

ECON 1030: PRINCIPLES OF MACROECONOMICS



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ECON 1030: Principles of Macroeconomics



This bronze statue is just across the street from the New York Stock Exchange on Wall Street in Lower Manhattan. The bull represents the concept of a *bull market* -- a market in which asset prices are increasing. A bull market in stocks is typical when the macroeconomy is strong and growing. A market that is characterized by falling asset prices is known as a bear market.

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This text was compiled on 04/16/2026

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CHAPTER OVERVIEW

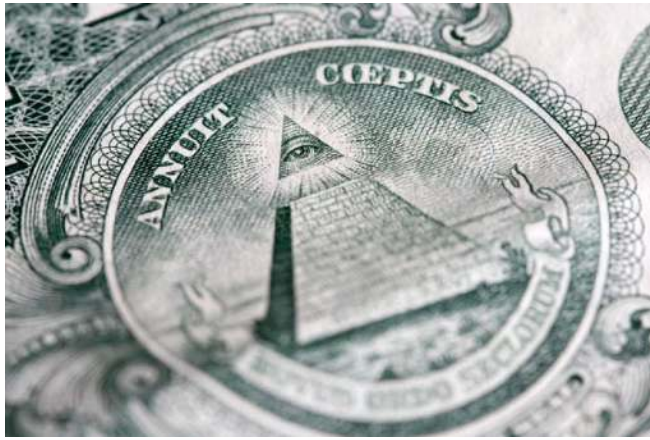
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1.1: Defining Economics



The Eye of Providence on the reverse side of a one dollar bill represents God watching over humanity. The unfinished pyramid dates back to ancient Egypt and represents the death of a king. There are lots of theories as to why these images appear, not only on the dollar bill, but also on the Great Seal of the United States (reverse side). Fact is -- nobody knows for sure.

Learning Objective

1. Define economics.
2. Explain the concepts of scarcity and opportunity cost and how they relate to the definition of economics.
3. Understand the three fundamental economic questions: What should be produced? How should goods and services be produced? For whom should goods and services be produced?

Economics is a social science that examines how people choose among the alternatives available to them. It is social because it involves people and their behavior. It is a science because it uses, as much as possible, a scientific approach in its investigation of choices.

Scarcity, Choice, and Cost

All choices mean that one alternative is selected over another. Selecting among alternatives involves three ideas central to economics: scarcity, choice, and opportunity cost.

Scarcity

Our resources are limited. At any one time, we have only so much land, so many factories, so much oil, so many people. But our wants, our desires for the things that we can produce with those resources, are unlimited. We would always like more and better housing, more and better education—more and better of practically everything.

If our resources were also unlimited, we could say yes to each of our wants—and there would be no economics. Because our resources are limited, we cannot say yes to everything. To say yes to one thing requires that we say no to another. Whether we like it or not, we must make choices.

Our unlimited wants are continually colliding with the limits of our resources, forcing us to pick some activities and to reject others. Scarcity is the condition of having to choose among alternatives. A scarce good is one for which the choice of one alternative requires that another be given up.

Consider a parcel of land. The parcel presents us with several alternative uses. We could build a house on it. We could put a gas station on it. We could create a small park on it. We could leave the land undeveloped in order to be able to make a decision later as to how it should be used.

Suppose we have decided the land should be used for housing. Should it be a large and expensive house or several modest ones? Suppose it is to be a large and expensive house. Who should live in the house? If the Lees live in it, the Nguyens cannot. There are alternative uses of the land both in the sense of the type of use and also in the sense of who gets to use it. The fact that land is scarce means that society must make choices concerning its use.

Virtually everything is scarce. Consider the air we breathe, which is available in huge quantity at no charge to us. Could it possibly be scarce?

The test of whether air is scarce is whether it has alternative uses. What uses can we make of the air? We breathe it. We pollute it when we drive our cars, heat our houses, or operate our factories. In effect, one use of the air is as a garbage dump. We certainly need the air to breathe. But just as certainly, we choose to dump garbage in it. Those two uses are clearly alternatives to each other. The more garbage we dump in the air, the less desirable—and healthy—it will be to breathe. If we decide we want to breathe cleaner air, we must limit the activities that generate pollution. Air is a scarce good because it has alternative uses.

Not all goods, however, confront us with such choices. A free good is one for which the choice of one use does not require that we give up another. One example of a free good is gravity. The fact that gravity is holding you to the earth does not mean that your neighbor is forced to drift up into space! One person's use of gravity is not an alternative to another person's use.

There are not many free goods. Outer space, for example, was a free good when the only use we made of it was to gaze at it. But now, our use of space has reached the point where one use can be an alternative to another. Conflicts have already arisen over the allocation of orbital slots for communications satellites. Thus, even parts of outer space are scarce. Space will surely become more scarce as we find new ways to use it. Scarcity characterizes virtually everything. Consequently, the scope of economics is wide indeed.

Scarcity and the Fundamental Economic Questions

The choices we confront as a result of scarcity raise three sets of issues. Every economy must answer the following questions:

1. **What should be produced?** Using the economy's scarce resources to produce one thing requires giving up another. Producing better education, for example, may require cutting back on other services, such as health care. A decision to preserve a wilderness area requires giving up other uses of the land. Every society must decide what it will produce with its scarce resources.
2. **How should goods and services be produced?** There are all sorts of choices to be made in determining how goods and services should be produced. Should a firm employ a few skilled or a lot of unskilled workers? Should it produce in its own country or should it use foreign plants? Should manufacturing firms use new or recycled raw materials to make their products?
3. **For whom should goods and services be produced?** If a good or service is produced, a decision must be made about who will get it. A decision to have one person or group receive a good or service usually means it will not be available to someone else. For example, representatives of the poorest nations on earth often complain that energy consumption per person in the United States is *17 times* greater than energy consumption per person in the world's 62 poorest countries. Critics argue that the world's energy should be more evenly allocated. Should it? That is a "for whom" question.

Every economy must determine what should be produced, how it should be produced, and for whom it should be produced. We shall return to these questions again and again.

Opportunity Cost

It is within the context of scarcity that economists define what is perhaps the most important concept in all of economics, the concept of opportunity cost. Opportunity cost is the value of the best alternative forgone in making any choice.

The opportunity cost to you of reading the remainder of this chapter will be the value of the best other use to which you could have put your time. If you choose to spend \$20 on a potted plant, you have simultaneously chosen to give up the benefits of spending the \$20 on pizzas or a paperback book or a night at the movies. If the book is the most valuable of those alternatives, then the opportunity cost of the plant is the value of the enjoyment you otherwise expected to receive from the book.

The concept of opportunity cost must not be confused with the purchase price of an item. Consider the cost of a college or university education. That includes the value of the best alternative use of money spent for tuition, fees, and books. But the most important cost of a college education is the value of the forgone alternative uses of time spent studying and attending class instead of using the time in some other endeavor. Students sacrifice that time in hopes of even greater earnings in the future or because they place a value on the opportunity to learn. Or consider the cost of going to the doctor. Part of that cost is the value of the best alternative use of the money required to see the doctor. But, the cost also includes the value of the best alternative use of the time

required to see the doctor. The essential thing to see in the concept of opportunity cost is found in the name of the concept. Opportunity cost is the value of the best opportunity forgone in a particular choice. It is not simply the amount spent on that choice. The concepts of scarcity, choice, and opportunity cost are at the heart of economics. A good is scarce if the choice of one alternative requires that another be given up. The existence of alternative uses forces us to make choices. The opportunity cost of any choice is the value of the best alternative forgone in making it.

Key Takeaways

- Economics is a social science that examines how people choose among the alternatives available to them.
- Scarcity implies that we must give up one alternative in selecting another. A good that is not scarce is a free good.
- The three fundamental economic questions are: What should be produced? How should goods and services be produced? For whom should goods and services be produced?
- Every choice has an opportunity cost and opportunity costs affect the choices people make. The opportunity cost of any choice is the value of the best alternative that had to be forgone in making that choice.

Try It!

