



## Chapter

# THE ECONOMIC PROBLEM

# 2

## The Big Picture

### Where we have been:

Chapter 1 introduced the economic reality that wants exceed the resources available to satisfy them—we face scarcity. Chapter 2 reinforces these central themes by laying out the core economic model, the Production Possibilities Frontier, or *PPF*, and uses it to illustrate the concepts of tradeoff and opportunity cost. Chapter 2 further details the concepts of marginal cost and marginal benefit, presenting a first look at the concept of efficiency. It then concludes with an explanation of the source of the gains from specialization and exchange and the roles of firms and markets in achieving those gains.

### Where we are going:

The key concept of *opportunity cost* and the widespread tendency for the opportunity cost of a good to increase as the quantity produced of that good increases returns in Chapter 3 when we explain the supply curve. For Micro classes, we see it again in Chapters 10 and 11 when we study a firm's costs and cost curves. Preferences return and are treated more rigorously when we explain marginal utility theory in Chapter 8 and indifference curves in Chapter 9. Efficiency returns in Chapter 5 when we study the efficiency of markets and first preview the impediments to

efficiency. The gains from trade are explored more completely in the context of international trade in Chapter 7 in Microeconomics and Chapter 15 of Macroeconomics. Finally, the role of markets and prices in allocating resources and coordinating activity is an ongoing theme throughout most of the rest of the text. The next task, in Chapter 3, is to develop the central demand and supply model.

### **New in the Tenth Edition**

Chapter 2 has been slightly rewritten. The material dealing with marginal benefit has been reshaped to sharpen the point that the marginal benefit is separate from the *PPF*. The text no longer discusses dynamic gains from trade.

## Lecture Notes

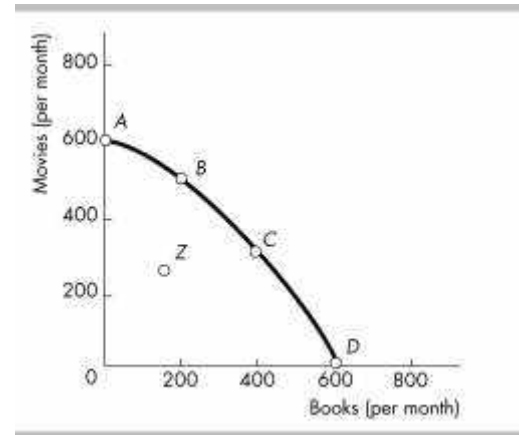
### The Economic Problem

- Scarcity creates the need to make choices.
- Economic choices can be evaluated in terms of their efficiency.
- We can expand possible choices through capital accumulation and specialization and trade.

#### I. Production Possibilities and Opportunity Cost

- The **production possibilities frontier (PPF)** is the boundary between those combinations of goods and services that can be produced and those that cannot given available resources and technology.
- Consider the production choices for two goods: books and movies. The table with the data for the *PPF* is below and a figure showing the *PPF* is to the right.

	Books	Movies
<i>A</i>	0	600
<i>B</i>	200	500
<i>C</i>	400	300
<i>D</i>	600	0



- Production points beyond the *PPF* are not attainable without increases in resources or technology (these factors shift the *PPF*);
- Production points on and within the *PPF* are attainable, but production points within the *PPF*, such as point *Z*, are inefficient. It is possible to get more of one good without giving up any of the other.
- The *PPF* illustrates how scarcity creates the need to make choices. Producing more books (moving from point *A* to point *B*) means producing fewer movies, and producing more movies (moving from point *C* to point *B*) means producing fewer books.

Using the *PPF* above, make a point outside the *PPF* and ask the students about it. Once they state it is not possible, ask them how we could get there. After they highlight a few shifters, summarize for them that the resources and technology we held constant when we drew the *PPF* now relocate it when they change. Now give them an example of a new movie camera invention and ask them if this will help us get more books? You will likely get an immediate round of “NO.” Reply, “Are you sure?” and you should be able to find a student who sees that the new resource frees up other resources that can now be used for more books. Show them graphically a shift that is pinned at the book axis and it will open their eyes to how technology and resource growth in any sector can make more of all goods!

