

Determining Comparative Advantage

Nations trade on the basis of comparative advantage, but how do we determine who has a comparative advantage? To do this, we need to calculate each country's or person's opportunity costs for both activities. The way we calculate opportunity cost depends crucially on how the productivity data are expressed.

There are two ways to measure productivity: We can calculate output over a given period of time, or we can measure it by the amount of inputs (usually time) necessary to do an activity. Examples of output are tons per acre, miles per gallon, words per minute, apples per tree and televisions produced per hour. Examples of input are number of hours to do a job, number of gallons of paint to paint a house, number of acres to feed a horse and number of pitches to throw a strike. We are going to work through two examples that measure productivity differently.

Part A Productivity Measures and Example Problems

Output Method

	Tons Produced per Hour	
	Fish (A)	Cheese (B)
Ted	60	25
Nancy	45	40

For Ted, the opportunity cost of producing fish in terms of cheese is 60 fish = 25 cheese; therefore 1 fish = $\frac{5}{12}$ cheese. On the other hand, 1 cheese = $\frac{12}{5}$ fish. Similarly we can calculate the opportunity costs for Nancy. We summarize the opportunity cost information in the table below.

	Opportunity Cost (B / A) Fish	Opportunity Cost (A / B) Cheese
Ted	$\frac{5}{12}$ (0.42) cheese	$\frac{12}{5}$ (2.4) fish
Nancy	$\frac{8}{9}$ (0.89) cheese	$\frac{9}{8}$ (1.125) fish

Ted should produce fish because his opportunity cost in terms of cheese is less than Nancy's opportunity cost. Nancy should produce cheese because her opportunity cost in terms of fish is less than Ted's opportunity cost to produce cheese. Ted producing fish and Nancy producing cheese yields the *most* fish and cheese per hour of any combination of production.

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Input Method

	Acres Required to Produce One Bushel	
	Apples (A)	Pears (B)
Tony	5	2
Chris	6	3

For the input method, the opportunity cost of producing one apple in terms of pears requires that we initially convert the input (acres) into output. For Tony, 5 acres = 1 apple; therefore, 1 acre = $\frac{1}{5}$ apple. Also 2 acres = 1 pear; therefore, 1 acre = $\frac{1}{2}$ pear. Now you can use the same method as for the output method: $\frac{1}{5}$ apple = $\frac{1}{2}$ pear; therefore 1 apple = $\frac{5}{2}$ pear. Likewise 1 pear = $\frac{2}{5}$ apple. We summarize the opportunity costs in the following table.

	Opportunity Cost (B / A)	Opportunity Cost (A / B)
	Apples	Pears
Tony	$\frac{5}{2}$ (2.5) pears	$\frac{2}{5}$ (0.40) apples
Chris	$\frac{6}{3}$ (2) pears	$\frac{3}{6}$ (0.50) apples

Tony has the comparative advantage in producing pears. To produce one bushel of pears, Tony must give up 0.40 bushels of apples, whereas Chris has to give up half (0.50) of a bushel of apples. Thus, the opportunity cost of a bushel of pears is lower for Tony than for Chris, and so Tony should produce pears. Conversely, Chris should produce apples because he has the lower opportunity cost in terms of forgone bushels of pears.

Part B

Practice Problems

First decide whether the problem is an output or input problem; underline *output* or *input*. Then in the space below the table, calculate the opportunity cost of each product and indicate the product with the lower opportunity cost for each person, firm or country. The first one is completed for you.

1. Anna and Barry can grow the following amounts of potatoes and cabbage with the same amount of labor. Type of problem: (output / input)

	Potatoes	Cabbage
Anna	100	200
Barry	120	150

For Anna, the opportunity cost of one potato is two cabbages; for Barry, the opportunity cost of one potato is 1.25 cabbages. Barry has to give up fewer cabbages than does Anna to grow one potato. Thus, the opportunity cost of potatoes is lower for Barry than for Anna, so Barry should grow potatoes. Conversely, to grow one cabbage, Anna must give up one-half potato and Barry must give up 0.80 potato. Thus, the opportunity cost of growing cabbages is lower for Anna than it is for Barry, so Anna should grow cabbages.

