A Primer on Macroeconomics, Volume I

Elements and Principles

Second Edition

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A Primer on Macroeconomics, Volume I: Elements and Principles
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Abstract

Economics, far from being the "dismal science," offers us valuable lessons that can be applied to our everyday experiences. At its heart, economics is the science of choice and a study of economic principles that allows us to achieve a more informed understanding of how we make our choices, regardless of whether these choices occur in our everyday life, in our work environment, or at the national or international level.

The present two-volume text represents a commonsense approach to basic macroeconomic principles. It is directed toward all students, but particularly toward those within business school settings, including students beginning an advanced business degree course of study. It will deliver clear statements of essential economic principles, supported by easy-to-understand examples, and uncluttered by extraneous material, the goal being to provide a concise readable primer that covers the substance of macroeconomic theory.

This volume explains the key economic principles, important terms, and essential models used in macroeconomic discussion.

Keywords

aggregate price level, business cycle, comparative advantage, crowding-out effect, demand and supply, deposit multiplier, economic growth, equilibrium, expenditure multiplier, fiscal and monetary policies, GDP, inflation rate, international trade issues, opportunity cost, recession, stabilization, unemployment rate

Contents

Preface

This two-volume *Primer on Macroeconomics* has been long in the writing. It has been shaped by after-class discussions with students over many years while we tried to break down economics into understandable concepts and examples. A former student, Dr. Jeff Edwards, now Chairman of the Economics Department at North Carolina A&T State University, requested that I write an introductory text, and advised "Make it like your lectures."

No book, at least no book that I'm capable of writing, can capture the immediacy and intimacy of a classroom environment but, equally, no classroom environment permits the opportunity to dwell on detail quite as effectively as the pages of a book. As with everything in economics, there are trade-offs.

I've devised this *Primer* to help you to master the concepts in what may to be your first, and perhaps only, economics course. I've given you opportunities to apply these concepts in real-world situations. Most economists stress the need for competence in three major areas—the application of economic concepts to real-world situations, the interpretation of graphs, and the analysis of numerical problems. This *Primer* allows you to develop and hone these important skills.

Throughout the text, I've attempted to maintain the sense of a dialogue—there are frequent "THINK IT THROUGH" pauses, with which you can review and check your grasp of the topic under discussion and relate it to real-world applications.

I hope that this book will ignite in you a passion for economics that will blaze for a lifetime. Economics surrounds us—it fills the airwaves, our daily lives, our hopes, and our dreams. Learning how to apply economic concepts to our world creates a better and more durable understanding, and a reasonable goal for a noneconomics major is to have sufficient insight to evaluate the economic content of articles in *The Wall Street Journal* or *The Economist* or the views expressed by commentators on CNN or Fox.

x   PREFACE

This *Primer* has been written with the hope that, long after you have turned the final page, you will retain a deeper understanding of the economic issues that confront us and the tools to analyze the exciting and challenging concerns that we all must address in our contemporary world.

My best wishes to you in your study of economics. You will find it a rewarding and worthwhile experience, and I trust that this *Primer* will stimulate you in your endeavors.

Acknowledgments

Through the years, many students have asked me questions and, by doing so, have given me deeper insights into the difficulties that arise when economics is first approached. I am grateful to all of them. Much of the material included in this book springs from such "after-class" discussions.

The efforts of reviewers Phil Romero and Jeff Edwards have added greatly to the quality of the final product. A former student, Jonas Feit, now thriving in Washington, DC, critiqued early drafts of the first edition. Scott Isenberg and Charlene Kronstedt provided stalwart support. Rene Caroline Balan of S4Carlisle Publishing Services deserves great credit for keeping things moving smoothly by encouraging and cajoling. Denver Harris was reliable in converting a misshapen poorly written first-edition manuscript into an orderly text. Needless to say, any remaining *lapsi calami* are my responsibility.

This *Primer* is dedicated, with love, to the memory of my parents, to my wife, Pamela, (a software instructor with Microsoft Certification), to our son, Andrew (whose surprises are no longer shocks but delights), and to the dogs and cats, and especially for Duckie, for whom all lunches are free.

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CHAPTER 1

Scarcity and Choice

Chapter Preview: In this introductory chapter we look at the fundamental concerns of economics and why these concerns arise. Also, we will develop the concept of opportunity cost that is embodied in the popular phrase "There's no such thing as a free lunch." Finally, we will consider a diagram (the production possibility frontier) that will permit us to use opportunity cost to explore the benefits flowing from trade.