### *Production Efficiency*

Production is efficient only on the frontier.

- We achieve **production efficiency** if we cannot produce more of one good without producing less of some other good.
- Inside the frontier (point *Z*), production is inefficient. Resources could be better employed to increase production of both books and movies.

### *Tradeoff Along the PPF*

- Moving along the *PPF*, there is always a tradeoff involved in diverting resources from the production of one thing to another. We gain one thing but at the opportunity cost of losing something else.

The key here is to make sure the student understands that given scarcity, because we produce one thing, we cannot produce something else. Some students will see the tradeoff immediately as a cost (giving up something), but they will incorrectly interpret that cost as only that valued in money units. To eliminate this ambiguity (better now than later), ask them to think about a meal they purchased recently. Now ask them what the money cost was as well as what else they might have picked for a meal? Most students pick up on this concept quickly with one or two more examples. And since this is a consumption example, tell them to put themselves in the place of an office manager, who must produce a service but can do so only given tradeoffs. While money costs are measurable and useful, propose to the students that

opportunity costs are indeed even more useful in identifying the tradeoffs made in production.

### *Opportunity Cost*

- The **opportunity cost** of an action is the highest valued alternative forgone.
- Efficiency means that the opportunity cost of producing more books or movies is the tradeoff along the frontier.

### *Increasing Opportunity Costs*

- The “bowed-out” shape of the *PPF* reflects the principle of increasing opportunity cost.
- Not all resources are the same, which is why the *PPF* bows out. Publishers are better at producing books and Hollywood studios are better at producing movies. Moving along the frontier and producing more movies inevitably means that more and more publishers must produce movies. As this happens, the increase in movies becomes smaller and the decrease in books becomes larger.
- Emphasize the intercepts where the *PPF* crosses the axes. Take the vertical intercept in the figure. At this point all resources are used to produce movies. Basically to get to that point the economy has crammed and slammed every resource into movie production. Now when the economy moves down the *PPF* to produce the first book, that book is really inexpensive—has very low opportunity cost—because the economy uses resources better suited for book production first rather than movies.
- As more and more resources are diverted from production of one good to another, the smaller the additional increase in the production of the one good will be and the larger the decrease in the production of the other good.

You can bring in the relationship of slope and opportunity cost here if you want. OPTION 1: A soft way to bring in slope is to offer it as a double check on calculating marginal cost: “The opportunity cost of whatever is being measured on the horizontal axis is equal to the magnitude of the slope of the *PPF*.” OPTION 2: You can also introduce the slope of a curve is the slope of a tangent line to the curve.

The bowed-out shape is a key feature of typical *PPFs*, often overlooked by the student (and too often not accentuated by the instructor). The key here is to link the ever increasing opportunity cost exhibited by the shape of a bowed out *PPF* with that of the marginal cost curve, which is upward sloping.

To make the *PPF* model useful, it was necessary to simplify. By considering the case where production of all goods other than two remain fixed, we can use a relatively simple picture to see how concepts apply to the real world. With three goods, we would have a 3-D frontier surface. With more than 3 goods, it would be impossible to represent the frontier using a graph. The cool thing is that all relevant results of the 2-D model are true in the N-good model.

