Introduction to Microeconomics

SIXTH EDITION

Edwin G. DOLAN

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PhD Yale University

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About the Author

Edwin G. Dolan, economist and educator, holds a PhD from Yale University. Early in his career, he was a member of the economics faculty at Dartmouth College, the University of Chicago, and George Mason University. From 1990 to 2001, he taught in Moscow, Russia, where he and his wife founded the American Institute of Business and Economics (AIBEc), an independent, not-for-profit MBA program. Since 2001, he has taught at several universities in Europe—including Central European University in Budapest, the University of Economics in Prague, and the Stockholm School of Economics in Riga. During breaks in his teaching career, he worked in Washington, DC, as an economist for the Antitrust Division of the Department of Justice and as a regulatory analyst for the Interstate Commerce Commission. He later served a stint in Almaty as an adviser to the National Bank of Kazakhstan. When not lecturing abroad, he makes his home in Northwest Michigan.

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PREFACE

The spread of instant electronic communication has changed not only the economy itself but also the way students learn economics and the way instructors teach the subject. A textbook, perhaps supplemented by a few photocopied handouts, used to be almost the only source of information for students. A blackboard was often the instructor's only teaching tool. All this has changed.

Today, both students and instructors rely on the Internet as their primary source of information about current economic events. They still need a good textbook to provide a framework for organizing all the information that is available, but that textbook needs to mesh with the material available from online news sources, blogs, and social media. This sixth edition of *Introduction to Microeconomics* from BVT Publishing includes several changes that integrate it more smoothly into the world of e-learning.

Some of the changes are stylistic. A few years ago I started a blog, and the exercise of blogging has affected the way I write. I have revised the entire text to make the language more active with shorter sentences, shorter paragraphs, and shorter chapters. Chapter titles are more descriptive and less technical. With all these changes, the book now reads less like a series of journal articles and more like something students might actually want to read.

In addition to a more inviting presentation, much of the content is new, including new case studies and examples throughout the book. Topics range from the latest controversies over climate change to trends in poverty and income distribution.

Furthermore, the range of new case studies and examples is not limited to those included in the book itself. Ed Dolan's Econ Blog regularly provides new material to both students and instructors. A new section at the end of most chapters provides links to blog posts and slideshows that tie in with material presented in the text. For still more up-to-date material, instructors and students are invited to read the blog itself regularly or follow @DolanEcon on Twitter®. I also invite instructors and students to suggest topics for blog posts or submit guest posts of their own on favorite subjects.

Finally, this edition recognizes the fact that instructors no longer rely solely on blackboards and photocopied handouts as teaching aids. Most instructors now regularly use slideshows, smartboards, and videos in class, and course websites to help students with their studying between classes.

One important aid to e-teaching and e-learning is a complete set of PowerPoint™ slides, which include all of the graphs and tables from each chapter, plus other relevant material that is available as a supplement to *Introduction to Microeconomics* from BVT. Beyond the basic slides for each chapter, Ed Dolan's Econ Blog provides links to additional content in PowerPoint format that can be cut-and-pasted directly into classroom presentations or posted to a course webpage.

ACKNOWLEDGEMENTS

As always, I thank the entire publishing and editorial staff of BVT Publishing for their highly professional support. They are a pleasure to work with, and I hope that all students and instructors who use this book benefit as much as I have from their unique and innovative approach to textbook publishing. Enjoy your teaching and learning!

Supplements & Resources

Instructors Supplements

A complete teaching package is available for instructors who adopt this book. This package includes an online lab, instructor's manual, test bank, course management software, and PowerPoint™ slides.

