucial parts here are 4b (which explains the law) and 4d (which establishes the link between trade theory and international finance). I find that the numerical explanations before the graphical analysis really helps the student to truly understand the law. The simple lawyer-secretary example should also render the law more immediately relevant to the student. I would also assign Problems 1-6.

3. In the third lecture, I would cover Sections 2.5 and 2.6a. I would pay particular attention to Sections 2.5c, 2.5d, and 2.6, which are the heart of the chapter.

4. In the fourth lecture, I would cover the remainder of the chapter. The crucial section here is 2.6b and the most difficult concept to explain is the shape of the combined supply curve for wheat and cloth. The appendixes could be made optional for the more enterprising students in the class. I would also assign Problems 7-13.

Answer to Problems

1. In case A, the United States has an absolute advantage in wheat and the United Kingdom in cloth.

   In case B, the United States has an absolute advantage (so that the United Kingdom has an absolute disadvantage) in both commodities.

   In case C, the United States has an absolute advantage in wheat but has neither an absolute advantage nor disadvantage in cloth.

   In case D, the United States has an absolute advantage over the United Kingdom in both commodities.

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2. In case A, the United States has a comparative advantage in wheat and the United Kingdom in cloth.

   In case B, the United States has a comparative advantage in wheat and the United Kingdom in cloth.

   In case C, the United States has a comparative advantage in wheat and the United Kingdom in cloth.

   In case D, the United States and the United Kingdom have a comparative advantage in neither commodities.

3. In case A, trade is possible based on absolute advantage.

   In case B, trade is possible based on comparative advantage.

   In case C, trade is possible based on comparative advantage.

   In case D, no trade is possible because the absolute advantage that the United States has over the United Kingdom is the same in both commodities.

4. a) The United States gains 1C.

   b) The United Kingdom gains 4C.

   c) $3C < 4W < 8C$.

   d) The United States would gain 3C while the United Kingdom would gain 2C.

5) a) The cost in terms of labor content of producing wheat is 1/4 in the United States a and 1 in the United Kingdom, while the cost in terms of labor content of producing cloth is 1/3 in the United States and 1/2 in the United Kingdom.

   b) In the United States, Pw=$1.50 and Pc=$2.00.

   c) In the United Kingdom, Pw=£1.00 and Pc=£0.50.

6) a) With the exchange rate of £1=$2, Pw=2.00 and Pc=$1.00 in the United Kingdom, so that the United States would be able to export wheat to the United Kingdom and the United Kingdom would be able to export cloth to the United States.

   b) With the exchange rate of £1=$4, Pw=$4.00 and Pc=$2.00 in the United Kingdom, so that the United States would be able to export wheat to the United Kingdom, but the United Kingdom would be unable to export any cloth to the United States.

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c) With £1=$1, Pw=$1.00 and Pc=$0.50 in the United Kingdom, so that the United Kingdom would be able to export both commodities to the United States.

d) $1.50 < £1.00 < $4.00.

7. a) See Figure 1.

b) In the United States Pw/Pc=3/4, while in the United Kingdom, Pw/Pc=2.

c) In the United States Pc/Pw=4/3, while in the United Kingdom Pc/Pw=1/2.

8. See Figure 2.
The autarky points are A and A' in the United States and the United Kingdom, respectively. The points of production with trade are B and B' in the United States and the United Kingdom, respectively. The points of consumption are E and E' in the United States and the United Kingdom, respectively. The gains from trade are shown by E > A for the U.S. and E' > A' for the U.K.

9. a) If $D_{W(US+UK)}$ shifted up in Figure 2.3, the equilibrium relative commodity price of wheat would also rise by 1/3 to $P_W/P_C=4/3$. Since the higher $D_{W(US+UK)}$ would still intersect the vertical portion of the $S_{W(US+UK)}$ curve, the United States would continue to specialize completely in the production of wheat and produce 180W, while the United kingdom would continue to specialize completely in the production of cloth and produce 120C.

b) Since the equilibrium relative commodity price of cloth is the inverse of the relative commodity price of wheat, if the latter rises to 4/3, then the former falls to ¾.. This means that $D_{C(UK+US)}$ shifts down by 1/3 in the right panel of Figure 2.3.