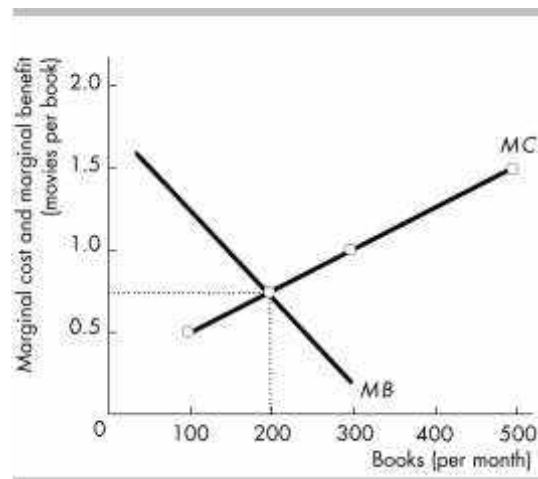
## II. Using Resources Efficiently

Which point on the *PPF* best serves the public interest? To answer this question, we must measure and compare costs and benefits of different points.

### The *PPF* and Marginal Cost

- **Marginal cost** is the opportunity cost of producing one more unit of a good.
- As more books are produced, the marginal cost of a book increases. The table shows the marginal cost of producing books from the *PPF* data presented before and the figure shows the upward sloping marginal cost curve.

	Books	Marginal cost of a book (movies per book)
<i>A</i>	0	0.5
<i>B</i>	200	1.0



<i>C</i>	400	
		1.5
<i>D</i>	600	

#### *Preferences and Marginal Benefit*

- **Preferences** are a description of a person's likes and dislikes.
- The **marginal benefit** of a good or services is the benefit received from consuming one more unit of it.
- The *principle of decreasing marginal benefits* is why the **marginal benefit curve** in the figure above slopes downward.

You might have some students that have had a microeconomics course in their past, and have already been introduced to the concept of marginal cost and marginal benefit. And, they might inquire if the marginal benefit curve is linked to the Law of Diminishing Marginal Utility. While this might be adequate discussion for an advanced undergraduate course, and certainly a graduate micro seminar, pass it up in your principles course. Let the student know that the goal is to employ demand side concepts, in a marginal sense. As such, key in on the fact that the marginal benefit curve can be characterized as a willingness to pay curve.

Keep the discussion of marginal cost and marginal benefit separate and distinct, making sure that the student realizes these are in essence the foundation of market forces (supply and demand, respectively). While the *PPF* can tell us the opportunity costs in production, and the tradeoffs therein, it is the market that allows us to determine the allocatively efficient point. Allocative efficiency only occurs with a balance between benefits and costs, *at the margin*.

#### *Allocative Efficiency*

**Allocative efficiency** occurs only when marginal benefit equal marginal cost.

- In the figure, when 100 books per month are produced, the marginal benefit from another book exceeds its marginal cost, which means that people prefer another book more than the movies they must give up.

- When the allocatively efficient number of books, 200 per month, is produced, the *PPF* in the previous figure shows that the allocatively efficient number of movies is 500 movies per month.
- When marginal cost equals marginal benefit it is impossible to make people better off by reallocating resources.

### III. Economic Growth

**Economic growth** expands production possibilities and shifts the *PPF* outward.

- **Technological change** (the development of new goods and of better ways of producing goods and services) and **capital accumulation** (the growth of capital resources, which includes human capital) lead to economic growth.

You can have some fun and generate some discussion by getting the students to think about what life might be like after another 200 years of economic growth. Provide some numbers: In 2008, income per person in the United States was about \$100 a day. In 1808 it was about 70¢ a day, and if the past growth rate prevails for another 200 years, in 2208 it will be \$14,000 a day. Emphasize the magic of compound growth. If they think that \$14,000 a day is a big income, get them to do a ballpark estimate of the daily income of Bill Gates (about \$10 *million!*). Encourage a discussion of why scarcity is still present even at these large incomes.

#### *The Cost of Economic Growth*

- Economic growth requires that resources must be devoted to developing technology or accumulating capital, which means that current consumption decreases. The decrease in current consumption is the opportunity cost of economic growth.

#### *A Nation's Economic Growth*

- Countries that devote a higher share of resources to developing technology or accumulating capital are more likely to grow faster.
- Some nations, such as Hong Kong, have chosen faster capital accumulation at the expense of current consumption and so have experienced faster economic growth.