By the end of this chapter, you will be able to:

- Identify the three fundamental economic questions.
- Explain why a production possibility frontier has a negative slope and why that slope depicts the concept of opportunity cost.
- Interpret what is depicted by a production possibility frontier.
- Explain why increasing opportunity costs occur in the real world and how this relates to the production possibility frontier diagram.
- Use the production possibility frontier to identify how economic growth might occur.
- Distinguish between productive efficiency and allocative efficiency.
- Distinguish between absolute advantage and comparative advantage.
- Use comparative advantage to explain the theory that individuals or countries can gain from specialization and exchange.

Welcome to our exploration of macroeconomics! In this two-part *Primer*, we will have several tasks. First, we must determine what economics is concerned with and then narrow the focus to look at macroeconomics alone. Further, we will need to define important macroeconomic variables, such as gross domestic product, the unemployment rate, and the inflation rate, so that we have a consistent vocabulary and then construct models to demonstrate how those variables interact. Our chief model is the aggregate demand and aggregate supply model and this is introduced in Volume II. Finally, we must evaluate policies that have been proposed to reduce short-run economic fluctuations and others intended to foster long-run economic growth.

What Is "Economics" All About?

Sometimes, as an icebreaker at the beginning of the semester, I ask my new students what they think economics is "about." I've grown to be accustomed to a wide range of answers, some tautological ("It's about the economy."), some focused on finance, with references to businesses, money, Wall Street, and profits, and some technical ("It's about demand and supply."). While a knowledge of economic principles may help us address these topics, the subject matter is more fundamental than any of them. Boiled down, economics is about choice.

Economics: The Scientific Study of Rational Choice

Imagine you're in a restaurant and the server has just handed you the menu. You are preparing to make a choice. You have entered the realm of economics. At its most fundamental, economics is about choice. We may define economics as the scientific study of rational choice. Although that assumption of rationality has recently come under some attack, it remains a good working assumption. We make choices and consider trade-offs as we strive to achieve the best outcomes possible in our own self-interest. Individually and as a society, we must make choices because, although we have unlimited wants, we have limited (scarce) resources to meet those wants.

Scarcity

In economics, an item is considered "scarce" if, when its price is zero, then there is not enough of the item available to satisfy our requirements. If a good has a positive price tag then it's scarce. Can you think of any "free" (nonscarce) goods? Is clean air a free good or is it scarce?

Resources

Economists define four types of scarce resource.

Natural resources include any usable naturally occurring resources. Farmland, a navigable river, or lobsters off the coast of Maine are examples of natural resources.

Capital resources are reusable tools—goods that are produced to make other goods. Private capital includes a carpenter's chisel, a sales rep's car, or a warehouse, whereas social capital includes the nation's roads, bridges, and docks.

Human resources ("labor") include all of the mental and physical attributes of the labor force, such as the shooting ability of LeBron James, the physical stamina of a fruit picker, or the specialized skills and knowledge of a brain surgeon. As an aside, if a worker trains and acquires new skills, this acquisition is termed "human capital." Education of any kind that increases our abilities is an investment in human capital.

Finally, **enterprise** ("entrepreneurial ability") is the risk-taking talent needed to recognize unfulfilled market opportunities and organize production to meet those needs.

The rewards for the use of these four classes of resource are rent, interest, wages and salaries, and profit, respectively. The farmer who lets a neighbor use his tractor during harvest would receive an interest payment, but if he lets him use some unneeded acreage, then the payment is rent. The farm laborer receives a wage or salary. The farmer (the owner of an enterprise) hopes to earn a profit for himself.

Comment: In economics, unlike in accounting, profit (more properly, a "normal" profit, which is a reasonable rate of return for the entrepreneur) is treated the same as wages and salaries, rent, and interest. Just as those other payments represent costs of doing business, so does profit. We will return to this point later in the chapter.

Caution #1: Although money can be used to buy or hire productive resources, it in itself is not a productive resource. A trunk filled with dollars washed up on Robinson Crusoe's island would do him no good at all. It has no productive value.

Caution #2: Terms used in economics may not mean the same as in regular speech. "Rent" is a good example. Apartment dwellers pay "rent" to their "landlord," but not much of that payment is for the use of a natural resource (the space the apartment occupies); most of it is for the structure itself, and for the wiring and plumbing and other man-made (capital) features being used. "Investment" is yet another such term—for an economist, "investment" is the accumulation of additional capital (not the accumulation of money or other financial assets).