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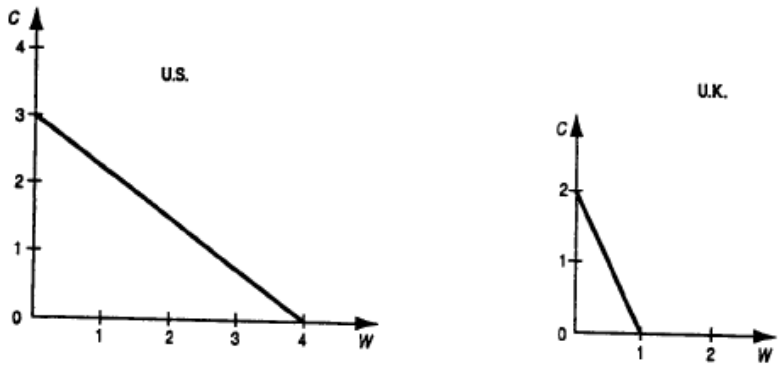


Figure 1

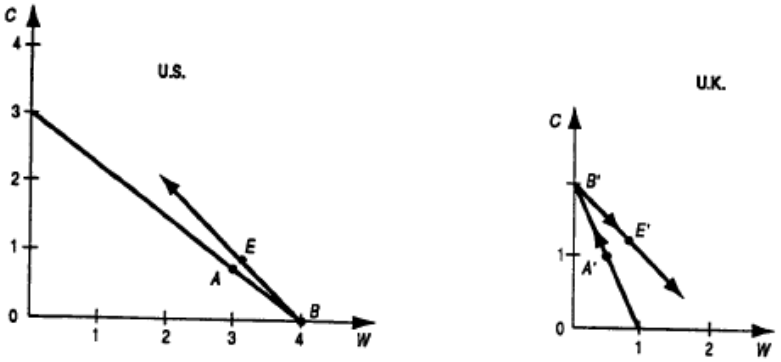


Figure 2

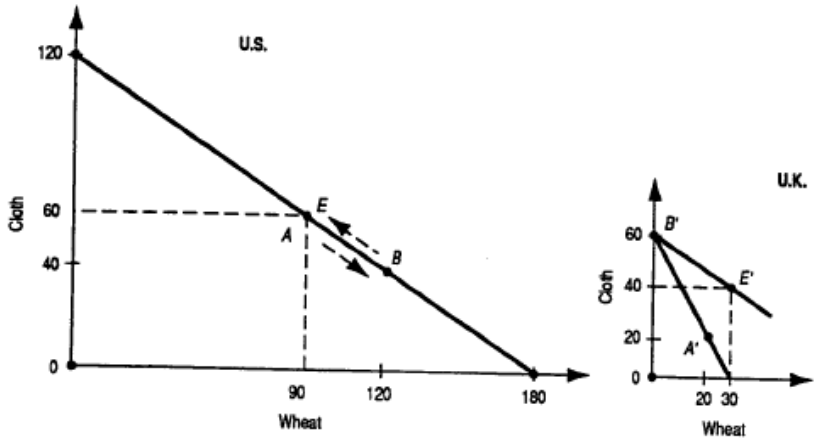


Figure 3

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10. If $D_{W(US+UK)}$ intersected $S_{W(US+UK)}$ at $P_W/P_C=2/3$ and 120W in the left panel of Figure 2.3, this would mean that the United States would not be specializing completely in the production of wheat.

The United Kingdom, on the other hand, would be specializing completely in the production of cloth and exchanging 20C for 30W with the United States. Since the United Kingdom trades at U.S. the pre-trade relative commodity price of $P_W/P_C=2/3$ in the United States, the United Kingdom receives all of the gains from trade.

11. See Figure 3 on page 15 and the discussion in the last paragraph of Section 2.6b in the text.

12. a) The Ricardian model was tested empirically by showing the positive correlation between relative productivities and the ratio of U.S.to U.K. exports to third countries and by the negative correlation between relative unit labor costs and relative exports

b) The Ricardian trade model was confirmed by the positive relationship found between the relative labor productivity and the ratio of U.S. to U.K. exports to third countries, as well as by the negative relationship between relative unit labor costs and relative exports.

c) Even though the Ricardian model was more or less empirically confirmed we still need other models because the former assumes rather than explains comparative advantage (i.e, it does not explain the reason for the different labor productivities in different nations) and cannot say much regarding the effect of international trade on the earnings of factors of production.

d) The United States has a comparative disadvantage in the production of textiles. Restricting textile imports would keep U.S. workers from eventually moving into industries in which the United States has a comparative advantage and in which wages are higher.

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Answer to Problem in Appendix 2

The numbers in the following table refer to the cost or price of commodities X, Y, and Z in nations A, B, and C in terms of the same currency. Thus, nation A exports commodity X to nations B and C; nation B exports commodity Y to nations A and C; nation C exports commodity Z to nations A and B.