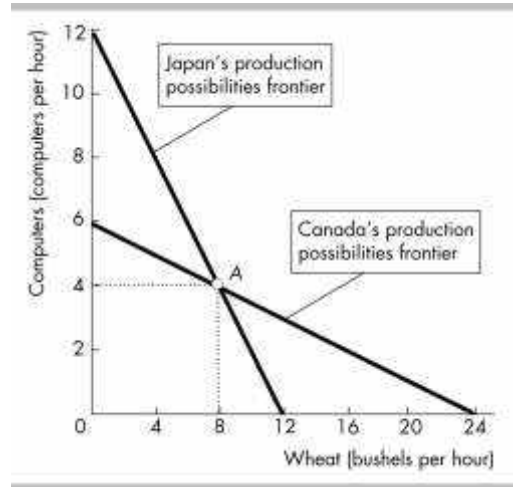
Running through the above example can really help students catch on to how economic growth is linked to choices (less consumption now for more later). You may wish to demonstrate more consumption or more capital biased shifts of the *PPF*, to demonstrate changes in opportunity costs.

#### IV. Gains from Trade

Specialization and trade expand consumption possibilities

##### *Comparative Advantage and Absolute Advantage*

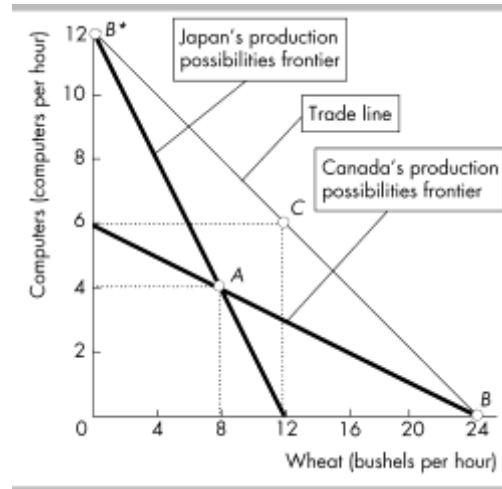
- A person has a **comparative advantage** in an activity if that person can perform the activity at a lower opportunity cost than anyone else.
- The *PPF* shows opportunity cost. In the figure the opportunity cost of a bushel of wheat in Canada is 1/4 of a computer and in Japan it is 1 computer. In Canada the opportunity cost of a computer is 4 bushels of wheat and in Japan it is 1 bushel of wheat. Canada has a comparative advantage in producing wheat and Japan has a comparative advantage in producing computers.
- A person has an **absolute advantage** if that person is more productive than others in that activity or activities. A person (or country) can have an absolute advantage in all activities but that person (or country) will *not* have a comparative advantage in all activities.



An easy way for students to remember the difference between comparative and absolute advantages is that with comparative advantage, the opportunity costs comparison matters. If one has a comparative advantage in producing something, they should specialize in production of that good or service. An absolute advantage can be characterized by being able to “absolutely out-produce” the other economic agent. Even though a country might have absolute advantages, it should not produce everything, and should focus on identifying its comparative advantages.

### Achieving the Gains from Trade

- When countries specialize by producing the good in which each country has a comparative advantage more goods in total can be produced. If Canada and Japan *each* produce at point *A*, a total of 8 computers and 16 bushels of wheat are produced. If they specialize according to comparative advantage, Japan produces at point *B\** and Canada produces at point *B* for a combined total of 12 computers and 24 bushels of wheat.
- Trade allows consumption to be different than production for each nation, so Canada can trade wheat for computers and Japan can trade computers for wheat. Because more computers and more wheat are produced, both nations can consume more than they can produce on their own. For example, suppose that the market price of wheat is  $\frac{1}{2}$  computer per 1 bushel of wheat. As illustrated, each country can now be consuming at point *C* along the trade line. Note that each country's consumption point lies *beyond* its own PPF.
- The gains from trade can now be easily seen in terms of Japan and Canada each gaining 2 computers and 4 bushels of wheat compared to their initial, no-trade consumption points.