> **THINK IT THROUGH**: Every productive activity involves some combination of those four categories of scarce resource. Think of your own work environment and identify examples of each of the four types of resource. It is almost impossible to specify a productive activity that does not involve human resources, natural resources, capital, and enterprise. Try it!

The Economic Challenge and Three Fundamental Questions

The economic challenge, then, is to find the way to best satisfy our unlimited wants with our limited resources. The three fundamental questions that must be answered by any economy are: "What to Produce?" "How to Produce?" and "How to Distribute Production?" Every economy must transform its scarce natural, capital, and human resources into usable production through the application of enterprise. In a complex society, the opportunity to cooperate and specialize offers great scope for increased production—but decisions must be made regarding the extent of cooperation, who specializes in what, and how goods are distributed. Even Robinson Crusoe and Friday on their island must come up with answers to these questions. Wants are limitless, but resources are scarce. We are compelled to make choices.

As a restaurant owner, because you cannot offer everything, you must decide *which* items will be on your menu (what to produce). You must also determine *how* your service will be produced (*cordon-bleu* chef or a microwave; self-service or servers and so on). Finally, you must come up

with a method of allocating your production among your potential customers (first-come first-serve or reservations; all you can eat or *a la carte*).

The trick is to choose the most effective technique in order to ensure that we do produce "the right stuff." In our economy, although there is a role for the public provision of certain goods and services such as national defense or our justice system, we mainly use private markets to answer the three fundamental questions. We produce items that can earn a profit as cheaply as possible (in order to make the most profit) and provide them to those who are able to pay the price.

THINK IT THROUGH: When the *Titanic* sank in 1912, there were limited spaces available in the lifeboats. The collision with the iceberg posed an immediate "distribution" question—who gets the lifeboat seats? The traditional solution of "Women and children first!" was largely adhered to (most babies and children and a high proportion of women survived) although upper-class males seem to have been given priority over steerage passengers. If "Women and children first" were not used to allocate lifeboat seats, what other methods would have been effective in such a crisis situation?

THINK IT THROUGH: Can you think of other "rules" that our society has developed to apportion our limited goods and services?

Opportunity Cost

Choice is at the heart of economics. Any time we make a choice, there is a cost. Economists use the term "opportunity cost." **Opportunity cost** is the *value of the next most preferred alternative given up when you make a choice.* This idea of opportunity cost is both simple and profound—there's no such thing as a free lunch, as the saying goes. In the restaurant, if you order shrimp lo mein, then, unless you are very hungry, you give up the opportunity to have other items on the menu. If the shrimp had not been available, then the value you place on the item you would have chosen instead is the opportunity cost of the shrimp. Similarly, if you choose to work in your garden today, then there is a cost. It is the value you place on the activity that you would otherwise have participated in.

Remember: Whenever you make a choice, you are choosing to accept one option (A) but you are also choosing to give up all the other options (B, C,

and so on). Opportunity cost is the value you place on the second-best option. The value of the option selected should exceed its opportunity cost otherwise you've not made a rational choice. Note that our opportunity cost definition doesn't refer explicitly to a financial cost. Even if a friend is paying the tab, it's still not a free lunch for you because you are making choices. Choosing the New York strip means that you can't choose your next-favorite option.

Production Possibility Frontier

The production possibility frontier (PPF) diagram can be used to depict choice and opportunity cost. A PPF diagram shows precisely what its name suggests—the frontier (or boundary) between what it's possible to produce and what it's not possible to produce, given the most effective use of our resources and our technology. We know already what our resources consist of (human resources, natural resources, capital, and enterprise), but what is "technology?" *Technology* is our method of combining our resources. If we develop a method of combining our resources that increases output, then this is a technological advance. A better crop rotation system in farming would be an example. Can you think of others?

In a world where two goods are produced (say, guns and butter) and where all resources are fully employed, if we allocate more of our resources to produce guns then fewer resources are available to produce butter and less butter will be produced—there is a trade-off. The opportunity cost of choosing to produce more guns is the butter we can no longer produce.

Following from this conclusion, it is clear that the PPF must have a negative slope. More guns mean less butter.