		Nation		
		A	B	C
Commodity	X	1	2	3
	Y	3	1.5	2
	Z	4	3	2

Multiple-Choice Questions

1. The Mercantilists did not advocate:

*a.free trade
b. stimulating the nation's exports
c. restricting the nations' imports
d. the accumulation of gold by the nation

2. According to Adam Smith, international trade was based on:

*a. absolute advantage
b. comparative advantage
c. both absolute and comparative advantage
d. neither absolute nor comparative advantage

3. What proportion of international trade is based on absolute advantage?

a. All
b. most
*c. some
d. none

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4. The commodity in which the nation has the smallest absolute disadvantage is the commodity of its:

a. absolute disadvantage
b. absolute advantage
c. comparative disadvantage
*d. comparative advantage

5. If in a two-nation (A and B), two-commodity (X and Y) world, it is established that nation A has a comparative advantage in commodity X, then nation B must have:

a. an absolute advantage in commodity Y
b. an absolute disadvantage in commodity Y
c. a comparative disadvantage in commodity Y
*d. a comparative advantage in commodity Y

6. If with one hour of labor time nation A can produce either 3X or 3Y while nation B can produce either 1X or 3Y (and labor is the only input):

a. nation A has a comparative disadvantage in commodity X
b. nation B has a comparative disadvantage in commodity Y
*c. nation A has a comparative advantage in commodity X
d. nation A has a comparative advantage in neither commodity

7. With reference to the statement in Question 6:

a Px/Py=1 in nation A
b. Px/Py=3 in nation B
c. Py/Px=1/3 in nation B
*d. all of the above

8. With reference to the statement in Question 6, if 3X is exchanged for 3Y:

a. nation A gains 2X
*b. nation B gains 6Y
c. nation A gains 3Y
d. nation B gains 3Y

9. With reference to the statement of Question 6, the range of mutually beneficial trade between nation A and B is:

a $3Y < 3X < 5Y$
b. $5Y < 3X < 9Y$
*c $3Y < 3X < 9Y$
d. $1Y < 3X < 3Y$

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10. If domestically 3X=3Y in nation A, while 1X=1Y domestically in nation B:

a. there will be no trade between the two nations
b. the relative price of X is the same in both nations
c. the relative price of Y is the same in both nations
*d. all of the above

11. Ricardo explained the law of comparative advantage on the basis of:

*a. the labor theory of value
b. the opportunity cost theory
c. the law of diminishing returns
d. all of the above

12. Which of the following statements is true?

a. The combined demand for each commodity by the two nations is negatively sloped
b. the combined supply for each commodity by the two nations is rising stepwise
c. the equilibrium relative commodity price for each commodity with trade is given by the intersection of the demand and supply of each commodity by the two nations
*d. all of the above

13. A difference in relative commodity prices between two nations can be based upon a difference in:

a. factor endowments
b. technology
c. tastes
*d. all of the above

14. In the trade between a small and a large nation:

a. the large nation is likely to receive all of the gains from trade
*b. the small nation is likely to receive all of the gains from trade
c. the gains from trade are likely to be equally shared
d. we cannot say

15. The Ricardian trade model has been empirically

*a. verified
b. rejected
c. not tested
d. tested but the results were inconclusive

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Part One: International Trade Theory

Chapter 2
The Law of Comparative Advantage

"The division of labor, however, so far as it can be introduced, occasions, in every art, a proportional increase of the productive powers of labor."
Adam Smith, Wealth of Nations, Book I, Chapter I.

I. Chapter Outline

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II. Chapter Summary and Review

This chapter introduces and begins the development of the **law of comparative advantage.** Comparative advantage is the principal idea at the core of modern trade theory, so it is worthwhile to learn it well now. Subsequent material is more

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complex and assumes the law of comparative advantage is understood and mastered. Consequently, the summary of the material in this chapter will tend to be somewhat more extensive than subsequent summaries.

One prominent view of trade during the 17th and 18th centuries is known as **mercantilism**. Although mercantilism is a mostly loose collection of writings by merchants, government officials, and economists, there is a clear thread about trade that emerges. The mercantilist view of trade is that exports should be promoted because they produce payments from other countries, while imports should be discouraged because they produce payments to other countries. During the mercantilist period, gold or silver bullion was the primary form of domestic and international payments. This meant that an excess of exports over imports would generate an inflow of such bullion. In the mercantilist view, the accumulation of bullion is how a nation gains from international commerce, so the role of government is to pursue policies that encourage exports and discourage imports.