2. Number caught per day. Type of problem: *(output / input)*

	Deer	Antelope
Henry	4	6
John	24	12

3. Days to produce one unit of each. Type of problem: *(output / input)*

	Cars	Planes
XYZ Corp.	8	10
QKFX Corp.	15	12

4. Acres to produce 100 bushels. Type of problem: *(output / input)*

	Corn	Rice
India	9	3
China	8	2

5. To produce the following from one ton of olives. Type of problem: (*output / input*)

	Cans of Olives	Bottles of Olive Oil
Zaire	60	10
Colombia	24	8

6. Why should a person, firm or country produce the product that has the lower opportunity cost and trade for the other product?

Economic Efficiency and Gains from Trade

The following comparative advantage problems illustrate how two nations can trade even if one is more efficient at producing both products. The country that is more efficient in the production of a good is the country that can produce the good with the least input. In other words, if the United States can produce a ton of oats in three hours and Scotland can produce a ton of oats in four hours, the United States is more efficient in the production of oats. In the language of economics, the United States would have an *absolute advantage* in the production of oats.

A nation has a *comparative advantage* in the good in which it has the lower opportunity cost. The nation should specialize in the good for which it has the lower opportunity cost and trade for the good for which the other country has the lower opportunity cost. A nation with an absolute advantage in the production of both goods will have a comparative advantage in the production of only one of these goods.

Terms of trade is the exchange rate between two commodities, for example, two bananas for 30 grapes. The *gains from trade* are the additional amount of commodities a country has after specialization and trade in comparison with the combination before specialization and trade. For example, a country may gain five bananas relative to the total amount of bananas it had when producing only with its own resources.

Underline the correct words in parentheses and complete the questions.

1. The following table gives the number of hours it takes in the United States and Scotland, using the same amount of resources, to produce a ton of oats or one bagpipe.

	Oats	Bagpipe
United States	3 hours	2 hours
Scotland	4 hours	5 hours

- (A) (*The United States / Scotland*) has an absolute advantage in the production of oats.
- (B) (*The United States / Scotland*) has an absolute advantage in the production of bagpipes.
- (C) (*The United States / Scotland*) has a comparative advantage in the production of oats because
- (D) (*The United States / Scotland*) has a comparative advantage in the production of bagpipes because
- (E) Based only on the data above and comparative advantage considerations, the United States should specialize in (*oats / bagpipes*).
- (F) Based only on the data above and comparative advantage considerations, Scotland should specialize in (*oats / bagpipes*).
- (G) Why will both Scotland and the United States be better off if they specialize and trade?
- (H) Suppose that Scotland and the United States agree to specialize according to comparative advantage and to the following terms of trade: 1 ton of oats for 1 bagpipe. In a production period there are 60 hours, and before specialization Scotland produced 7.5 tons of oats and six bagpipes. After specialization and trade with the United States, Scotland wants to maintain the six bagpipes. How many tons of oats will it have? What are its gains from trade?

2. The following table gives the number of hours it takes in the United States and Canada, using the same amount of resources, to produce a ton of wheat or one bolt of cloth.

	Wheat	Cloth
United States	1 hour	2 hours
Canada	3 hours	4 hours

- (A) (*The United States / Canada*) has an absolute advantage in the production of wheat.
- (B) (*The United States / Canada*) has an absolute advantage in the production of cloth.
- (C) (*The United States / Canada*) has a comparative advantage in the production of wheat because
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- (D) (*The United States / Canada*) has a comparative advantage in the production of cloth because
- (E) Based only on the data above and comparative advantage considerations, the United States should specialize in (*wheat / cloth*).
- (F) Based only on the data above and comparative advantage considerations, Canada should specialize in (*wheat / cloth*).
- (G) Why will both Canada and the United States be better off if they specialize and trade?
- (H) Suppose that Canada and the United States agree to specialize according to comparative advantage and to the following terms of trade: three tons of wheat for two bolts of cloth. In a production period, there are 60 hours; and before specialization, Canada produced nine tons of wheat and 8.25 bolts of cloth. After specialization and trade with the United States, Canada wants to maintain the nine tons of wheat for each production period. How many bolts of cloth will it have? What are its gains from trade?