Suppose we have a small firm that produces two goods—wooden chairs and tables. We have workers and other resources. Each hour, using the best available production methods (technology), there can be only a finite quantity of chairs we can produce. Let's say six chairs. We can plot this option (6 chairs, 0 tables) on the vertical axis of Figure 1.1 at point A. Similarly, there are only so many tables we can produce each hour—perhaps three tables. We can plot this option (0 chairs, 3 tables) on the horizontal axis at point D. If we're currently producing six chairs then, if we increase the production of tables, we will have to pull resources away from chair production. Chair production will decrease as table production increases—there is a negative relationship between them.
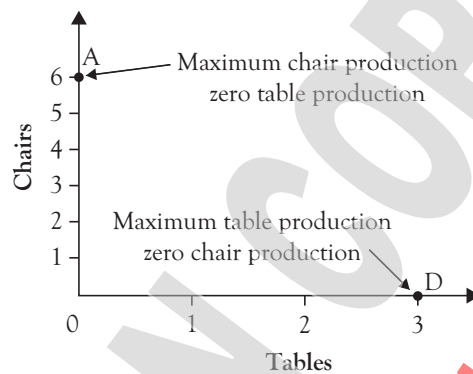
Figure 1.1 Constructing a production possibility frontier

So far, we have the two endpoints of the PPF and we know that it must have a negative slope. The frontier's slope represents the rate at which one good is given up as more of the other good is produced. This rate, of trade-off known formally as the "marginal rate of transformation," describes opportunity cost. For example, if we produce one more table, then the opportunity cost is the number of chairs we will no longer be able to produce.

The Law of Increasing Cost

This rate of trade-off is unlikely to remain constant as we increase the production of chairs because not all resources are equally well suited to different activities. Think back to high school and the choosing of teams for basketball. Just as some players were better than others at basketball (taller, faster, and with greater passing or shooting abilities) and would be chosen first, some resources will be more productive in chair production than others and will be preferred. It is because our resources have differing qualities and abilities that we should expect to encounter increasing costs.

Suppose we have three workers with differing skills—Abe, Bill, and Calvin—whose hourly outputs are listed as follows.

Worker	Tables per hour		Chairs per hour	Opportunity cost of one	
				Table	Chair
Abe	1	or	1	1 chair	1 table
Bill	1	or	2	2 chairs	1/2 table
Calvin	1	or	3	3 chairs	1/3 table

Who would you choose first to produce tables? And who would be your next choice? You should choose Abe first to produce tables, then Bill, and, finally, Calvin because, relative to the others, Abe can produce tables at the lowest (opportunity) cost. With Abe, the table he produces "costs" one chair, but, if Calvin produces a table, then we must give up the three chairs he could otherwise have produced. Looked at differently, we should keep Calvin producing chairs as long as possible because he is so good at chair production.

Note that, as we expand production of tables, the opportunity cost of tables increases. The first table (Abe's) costs one chair, Bill's costs two chairs, and Calvin's costs three chairs. The production alternatives are given as follows.

Production alternative	Tables	Chairs
A	0	6
B	1	5
C	2	3
D	3	0

At alternative A, all three workers are producing chairs. At alternative B, one table is being produced (by Abe). Although any of the three workers *could* produce the table (all are capable), if we wish to maximize overall production of tables and chairs, then Abe should be switched first. Why? Because the opportunity cost, in terms of chairs lost, is least with Abe.

> **THINK IT THROUGH:** Verify that, if one table is being produced, then the maximum possible number of chairs that can be produced at the same time is five chairs. If, however, either Bill or Calvin is chosen to produce the first table, then total chair production will be less than five chairs.

At alternative C, two tables are being produced. Who should be moved from producing chairs and asked to produce the second table? Bill, because, relative to Calvin, the opportunity cost of the table, in terms of chairs given up, is less—only two chairs lost, instead of three.

At alternative D, we finally switch over Calvin to table production. We have saved him until last, because this is a relatively expensive decision, in the sense that the three chairs that Calvin could have produced are being sacrificed to increase table production by one.

The "big idea" revealed in this example is that, as we begin table production, we should choose the least-cost resource (Abe) and, as table production expands, we are forced to switch over resources that involve progressively higher opportunity costs.