Identify the elements of scarcity, choice, and opportunity cost in each of the following:

1. The Environmental Protection Agency is considering an order that a 500-acre area on the outskirts of a large city be preserved in its natural state, because the area is home to a rodent that is considered an endangered species. Developers had planned to build a housing development on the land.
2. The manager of an automobile assembly plant is considering whether to produce cars or sport utility vehicles (SUVs) next month. Assume that the quantities of labor and other materials required would be the same for either type of production.
3. A young man who went to work as a nurses' aide after graduating from high school leaves his job to go to college, where he will obtain training as a registered nurse.

Case in Point: The Rising Cost of Energy

Oil is an exhaustible resource. The oil we burn today will not be available for use in the future. Part of the opportunity cost of our consumption of goods such as gasoline that are produced from oil includes the value people in the future might have placed on oil we use today.

It appears that the cost of our use of oil may be rising. We have been using "light crude," the oil found in the ground in deposits that can be readily tapped. As light crude becomes more scarce, the world may need to turn to so-called "heavy crude," the crude oil that is found in the sandy soil of places such as Canada and Venezuela. That oil exists in such abundance that it propels Venezuela to the top of the world list of available oil. Saudi Arabia moves to the second position; Canada is third.

The difficulty with the oil mixed in the sand is that extracting it is far more costly than light crude, both in terms of the expenditures required and in terms of the environmental damage that mining it creates. Northern Alberta, in Canada, boasts a Florida-sized area whose sandy soils are rich in crude oil. Some of that oil is 1,200 feet underground. Extracting it requires pumping steam into the oily sand and then pumping up the resultant oily syrup. That syrup is then placed into huge, industrial-sized washing machines that separate crude oil. What is left over is toxic and will be placed in huge lakes that are being created by digging pits in the ground 200 feet deep. The oil produced from these sands has become important—Alberta is the largest foreign supplier of oil to the United States.

Sands that are closer to the surface are removed by bulldozers and giant cranes; the forest over it is cleared away. The oily sand is then hauled off in two-story dump trucks which, when filled, weigh more than a Boeing 747. Total SA, a French company, is leading the race to develop Canada's oil. Jean Luc-Guiziou, the president of Total SA's Canadian operations, says that the extraordinarily costly process of extracting heavy crude is something the world is going to have to get used to. "The light crude undiscovered today is getting scarcer and scarcer," he told *The Wall Street Journal*. "We have to accept the reality of geoscience, which is that the next generation of oil resources will be heavier."



Figure 1.1: IFPRI – IMAGES – oil barrels – CC BY-NC-ND 2.0.

Already, Total SA has clear-cut thousands of acres of forest land in order to gain access to the oily sand below. The process of extracting heavy crude oil costs the company \$25 a barrel—compared to the \$6 per barrel cost of extracting and refining light crude. Extracting heavy crude generates three times as much greenhouse gas per barrel as does light crude. By 2015, Fort McMurray, the small (population 61,000) town that has become the headquarters of Northern Alberta’s crude oil boom, will emit more greenhouse gas than the entire country of Denmark (population 5.4 million). Canada will exceed its greenhouse gas quota set by the Kyoto Accords—an international treaty aimed at limiting global warming—largely as a result of developing its heavy crude deposits.

No one even considered the extraction of heavy crude when light crude was cheap. In the late 1990s, oil cost just \$12 per barrel, and deposits of heavy crude such as those in Canada attracted little attention. By mid-2006, oil sold for more than \$70 per barrel, and Canada’s heavy crude was suddenly a hot commodity. “It moved from being just an interesting experiment in northern Canada to really this is the future source of oil supply,” Greg Stringham of the Canadian Association of Petroleum Producers told Al Jazeera.

Alberta’s energy minister, Greg Melchin, defends the province’s decision to proceed with the exploitation of its oily sand. “There is a cost to it, but the benefits are substantially greater,” he insists.

Not everyone agrees. George Poitras, a member of the Mikisew Cree tribe, lives downstream from the oil sands development. “You see a lot of the land dug up, a lot of the boreal forest struck down and it’s upsetting, it fills me with rage,” he says. Diana Gibson of the Parkland Institute, an environmental advocacy group, says that you can see the environmental damage generated by the extraction of oil sands around Fort McMurray from the moon. “What we are going to be having is destruction of very, very valuable ecosystems, and permanent pollution,” she says.

Sources: “Alberta’s Heavy Oil Burden,” Al Jazeera English, March 17, 2008 (see english.aljazeera.net); and Russell Gold, “As Prices Surge, Oil Giants Turn Sludge into Gold,” *The Wall Street Journal Online*, March 27, 2006, A1.

Answers to Try It! Problems

1. The 500-acre area is scarce because it has alternative uses: preservation in its natural state or a site for homes. A choice must be made between these uses. The opportunity cost of preserving the land in its natural state is the forgone value of the land as a housing development. The opportunity cost of using the land as a housing development is the forgone value of preserving the land.
2. The scarce resources are the plant and the labor at the plant. The manager must choose between producing cars and producing SUVs. The opportunity cost of producing cars is the profit that could be earned from producing SUVs; the opportunity cost of producing SUVs is the profit that could be earned from producing cars.

3. The man can devote his time to his current career or to an education; his time is a scarce resource. He must choose between these alternatives. The opportunity cost of continuing as a nurses' aide is the forgone benefit he expects from training as a registered nurse; the opportunity cost of going to college is the forgone income he could have earned working full-time as a nurses' aide.

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1.2: The Field of Economics

Learning Objective

1. Explain the distinguishing characteristics of the economic way of thinking.
2. Distinguish between microeconomics and macroeconomics.

We have examined the basic concepts of scarcity, choice, and opportunity cost in economics. In this section, we will look at economics as a field of study. We begin with the characteristics that distinguish economics from other social sciences.

The Economic Way of Thinking

Economists study choices that scarcity requires us to make. This fact is not what distinguishes economics from other social sciences; all social scientists are interested in choices. An anthropologist might study the choices of ancient peoples; a political scientist might study the choices of legislatures; a psychologist might study how people choose a mate; a sociologist might study the factors that have led to a rise in single-parent households. Economists study such questions as well. What is it about the study of choices by economists that makes economics different from these other social sciences?

Three features distinguish the economic approach to choice from the approaches taken in other social sciences:

1. Economists give special emphasis to the role of opportunity costs in their analysis of choices.
2. Economists assume that individuals make choices that seek to maximize the value of some objective, and that they define their objectives in terms of their own self-interest.
3. Individuals maximize by deciding whether to do a little more or a little less of something. Economists argue that individuals pay attention to the consequences of small changes in the levels of the activities they pursue.

The emphasis economists place on opportunity cost, the idea that people make choices that maximize the value of objectives that serve their self-interest, and a focus on the effects of small changes are ideas of great power. They constitute the core of economic thinking. The next three sections examine these ideas in greater detail.

Opportunity Costs Are Important

If doing one thing requires giving up another, then the expected benefits of the alternatives we face will affect the ones we choose. Economists argue that an understanding of opportunity cost is crucial to the examination of choices.

As the set of available alternatives changes, we expect that the choices individuals make will change. A rainy day could change the opportunity cost of reading a good book; we might expect more reading to get done in bad than in good weather. A high income can make it very costly to take a day off; we might expect highly paid individuals to work more hours than those who are not paid as well. If individuals are maximizing their level of satisfaction and firms are maximizing profits, then a change in the set of alternatives they face may affect their choices in a predictable way.

The emphasis on opportunity costs is an emphasis on the examination of alternatives. One benefit of the economic way of thinking is that it pushes us to think about the value of alternatives in each problem involving choice.

Individuals Maximize in Pursuing Self-Interest

What motivates people as they make choices? Perhaps more than anything else, it is the economist's answer to this question that distinguishes economics from other fields.

Economists assume that individuals make choices that they expect will create the maximum value of some objective, given the constraints they face. Furthermore, economists assume that people's objectives will be those that serve their own self-interest.

Economists assume, for example, that the owners of business firms seek to maximize profit. Given the assumed goal of profit maximization, economists can predict how firms in an industry will respond to changes in the markets in which they operate. As labor costs in the United States rise, for example, economists are not surprised to see firms moving some of their manufacturing operations overseas.