Mercantilist policies could be beneficial to a nation or special interest groups in a nation. Merchants constitute a special interest group that would gain either from the emphasis on increasing their production for export or from protecting their domestic activity from the competition of foreign imports. The mercantilist view also may make sense from the point of view of building a nation state in the 17th and 18th centuries. The accumulation of bullion as reserves can help finance military to consolidate and expand state power. Finally, an inflow of gold might also help economies in recession by increasing the money supply which would promote output and employment.

The mercantilist view of the world is a dim one, however, in that not all nations can be successful from the mercantilist perspective. Because one nation's exports are some other nation’s imports, an excess of exports over imports by one nation means that its trading partners must import more than they export. If one nation gains from trade, at least from a mercantilist perspective, by successfully exporting more than it imports, then the nation’s trading partners, as a group, must necessarily lose. In the mercantilist view, trade is a zero-sum game. Although some nations will gain from trade, defined as accumulation of bullion, the remaining nations, as a group, must lose an equal amount. According to the mercantilist view of the world then, the net world gain from trade is always zero and nations are pitted against each other in the arena of international trade. One nation’s gain comes only at the expense of other nations.

Although mercantilism was the predominant view of trade in the 17th and 18th centuries, it is important to note that modern views of trade, including the press and

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the person on the street, as well as national governments, are in many respects still mercantilists. A trade deficit (excess of imports over exports) generates a good deal of criticism in the popular press with demands for polices to correct the situation. This view often meets the approval of citizens.

It was largely in response to mercantilism that Adam Smith in his classic book, *An Inquiry into the Nature and Causes of the Wealth of Nations*, which was published in 1776, explained how trade produces gains to all nations. Smith argued that if two nations freely trade according to their strengths then both nations will gain. The strength of a nation was identified in terms of labor productivity. The nation with higher labor productivity in a good has an absolute advantage in the production of the good and so should produce the good for itself and other nations. In Smith's views both exports and imports are good if they occur willingly. If a nation freely exports a good, then both the exporting seller and the importing buyer must gain or the transaction would not be willingly made.

The concept of absolute advantage can be explained by considering two countries, each producing two goods with one input, labor. By comparing the productivity of labor, as measured by output per laborer per some time period in each country, the absolute advantage of each country can be determined. This is best demonstrated with a numerical example.

Table 2.1 provides assumed *units of output per laborer* (for some given time period, such as a day) for commodities X and Y in Nations 1 and 2. One laborer in Nation 1 can produce 10 units of Commodity X ***or*** 1 unit of Commodity Y. One laborer in Nation 2 can produce 1 unit of Commodity X ***or*** 20 units of Commodity Y. Because Nation 1 can produce more of Commodity X per laborer than Nation 2, Nation 1 has an absolute advantage in the production of Commodity X. Nation 2 can produce more of Commodity Y per laborer than Nation 1, so Nation 2 has the absolute advantage in Commodity Y.

Table 2.1: Output per Laborer and Absolute Advantage

	Nation 1	Nation 2
Commodity X	**10**	1
Commodity Y	1	**20**

Given the productivity of labor in the production of commodities X and Y, the world will be better off and each nation can be better off if Nation 1 produces Commodity X and Nation 2 produces Commodity Y. For every laborer shifted from Commodity Y to Commodity X in Nation 1, there will be 1 unit of Commodity Y lost and 10 units of Commodity X gained. In Nation 2, every laborer shifted from

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Commodity X to Commodity Y will produce a loss of 1 unit of Commodity X and a gain of 20 units of Commodity Y.

These gains and losses due to a reallocation of one unit of in each nation labor are recorded in Table 2.2. Table 2.2 also shows in the last column the *net changes* in total production in the world. The consequence of reallocating each unit of labor in each nation towards the good in which it has the absolute advantage is an increase in world production. ***Specialization according to absolute advantage increases world production.***

Table 2.2: Changes in Production from Reallocating One Unit of Labor

	Nation 1	Nation 2	World
Change in Production of X	+10	-1	+9
Change in Production of Y	-1	+20	+19

Note at this point that the reallocation of labor does increase production of one good in each nation, but it decreases the production of the other good. Nation 1 has more of Commodity X, but less of Commodity Y, while Nation 2 has more of Commodity Y and less of Commodity X. World production has increased, but each country has less of one good.

In this example, both nations could realize an increase in the availability of both goods if they exchanged with each other. Suppose, given the changes in production in Table 2.2, that Nation 1 exports 5 units of Commodity X in return for 5 units of Commodity Y from Nation 2. The results are shown Table 2.3.