3. The following table gives the number of hours it takes in the United States and Japan, using the same amount of resources, to produce one computer or one auto.


	Computer	Auto
United States	2 hours	5 hours
Japan	1 hour	4 hours

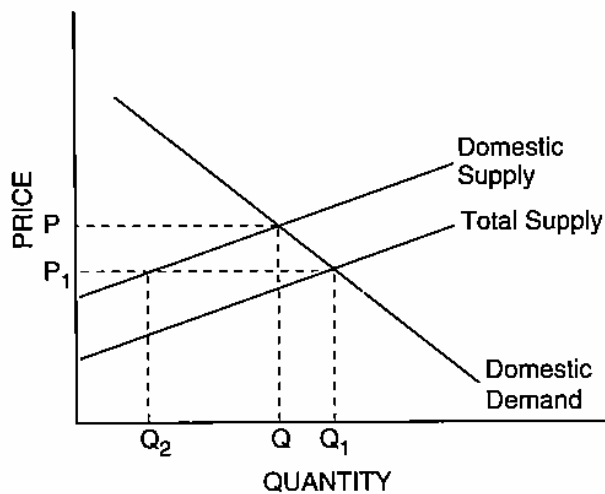
- (A) (*The United States / Japan*) has an absolute advantage in the production of computers.
- (B) (*The United States / Japan*) has an absolute advantage in the production of autos.
- (C) (*The United States / Japan*) has a comparative advantage in the production of computers because
- (D) (*The United States / Japan*) has a comparative advantage in the production of autos because
- (E) Based only on the data above and comparative advantage considerations, the United States should specialize in (*computers / autos*).
- (F) Based only on the data above and comparative advantage considerations, Japan should specialize in (*computers/autos*).
- (G) Why will both Japan and the United States be better off if they specialize and trade?
- (H) Suppose that Japan and the United States agree to specialize according to comparative advantage and to the following terms of trade: three computers for one auto. In a production period there are 60 hours; and before specialization, Japan produced 40 computers and five autos. After specialization and trade with the United States, Japan wants to maintain the five autos for each production period. How many computers will it have? What are its gains from trade?

Barriers to Trade

The free trade movement started about 200 years ago. Previously, it appears that one of the goals of governments was to stifle international trade, presumably for the benefit of their own economies. Over the last 50 years, there have been efforts to reduce trade barriers, with significant success during the 1990s. Examples of these efforts include the North American Free Trade Agreement (NAFTA), the World Trade Organization (WTO), the European Union (EU) and the Asia-Pacific Economic Cooperation (APEC) forum.

We want to be able to investigate the economic effects of various barriers to trade that a nation might impose to protect domestic industries. In Figure 51.1, the demand curve represents the demand by the domestic economy for a commodity that is produced domestically and also imported. The domestic supply curve indicates what the domestic suppliers are willing and able to produce at alternative prices. If there were no international trade or a complete ban on imports, the equilibrium price would be P , and the equilibrium quantity, Q , would be produced only by domestic firms.

 Figure 51.1
International Trade



If there is free international trade, the Total Supply curve represents the production by domestic and foreign producers. Domestic consumers would pay P_1 and consume Q_1 : They are able to consume more of the commodity at a lower price. Also, at P_1 , domestic firms are producing Q_2 and foreign producers are producing $(Q_1 - Q_2)$. Thus, domestic firms are producing less under free trade than they would if the nation did not import the commodity.