Similarly, economists assume that maximizing behavior is at work when they examine the behavior of consumers. In studying consumers, economists assume that individual consumers make choices aimed at maximizing their level of satisfaction. In the next chapter, we will look at the results of the shift from skiing to snowboarding; that is a shift that reflects the pursuit of self-interest by consumers and by manufacturers.

In assuming that people pursue their self-interest, economists are not assuming people are selfish. People clearly gain satisfaction by helping others, as suggested by the large charitable contributions people make. Pursuing one's own self-interest means pursuing the things that give one satisfaction. It need not imply greed or selfishness.

Choices Are Made at the Margin

Economists argue that most choices are made “at the margin.” The margin is the current level of an activity. Think of it as the edge from which a choice is to be made. A choice at the margin is a decision to do a little more or a little less of something.

Assessing choices at the margin can lead to extremely useful insights. Consider, for example, the problem of curtailing water consumption when the amount of water available falls short of the amount people now use. Economists argue that one way to induce people to conserve water is to raise its price. A common response to this recommendation is that a higher price would have no effect on water consumption, because water is a necessity. Many people assert that prices do not affect water consumption because people “need” water.

But choices in water consumption, like virtually all choices, are made at the margin. Individuals do not make choices about whether they should or should not consume water. Rather, they decide whether to consume a little more or a little less water. Household water consumption in the United States totals about 105 gallons per person per day. Think of that starting point as the edge from which a choice at the margin in water consumption is made. Could a higher price cause you to use less water brushing your teeth, take shorter showers, or water your lawn less? Could a higher price cause people to reduce their use, say, to 104 gallons per person per day? To 103? When we examine the choice to consume water at the margin, the notion that a higher price would reduce consumption seems much more plausible. Prices affect our consumption of water because choices in water consumption, like other choices, are made at the margin.

The elements of opportunity cost, maximization, and choices at the margin can be found in each of two broad areas of economic analysis: microeconomics and macroeconomics. Your economics course, for example, may be designated as a “micro” or as a “macro” course. We will look at these two areas of economic thought in the next section.

Microeconomics and Macroeconomics

The field of economics is typically divided into two broad realms: microeconomics and macroeconomics. It is important to see the distinctions between these broad areas of study.

Microeconomics is the branch of economics that focuses on the choices made by individual decision-making units in the economy—typically consumers and firms—and the impacts those choices have on individual markets. Macroeconomics is the branch of economics that focuses on the impact of choices on the total, or aggregate, level of economic activity.

Why do tickets to the best concerts cost so much? How does the threat of global warming affect real estate prices in coastal areas? Why do women end up doing most of the housework? Why do senior citizens get discounts on public transit systems? These questions are generally regarded as microeconomic because they focus on individual units or markets in the economy.

Is the total level of economic activity rising or falling? Is the rate of inflation increasing or decreasing? What is happening to the unemployment rate? These are questions that deal with aggregates, or totals, in the economy; they are problems of macroeconomics. The question about the level of economic activity, for example, refers to the total value of all goods and services produced in the economy. Inflation is a measure of the rate of change in the average price level for the entire economy; it is a macroeconomic problem. The total levels of employment and unemployment in the economy represent the aggregate of all labor markets; unemployment is also a topic of macroeconomics.

Both microeconomics and macroeconomics give attention to individual markets. But in microeconomics that attention is an end in itself; in macroeconomics it is aimed at explaining the movement of major economic aggregates—the level of total output, the level of employment, and the price level.

We have now examined the characteristics that define the economic way of thinking and the two branches of this way of thinking: microeconomics and macroeconomics. In the next section, we will have a look at what one can do with training in economics.

Putting Economics to Work

Economics is one way of looking at the world. Because the economic way of thinking has proven quite useful, training in economics can be put to work in a wide range of fields. One, of course, is in work as an economist. Undergraduate work in economics can be applied to other careers as well.

Careers in Economics

Economists work in three types of organizations. About 58% of economists work for government agencies (Bureau of Labor Statistics). The remainder work for business firms or in colleges and universities.

Economists working for business firms and government agencies sometimes forecast economic activity to assist their employers in planning. They also apply economic analysis to the activities of the firms or agencies for which they work or consult. Economists employed at colleges and universities teach and conduct research.

Peruse the website of your college or university's economics department. Chances are the department will discuss the wide variety of occupations that their economics majors enter. Unlike engineering and accounting majors, economics and other social science majors tend to be distributed over a broad range of occupations.

Applying Economics to Other Fields

Suppose that you are considering something other than a career in economics. Would choosing to study economics help you?

The evidence suggests it may. Suppose, for example, that you are considering law school. The study of law requires keen analytical skills; studying economics sharpens such skills. Economists have traditionally argued that undergraduate work in economics serves as excellent preparation for law school. Economist Michael Nieswiadomy of the University of North Texas collected data on Law School Admittance Test (LSAT) scores for undergraduate majors listed by 2,200 or more students taking the test in 2003. Table 1.1 "LSAT Scores and Undergraduate Majors" gives the scores, as well as the ranking for each of these majors, in 2003 and in two previous years in which the rankings were compiled. In rankings for all three years, economics majors recorded the highest scores.

Table 1.1: LSAT Scores and Undergraduate Majors

Major field	LSAT average 2003–2004	2003–2004 Rank	1994–1995 Rank	1991–1992 Rank
Economics	156.6	1	1	1
Engineering	155.4	2	4	2
History	155.0	3	2	3
English	154.3	4	3	4
Finance	152.6	5	6	5
Political science	152.1	6	9	9
Psychology	152.1	7	7	8
Accounting	151.1	8	8	6
Communications	150.5	9	10	10
Sociology	150.2	10	12	13
Bus. Administration	149.6	11	13	12
Criminal Justice	144.7	12	14	14

Here are the average LSAT scores and rankings for the 12 undergraduate majors with more than 2200 students taking the test to enter law school in the 2003–2004 academic year.

Source: Michael Nieswiadomy, “LSAT Scores of Economics Majors: 2003–2004 Class Update,” *Journal of Economic Education*, 37(2) (Spring 2006): 244–247 and Michael Nieswiadomy, “LSAT Scores of Economics Majors” *Journal of Economic Education*, 29(4) (Fall 1998): 377–379.

Did the strong performance by economics, engineering, and history majors mean that training in those fields sharpens analytical skills tested in the LSAT, or that students with good analytical skills are more likely to major in them? Both factors were probably at work. Economics clearly attracts students with good analytical skills—and studying economics helps develop those skills.

Economics majors shine in other areas as well. According to the Bureau of Labor Statistics *Occupational Outlook Handbook*, a strong background in economic theory, mathematics, and statistics provides the basis for competing for the best job opportunities, particularly research assistant positions, in a broad range of fields. Many graduates with bachelor’s degrees will find good jobs in industry and business as management or sales trainees or as administrative assistants. Because economists are concerned with understanding and interpreting financial matters, among other subjects, they will also be attracted to and qualified for jobs as financial managers, financial analysts, underwriters, actuaries, securities and financial services sales workers, credit analysts, loan and budget officers, and urban and regional planners.

Table 1.2 “Average Yearly Salary Offers, May 2006 and Occupational Outlook 2004–2014, Selected Majors/Occupations” shows average yearly salary offers for bachelor degree candidates for May 2006 and the outlook for related occupations to 2014.