We can plot these alternatives. Graphically, as shown in Figure 1.2, the PPF bends outward. The "bowed-outward" slope of the PPF depicts the increasing opportunity cost we have discussed.
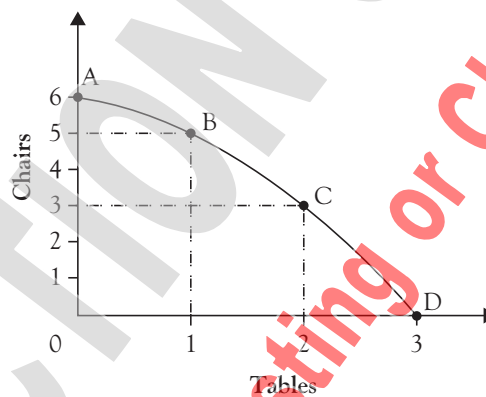
Figure 1.2 Production possibility frontier

THINK IT THROUGH: Verify that, if the workers are all producing tables, and we switch them over to producing chairs, we should switch Calvin first, then Bill, and, finally, Abe. Opportunity cost again increases as we expand the production of chairs. Movements along a bowed-out PPF in either direction reveal increasing costs.

Comment on Reciprocals: Note that, for Calvin, the opportunity cost of producing one table is three chairs and the opportunity cost of one chair is a third of a table. The opportunity costs are reciprocals of each other. If Calvin is the least costly at producing chairs then he necessarily must be the most costly at producing tables. This is a general result and we'll use it later in this chapter when we look at comparative advantage.

Marginal Cost

Let's press this example a little further. Economists, as we will see later, are deeply concerned with "marginal" analysis. "Marginal" is just a fancy term

economists use, meaning "extra" or "additional." **Marginal cost** is the additional cost incurred when an extra unit of a good is produced. (Similarly, **marginal benefit** is the additional benefit that is received when an extra unit of a good is consumed.) Superficially, we think of "the additional cost incurred when an extra unit of a good is produced" in dollars and cents terms but, more profoundly, it is the opportunity cost. Alone on his island, Robinson Crusoe has no money, but, because he makes choices, he incurs costs. If he chooses to pick berries today, the cost is not financial, it is the value of the next most preferred alternative he gives up.

In our example, choosing to produce more chairs results in increasing costs. The extra opportunity cost of the first table was one chair, but the second table costs two chairs, and the third table's cost was higher still, at three chairs. Typically, because of the law of increasing cost, we'd predict that the marginal cost would increase as more tables are produced.

THINK IT THROUGH: If the cost of producing additional tables increases, what must happen to the price of tables in order to encourage the producer to boost output? The price received by the producer would have to increase. We will pick up on this point in Chapter 2.

Constant Costs

An outward-bending PPF depicts increasing cost. However, if the PPF is a straight downward-sloping line, then the opportunity cost is constant. This would happen if resources were identical in abilities. If the PPF were to bend inward, then this would tell us that opportunity cost is decreasing—in real-world terms, improbable.

Any PPF diagram has three regions—the frontier itself, inside the frontier, and beyond the frontier. Consider Figure 1.3. Any point on the frontier (such as point K) represents a point of maximum production; any point inside the frontier (such as point L) indicates underproduction; and any point beyond the frontier (such as point M) is an option that is not attainable given our current resources and technology.

Although increasing costs are typical in the real world, from now on we will assume that producers face constant opportunity costs, because this will allow us to draw the simpler straight-line PPFs.

Note: If we have constant costs, then marginal cost is constant, rather than increasing, as output increases.
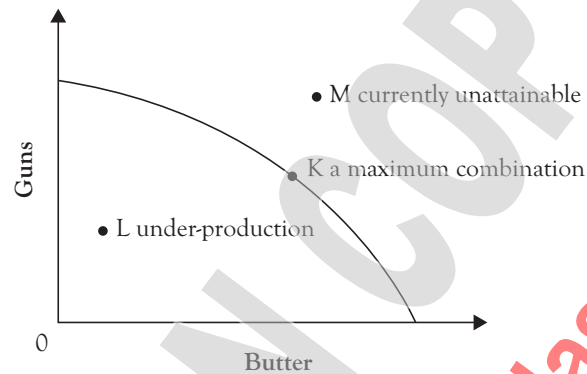
Figure 1.3 The components of a production possibility frontier.