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Part A


Quotas

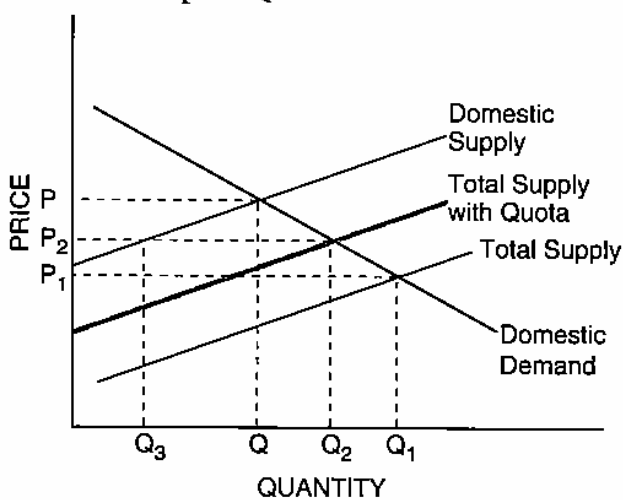
Instead of permitting free trade or imposing a complete ban, a nation may decide to set a quota to limit the number of imports. Import quotas are sometimes referred to as *voluntary export restraints* (VERs) because the two countries have agreed that the exporting nation will not export more than a certain amount.

We can see the effect of an import quota by looking at Figure 51.2. Here the domestic price would be P and the quantity would be Q if there were a complete import ban. If there were free trade, the price would be P_1 and the quantity demanded by domestic consumers would be Q_1 .

Notice that under free trade, the entire market is supplied by foreign producers as the market is drawn in Figure 51.2. This does not have to be the case; it depends on the costs of the domestic industry and the domestic industry's ability to sell at the lower price.

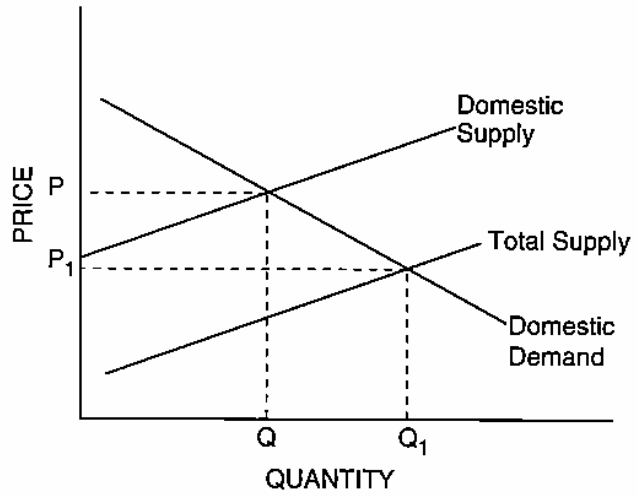
Suppose the importing nation imposes a quota, or VER, of X amount; the Total Supply with Quota curve represents the new supply curve. Total Supply with Quota is the domestic supply curve plus X amount at every price level ($X = Q_2 - Q_3$). The domestic price has risen from P_1 to P_2 , and consumers are able to purchase less of the commodity. Equilibrium quantity has decreased from Q_1 units to Q_2 units. However, domestic producers are now producing Q_3 units, and foreign producers are supplying $X = Q_2 - Q_3$.

 Figure 51.2
Effects of Import Quota



1. Use Figure 51.3 to demonstrate what will happen to the domestic price, domestic production and the amount of imports if a quota is removed. The Domestic Supply and Total Supply curves on the graph are without any barriers to trade imposed. Be sure to show on the graph the supply curve with the quota. It is not on the graph now.