Table 2.3: Goods Available After Exchanging 5 Units of X for 5 Units of Y

	Nation 1	Nation 2
Change in X Available	+5 (10-5)	+4 (-1+5)
Change in Y Available	+4 (-1+5)	+15 (20-5)

The numbers in parentheses are the production changes from Table 2.2 to which exports are added or imports are subtracted. For example, the (-1+5) in under Nation 2 for the “Change in X Available” row is the Change in Production from Table 2.2 plus imports of 5 units. Table 2.3 shows that after the reallocation of labor, trade increases the quantity of goods available in each nation. ***Each nation can be made better off by producing and exporting the good in which it has an absolute advantage and importing the good in which their trading partner has the absolute advantage.***

In the above example, the rate at which Y exchanges for X is five-for-five. There are other rates at which Y will exchange for X for which both nations gain, but

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the **gains from trade** will be distributed differently than is shown in Table 2.3. The rate at which goods will trade and how the gains will be distributed between nations will be developed in Chapter 4.

The concept of absolute advantage brings up the question of what happens when one country has the absolute advantage in both goods, an example of which is shown in Table 2.4. In a two-nation, two-good model, will the nation with the absolute advantage in both goods out-compete the other nation? A contribution of the British economist David Ricardo (1772-1823) to international trade theory was to show that it is **comparative advantage** rather than absolute advantage that determines the **pattern of trade** between countries, although in many cases the two advantages are identical.

Table 2.4: Output per Laborer and Comparative Advantage

	Nation 1	Nation 2
Commodity X	**10**	1
Commodity Y	5	**1**

If a nation has an absolute advantage in both goods its comparative advantage exists where its absolute advantage is relative greater. If a nation has an absolute disadvantage in both good its comparative advantage exists where its absolute disadvantage is relatively smaller.

In Table 2.4, Nation 1 has the absolute advantage in both goods, but Nation 1's absolute advantage is relatively larger for Commodity X (a ten-to-one ratio) than for Commodity Y (a five-to-one ratio), so Nation 1 has a comparative advantage in Commodity X. Nation 2 has an absolute disadvantage in both goods, but its disadvantage is relatively less in Commodity Y, so Nation 2 has a comparative advantage in Commodity Y.

Based on comparative advantage, Nation 1 should specialize in Commodity X and export it to Nation 2 in exchange for Commodity Y. Nation 2 should specialize in Commodity Y and export it to Nation 1 in exchange for Commodity X.

To show this, assume a reallocation of labor in each nation. Let Nation 1 reallocate 1 laborer towards Commodity X, the good in which Nation 1 has a comparative advantage. Let Nation 2 reallocate 7 laborers towards Commodity Y, the good in which Nation 2 has a comparative advantage. As shown in Table 2.5, world production increases as nations specialize according to comparative advantage. ***Specialization according to comparative advantage can increase world production.***

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Table 2.5: Changes in Production from Reallocating Labor
Nation 1: Reallocation of 1 Laborer
Nation 2: Reallocation of 7 Laborers

	Nation 1	Nation 2	World
Change in Production of X	+10	-7	+3
Change in Production of Y	-5	+7	+2

As in the case shown in Table 2.2, specialization does increase world production and the production of one commodity in each nation, but the production of the other commodity is reduced in each nation. Exchange, however, can now increase the amounts of both commodities available in both nations. Assume that 8 units of X exchange for 6 units of Y. If Nation 1 exports 8 units of X in return for 6 units of Y, then Nation 1 will have more of both goods. This rate of exchange will mean Nation 2 imports 8 units of X and exports 6 units of Y. The goods available to each nation as a result of the exchange are shown in Table 2.6.

Table 2.6: Goods Available After Exchange of 8 Units of X for 6 Units of Y
Nation 1: Exports 8 units of X, imports 6 units of Y
Nation 2: Exports 6 units of Y, imports 8 units of X

	Nation 1	Nation 2
Change in X Available	+2 (10-8)	+1 (-7+8)
Change in Y Available	+1 (-5+6)	+1 (7-6)

Because specialization increased the amount of goods available there must be some way to share the increased production to make both nations better off. Exchanging at the rate of 8 units of X for 6 units of Y is one way to increase the quantity of both goods in both nations.

The conclusion is worth summarizing and emphasizing: ***Even if a nation has an absolute advantage in the production of both goods, two nations can engage in mutually beneficial trade if each nation specializes in and exports the good in which it has the comparative advantage.***

The point of comparative advantage can also be understood in the activities of individuals. If individuals do not specialize and exchange, then each individual must produce all of the goods that each individual consumes. Consider your own consumption if you had to produce all of the goods that you consume, e.g., automobiles, houses, air travel, education, clothes, food, etc. Individuals specialize in order to increase production and then exchange in order to realize those gains

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from production. Without the ability to exchange goods and services, we would be unable to trade the surplus of goods in which we specialize for the surplus of goods in which others specialize. Although self-sufficiency may be appealing, the cost of self-sufficiency is a significantly lower standard of living.