BVTLab	An online lab is available for this textbook at www.BVTLab.com, as described in the BVTLab section below.
Instructor's Manual	The instructor's manual helps first-time instructors develop the course, while offering seasoned instructors a new perspective on the material. Each section of the instructor's manual coincides with a chapter in the textbook. The user-friendly format begins by providing learning objectives and detailed outlines for each chapter. Then, the manual presents lecture discussions, class activities and sample answers to the end-of-chapter review questions. Lastly, additional resources—books, articles, websites—are listed to help instructors review the materials covered in each chapter.
Test Bank	An extensive test bank is available to instructors in both hard copy and electronic form. Each chapter has approximately 200 multiple choice, 100 true/false, 50 short answer, and 10 essay questions ranked by difficulty and style. Each question is referenced to the appropriate section of the text to make test creation quick and easy.
Course Management Software	BVT's course management software, Respondus, allows for the creation of tests and quizzes that can be downloaded directly into a wide variety of course management environments such as Blackboard®, WebCT™, Desire2Learn®, Canvas™, and others.
PowerPoint Slides	A set of PowerPoint slides for each chapter, comprising a chapter overview, learning objectives, slides covering all key topics, key figures and charts, as well as summary and conclusion slides.

Student Resources

Student resources are available for this textbook at www.BVTLab.com. These resources are geared toward students needing additional assistance, as well as those seeking complete mastery of the content. The following resources are available:

Practice Questions	Students can work through hundreds of practice questions online. Questions are multiple choice or true/false in format and are graded instantly for immediate feedback.
Flashcards	BVTLab includes sets of flashcards that reinforce the key terms and concepts from each chapter.
Chapter Summaries	A convenient and concise chapter summary is available as a study aid.
PowerPoint Slides	All instructor PowerPoints are available for convenient lecture preparation and for students to view online for a study recap.

BVTLab

BVTLab is an affordable online lab for instructors and their students. It includes an online classroom with a grade book and chat room, a homework grading system, extensive test banks for quizzes and exams, and a host of student study resources. Even if a class is not taught in the lab, students can still utilize the resources described below.

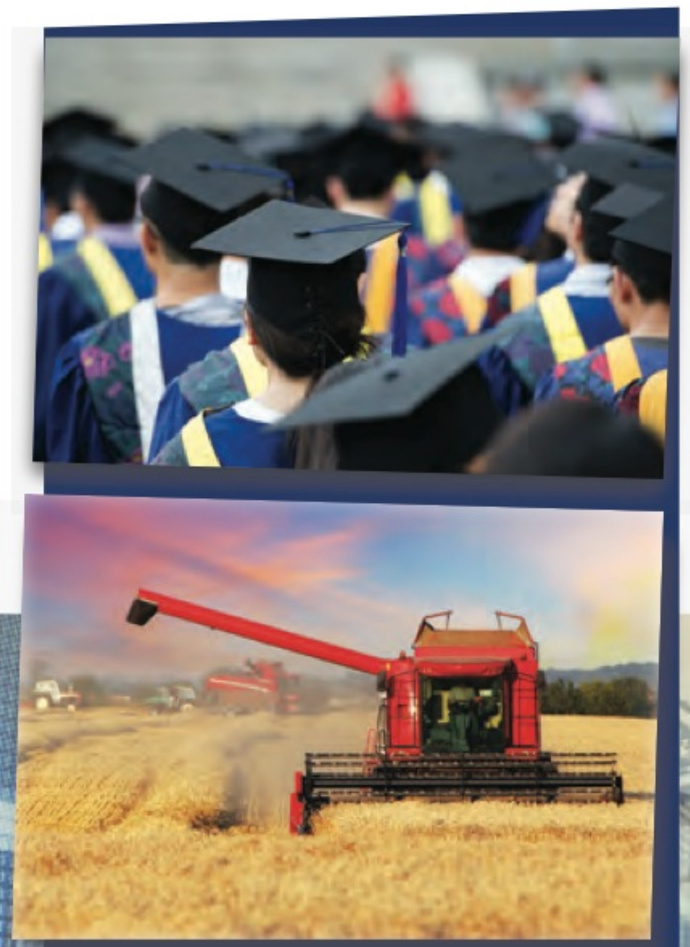
Course Setup	BVTLab has an easy-to-use, intuitive interface that allows instructors to quickly set up their courses and grade books, and to replicate them from section to section and semester to semester.
Grade Book	Using an assigned passcode, students register for the grade book, which automatically grades and records all homework, quizzes, and tests.
Chat Room	Instructors can post discussion threads to a class forum and then monitor and moderate student replies.
Student Resources	All student resources for this textbook are available in BVTLab in digital form.
eBook	Students who have purchased a product that includes an eBook can download the eBook from a link in the lab. A web-based eBook is also available within the lab for easy reference during online classes, homework, and study sessions.