Table 1.2: Average Yearly Salary Offers, May 2006 and Occupational Outlook 2004–2014, Selected Majors/Occupations

Undergraduate major	Average \$ Offer May, 2006	Projected % Change in Total Employment in Occupation 2004–2014
Computer Engineering	\$54,200	10.1
Electrical/Electronic Engineering	54,053	11.8
Computer Science	50,892	25.6
Accounting	46,188	22.4
Economics and Finance	45,058	12.4
Management Information Systems	44,755	25.9
Logistics and Materials Management	43,426	13.2
Business Administration	40,976	17.0
Environmental Sciences (including forestry and conservation science)	39,750	6.3
Other Business Majors (e.g., Marketing)	37,446	20.8
Human Resources (incl. Labor Relations)	36,256	15.9
Geology and Geological Sciences	35,034	8.3
Sociology	33,752	4.7
Political Science/Government	33,151	7.3
Liberal Arts & Sciences (general studies)	32,627	na
Public Relations	32,623	21.7
Special Education	31,817	23.3
Elementary Education	31,778	18.2
Foreign Languages	31,364	na
Letters (incl. English)	31,204	20.4
Other Social Sciences (Including Criminal Justice and History)	30,788	12.3
Psychology	30,308	9.9
Pre-elementary Education	27,550	22.4
Social Work	25,865	19.6
Visual and Performing Arts	21,726	15.2

Sources: National Association of Colleges and Employers, *Salary Survey*, Spring 2006 <http://naceweb.org>; Bureau of Labor Statistics, 2006–2007 edition of the *Occupational Outlook Handbook*; *Occupational Employment, Training, and Earnings: Educational Level Report* (May, 2006) URL: data.bls.gov/oep/noeted/empoptd.jsp (note: na = not reported; that is, no specific occupation was reported in BLS report; Other business majors, Other social sciences, Social work (including Sociology), and Environmental Sciences are weighted averages of various disciplines, calculated by authors.)

One's choice of a major, or minor, is not likely to be based solely on considerations of potential earnings or the prospect of landing a spot in law school. You will also consider your interests and abilities in making a decision about whether to pursue further study

in economics. And, of course, you will consider the expected benefits of alternative courses of study. What is *your* opportunity cost of pursuing study of economics? Does studying more economics serve your interests and will doing so maximize your satisfaction level? These considerations may be on your mind as you begin to study economics at the college level and obviously students will make many different choices. But, should you decide to pursue a major or minor in economics, you should know that a background in this field is likely to serve you well in a wide range of careers.

Key Takeaways

- Economists focus on the opportunity costs of choices, they assume that individuals make choices in a way that maximizes the value of an objective defined in terms of their own self-interest, and they assume that individuals make those choices at the margin.
- Economics is divided into two broad areas: microeconomics and macroeconomics.
- A wide range of career opportunities is open to economics majors. Empirical evidence suggests that students who enter the job market with a major in economics tend to earn more than do students in most other majors. Further, economics majors do particularly well on the LSAT.

Try It!

The Department of Agriculture estimated that the expenditures a middle-income, husband–wife family of three would incur to raise one additional child from birth in 2005 to age 17 would be \$250,530. In what way does this estimate illustrate the economic way of thinking? Would the Department’s estimate be an example of microeconomic or of macroeconomic analysis? Why?

Case in Point: The Financial Payoff to Studying Economics

College economics professors have long argued that studying economics is good preparation for a variety of careers. A recent study suggests they are right and that studying economics is even likely to make students more prosperous. Students who major in economics but did not pursue graduate work are likely to earn more than students in virtually every other college major. Students who major in economics and then go on to law school or an MBA program are likely to earn more than students who approach those areas of study having majored in most other areas.

Economists Dan A. Black, Seth Sanders, and Lowell Taylor used the 1993 National Survey of College Graduates, which included more than 86,000 college-educated workers between the ages of 25 and 55 that asked what field they had majored in. They then controlled for variables such as gender, race, and ethnicity. They found that students who had not done graduate work and had majored in economics earned more than students in any other major except engineering. Specifically, economics majors earned about 13% more than other social sciences majors, 11% more than business administration majors, and about the same as natural science and accounting majors. The economics majors in their survey, like those who majored in other social sciences and business administration and unlike those who majored in engineering or accounting, were spread out over a wide range of occupations but with many in management positions.



Figure 1.2: Jeremy Wilburn – [Students in Classrooms at UIS](#) – CC BY-NC-ND 2.0.

Based on the survey they used, over 40% of economics majors went on to earn graduate degrees, many in law and business. Economics majors ranked first in terms of wages, as compared to other law school graduates with the 12 most common pre-law majors (including such majors as business administration, finance, English, history, psychology, and political science). MBA graduates who had majored in economics earned more than those who had majored in any other field except chemical engineering. Specifically, undergraduate economics majors with MBAs earned about 15% more than those who had majored in other disciplines represented in the survey, including business-related majors.

It is remarkable that all of the business-related majors generated salaries much lower than those earned by economics majors with an MBA. One could argue that this reflects self-selection; that students who major in economics are simply brighter. But, students who major in physics have high SAT scores, yet they, too, earned wages that were about 20% lower than MBA students who had majored in economics. This finding lends some credence to the notion that the marketplace rewards training in the economic way of thinking.

Source: Dan A. Black, Seth Sanders, and Lowell Taylor, "The Economic Reward for Studying Economics," *Economic Inquiry*, 41(3), July 2003, 365–377.

Answer to Try It! Problem

The information given suggests one element of the economic way of thinking: assessing the choice at the margin. The estimate reflects the cost of one more child for a family that already has one. It is not clear from the information given how close the estimate of cost comes to the economic concept of opportunity cost. The Department of Agriculture's estimate included such costs as housing, food, transportation, clothing, health care, child care, and education. An economist would add the value of the best alternative use of the additional time that will be required for the child. If the couple is looking far ahead, it may want to consider the opportunity cost of sending a child to college. And, if it is looking *very* far ahead, it may want to consider the fact that nearly half of all parents over the age of 50 support at least one child over the age of 21. This is a problem in microeconomic analysis, because it focuses on the choices of individual households.

References

Bureau of Labor Statistics *Occupational Outlook* at www.bls.gov/oco/.

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1.3: The Economists' Tool Kit

Learning Objective

1. Explain how economists test hypotheses, develop economic theories, and use models in their analyses.
2. Explain how the all-other-things unchanged (*ceteris paribus*) problem and the fallacy of false cause affect the testing of economic hypotheses and how economists try to overcome these problems.
3. Distinguish between normative and positive statements.

Economics differs from other social sciences because of its emphasis on opportunity cost, the assumption of maximization in terms of one's own self-interest, and the analysis of choices at the margin. But certainly much of the basic methodology of economics and many of its difficulties are common to every social science—indeed, to every science. This section explores the application of the scientific method to economics.

Researchers often examine relationships between variables. A variable is something whose value can change. By contrast, a constant is something whose value does not change. The speed at which a car is traveling is an example of a variable. The number of minutes in an hour is an example of a constant.

Research is generally conducted within a framework called the scientific method, a systematic set of procedures through which knowledge is created. In the scientific method, hypotheses are suggested and then tested. A hypothesis is an assertion of a relationship between two or more variables that could be proven to be false. A statement is not a hypothesis if no conceivable test could show it to be false. The statement “Plants like sunshine” is not a hypothesis; there is no way to test whether plants like sunshine or not, so it is impossible to prove the statement false. The statement “Increased solar radiation increases the rate of plant growth” is a hypothesis; experiments could be done to show the relationship between solar radiation and plant growth. If solar radiation were shown to be unrelated to plant growth or to retard plant growth, then the hypothesis would be demonstrated to be false.

If a test reveals that a particular hypothesis is false, then the hypothesis is rejected or modified. In the case of the hypothesis about solar radiation and plant growth, we would probably find that more sunlight increases plant growth over some range but that too much can actually retard plant growth. Such results would lead us to modify our hypothesis about the relationship between solar radiation and plant growth.

If the tests of a hypothesis yield results consistent with it, then further tests are conducted. A hypothesis that has not been rejected after widespread testing and that wins general acceptance is commonly called a theory. A theory that has been subjected to even more testing and that has won virtually universal acceptance becomes a law. We will examine two economic laws in the next two chapters.

Even a hypothesis that has achieved the status of a law cannot be proven true. There is always a possibility that someone may find a case that invalidates the hypothesis. That possibility means that nothing in economics, or in any other social science, or in any science, can ever be *proven* true. We can have great confidence in a particular proposition, but it is always a mistake to assert that it is “proven.”

Models in Economics

All scientific thought involves simplifications of reality. The real world is far too complex for the human mind—or the most powerful computer—to consider. Scientists use models instead. A model is a set of simplifying assumptions about some aspect of the real world. Models are always based on assumed conditions that are simpler than those of the real world, assumptions that are necessarily false. A model of the real world cannot *be* the real world.