## V. Economic Coordination

### Firms and Markets

- A **firm** is an economic unit that hires factors of production and organizes those factors to produce and sell goods and services.
- A **market** is any arrangement that enables buyers and sellers to get information and to do business with each other.

### Property Rights and Money

- The social arrangements that govern the ownership, use, and disposal of

resources, goods, and services are called **property rights**. Types of property include real (buildings and land), financial (stocks and bonds) and intellectual (ideas and technology).

- **Money** is anything generally accepted as a means of payment. Money's main purpose is to facilitate trade.

Students are usually fixated on money, but ask them to dig deeper. It is what we can do or buy with money that brings us happiness not the actual bills themselves.

#### *Circular Flows through Markets*

- Firms and households interact in markets and it is this interaction that determines what will be produced, how it will be produced, and who will get it.

#### *Coordinating Decisions*

- Prices within markets coordinate firms' and households' decisions.

Everyone knows what prices are. But not everyone knows why prices rise or fall. The point is that no one needs to know *why* a price has changed when making the choice to buy or sell. All that someone needs to know is what the price is relative to what he or she believes the item to be worth.

- Enforced property rights ensure that exchange is voluntary (not theft). Property rights and prices help insure that production takes place efficiently without waste because the owner of a firm has the property right to any profit the firm can earn.

Willingness to pay affects production and production affects willingness to pay. It would appear that we have the classic "which came first, the chicken or the egg" conundrum. However, in the next chapter, we will discuss the most powerful model in economics, Demand and Supply, which allows us to think clearly about the behavior of markets.

## Additional Discussion Questions

1. *Using the PPF model to analyze an “Arms Race” between nations.* You might like to get the students to realize how useful even a simple economic model (such as the *PPF* model) is for helping us understand and interpret important political events in history. Draw a *PPF* for *military* goods and *civilian* goods production (or, simply, the traditional example of “guns versus butter”). Then draw another *PPF* for a country that is about twice the size of the first, but with the same degree of concavity as the *PPF* for the first country. Now assume that each country considers the other as a mortal “enemy,” and that they engage in a costly “arms race.” Each country picks a point on the *PPF* that produces an equal level of military output (in absolute terms).

***What would happen if the larger country decided to increase military production?*** Emphasize that while the distance on the military output axis at the point of production is *equal* for both countries, the resulting distance on the civilian output axis is (by definition) a smaller quantity for the smaller country. The large country can create significant economic and political pressures on the government of the small country by forcing the small country to *match* the increase in military production. The *PPF* reveals how much more additional civilian output is forgone by the citizens of the small economy relative to the citizens of the larger economy. Emphasize also that the *opportunity cost* of civilian goods is higher for the smaller country.

***What were the economic repercussions of the Cold War?*** History and political science majors quickly perceive that these two *PPF* models reflect the Cold War relationship between the United States and the U.S.S.R. during the early 1980s. The Reagan administration increased U.S. military expenditures during the early 1980s to a post-Viet Nam War peak of 6.6 percent of GDP (as compared to about 3.5 percent of GDP in the late 1990s). Many experts agree that this strategy contributed to the

many political and economic pressures that ultimately lead to the dissolution of the U.S.S.R.

***“What are the implications for the next 50 years?”*** China is currently the world’s third largest economy. It becomes the second in a few years and the biggest by mid-century. How does this development influence the strategic balance and the position of the United States?

2. ***Using the PPF model to analyze global environmental agreements***

***between nations.*** This application of the *PPF* is a less “hawkish” and perhaps a more “green” perspective on a timely international policy issue. Compare a rich economy *PPF* to a poor economy *PPF*, each with the same degree of concavity. (Production levels are now measured as output per person.) The goods are now “cleaner air” and “other goods and services.”