Customization

BVT's Custom Publishing Division can help you modify this book's content to satisfy your specific instructional needs. The following are examples of customization:

- Rearrangement of chapters to follow the order of your syllabus
- Deletion of chapters not covered in your course
- Addition of paragraphs, sections, or chapters you or your colleagues have written for this course
- Editing of the existing content, down to the word level
- Customization of the accompanying student resources and online lab
- Addition of handouts, lecture notes, syllabus, etc.
- Incorporation of student worksheets into the textbook

All of these customizations will be professionally typeset to produce a seamless textbook of the highest quality, with an updated table of contents and index to reflect the customized content.



PART 1

Introduction to Economics

CHAPTER 1

How Economists Think

AFTER READING THIS CHAPTER, you will understand the following:

1. What economics is really about
2. Four fundamental economic choices
3. The coordination of economic choices
4. How economists use theory, graphs, and data

CHAPTER Outline

What do you consider the most important economic issue today? Inequality of income and wealth? (Increasing for the United States, but decreasing for the world as a whole.) The high cost of college? (Rising faster than inflation for years.) The federal budget deficit? (Dramatically lower than its peak, but likely to increase in coming years.) The high price of gasoline? (Down for the month as I write this, but maybe back up again by the time you read it.) How can we understand these complex, yet interrelated, issues?

There are many ways to understand what goes on in the world around us. Sociologists, poets, and religious leaders each have a contribution to make. So do economists. Although reading this book will not make you an economist, it should give you a good overview of how economists think about things. By adding the economic perspective to others, you will better understand the world around you.

This chapter will take the first steps toward explaining the economic way of thinking by introducing a few big ideas that apply everywhere, in all countries, at all times. The most important of them is **scarcity**. Scarcity means any situation in which there is not enough of something to fill everyone's wants. For example corn grown in the US Midwest is scarce because there is not enough of it to meet all the competing needs of Chinese consumers, who want to eat more corn-fed pork as they become wealthier, and of US drivers, who are burning more corn-based ethanol in their cars. The scarcity of corn affects people's choices about how to use not only corn but also other goods like wheat and gasoline. Any change in the scarcity of corn can have indirect effects on exchange rates and stock markets that may not be quite so easy to trace, but are no less important.

Scarcity and the way people deal with it are defining concepts of **economics**, the social science that seeks to understand the choices people make in using scarce resources to meet their wants. As this definition makes clear, economics is a study not of things, money, or wealth, but of *people*. Economics is about people because scarcity itself is a human phenomenon. Wild strains of corn grew for millions of years and deposits of crude oil lay undisturbed in the ground long before they became the objects of human wants. Only after humans deemed them desirable did they become scarce, at least in the sense that economists understand the term.

Scarcity
A situation in which there is not enough of a resource to meet all of everyone's wants

Economics
The social science that seeks to understand the choices people make in using scarce resources to meet their wants

The focus on the human dimension of scarcity and choice is part of what makes economics a social science. Economics is a social science also because people do not deal with scarcity in isolation. Instead they can stretch scarce resources to meet their wants more effectively by trading with one another. As people trade, each person gives up something of value to others so that everyone gains from the exchange. Some economists think exchange is even more important than scarcity as a defining characteristic of economics.

We can divide the wide range of topics covered by economics into two main branches. Understanding what determines corn prices belongs to the branch known as **microeconomics**. The prefix *micro*, meaning "small," indicates that this branch of economics deals with the choices of small economic units such as households, firms, and government agencies. Although microeconomics studies individual behavior, its scope can be worldwide, as when it focuses on global trade in goods such as food and energy.

Microeconomics
The branch of economics that studies the choices of individual units—including households, business firms, and government agencies

Economics also has another branch, known as **macroeconomics**. The prefix *macro*, meaning "large," indicates that it deals with larger-scale phenomena. Typical problems in macroeconomics include the causes of unemployment, inflation, and changes in living standards. Macroeconomics and microeconomics are not really separate. Because macroeconomic phenomena like inflation represent the result of millions of individual choices about the prices of particular goods and services, macroeconomics ultimately rests on a microeconomic foundation.