We will encounter our first economic model in Chapter 35 “Appendix A: Graphs in Economics”. For that model, we will assume that an economy can produce only two goods. Then we will explore the model of demand and supply. One of the assumptions we will make there is that all the goods produced by firms in a particular market are identical. Of course, real economies and real markets are not that simple. Reality is never as simple as a model; one point of a model is to simplify the world to improve our understanding of it.

Economists often use graphs to represent economic models. The appendix to this chapter provides a quick, refresher course, if you think you need one, on understanding, building, and using graphs.

Models in economics also help us to generate hypotheses about the real world. In the next section, we will examine some of the problems we encounter in testing those hypotheses.

Testing Hypotheses in Economics

Here is a hypothesis suggested by the model of demand and supply: an increase in the price of gasoline will reduce the quantity of gasoline consumers demand. How might we test such a hypothesis?

Economists try to test hypotheses such as this one by observing actual behavior and using empirical (that is, real-world) data. The average retail price of gasoline in the United States rose from an average of \$2.12 per gallon on May 22, 2005 to \$2.88 per gallon on May 22, 2006. The number of gallons of gasoline consumed by U.S. motorists rose 0.3% during that period.

The small increase in the quantity of gasoline consumed by motorists as its price rose is inconsistent with the hypothesis that an increased price will lead to a reduction in the quantity demanded. Does that mean that we should dismiss the original hypothesis? On the contrary, we must be cautious in assessing this evidence. Several problems exist in interpreting any set of economic data. One problem is that several things may be changing at once; another is that the initial event may be unrelated to the event that follows. The next two sections examine these problems in detail.

The All-Other-Things-Unchanged Problem

The hypothesis that an increase in the price of gasoline produces a reduction in the quantity demanded by consumers carries with it the assumption that there are no other changes that might also affect consumer demand. A better statement of the hypothesis would be: An increase in the price of gasoline will reduce the quantity consumers demand, *ceteris paribus*. *Ceteris paribus* is a Latin phrase that means “all other things unchanged.”

But things changed between May 2005 and May 2006. Economic activity and incomes rose both in the United States and in many other countries, particularly China, and people with higher incomes are likely to buy more gasoline. Employment rose as well, and people with jobs use more gasoline as they drive to work. Population in the United States grew during the period. In short, many things happened during the period, all of which tended to increase the quantity of gasoline people purchased.

Our observation of the gasoline market between May 2005 and May 2006 did not offer a conclusive test of the hypothesis that an increase in the price of gasoline would lead to a reduction in the quantity demanded by consumers. Other things changed and affected gasoline consumption. Such problems are likely to affect any analysis of economic events. We cannot ask the world to stand still while we conduct experiments in economic phenomena. Economists employ a variety of statistical methods to allow them to isolate the impact of single events such as price changes, but they can never be certain that they have accurately isolated the impact of a single event in a world in which virtually everything is changing all the time.

In laboratory sciences such as chemistry and biology, it is relatively easy to conduct experiments in which only selected things change and all other factors are held constant. The economists' laboratory is the real world; thus, economists do not generally have the luxury of conducting controlled experiments.

The Fallacy of False Cause

Hypotheses in economics typically specify a relationship in which a change in one variable causes another to change. We call the variable that responds to the change the dependent variable; the variable that induces a change is called the independent variable. Sometimes the fact that two variables move together can suggest the false conclusion that one of the variables has acted as an independent variable that has caused the change we observe in the dependent variable.

Consider the following hypothesis: People wearing shorts cause warm weather. Certainly, we observe that more people wear shorts when the weather is warm. Presumably, though, it is the warm weather that causes people to wear shorts rather than the wearing of shorts that causes warm weather; it would be incorrect to infer from this that people cause warm weather by wearing shorts.

Reaching the incorrect conclusion that one event causes another because the two events tend to occur together is called the fallacy of false cause. The accompanying essay on baldness and heart disease suggests an example of this fallacy.

Because of the danger of the fallacy of false cause, economists use special statistical tests that are designed to determine whether changes in one thing actually do cause changes observed in another. Given the inability to perform controlled experiments, however, these tests do not always offer convincing evidence that persuades all economists that one thing does, in fact, cause changes in another.

In the case of gasoline prices and consumption between May 2005 and May 2006, there is good theoretical reason to believe the price increase should lead to a reduction in the quantity consumers demand. And economists have tested the hypothesis about price and the quantity demanded quite extensively. They have developed elaborate statistical tests aimed at ruling out problems of the fallacy of false cause. While we cannot prove that an increase in price will, *ceteris paribus*, lead to a reduction in the quantity consumers demand, we can have considerable confidence in the proposition.

Normative and Positive Statements

Two kinds of assertions in economics can be subjected to testing. We have already examined one, the hypothesis. Another testable assertion is a statement of fact, such as “It is raining outside” or “Microsoft is the largest producer of operating systems for personal computers in the world.” Like hypotheses, such assertions can be demonstrated to be false. Unlike hypotheses, they can also be shown to be correct. A statement of fact or a hypothesis is a positive statement.

Although people often disagree about positive statements, such disagreements can ultimately be resolved through investigation. There is another category of assertions, however, for which investigation can never resolve differences. A normative statement is one that makes a value judgment. Such a judgment is the opinion of the speaker; no one can “prove” that the statement is or is not correct. Here are some examples of normative statements in economics: “We ought to do more to help the poor.” “People in the United States should save more.” “Corporate profits are too high.” The statements are based on the values of the person who makes them. They cannot be proven false.

Because people have different values, normative statements often provoke disagreement. An economist whose values lead him or her to conclude that we should provide more help for the poor will disagree with one whose values lead to a conclusion that we should not. Because no test exists for these values, these two economists will continue to disagree, unless one persuades the other to adopt a different set of values. Many of the disagreements among economists are based on such differences in values and therefore are unlikely to be resolved.

Key Takeaways

- Economists try to employ the scientific method in their research.
- Scientists cannot prove a hypothesis to be true; they can only fail to prove it false.
- Economists, like other social scientists and scientists, use models to assist them in their analyses.
- Two problems inherent in tests of hypotheses in economics are the all-other-things-unchanged problem and the fallacy of false cause.
- Positive statements are factual and can be tested. Normative statements are value judgments that cannot be tested. Many of the disagreements among economists stem from differences in values.

Try It!

Look again at the data in Table 1.1 “LSAT Scores and Undergraduate Majors”. Now consider the hypothesis: “Majoring in economics will result in a higher LSAT score.” Are the data given consistent with this hypothesis? Do the data prove that this hypothesis is correct? What fallacy might be involved in accepting the hypothesis?

Case in Point: Does Baldness Cause Heart Disease?

A website called embarrassingproblems.com received the following email:

“Dear Dr. Margaret,

“I seem to be going bald. According to your website, this means I’m more likely to have a heart attack. If I take a drug to prevent hair loss, will it reduce my risk of a heart attack?”

What did Dr. Margaret answer? Most importantly, she did not recommend that the questioner take drugs to treat his baldness, because doctors do not think that the baldness causes the heart disease. A more likely explanation for the association between baldness and heart disease is that both conditions are affected by an underlying factor. While noting that more research needs to be done, one hypothesis that Dr. Margaret offers is that higher testosterone levels might be triggering both the hair loss and the heart disease. The good news for people with early balding (which is really where the association with increased risk of heart disease has been observed) is that they have a signal that might lead them to be checked early on for heart disease.

Source: www.embarrassingproblems.com/problems/problempage230701.htm.



Figure 1.3.1: Mark Hunter – bald – CC BY-NC-ND 2.0.

Answer to Try It! Problem

The data are consistent with the hypothesis, but it is never possible to prove that a hypothesis is correct. Accepting the hypothesis could involve the fallacy of false cause; students who major in economics may already have the analytical skills needed to do well on the exam.