Relaxing the Diagram's Assumptions

The PPF is drawn based on a given set of resources and a given best way of combining them. If we get more resources or better resources, or an improved way of combining our given resources, then there will be a general increase in what is possible to produce. In such a case, the PPF will shift outward from PPF1 to PPF2, as shown in Figure 1.4. A decrease in the quantity or quality of resources or a deterioration in technology will shift the whole curve inwards as what is possible to produce is diminished.

Comment: It may be hard to imagine a situation where one would willingly adopt a less productive technology. However, choosing to ban fracking because of environmental concerns might be an example. Other examples
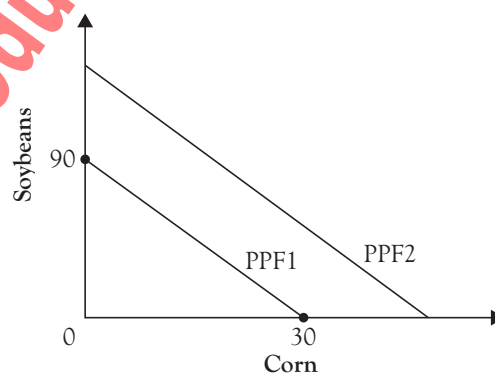
Figure 1.4 A general increase in the production possibility frontier

of not-so-good technological "improvements" might include using lead for pipes and asbestos for insulation.

A resource or technology change could be specific to only one good. In farming, for example, a strain of corn with a higher yield might be developed. In this case, although the maximum production of soybeans would be unaltered, the maximum production of corn would increase, causing the PPF to pivot from PPF1 to PPF2, as shown in Figure 1.5. Observe that the slope of the PPF has changed. Because the slope of the frontier depicts opportunity cost, the opportunity cost of corn (and thus soybeans) must have changed.

Consider the slope of PPF1 and its endpoints. If we choose to produce only corn then we can produce 30 units of corn, but we must give up the 90 units of soybeans that could have been produced. Each unit of corn "costs" three units of soybeans. Now consider the slope of PPF2. If we choose to produce only corn then we can produce 45 units of corn, but we must give up the 90 units of soybeans. Each unit of corn now "costs" only two units of soybeans. The opportunity cost of corn has decreased. Verify for yourself that the opportunity cost of a unit of soybeans has increased from one-third of a unit of corn to one-half of a unit of corn.
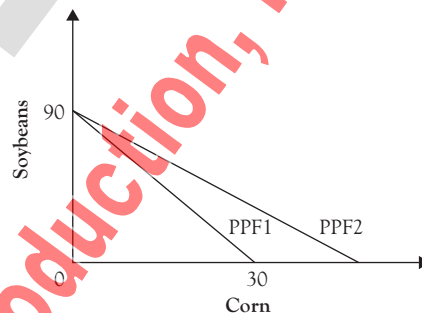
Figure 1.5 A good-specific increase in the production possibility frontier

THINK IT THROUGH: What happened to Europe's PPF during the Black Death? What was the effect on American production of the introduction of the Internet in the 1990s? Finally, in 1945, the Manhattan Project developed the atomic bomb. In terms of "guns and butter," how did the Allies' PPF change? Show each of these cases with a PPF diagram.

Using the Production Possibility Frontier Diagram

We have now developed an understanding of the general meaning of the PPF and the assumptions behind it. But how can it be used? The analysis can be used in several ways, for instance, when thinking about the consequences of choice, different concepts of efficiency, the distinction between microeconomics and macroeconomics, and the basis for trade.

The PPF illustrates **choice**. Along the frontier, where we have full employment of resources, if we choose to produce more guns, then the consequence is that we must settle for less butter. The slope of the frontier shows the rate of trade-off and reminds us that "there's no such thing as a free lunch."

Comment: Note, though, that if we have unemployed resources, we may be able to produce more guns without giving up any butter. There need be no opportunity cost in this situation.

Efficiency: The diagram can also be used to distinguish between two differing concepts of efficiency. Consider Figure 1.6.

Any point on the frontier is a point of maximum **productive efficiency**. In this sense of producing at maximum capacity, points A, B, C, and D are all equally "efficient." Point E is inefficient because some of our scarce resources are being squandered—we could be producing more meat, more vegetables, or more of both.