Macroeconomics
The branch of economics that studies large-scale economic phenomena, particularly inflation, unemployment, and economic growth

1.1 What? How? Who? For Whom?

Among the most important economic choices people make are what goods will be produced, how people will produce them, who will do which jobs, and who will benefit from the goods and services that the economy produces. Scarcity makes each of these choices necessary. We can use each of them to introduce a key aspect of how economists think.

1.1a Deciding What to Produce: Opportunity Cost

The first choice is what goods to produce. In a real economy there are more distinct goods and services than we can count, but we can illustrate some basic principles with an economy that produces just two goods: cars and education. Both goods are scarce. Going without a car (or driving a used car instead of a new one) is a sacrifice many students must make to get a college education. The economy as a whole faces the same trade-off that individual students face. It is not possible to give everyone all the cars and education they want or just the kind and quality they would like. Somehow, someone must make choices.

No economy can produce as much of everything as everyone wants because the resources used to make things are, themselves, scarce. For example making a car requires steel, glass, paint, welding machines, land for factories, and the labor of autoworkers. Economists traditionally group all the various resources used in production into three basic categories called **factors of production**: labor, capital, and natural resources. **Labor** includes all of the productive contributions made by people working with their minds and hands. **Capital** includes all the productive inputs created by people, including tools, machinery, buildings, and intangible items like computer software. **Natural resources** include anything that people can use as a productive input in its natural state—for example, farmland, building sites, forests, and mineral deposits.

We cannot use factors of production to satisfy two wants at the same time. We cannot use the same steel, concrete, and building sites both for automobile factories and for classrooms. People who work as teachers cannot spend the same time working on an automobile assembly line. Students could spend part of their time working in an auto plant to earn money to pay for college, but if they did, that would take time away from studying. Whenever scarce inputs have more than one possible use, using them to produce one good means giving up the opportunity to produce something else instead. Economists express this basic truth by saying that everything has an **opportunity cost.** The opportunity cost of a good or service is its cost in terms of the forgone opportunity to pursue the best possible alternative activity with the same time or resources.

In our two-good economy, the opportunity cost of producing a college graduate can be expressed as the number of cars that could have been produced by using the same labor, capital, and natural resources. Suppose that

Factors of production
The basic inputs of labor, capital, and natural resources used in producing all goods and services

Labor
The contributions to production made by people working with their minds and their hands

Capital
All means of production that are created by people, including tools, industrial equipment, and structures

Natural resources
Anything that people can use as a productive input in its natural state, such as farmland, building sites, forests, and mineral deposits

Opportunity cost
The cost of a good or service measured in terms of the forgone opportunity to pursue the best possible alternative activity with the same time or resources

Many students must go without a car (or drive a used car instead of a new one) in order to get a college education. (Shutterstock)

BVT Lab

Flashcards are available for this chapter at www.BVTLab.com.

the opportunity cost of educating a college graduate is four Toyota® Camrys®. That ratio (graduates per car or cars per graduate) would be a useful way to express opportunity cost in an economy with just two goods; more typically, though, we deal with situations in which there are many goods. Having more of one means giving up a little bit of many others.

In an economy with many goods, we can express opportunity costs in terms of a common unit of measurement: money. For example rather than saying that a college education is worth four Camrys, or that a Camry is worth one-fourth of a college education, we could say that the opportunity cost of a car is $30,000 and that of a college education is $120,000.

Useful as it is to have a common unit of measurement, we must take great care when expressing opportunity costs in terms of money because not all out-of-pocket money expenditures represent the sacrifice of opportunities to do something else. At the same time, not all forgone opportunities take the form of money spent. *Applying Economic Ideas 1.1,* which analyzes both the out-of-pocket expenditures and the opportunity costs of a college education, shows why.

We will stress the importance of opportunity cost repeatedly in this book. The habit of looking for opportunity costs is one of the distinguishing features of the economic way of thinking.