The above description of trade was described in terms of bartering some number of units of Commodity X for some number of units of Commodity Y. If instead, monetary exchange is introduced, whereby money is exchanged for X and Y, then the outcomes are identical to the barter analysis.

In a monetary economy exchange takes place on the basis of monetary prices that each nation's citizens convert to their own currency using an exchange rate. If, for example, good X that is produced in the US has a selling price of $2 and the exchange rate is 20 Mexican pesos per dollar, then the price of the good to Mexicans is 40 pesos. Mexicans will compare that 40 peso price for good X produced in the US with the price of good X produced in Mexico. The price of a good, in turn, depends upon the cost of producing it which is dependent on the wage rate of labor and the productivity of labor.

Suppose that at some wage rates in US and Mexico and some exchange rate between the peso and the US dollar that the US has cheaper prices for all goods. Although this situation is possible, it is a disequilibrium situation that cannot be maintained. There will be demand, from both nations, for the products of the US but no demand for the products of Mexico. The demand for the products produced by the laborers of US will cause the wage rate in the US to increase relative to the wage rate in Mexico, and the cost of a dollar on the foreign exchange market to increase. The increase in US wages and the cost of the dollar on the foreign exchange market will cause the price of products produced in the US to increase. The lack of demand for products produced by the laborers of Mexico will cause the wage rate in Mexico to decrease, and the cost of peso on the foreign exchange market to fall, both of which will lower the price of Mexican products. This will continue until there is some demand for Mexican products. There will also have to be demand for US products or the reverse would occur. The product in which Mexico will eventually compete will be the product in which it has the smaller absolute disadvantage because prices will not have to fall as much for this product in order to make Mexico competitive. An example of comparative advantage in a monetary economy and possible equilibrium wages and exchange rates is provided in Question 4 of Section III below.

The comparative advantage model rejects the argument that nations with lower wages will perpetually out-compete nations with high wages, and that nations

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with higher productivity will perpetually out-compete nations with lower productivity. It is not wages alone or productivity alone that determines competitiveness, but wages relative to productivity. If one nation has lower prices for all goods due to low wages, then it is a disequilibrium situation. This "sweatshop labor" argument fails to consider that in such a situation, wages, the value of the nation's currency, and the prices of its goods will increase. Similarly, high productivity nations will not continually out-compete low productivity nations. If a nation has lower prices for all goods due to high productivity, then it is also a disequilibrium situation that will produce an increase in wages, the value of the nation's currency, and the prices of its goods.

Comparative advantage was identified above as greater relative absolute advantage or smaller relative absolute disadvantage. A more appealing and equivalent explanation of comparative advantage is in terms of **opportunity cost**.

The opportunity cost of one unit of a good is defined as the number of units of one good foregone in order to produce one unit of another good. For example, if 1 unit of Commodity Y must be given up to release the resources necessary to produce 2 units of Commodity X, then the opportunity cost of Commodity X is ½. This can be written as,

$$\text{Opportunity Cost of one unit of X} = \Delta Y/\Delta X = ½.$$

The "½" refers to the quantity of good Y that must be given up in order to release the resources (in this case, labor) necessary to produce 1 unit of good X.

Indicate the opportunity cost of good X in Nation 1 as $(\Delta Y/\Delta X)_1$ and in Nation 2 as $(\Delta Y/\Delta X)_2$. Now suppose that $(\Delta Y/\Delta X)_1 < (\Delta Y/\Delta X)_2$. This says the amount of Y that must be given up in Nation 1 to produce a unit of X is less than that of Nation 2. In producing Commodity X it is better for it to be produced in Nation 1 because fewer units of Commodity Y will be given up to produce Commodity X. Because the opportunity cost of X is lower in Nation 1, Nation 1 has a comparative advantage in the production of good X. Return to Table 2.4 and verify that Nation 1 has a lower opportunity cost in producing Commodity X than Nation 2, and that Nation 2 has a lower opportunity cost in producing Commodity Y.

Expressing cost in terms of opportunity cost makes it apparent that if one nation has a comparative advantage in the production of one good, then the other nation *must* have a comparative advantage in the other good. To see this first note that the opportunity cost of X, $\Delta Y/\Delta X$, is just the inverse of the opportunity cost of Y.

