

# Chapter 2

## Tools of Analysis for International Trade Models

This chapter develops the theory underlying two dimensional general equilibrium trade models. In particular, it considers topics such as the importance of relative (vs. nominal) prices in economic decision making; the role of opportunity costs in determining the shape of the production possibility frontier; and consumer choice and the difficulty in extending this analysis to community choice. Students are taught how to solve simple general equilibrium models for consumption and production points and the autarky relative price. Finally, they are shown why differences in pretrade relative prices might serve as an incentive for international trade. When teaching this material, we find it helpful to solve the autarky model and then to consider the effect of changes in supply and demand conditions. For instance, it is straightforward to show how a technological innovation in the production of, say, *S* would affect the PPF and relative prices. This procedure reinforces to the students the notion that the forces of supply and demand work in this setting as well and helps to convince them that they can work with this form of analysis.

The obvious intent of this chapter is to lay a theoretical foundation for the material that is to come. That is why we discuss these topics in terms of a progression of assumptions. With the possible exceptions of our increased emphasis on relative prices and our treatment of community indifference curves, most of this material should be a review for the students. Nonetheless, it is a vital review—and we think it should be emphasized as such—since virtually all of the tools of analysis used in later chapters are developed here. Consequently, in teaching this material we try to emphasize to the students that despite all of the discussion of autarky, we *are* building a model of international trade. However, these assumptions must be made first.

### ■ Chapter Outline

Introduction

Some Methodological Preliminaries

The Basic Model: Assumptions

*Global Insights 2.1: World Response to Higher Relative Price of Oil*

The Basic Model: Solutions

Measuring National Welfare

National Supply and Demand

Summary

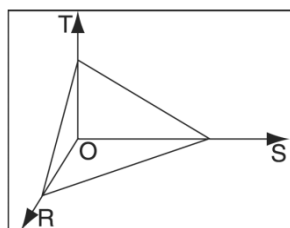
Exercises

*Appendix 2.1: Derivation of National Supply and Demand Curves*

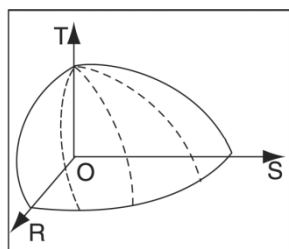
## ■ Suggested Answers for the End-of-Chapter Exercises

- Suppose that the economy produces three goods—raisins ( $R$ ), soybeans ( $S$ ), and textiles ( $T$ ). What would its PPF look like under conditions of constant opportunity costs? What would it look like with increasing opportunity costs?

With three goods, we have a three dimensional figure with three axes,  $R$ ,  $S$  and  $T$ . With constant opportunity costs, the PPF is a plane instead of a line.



Again, three goods requires a three dimensional picture with three axes. But in the case of increasing opportunity costs, the figure will look like a hemisphere rather than the plane above.



- Using the following data, calculate the country's nominal and real GDP levels.

	$P_s$	$S$	$P_T$	$T$
a.	\$ 5	20	\$1	15
b.	\$10	20	\$2	15
c.	\$ 4	40	\$8	12
d.	\$ 4	60	\$8	18

Using  $GDP = P_s \times S + P_T \times T$  to calculate nominal GDP, and  $GDP/P_T = (P_s/P_T) \times S + T$  to calculate real GDP, we find:

	Nominal GDP	Real GDP
a.	\$115	\$115
b.	\$230	\$115
c.	\$256	\$ 32
d.	\$384	\$ 48

- Using your calculations from Exercise 2, compare changes in nominal and real GDP between cases a and b. Explain your result.

Real GDP is constant in cases a and b. because real output is the same in the two cases—only the prices have changed. Since the prices doubled, we would expect nominal GDP to double as well.

4. Suppose the economy is characterized by constant opportunity costs so that  $P_S/P_T = 1.5$ . Derive the economy's national supply schedule. How does it differ from the one derived in Figure A2.1 on page 51? Explain.

A relative price greater than 1.5 would produce a corner solution, with no  $T$  production and maximum output of  $S$ . A relative price below 1.5 would also result in a corner solution: No  $S$  would be produced; producers would maximize  $T$  output. Note that under conditions of constant opportunity costs, demand plays no role in determining relative prices in the model, but it is necessary to determine the exact output mix.

5. Suppose that in world markets the relative price of  $S$  is lower than  $A$ 's autarky price. Would  $A$  be a net exporter or importer of  $S$ ? What would be the case for good  $T$  in country  $A$  in this situation?