Applying Economic Ideas 1.1

The Opportunity Cost of a College Education

How much does it cost you to go to college? If you are a resident student at a typical four-year college in the United States, you can answer this question by making up a budget like the one shown in Part A of the table. We can call this a budget of out-of-pocket costs because it includes all the items—and only those items—that you or your parents must actually pay for in a year.

Part A: Budget of Out-of-Pocket Costs		Part B: Budget of Opportunity Costs	
Item	**Amount**	**Item**	**Amount**
Tuition and fees	$14,000	Tuition and fees	$14,000
Books and supplies	1,200	Books and supplies	1,200
Transportation to and from home	1,100	Transportation to and from home	1,100
Room and board	7,000	Forgone income	16,000
Personal expenses	1,400		
Total out-of-pocket costs	**$24,700**	**Total opportunity costs**	**$32,300**

Your own out-of-pocket costs may be much higher or lower than those given in the table, but chances are these are the main categories that first come to mind when you think about the costs of college. As you begin to think more like an economist, you may find it useful to restate your college budget in terms of opportunity costs. Which of the items in Part A represent opportunities that you have forgone in order to go

to college? Are any forgone opportunities missing? To answer these questions, compare Part A with Part B, which shows a budget of opportunity costs.

Some items are both opportunity costs and out-of-pocket costs. The first three items in Part A show up again in Part B. To spend $14,000 on tuition and fees and $1,200 on books and supplies, you must give up the opportunity to buy other goods and services—maybe to buy a car or rent a ski condo. To spend $1,100 getting to and from school, you may have to pass up the opportunity to travel somewhere else or to spend the money on something other than travel. Not all out-of-pocket costs are also opportunity costs, however. Consider the last two items in the out-of-pocket budget. By spending $8,400 on room, board, and personal expenses during the year, you are not really giving up the opportunity to do something else. Whether or not you were going to college, you would have to eat, live somewhere, and buy clothes. Because you would have those expenses in any case, they do not count as opportunity costs of going to college.

Finally, some items are opportunity costs without being out-of-pocket costs. Think about what you would be doing if you were not going to college. If you were not going to college, you probably would have taken a job and started earning money soon after leaving high school. As a high-school graduate, your earnings would be about $16,000 during the nine months of the school year. (You can work during the summer even if you are attending college.) Because this potential income is something that you must forgo for the sake of college, it is an opportunity cost even though it does not involve an outlay of money.

Income that could have been earned with time spent studying is an opportunity cost of getting a college education. (iStock)

Which budget you use depends on the kind of decision you are making. If you have already decided to go to college and are doing your financial planning, the out-of-pocket budget will tell you how much you have to raise from savings, money earned, parents' contributions, loans, and scholarships to make ends meet. But if you are making the more basic choice between going to college and pursuing a career that does not require a college degree, the opportunity cost of college is what counts.

1.1b Deciding How to Produce: Efficiency and Entrepreneurship

How to produce is a second basic economic choice. There is more than one way to make almost anything. Auto firms can, for example, make cars in highly automated factories, using a lot of capital equipment and relatively little labor, or build them one by one in smaller shops, using a lot of labor and only a few general-purpose machines. Toyota builds its Camrys the first way; Lamborghini builds its Huracán (priced at a thrifty $237,000) the second way. We could say the same about education. A professor can teach a course directly to twenty students in a small classroom using only a whiteboard, or teach the same course online to hundreds of students.

Some cars come from highly automated factories, while others use lots of hand labor. (Dreamstime)

Efficiency

Efficiency is one of the most important things to keep in mind when deciding how to produce something. In everyday language, efficiency means producing with a minimum of expense, effort, and waste. Economists use a more precise definition. **Economic efficiency**, they say, refers to a state of affairs in which it is impossible to make any change that satisfies one person's wants more fully without causing some other person's wants to be satisfied less fully.[1]

This formal definition of economic efficiency does not differ greatly from the everyday notion. If there is some way to make you better off without making me worse off, it is wasteful to pass up the opportunity. If I have a red pen that I am not using, and you need one just for a minute, it would be wasteful for you to buy a red pen of your own. It is more efficient for me to lend you my pen; it makes you better off and me no worse off. If there is a way to make us both better off, it would be all the more wasteful not to take advantage of the opportunity. You lend me your bicycle for the afternoon, and I will lend you my volleyball. If I do not ride a bicycle very often and you do not play volleyball very often, it would be inefficient for us both to own one of each.