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1.4: Review and Practice

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CHAPTER OVERVIEW

2: Demand and Supply

[2.1: Demand](#)

[2.2: Supply](#)

[2.3: Demand, Supply, and Equilibrium](#)

[2.4: Review and Practice](#)

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2.1: Demand

Learning Objective

1. Define the quantity demanded of a good or service and illustrate it using a demand schedule and a demand curve.
2. Distinguish between the following pairs of concepts: demand and quantity demanded, demand schedule and demand curve, movement along and shift in a demand curve.
3. Identify demand shifters and determine whether a change in a demand shifter causes the demand curve to shift to the right or to the left.

How many pizzas will people eat this year? How many doctor visits will people make? How many houses will people buy?

Each good or service has its own special characteristics that determine the quantity people are willing and able to consume. One is the price of the good or service itself. Other independent variables that are important determinants of demand include consumer preferences, prices of related goods and services, income, demographic characteristics such as population size, and buyer expectations. The number of pizzas people will purchase, for example, depends very much on whether they like pizza. It also depends on the prices for alternatives such as hamburgers or spaghetti. The number of doctor visits is likely to vary with income—people with higher incomes are likely to see a doctor more often than people with lower incomes. The demands for pizza, for doctor visits, and for housing are certainly affected by the age distribution of the population and its size.

While different variables play different roles in influencing the demands for different goods and services, economists pay special attention to one: the price of the good or service. Given the values of all the other variables that affect demand, a higher price tends to reduce the quantity people demand, and a lower price tends to increase it. A medium pizza typically sells for \$5 to \$10. Suppose the price were \$30. Chances are, you would buy fewer pizzas at that price than you do now. Suppose pizzas typically sold for \$2 each. At that price, people would be likely to buy more pizzas than they do now.

We will discuss first how price affects the quantity demanded of a good or service and then how other variables affect demand.

Price and the Demand Curve

Because people will purchase different quantities of a good or service at different prices, economists must be careful when speaking of the “demand” for something. They have therefore developed some specific terms for expressing the general concept of demand.

The **quantity demanded** of a good or service is the quantity buyers are willing and able to buy at a particular price during a particular period, all other things unchanged. (As we learned, we can substitute the Latin phrase “*ceteris paribus*” for “all other things unchanged.”) Suppose, for example, that 100,000 movie tickets are sold each month in a particular town at a price of \$8 per ticket. That quantity—100,000—is the quantity of movie admissions demanded per month at a price of \$8. If the price were \$12, we would expect the quantity demanded to be less. If it were \$4, we would expect the quantity demanded to be greater. The quantity demanded at each price would be different if other things that might affect it, such as the population of the town, were to change. That is why we add the qualifier that other things have not changed to the definition of quantity demanded.

A **demand schedule** is a table that shows the quantities of a good or service demanded at different prices during a particular period, all other things unchanged. To introduce the concept of a demand schedule, let us consider the demand for coffee in the United States. We will ignore differences among types of coffee beans and roasts, and speak simply of coffee. The table in Figure 3.1 shows quantities of coffee that will be demanded each month at prices ranging from \$9 to \$4 per pound; the table is a demand schedule. We see that the higher the price, the lower the quantity demanded.

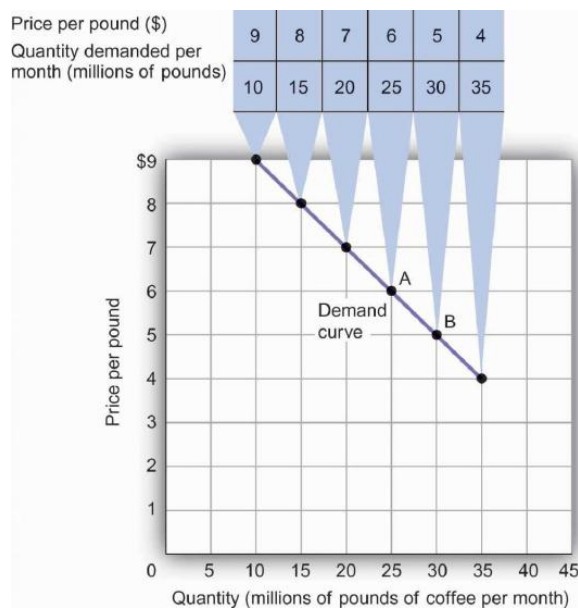


Figure 3.1 A Demand Schedule and a Demand Curve The table is a demand schedule; it shows quantities of coffee demanded per month in the United States at particular prices, all other things unchanged. These data are then plotted on the demand curve. At point A on the curve, 25 million pounds of coffee per month are demanded at a price of \$6 per pound. At point B, 30 million pounds of coffee per month are demanded at a price of \$5 per pound.

The information given in a demand schedule can be presented with a [demand curve](#), which is a graphical representation of a demand schedule. A demand curve thus shows the relationship between the price and quantity demanded of a good or service during a particular period, all other things unchanged. The demand curve in Figure 3.1 shows the prices and quantities of coffee demanded that are given in the demand schedule. At point A, for example, we see that 25 million pounds of coffee per month are demanded at a price of \$6 per pound. By convention, economists graph price on the vertical axis and quantity on the horizontal axis.

Price alone does not determine the quantity of coffee or any other good that people buy. To isolate the effect of changes in price on the quantity of a good or service demanded, however, we show the quantity demanded at each price, assuming that those other variables remain unchanged. We do the same thing in drawing a graph of the relationship between any two variables; we assume that the values of other variables that may affect the variables shown in the graph (such as income or population) remain unchanged for the period under consideration.

A change in price, with no change in any of the other variables that affect demand, results in a movement *along* the demand curve. For example, if the price of coffee falls from \$6 to \$5 per pound, consumption rises from 25 million pounds to 30 million pounds per month. That is a movement from point A to point B along the demand curve in Figure 3.1. A movement along a demand curve that results from a change in price is called a [change in quantity demanded](#). Note that a change in quantity demanded is not a change or shift in the demand curve; it is a movement *along* the demand curve.

The negative slope of the demand curve in Figure 3.1 suggests a key behavioral relationship of economics. All other things unchanged, the [law of demand](#) holds that, for virtually all goods and services, a higher price leads to a reduction in quantity demanded and a lower price leads to an increase in quantity demanded.

The law of demand is called a law because the results of countless studies are consistent with it. Undoubtedly, you have observed one manifestation of the law. When a store finds itself with an overstock of some item, such as running shoes or tomatoes, and needs to sell these items quickly, what does it do? It typically has a sale, expecting that a lower price will increase the quantity demanded. In general, we expect the law of demand to hold. Given the values of other variables that influence demand, a higher price reduces the quantity demanded. A lower price increases the quantity demanded. Demand curves, in short, slope downward.

Changes in Demand

Of course, price alone does not determine the quantity of a good or service that people consume. Coffee consumption, for example, will be affected by such variables as income and population. Preferences also play a role. The story at the beginning of the chapter

illustrates as much. Starbucks “turned people on” to coffee. We also expect other prices to affect coffee consumption. People often eat doughnuts or bagels with their coffee, so a reduction in the price of doughnuts or bagels might induce people to drink more coffee. An alternative to coffee is tea, so a reduction in the price of tea might result in the consumption of more tea and less coffee. Thus, a change in any one of the variables held constant in constructing a demand schedule will change the quantities demanded at each price. The result will be a *shift* in the entire demand curve rather than a movement along the demand curve. A *shift* in a demand curve is called a **change in demand**.

Suppose, for example, that something happens to increase the quantity of coffee demanded at each price. Several events could produce such a change: an increase in incomes, an increase in population, or an increase in the price of tea would each be likely to increase the quantity of coffee demanded at each price. Any such change produces a new demand schedule. Figure 3.2 shows such a change in the demand schedule for coffee. We see that the quantity of coffee demanded per month is greater at each price than before. We show that graphically as a shift in the demand curve. The original curve, labeled D_1 , shifts to the right to D_2 . At a price of \$6 per pound, for example, the quantity demanded rises from 25 million pounds per month (point A) to 35 million pounds per month (point A').