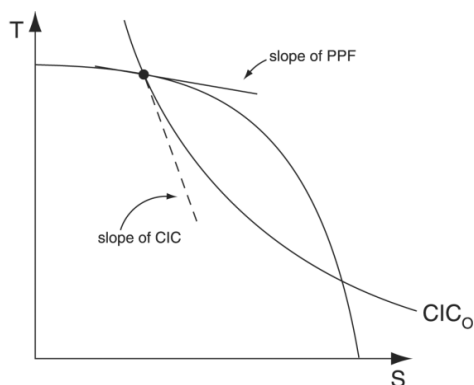
This is exactly the situation discussed in the previous question. If the world's relative price of  $S$  is lower than  $A$ 's autarky price, the relative price line will be flatter and a corner solution would occur. Which corner? If producers completely specialized in  $S$ , they would actually be minimizing their income. They would maximize their income by only producing  $T$ .

6. Derive country  $A$ 's national supply and demand curves for good  $T$ . Be careful how you label the axes!

Follow the example in text Figure 2.8.

7. If a country is at a point on its PPF where the slope of the PPF is flatter than the slope of the CIC touching that same point, then the standard of living would rise if outputs of the two goods would change so as to move down the PPF. True or false? Demonstrate and explain.

This statement is true. See the following graph. The slope of the PPF tells us the cost of producing one more unit of the good on the horizontal axis. That is, it tells us the cost of moving down the PPF. The slope of the CIC tells how much society would value having one more unit of the good on the horizontal axis. In this case, society is willing to pay more than it would cost to obtain one more unit of the good on the horizontal axis. Hence a movement in that direction would raise the standard of living.



8. Suppose that country  $A$  produces two goods under conditions of constant opportunity costs. Given its resources, the maximum  $S$  that it can make is 500 units and the opportunity cost of making  $T$  is 2. What is the maximum amount of  $T$  that it can produce? Draw a graph and explain.

The maximum amount of  $T$  that can be produced is 250. Note that in the question cost (and price) are measured in units of  $S$ —the opportunity cost of making  $T$  is 2.

9. Suppose that a country produces two goods,  $X$  and  $Y$ , with two factors of production,  $K$  and  $L$ . The production of good  $X$  always requires more  $K$  per unit than does the production of good  $Y$ . What does this imply for the shape of the country's PPF? Explain carefully.

In this case, the PPF will be concave to the origin, that is, it will be bowed out. Why? Suppose that you start from a point of complete specialization in the production of  $Y$  (say, on the vertical axis). Think about the logistics of expanding the production of  $X$ . Initially, industry  $Y$  has all of the resources. If  $X$  is to expand, it must obtain resources from  $Y$ . Since  $Y$  utilizes less  $K$  per unit than does  $X$ , as it begins to contract, the  $Y$  sector will probably idle relatively more  $K$  than  $L$ , but high ratios of available  $K$  to  $L$  are precisely what the  $X$  industry needs in its production process. Hence, at first, the output of  $Y$  will not fall by very much even as the output of  $X$  expands. If the process continues, however, at some point as  $Y$  continues to contract it will begin to layoff larger amounts of  $L$  relative to the  $K$  it releases. Losing this combination of factors will produce large falls in the output of  $Y$ , and, since this ratio of factors is not ideal for  $X$ , the expanding industry will see a relatively smaller increase in its output. This question helps to prepare students for the material in Chapter 4.

10. Why are relative prices more important for decisions about consumption and production than nominal prices? Provide an example to illustrate your answer.

Relative prices are more important than nominal prices because they are more informative to both producers and consumers. That is, they provide these groups with complete information about the degree to which economic conditions have changed.

11. Suppose that a small, tropical country produces mangoes for domestic consumption and possibly for export. The national demand and supply curves for mangoes in this country are given by the following:

$$\begin{aligned} P &= 50 - M && \text{(national demand)} \\ P &= 25 + M && \text{(national supply)} \end{aligned}$$

where  $P$  denotes the relative price of mangoes and  $M$  denotes the quantity of mangoes (in metric tons).

- Illustrate these relationships geometrically.
- What is the autarky price and quantity exchanged?
- Suppose that the world price of mangoes is 45. Will this small country export mangoes? If so, how many tons?

To find the autarky prices and quantities, the demand and supply equations must be solved simultaneously. To find  $M$ , set the right hand sides equal to each other. So doing, yields  $M = 12.5$ . Using this result, insert it into either equation to find  $P = 37.5$ . Note that if the world price is 45, this country would be an exporter of mangoes. To find out how many it would export, construct an export supply equation—that is, an excess supply equation. Algebraically, this is done by subtracting demand from supply (both expressed in terms of  $M$ ):

$$\begin{aligned} \text{EXPORT SUPPLY} &= NS - ND \\ &= P - 25 - (50 - P) \\ &= -75 + 2P \end{aligned}$$

If the world price equals 45, then this country will export 15. Note that students could also obtain this result by substituting 45 for  $P$  in national demand and supply equations to find the quantity demanded and supplied at the price and calculating the surplus available for export.