The examples of the pen, the bicycle, and the volleyball all concerned goods that already existed, but many applications of efficiency concern the production of new goods. **Efficiency in production** refers to a situation in which it is not possible, given available productive resources and existing knowledge, to produce more of one good without forgoing the opportunity to produce some of another good. Like the broader concept of economic efficiency, efficiency in production has its roots in the everyday notion of avoiding waste. For example a grower of apples finds that, beyond some certain quantity, using more water per tree does not increase the yield of apples; so using more than that amount would be wasteful. Better to transfer the extra water to the production of, say, peaches. That way the grower can get more peaches without reducing the apple crop.

Economic efficiency
A state of affairs in which it is impossible to make any change that satisfies one person's wants more fully without causing some other person's wants to be satisfied less fully

Efficiency in production
A situation in which it is not possible, given available knowledge and productive resources, to produce more of one good without forgoing the opportunity to produce some of another good

The economist's definition also includes more subtle possibilities for improving the efficiency of production. For example it is possible to grow apples in Georgia. It is also possible, by selecting the right tree varieties and using winter protection, to grow peaches in Vermont. Some hobbyists do grow both fruits in both states. However, growing them commercially would be inefficient even if growers in both states followed best practices and avoided any obvious waste.

An example will show why. Suppose that, to start with, growers plant equal numbers of apple and peach trees in each state. Then compare a situation with five hundred fewer struggling peach trees growing in Vermont, with their place taken by five hundred thriving apple trees. At the same time, suppose growers plant five hundred fewer heat-stressed apple trees in Georgia, and peaches take their place. The second situation would increase the output of both fruits without increasing the total land, labor, and capital used in fruit production, showing that the original distribution of trees was inefficient.

How to Increase Production Potential

Once the economy is producing efficiently, we can get more of one good only by giving up the opportunity to produce something else—assuming we hold productive resources and knowledge constant. Over time, though, we can find new resources or new ways to use existing resources.

It is more efficient to grow apples in Vermont than in Georgia.(Shutterstock)

At one time population growth and the discovery of new supplies of natural resources were the most important ways of increasing production potential. However, as we deplete the most easily tapped supplies of natural resources and as population growth slows in most parts of the world, capital will increasingly be the factor of production that contributes most to the expansion of production potential.

Economists use the term **investment** to refer to the act of increasing the economy's stock of capital—that is, its supply of productive inputs made by people. Investment involves a trade-off of present consumption for future consumption. To build more factories, roads, and computers, we have to divert resources from the production of bread, movies, haircuts, and other things that satisfy immediate wants. In return we put ourselves in a better position to satisfy our future wants.

Increases in the quantities of labor, capital, and natural resources are not the only sources of economic growth. Even more important are improvements in knowledge—the invention of new technology, new forms of organization, and new ways of satisfying wants. **Entrepreneurship** is the process of looking for new possibilities, making use of new ways of doing things, being alert to new opportunities, and overcoming old limits. It is a dynamic process that breaks down the constraints imposed by existing knowledge and limited supplies of factors of production.

Entrepreneurship does not have to mean inventing something or starting a new business, although it often does. It may mean finding a new market for an existing product—for example, convincing people in Germany that Japanese sushi makes a quick and tasty lunch. It may mean taking advantage of price differences between one market and another—for example, buying hay at a low price in Pennsylvania, where growing conditions have been good in the past year, and reselling it in Virginia, where the weather has been too dry.

We can be entrepreneurs in our roles as consumers and workers, too. We do not just repeat the same patterns of work and leisure every day. We seek variety—new jobs, new foods, and new places to visit. Each time we try something new, we are taking a step into the unknown. In that sense, we are all entrepreneurs.