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The inverse of $\Delta Y/\Delta X$ is $\Delta X/\Delta Y$, which is the number of units of X given up to produce one unit of Y.
If

$$(\Delta Y/\Delta X)_1 < (\Delta Y/\Delta X)_2,$$

then it is necessarily the case that

$$(\Delta X/\Delta Y)_1 > (\Delta X/\Delta Y)_2.$$

If Nation 1 has a lower opportunity cost for X, then Nation 2 must have a lower opportunity cost for Y. Thus, it is impossible for one nation to have a comparative advantage in the production of both goods.

III. Questions

1. The outputs per laborer per day in the production of computers and autos in Nation 1 and in Nation 2 are given in the table below.

Output per Laborer

	Nation 1	Nation 2
Autos	2	4
Computers	6	4

a) Which nation has the absolute advantage in each good?

b) Fill in the blanks in the table below, assuming that one unit of labor is transferred in each country towards the good in which it has the absolute advantage.

Changes in Production from Reallocating One Unit of Labor

	Nation 1	Nation 2	World
Change in Production of Autos	___	___	___
Change in Production of Computers	___	___	___

c) Will both nations gain if 4 autos can be exchanged for 4 computers?

d) Will both nations gain if 2 autos can be exchanged for 6 computers?
e) Will both nations gain if 2 autos can be exchanged for 4 computers?

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f) What do your answers suggest about the effect of the terms of trade on the gains from trade for each nations and what a mutually beneficial terms of trade might be?

g) Calculate the opportunity cost of one automobile in each country.

h) Calculate the opportunity cost of one computer in each country.

i) Do Nations 1 and 2 have a comparative advantage in the same good in which each has an absolute advantage?

2. The outputs per laborer per day for Tanzania and Zaire for fish and lumber are given in the table below.

Output per Laborer per Day

	Tanzania	Zaire
Fish	6	4
Lumber	8	2

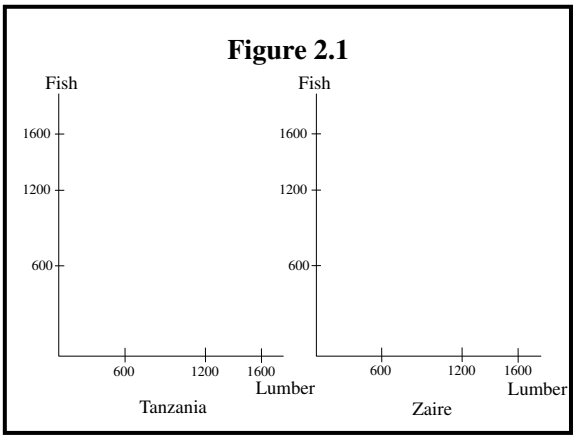
a) Which nation has the absolute advantage in each product?

b) Calculate the opportunity cost of a unit of Lumber in Tanzania and in Zaire.

c) Which nation has the comparative advantage in each product?

d) Suppose 300 total labor-days are available in Zaire, and 200 total labor-days are available in Tanzania. Assuming the numbers in the above table are constant at all levels of production, draw the **production possibility frontier** for Tanzania and for Zaire in Fig. 2.1.

Figure 2.1



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e) Is it in the joint interest of Tanzania and Zaire to completely specialize in the good in which each has the comparative advantage?

f) Suppose each nation does **completely specialize** in the good in which it has a comparative advantage. Use "P" to indicate these production points in Fig. 2.1.

3. Refer to the table and the production possibility frontiers produced in Question 2.

a) Assume that Tanzania completely specializes in the production of Lumber.
   i) What is the opportunity cost of obtaining 6 Fish in Tanzania?
   ii) Calculate $(\Delta F/\Delta L)_{TANZ}$.

b) Will Tanzania willingly export Lumber in exchange for Fish from Zaire if the terms of international trade are 8 Lumber for 6 Fish?

c) Will Tanzania willingly trade with Zaire if the terms of trade are 8 Lumber for 5 Fish?

d) Will Tanzania willingly trade if the terms of trade are 8 Lumber for 7 Fish?

e) Based on your answer to part d, circle the correct inequality below if Tanzania is to gain from trade.

$$(\Delta F/\Delta L)_{\text{Terms of Trade}} \textbf{ > or < } (\Delta F/\Delta L)_{TANZ}$$

f) Calculate $(\Delta F/\Delta L)_{ZAIRE}$.

g) Calculate the acceptable terms of trade for Zaire.

h) Calculate the range of the possible terms of trade that will be acceptable to both Tanzania and Zaire.

4. The outputs per laborer per day for wine and cheese for France and the U.S. are provided in the table below. Labor is the only input.