However, there's more to life than simply producing lots of stuff. Our economy ought to produce "the right stuff" to best satisfy the wants of its citizens. Consider the figure once more. Are points A, B, C, and D equal in terms of satisfying our wants?
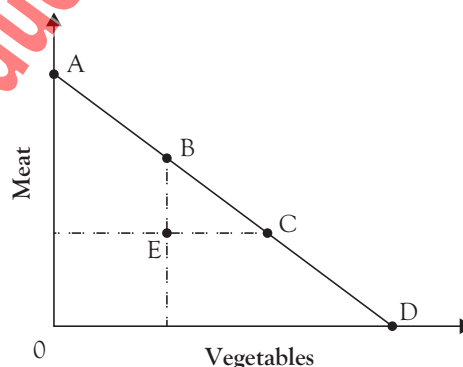
Figure 1.6 Productive efficiency and allocative efficiency

Clearly not! If we are a society of vegans then point A (all meat, no vegetables) is certainly a less desirable option than point D. Not all points on the frontier are equivalent in terms of **allocative efficiency** (producing the mixture of goods that society prefers the most). In fact, points inside the frontier may be superior to some of the points on the frontier. For example, point A is less desirable than point E (where we get at least some vegetables).

The two "efficiency" concepts are distinct. In terms of productive efficiency, any point on the PPF is superior to any point inside the frontier. However, in terms of allocative efficiency, a given point inside the frontier may be preferred to some points on the frontier. (As a general rule though, there must be at least one point on the frontier that is superior to any point inside. Point C, for example, is preferred to point E because society gets more vegetables without losing any meat.)

Comment: Intuitively, productive efficiency may be thought of as "activity" while allocative efficiency may be thought of as "achievement."

Microeconomics versus Macroeconomics: Microeconomics generally starts from the assumption that society is already at a point on its PPF and can be thought of as examining how we might move the production mix to a point of greater allocative efficiency along the line. Macroeconomics, which considers the consequences of unemployment or lackluster growth, may be thought of as exploring how we might either move toward the frontier or, indeed, shift the frontier itself.

Comparative Advantage and the Basis for Trade

The PPF and opportunity cost can be used to examine the basis for specialization and trade. The roots of this analysis reach back to the early 19th century and the British economist, David Ricardo, who developed the Law of Comparative Advantage, which we will examine in more detail in Chapter 8 (Volume II).

Briefly, assuming two participants (Jack and Jill), two goods (bread and wine), and constant costs (straight-line PPFs), if Jack and Jill's opportunity costs differ, then it must be the case that each individual must have a *comparative advantage* in the production of one of the two goods. The one exception to this would be if the opportunity costs were identical. We can make this analysis a little easier if we realize that the comparative

advantage referred to is an *opportunity cost* advantage. If, relatively, Jack can produce wine at a lower opportunity cost than Jill, (that is, Jack has a comparative cost advantage in wine production), then Jill must be able to produce bread at a lower opportunity cost than Jack (that is, a comparative cost advantage in bread production).

This may seem a curious conclusion. An obvious objection to raise would be "But what if Jack can produce both goods more cheaply than Jill?" Such a situation is impossible. Recall the tables and chairs example where we concluded that each worker's opportunity cost of producing a chair is the reciprocal of his opportunity cost of producing a table. Relatively, the greater the cost advantage a worker has in the production of one good, the greater the cost disadvantage he has in the production of the other good.
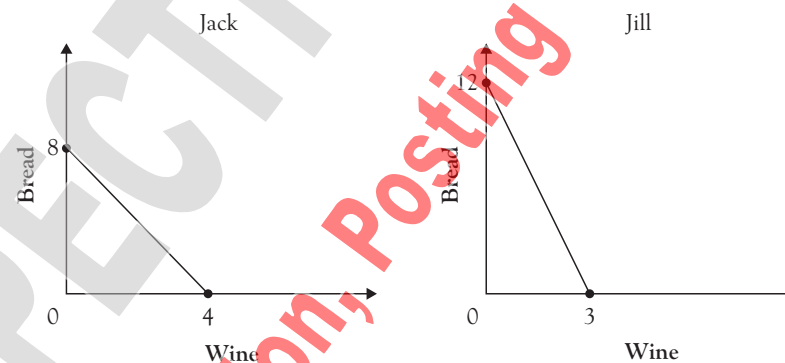
Figure 1.7 The graphical basis for trade

Consider Figure 1.7. Jack, specializing only in bread production, can bake 8 loaves each day, while Jill, similarly devoted to bread production, can bake 12 loaves each day. Jill can produce more loaves perhaps because of superior skill, better ingredients, or a more reliable oven. Fully devoted to wine production, Jack can produce four bottles each day, but Jill (less skilled perhaps, or with less good grapes) can produce only three. Recall that the slope of the PPF depicts opportunity cost so the straight lines indicate that the opportunity costs are constant for each individual. The differing slopes indicate that the opportunity costs between individuals are different.