***What if the citizens of each country were required to make equal reductions in per-person greenhouse gas emissions?*** Show an equal

quantity increase in per person output on the clean air axis for both countries’ *PPF* curves. Show how the opportunity cost of requiring additional pollution reduction (cleaner air) of equal amounts per person is much greater for the citizens of a poorer country than for the citizens of the richer country. This fact has been used to persuade developed

Recreation (hours per day)	Marginal cost (GPA points per hour)
0.5	0.1
1.5	0.2
2.5	0.3
3.5	0.4
4.5	0.5
5.5	0.6
6.5	0.7
7.5	0.8

countries (like the United States) to accept larger pollution reduction targets than developing countries (like China, India, and African nations).

3. ***Why do some of the brightest students not get a 4.0 GPA?*** The answer—because it doesn’t achieve allocative efficiency—can now be approached. The first conceptual step is to derive the marginal cost curve from the *PPF*. The table provides eight points on the *MC* curve. Tell the students

that this table is from a *PPF* between hours spent at recreation and GPA. Use this opportunity to explain why we plot marginal values at the midpoints of changes because the marginal cost at the midpoint approximately equals the average of the opportunity costs across the interval. The students must now think about *preferences* for recreation and study. You'll be surprised how many students want to derive preferences from the *PPF*! Explain that the *PPF* provides the constraint—what is feasible—and preferences provide the objective—what is desirable in the opinion of the chooser.

Each additional hour of recreation likely yields a smaller marginal benefit to the student. Translate this to the proposition that the student's willingness to give up GPA points for additional hours of recreation decreases and provide a table similar to that in Figure 2.3 that captures this observation. The table has a preference schedule. Stress once again that this table did *not* come from the *PPF*.

<b>Recreation (hours per day)</b>	<b>Willingness to pay (GPA points per hour)</b>
0.5	0.7
1.5	0.6
2.5	0.5
3.5	0.4
4.5	0.3
5.5	0.2
6.5	0.1
7.5	0

To determine the efficient amount of recreation and hence study time, the student must ask "Do I study a little bit longer?" That is the question.

Walk the student through the thought experiment:

1. If I study for 8 hours a day I get a 4.0, but I am willing to pay much more than I will pay if I take a bit of time off studying and have some fun. So I will be better off if I study less and take more recreation time.
2. If I don't study at all I get a 0.4, and I am paying much more in lost GPA than I am willing to pay for the last bit of fun. So I will be better off if I study more and take less recreation time.

3. The only allocation at which I can't become better off by studying a little bit more or a little bit less is where I am just willing to pay what the last bit of recreation costs—where marginal cost equals marginal benefit.

In this example, the student studies for 4.5 hours and takes 3.5 hours a week of recreation time.

Explain that there is nothing strange or wrong with the fact that the student gets no net benefit from the last seconds-worth of recreation time. He or she is just willing to pay what it costs him or her.

4. ***Gains from Trade*** The gain from trade is a real eye-opener for students. Their first reaction is one of skepticism. Convincing students of the power of trade to raise living standards and the costs of trade restriction is one of the most productive things we will ever do. Here are some questions to drive home the idea of comparative advantage:

***Why didn't Billy Sunday do his own typing?*** Billy Sunday, an evangelist in the 1930s, was reputed to be the world's fastest typist. Nonetheless, he employed a secretary who was a slower typist than he. Why? Because in one hour of preaching, Billy could raise several times the revenue that he could raise by typing for an hour. So Billy plays to his comparative advantage.

***Why doesn't Martha Stewart bake her own bread?*** Martha Stewart is probably a better cook than most people, but she is an even better writer and TV performer on the subject of food. So Martha plays to her comparative advantage and writes about baking bread but buys her bread.

***Why doesn't Vinnie Jones play soccer?*** Vinnie Jones was one of the world's best soccer players. But he stopped playing soccer and started making movies some years ago. Why? Because, as he once said, "You go to the bank more often when you're in movies." Vinnie's comparative advantage turned out to be in acting.