* Figure 51.3
Eliminating a Quota

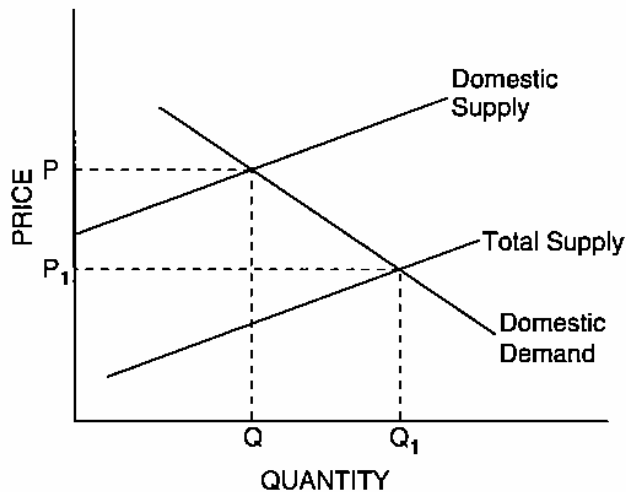


Part B
Tariffs

A tariff is a tax on an import. The imposition of a tax increases the cost of each unit, which is represented by a decrease in supply. This would result in an increase in equilibrium price and a decrease in equilibrium quantity.

4. Modify Figure 51.4 to show the effect of an import tariff of \$T per unit. Be sure to show on the graph the amount of the tariff. Add one curve to the graph, and label it Total Supply with Tariff. After the imposition of the tariff, label the new equilibrium price P_T and the equilibrium quantity Q_T .

 Figure 51.4
Effect of Import Tariff



5. What is the effect of the tariff on the equilibrium price and quantity for domestic consumers compared with the free trade levels?

6. What are the similarities between the effects of a quota and those of a tariff?

7. What is the primary difference between the effects of a quota and those of a tariff?

8. Suppose a country can impose either a quota that raises the domestic price to P_2 as in Figure 51.2 or a tariff that raises the domestic price to P_2 . Explain whether domestic consumers would prefer a tariff or a quota and why.

Part C

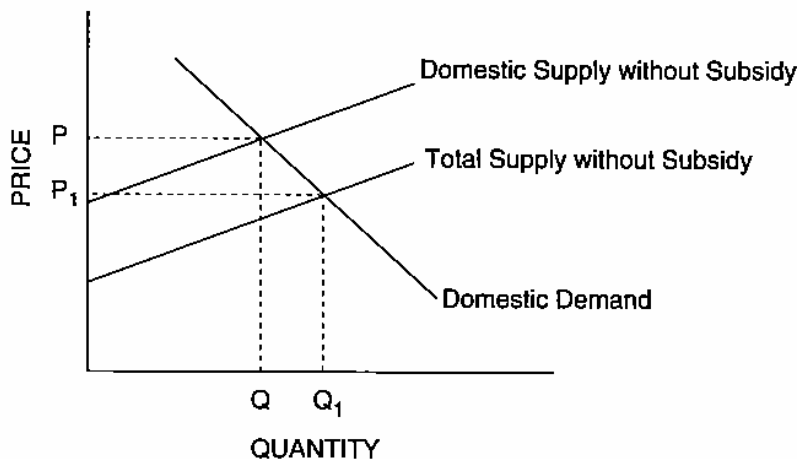
Export Subsidies

Nations may choose to assist domestic industries by providing subsidies to an industry. The subsidies would lower the costs and permit the industry to sell at a lower price. This assistance is called an *export subsidy* because the industry can now compete on the world market and export some of its product to other nations.

9. Modify Figure 51.5 to show the effects of an export subsidy on domestic producers. Indicate as P_S and Q_S the equilibrium price and quantity for domestic consumers after an export subsidy. Add two curves to the graph: a Domestic Supply with Subsidy curve and a Total Supply with Subsidy curve.



Figure 51.5
Effects of a Subsidy



According to Figure 51.5 with your modification, what would be the equilibrium price and quantity for

- (A) a completely closed economy (no imports and no subsidy)? _____
 - (B) an open economy (completely free trade) with no export subsidy? _____
 - (C) an open economy with a domestic export subsidy? _____
10. What is the effect of an export subsidy on the equilibrium price and quantity for domestic consumers relative to the free trade equilibrium without a subsidy?
11. If an industry receives a subsidy, what will happen at the equilibrium to domestic production and the amount of imports?