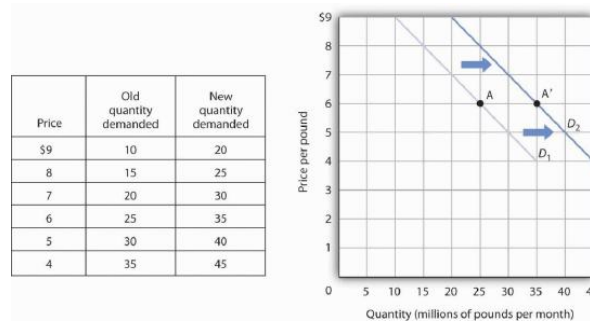


Figure 3.2 An Increase in Demand An increase in the quantity of a good or service demanded at each price is shown as an increase in demand. Here, the original demand curve D_1 shifts to D_2 . Point A on D_1 corresponds to a price of \$6 per pound and a quantity demanded of 25 million pounds of coffee per month. On the new demand curve D_2 , the quantity demanded at this price rises to 35 million pounds of coffee per month (point A').

Just as demand can increase, it can decrease. In the case of coffee, demand might fall as a result of events such as a reduction in population, a reduction in the price of tea, or a change in preferences. For example, a definitive finding that the caffeine in coffee contributes to heart disease, which is currently being debated in the scientific community, could change preferences and reduce the demand for coffee.

A reduction in the demand for coffee is illustrated in Figure 3.3. The demand schedule shows that less coffee is demanded at each price than in Figure 3.1. The result is a shift in demand from the original curve D_1 to D_3 . The quantity of coffee demanded at a price of \$6 per pound falls from 25 million pounds per month (point A) to 15 million pounds per month (point A''). Note, again, that a change in quantity demanded, *ceteris paribus*, refers to a movement *along* the demand curve, while a change in demand refers to a *shift* in the demand curve.

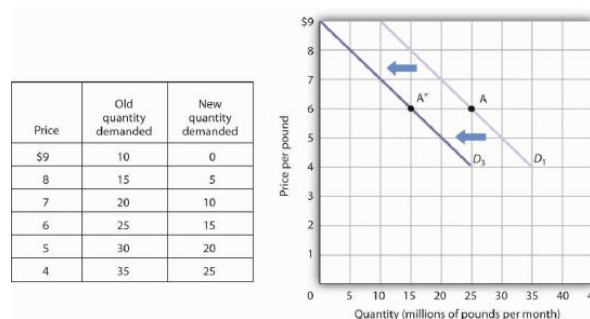


Figure 3.3 A Reduction in Demand A reduction in demand occurs when the quantities of a good or service demanded fall at each price. Here, the demand schedule shows a lower quantity of coffee demanded at each price than we had in Figure 3.1. The reduction shifts the demand curve for coffee to D_3 from D_1 . The quantity demanded at a price of \$6 per pound, for example, falls from 25 million pounds per month (point A) to 15 million pounds of coffee per month (point A'').

A variable that can change the quantity of a good or service demanded at each price is called a **demand shifter**. When these other variables change, the all-other-things-unchanged conditions behind the original demand curve no longer hold. Although different goods and services will have different demand shifters, the demand shifters are likely to include (1) consumer preferences, (2) the prices of related goods and services, (3) income, (4) demographic characteristics, and (5) buyer expectations. Next we look at each of these.

Preferences

Changes in preferences of buyers can have important consequences for demand. We have already seen how Starbucks supposedly increased the demand for coffee. Another example is reduced demand for cigarettes caused by concern about the effect of smoking on health. A change in preferences that makes one good or service more popular will shift the demand curve to the right. A change that makes it less popular will shift the demand curve to the left.

Prices of Related Goods and Services

Suppose the price of doughnuts were to fall. Many people who drink coffee enjoy dunking doughnuts in their coffee; the lower price of doughnuts might therefore increase the demand for coffee, shifting the demand curve for coffee to the right. A lower price for tea, however, would be likely to reduce coffee demand, shifting the demand curve for coffee to the left.

In general, if a reduction in the price of one good increases the demand for another, the two goods are called **complements**. If a reduction in the price of one good reduces the demand for another, the two goods are called **substitutes**. These definitions hold in reverse as well: two goods are complements if an increase in the price of one reduces the demand for the other, and they are substitutes if an increase in the price of one increases the demand for the other. Doughnuts and coffee are complements; tea and coffee are substitutes.

Complementary goods are goods used in conjunction with one another. Tennis rackets and tennis balls, eggs and bacon, and stationery and postage stamps are complementary goods. Substitute goods are goods used instead of one another. iPods, for example, are likely to be substitutes for CD players. Breakfast cereal is a substitute for eggs. A file attachment to an e-mail is a substitute for both a fax machine and postage stamps.

Figure 3.4



Income

As incomes rise, people increase their consumption of many goods and services, and as incomes fall, their consumption of these goods and services falls. For example, an increase in income is likely to raise the demand for gasoline, ski trips, new cars, and jewelry. There are, however, goods and services for which consumption falls as income rises—and rises as income falls. As incomes rise, for example, people tend to consume more fresh fruit but less canned fruit.

A good for which demand increases when income increases is called a **normal good**. A good for which demand decreases when income increases is called an **inferior good**. An increase in income shifts the demand curve for fresh fruit (a normal good) to the right; it shifts the demand curve for canned fruit (an inferior good) to the left.

Demographic Characteristics

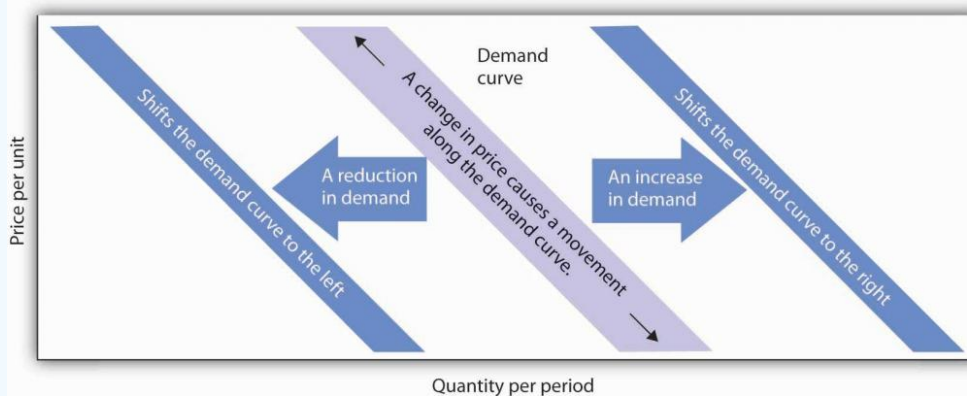
The number of buyers affects the total quantity of a good or service that will be bought; in general, the greater the population, the greater the demand. Other demographic characteristics can affect demand as well. As the share of the population over age 65 increases, the demand for medical services, ocean cruises, and motor homes increases. The birth rate in the United States fell sharply between 1955 and 1975 but has gradually increased since then. That increase has raised the demand for such things as infant supplies, elementary school teachers, soccer coaches, in-line skates, and college education. Demand can thus shift as a result of changes in both the number and characteristics of buyers.

Buyer Expectations

The consumption of goods that can be easily stored, or whose consumption can be postponed, is strongly affected by buyer expectations. The expectation of newer TV technologies, such as high-definition TV, could slow down sales of regular TVs. If people expect gasoline prices to rise tomorrow, they will fill up their tanks today to try to beat the price increase. The same will be true for goods such as automobiles and washing machines: an expectation of higher prices in the future will lead to more purchases today. If the price of a good is expected to fall, however, people are likely to reduce their purchases today and await tomorrow's lower prices. The expectation that computer prices will fall, for example, can reduce current demand.

Heads Up!

Figure 3.5



It is crucial to distinguish between a change in quantity demanded, which is a movement along the demand curve caused by a change in price, and a change in demand, which implies a shift of the demand curve itself. A change in demand is caused by a change in a demand shifter. An increase in demand is a shift of the demand curve to the right. A decrease in demand is a shift in the demand curve to the left. This drawing of a demand curve highlights the difference.