Some people call entrepreneurship the fourth factor of production, but it differs from the three classical factors of production in important ways. Unlike labor, capital, and natural resources, we cannot measure entrepreneurship because it is intangible. Although entrepreneurs earn incomes reflecting the value that the market places on their accomplishments, we cannot speak of a price per unit of entrepreneurship; there are no such units. Also, unlike human resources (which grow old), machines (which wear out), and natural resources (which can be used up), the inventions and discoveries of entrepreneurs are not depleted as they are used. Once someone invents a new product or concept—lithium battery power for cars, taking pictures with cell phones, or hedge funds as a form of financial investment—the required knowledge does not have to be created again, although it may be supplanted by even better ideas. All in all, it is more helpful to think of entrepreneurship as a process of learning better ways of using the three basic factors of production than as a separate factor of production.

Investment
The act of increasing the economy's stock of capital—that is, its supply of productive inputs made by people

Entrepreneurship
The process of looking for new possibilities, making use of new ways of doing things, being alert to new opportunities, and overcoming old limits

1.1c Deciding Who Will Do Which Work: The Division of Labor

Even a person living in complete isolation would have to choose what to produce and how to produce it. The fictional castaway Robinson Crusoe had to decide whether to fish or hunt birds. If he decided to fish, he had to decide whether to do so with a net or with a hook and line. Other important economic choices, including who will do which work and who will get the resulting output, exist only for people living in society. That is another reason economics is one of the social sciences.

Working as a team, two people can get a job done more easily. (Dreamstime)

Deciding who will do which work is a matter of organizing the social division of labor. Will everyone work independently—be a farmer in the morning, a tailor in the afternoon, and a poet in the evening? Or will people cooperate by specializing in one particular job, coordinating their work with other specialists, and trading the resulting goods and services? Economists have long argued that specialization and cooperation are the best strategies. Three things make cooperation pay off: teamwork, learning by doing, and comparative advantage.

First, consider *teamwork*. In a classic paper on this subject, Armen Alchian and Harold Demsetz used the example of workers unloading bulky crates from a truck.[2] The crates are so large that one worker alone cannot move them at all without unpacking them. Two people, each working independently, would take hours to unload the truck. However, if they work as a team, they can easily pick up the crates and stack them on the loading dock. This example shows that even when everyone is doing the same work, and even when little skill is involved, teamwork pays.

A second reason for cooperation applies when there are different jobs to do and different skills to learn. In a furniture plant, for instance, some workers operate production equipment, others use office equipment, and still others buy materials. Even if all the workers start out with equal abilities, each gets better at a particular job by doing it repeatedly. *Learning by doing* turns workers of average productivity into specialists, thereby creating a more productive team.

Comparative advantage

The ability to produce a good or service at a lower opportunity cost than someone else

A third reason for cooperation comes into play when the differing skills of workers give them a *comparative advantage* in particular tasks. **Comparative advantage** is the ability to do a job or produce a good at a lower opportunity cost than someone else. An example will show how two people can use comparative advantage to improve the efficiency of the division of labor.

Suppose two clerical workers, Bill and Jim, are working at the job of getting out a batch of invoices to clients. The invoices include both a personalized text and a table with data. Jim is very good at working with both text and data. He can prepare the text section of an invoice in five minutes and do the data table in one minute. Working alone, he can finish ten invoices in an hour. Bill is not so good at either task. It takes him ten minutes to do the text for an invoice and five minutes to prepare the data. Alone, he can do only four invoices an hour. In summary form:

Jim: Prepare one text, five minutes

Prepare one data table, one minute

Bill: Prepare one text, ten minutes

Prepare one data table, five minutes

INVOICE

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Yours truly,
Andrea Martin

Part No.	Quantity	Item	Price per Unit	Total
P622.2	8	Replacement module	$ 56.27	$450.16
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Subtotal				$2,046.16
	Preferred customer discount			–$204.62
	Total due 30 days after receipt			$1,841.54

Without cooperation, the two workers' limit is fourteen invoices per hour between them. Could they do better by cooperating? It depends on who does which job. One way of cooperating would be for Jim to prepare all the text while Bill does all the data; with this division of labor, they can just keep up with one another. That turns out to not be such a good idea. At five minutes per invoice, that kind of cooperation cuts their combined output to only twelve invoices per hour, which is worse than when they weren't cooperating at all.