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Output per Laborer per Day

	France	U.S.
Wine	5	10
Cheese	20	25

The current wage rate in France is 40 Euros per day, while in the U.S. it is $100 per day. Assume that the current exchange rate is one Euro per one U.S. dollar.

a) Fill in the table below, calculating French prices using the wage rate of 40 Euros per day and U.S. prices using the wage rate of $100 per day. With labor as the only input, the price of cheese and wine will equal the cost of labor to produce that cheese if markets are competitive (price equals the average cost of production in competitive markets in the long run). For example, the price of wine in France is 8 Euros because one laborer makes 5 units of cheese and one laborer costs 40 Euros. (Price = Wage/Production per laborer.)

Price of Wine and Cheese in France and the U.S. Measured in Euros

	France	U.S.
Price of Wine (in Euros)	**8**	___
Price of Cheese (in Euros)	___	___

b) Will the low productivity country in this example initially dominate trade as a result of low wages?

c) Suppose the exchange rate between France and the U.S. is fixed at one Euro per one U.S. dollar and cannot change. Explain why the situation given in the price table above is a disequilibrium situation and how wages and prices will change in France and the U.S.

d) Now suppose that wages in France and the U.S. cannot change, but the exchange rate is allowed to vary. What will happen to the exchange rate and to prices in the U.S., expressed in Euros?

e) Explain the fallacy in the argument that a nation with high wages (a rich country) cannot mutually beneficially trade with a nation with very low wages (a poor country).

5. Nation 1 has 100 laborers and Nation 2 has 200 laborers. The labor productivity of each nation for bicycles and shoes is given in the table below.

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Output Per Labor Day

	Nation 1	Nation 2
Bicycles	1	30
Shoes (pairs)	1	20

a) Draw the daily production possibility frontier for each nation, with Bicycles on the vertical axis.

b) Which nation has a higher standard of living before trade? (Assume the population is the same as the number of laborers.)

c) Calculate the opportunity cost of a pair of Shoes in each nation, and the opportunity cost of a Bicycle in each nation.

d) Can these two nations, with very different standards of living, beneficially trade with each other?

e) Suppose now that one laborer in Nation 2 can produce 30 units of Shoes or 30 Bicycles per day. Can these two nations beneficially trade with each other now?

6. The production possibility frontiers for two countries are shown in Fig. 2.2.

Figure 2.2 Production Possibility Frontiers

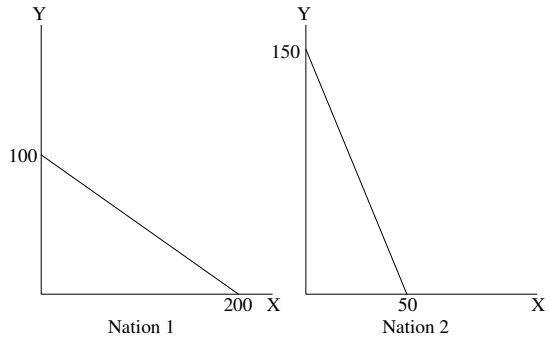
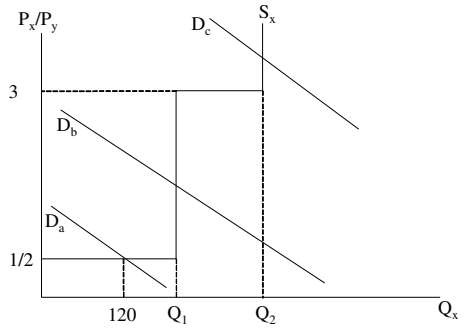


Figure 2.3: World Supply and Demand



a) Which nation has the comparative advantage in good X? Explain in terms of opportunity cost.

b) What do these linear production possibility frontiers assume about how costs change as production changes?

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c) Based on the production possibility frontiers in Fig. 2. 2, what are the values of Q_1 and Q_2 in Fig. 2.3?

d) How much of goods X and Y is produced by each nation if world demand is D_a in Fig. 2.3?

e) How much of goods X and Y is produced by each nation if world demand is D_b in Fig. 2.3?

f) How much of goods X and Y is produced by each nation if world demand is D_c in Fig. 2.3?

7. Ricardo's concept of comparative advantage shows that trade can occur if the relative productivity of labor differs across countries.
a) Based on Figure 2.4 in *International Economics*, can the export performance of the U.S. relative to the U.K. be explained by relative labor productivities?
b) The Ricardian model is based on relative labor productivities, but does not explain relative labor productivities. Why might labor productivity differ across nations?

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