The **Law of Comparative (Cost) Advantage** states that Jack and Jill will benefit from specialization and trade if their opportunity costs (and the slopes of the frontiers) differ.

We must determine who should produce what good by comparing opportunity costs. For Jack, the opportunity cost of producing eight loaves is the four bottles of wine he is no longer able to produce—one loaf costs half a bottle of wine. Using the reciprocal trick, one bottle of wine "costs" two loaves. For Jill, the opportunity cost of producing 12 loaves is the three bottles of wine she can no longer produce—one loaf costs a fourth of a bottle of wine. Using the reciprocal trick, one bottle of wine "costs" four loaves.

Jack can produce wine cheaper (he has a comparative advantage in wine) while Jill can produce bread cheaper (she has a comparative advantage in bread). As long as the slopes of the PPFs differ, then it must be true that one producer has a comparative advantage in one good and the other producer has the comparative advantage in the other good. Again, because of reciprocity, no individual can have a comparative advantage in both goods.

Caution: "But," you say, "this result is obvious. Jack is better at wine production because he can produce more wine than Jill, and Jill is better at bread production because she can produce more loaves than Jack!" This is false logic. You have fallen into the trap of absolute advantage. In absolute terms, while it is true that Jack is superior to Jill in wine production and Jill trumps Jack in bread production, this fact has no bearing on how the two parties should specialize.

The fallacy is easy to show. Suppose that Jack can produce more wine *and* more bread than Jill. Does this mean that Jack should produce everything and that Jill should produce nothing? Clearly not. In the real world, there are large countries with many resources and small countries with few, but the small countries can still gain from trade and can contribute to general prosperity despite an absolute disadvantage in all goods.

We can summarize the results thus far.

Opportunity cost of	Jack	Jill	Comparative advantage
one loaf of bread	1/2 bottle	1/4 bottle	Jill
one bottle of wine	2 loaves	4 loaves	Jack

Jack and Jill decide to specialize according to comparative advantage and trade with each other. Is mutually beneficial trade possible? Let's assume that Jack and Jill barter their trade goods, wine and bread, respectively. If the "price" of a bottle of wine is two loaves then Jack will not

gain from trade (as his cost of production of a bottle of wine is also two loaves) but Jill will gain from trade. (Can you verify this?) If the "price" of a bottle of wine rises to four loaves then Jack gains from trade but Jill will not gain because, if the price of wine is four loaves then the price of bread is a quarter of a bottle of wine, which equals Jill's cost of production—her cost and the price at which she is trading are equal.

Between these two prices for a bottle of wine (two loaves and four loaves) lies a range of prices that will benefit both traders. Consider the situation where one bottle of wine is traded for three loaves. Jack, producing wine at a cost of two loaves, will gain because the price exceeds his cost. Similarly, but less obviously, Jill, producing bread at a cost of a quarter of a bottle of wine per loaf, will also gain because the price of a loaf (one-third of a bottle of wine) is also higher than her cost. Both benefit.

There is no requirement that both benefit equally—that depends on relative negotiating abilities, for example. As long as the price lies between the limits where one party or the other does not gain (one wine sells for two loaves and one wine sells for four loaves), trade will be mutually beneficial. We will look more closely at trade and comparative advantage in Chapter 8.

Caution: We have concluded that the Law of Comparative Advantage persuades us that trade can be beneficial. Before moving on, it's worth noting that the analysis depends on the assumption that each person (or economy) is fully employed, that is, on his or her production possibility frontier. If that is not the case, then the basis for trade (being on the PPF and, from there, being able to compare opportunity costs) evaporates. Our opportunity cost calculations are valid only along the frontier itself. A nation struggling through a recession might still find it to be in its own best interests to restrict imports and boost domestic employment.

Review: In this chapter, we have discovered that "there is no such thing as a free lunch," in the sense that, any time a choice is made an alternative is chosen, but that other alternatives are given up. The value placed on the next-best alternative that is given up when a choice is made is its *opportunity cost*—perhaps the single most important idea in economics. When we look at "cost" in future chapters, keep in mind that, at its most profound level, it is opportunity cost that is involved.

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