Instead they should divide the work according to the principle of *comparative advantage*. Even though Bill is slower at preparing the text, he has a comparative advantage in text preparation because the opportunity cost of that part of the work is lower for him: The ten minutes he takes to do the text for one invoice is equal to the time he needs to do two data tables. Jim could use the five minutes he takes to prepare text for one invoice to do the data for five invoices. For Bill, then, the opportunity cost of preparing one text is to forgo two data tables, whereas for Jim the opportunity cost of preparing one text is to forgo five data tables.

Because Bill gives up fewer data tables per text than Jim, the principle of comparative advantage says that Bill should spend all his time preparing text. If he does, he can produce the text for six invoices per hour. Meanwhile Jim can spend forty-five minutes of each hour preparing the text for nine invoices, and the last fifteen minutes of each hour doing the data for all fifteen invoices. By specializing according to comparative advantage, the two workers can increase their total output to fifteen invoices per hour—which is the best they can possibly do.

In this example, two people working side-by-side use comparative advantage to work out the efficient division of labor, but the principle also has broader implications. It can apply to a division of labor between individuals or business firms working far apart—even in different countries. In fact the earliest application of the principle was to international trade (see *Who Said It? Who Did It? 1.1*). Comparative advantage remains one of the primary principles of mutually beneficial cooperation, whether on the scale of the workplace or on that of the world as a whole.

Whatever the context, comparative advantage arises from opportunity cost. Suppose there are two tasks, A and B, and two parties, X and Y (individuals, firms, or countries), each capable of doing both tasks but not equally well. First ask what the opportunity cost is for X doing a unit of task A, measured in terms of how many units of task B could be done with the same time or resources. Then ask the same question for Y. The party with the lower opportunity cost for doing a unit of task A has the comparative advantage in doing that task. To check, ask what the opportunity cost is for each party doing a unit of task B, measured in terms how many units of task A could be done with the same time or resources. The party with the lower opportunity cost for doing a unit of task B has the comparative advantage in doing that task. Both X and Y will be better off if each specializes according to comparative advantage.

Who Said It? Who Did It? 1.1

David Ricardo and the Theory of Comparative Advantage

(Wikimedia Commons)

David Ricardo was born in London in 1772, the son of an immigrant who was a member of the London stock exchange. Ricardo's education was rather haphazard, and he entered his father's business at the age of 14. In 1793, he married and went into business on his own. These were years of war and financial turmoil. The young Ricardo developed a reputation for remarkable astuteness and quickly made a large fortune.

In 1799, Ricardo read Adam Smith's *The Wealth of Nations* and developed an interest in political economy (as people at that time called the field we now call economics). In 1809, Ricardo published his first writings on economics—a series of newspaper articles on "The High Price of Bullion." Several other short works added to his reputation in this area. In 1814, he retired from business to devote all his time to political economy.

Ricardo's major work was *On the Principles of Political Economy and Taxation*, first published in 1817. This work contains, among other things, a pioneering statement of comparative advantage as applied to international trade. Using a simple numerical example, Ricardo showed why—even though Portugal could produce both wine and wool with fewer labor hours than England—it was to the advantage of both countries for England to export wool to Portugal and to import wine in return because the comparative cost was less in England.

International trade is only one topic in Ricardo's *Principles*. The book covers the whole field of economics, as it then existed, beginning with value theory and progressing to a theory of economic growth and evolution. Ricardo held that the economy was growing toward a future "steady state." At that point, economic growth would come to a halt, and the wage rate would fall to the subsistence level. This gloomy view and the equally pessimistic views of Ricardo's contemporary, Thomas Malthus, gave political economy a reputation as "the dismal science."

Ricardo's book was extremely influential. For more than half a century thereafter, much of the writing on economic theory published in England consisted of expansions of and commentaries on Ricardo's work. Economists as different as Karl Marx, the revolutionary socialist, and John Stuart Mill, a defender of liberal capitalism, took Ricardo's theories as their starting point. Even today there are "neo-Ricardian" and "new classical" economists who look to Ricardo's works for inspiration.

Ricardo's pioneering book on political economy applied the concept of comparative advantage to trade in wine and wool between England and Portugal. (Wikimedia Commons)