Key Takeaways

- The quantity demanded of a good or service is the quantity buyers are willing and able to buy at a particular price during a particular period, all other things unchanged.
- A demand schedule is a table that shows the quantities of a good or service demanded at different prices during a particular period, all other things unchanged.
- A demand curve shows graphically the quantities of a good or service demanded at different prices during a particular period, all other things unchanged.
- All other things unchanged, the law of demand holds that, for virtually all goods and services, a higher price induces a reduction in quantity demanded and a lower price induces an increase in quantity demanded.
- A change in the price of a good or service causes a change in the quantity demanded—a movement *along* the demand curve.

- A change in a demand shifter causes a change in demand, which is shown as a *shift* of the demand curve. Demand shifters include preferences, the prices of related goods and services, income, demographic characteristics, and buyer expectations.
- Two goods are substitutes if an increase in the price of one causes an increase in the demand for the other. Two goods are complements if an increase in the price of one causes a decrease in the demand for the other.
- A good is a normal good if an increase in income causes an increase in demand. A good is an inferior good if an increase in income causes a decrease in demand.

Try It!

All other things unchanged, what happens to the demand curve for DVD rentals if there is (a) an increase in the price of movie theater tickets, (b) a decrease in family income, or (c) an increase in the price of DVD rentals? In answering this and other “Try It!” problems in this chapter, draw and carefully label a set of axes. On the horizontal axis of your graph, show the quantity of DVD rentals. It is necessary to specify the time period to which your quantity pertains (e.g., “per period,” “per week,” or “per year”). On the vertical axis show the price per DVD rental. Since you do not have specific data on prices and quantities demanded, make a “free-hand” drawing of the curve or curves you are asked to examine. Focus on the general shape and position of the curve(s) before and after events occur. Draw new curve(s) to show what happens in each of the circumstances given. The curves could shift to the left or to the right, or stay where they are.

Case in Point: Solving Campus Parking Problems Without Adding More Parking Spaces

Figure 3.6



Alden Jewell – [The Parking Lot](#) – CC BY 2.0.

Unless you attend a “virtual” campus, chances are you have engaged in more than one conversation about how hard it is to find a place to park on campus. Indeed, according to Clark Kerr, a former president of the University of California system, a university is best understood as a group of people “held together by a common grievance over parking.”

Clearly, the demand for campus parking spaces has grown substantially over the past few decades. In surveys conducted by Daniel Kenney, Ricardo Dumont, and Ginger Kenney, who work for the campus design company Sasaki and Associates, it was found that 7 out of 10 students own their own cars. They have interviewed “many students who confessed to driving from their dormitories to classes that were a five-minute walk away,” and they argue that the deterioration of college environments is largely attributable to the increased use of cars on campus and that colleges could better service their missions by not adding more parking spaces.

Since few universities charge enough for parking to even cover the cost of building and maintaining parking lots, the rest is paid for by all students as part of tuition. Their research shows that “for every 1,000 parking spaces, the median institution loses almost \$400,000 a year for surface parking, and more than \$1,200,000 for structural parking.” Fear of a backlash from students and their

parents, as well as from faculty and staff, seems to explain why campus administrators do not simply raise the price of parking on campus.

While Kenney and his colleagues do advocate raising parking fees, if not all at once then over time, they also suggest some subtler, and perhaps politically more palatable, measures—in particular, shifting the demand for parking spaces to the left by lowering the prices of substitutes.

Two examples they noted were at the University of Washington and the University of Colorado at Boulder. At the University of Washington, car poolers may park for free. This innovation has reduced purchases of single-occupancy parking permits by 32% over a decade. According to University of Washington assistant director of transportation services Peter Dewey, “Without vigorously managing our parking and providing commuter alternatives, the university would have been faced with adding approximately 3,600 parking spaces, at a cost of over \$100 million...The university has created opportunities to make capital investments in buildings supporting education instead of structures for cars.” At the University of Colorado, free public transit has increased use of buses and light rail from 300,000 to 2 million trips per year over the last decade. The increased use of mass transit has allowed the university to avoid constructing nearly 2,000 parking spaces, which has saved about \$3.6 million annually.

Sources: Daniel R. Kenney, “How to Solve Campus Parking Problems Without Adding More Parking,” *The Chronicle of Higher Education*, March 26, 2004, Section B, pp. B22-B23.

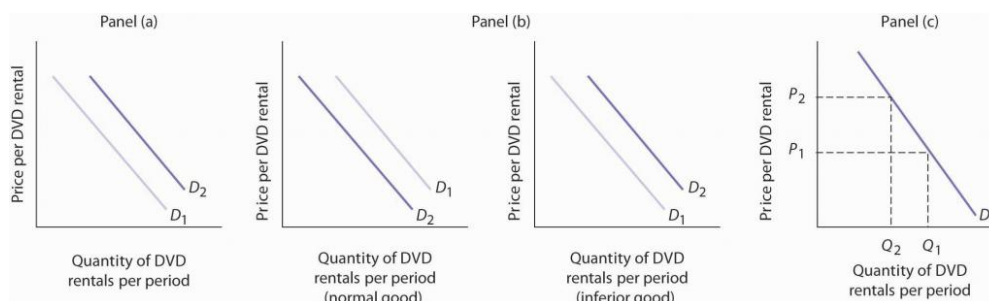
Answer to Try It! Problem

Since going to the movies is a substitute for watching a DVD at home, an increase in the price of going to the movies should cause more people to switch from going to the movies to staying at home and renting DVDs. Thus, the demand curve for DVD rentals will shift to the right when the price of movie theater tickets increases [Panel (a)].

A decrease in family income will cause the demand curve to shift to the left if DVD rentals are a normal good but to the right if DVD rentals are an inferior good. The latter may be the case for some families, since staying at home and watching DVDs is a cheaper form of entertainment than taking the family to the movies. For most others, however, DVD rentals are probably a normal good [Panel (b)].

An increase in the price of DVD rentals does not shift the demand curve for DVD rentals at all; rather, an increase in price, say from P_1 to P_2 , is a movement upward to the left along the demand curve. At a higher price, people will rent fewer DVDs, say Q_2 instead of Q_1 , ceteris paribus [Panel (c)].

Figure 3.7



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2.2: Supply

Learning Objective

1. Define the quantity supplied of a good or service and illustrate it using a supply schedule and a supply curve.
2. Distinguish between the following pairs of concepts: supply and quantity supplied, supply schedule and supply curve, movement along and shift in a supply curve.
3. Identify supply shifters and determine whether a change in a supply shifter causes the supply curve to shift to the right or to the left.

What determines the quantity of a good or service sellers are willing to offer for sale? Price is one factor; *ceteris paribus*, a higher price is likely to induce sellers to offer a greater quantity of a good or service. Production cost is another determinant of supply. Variables that affect production cost include the prices of factors used to produce the good or service, returns from alternative activities, technology, the expectations of sellers, and natural events such as weather changes. Still another factor affecting the quantity of a good that will be offered for sale is the number of sellers—the greater the number of sellers of a particular good or service, the greater will be the quantity offered at any price per time period.

Price and the Supply Curve

The **quantity supplied** of a good or service is the quantity sellers are willing to sell at a particular price during a particular period, all other things unchanged. *Ceteris paribus*, the receipt of a higher price increases profits and induces sellers to increase the quantity they supply.

In general, when there are many sellers of a good, an increase in price results in an increase in quantity supplied, and this relationship is often referred to as the law of supply. We will see, though, through our exploration of microeconomics, that there are a number of exceptions to this relationship. There are cases in which a higher price will not induce an increase in quantity supplied. Goods that cannot be produced, such as additional land on the corner of Park Avenue and 56th Street in Manhattan, are fixed in supply—a higher price cannot induce an increase in the quantity supplied. There are even cases, which we investigate in microeconomic analysis, in which a higher price induces a reduction in the quantity supplied.

Generally speaking, however, when there are many sellers of a good, an increase in price results in a greater quantity supplied. The relationship between price and quantity supplied is suggested in a **supply schedule**, a table that shows quantities supplied at different prices during a particular period, all other things unchanged. Figure 3.8 gives a supply schedule for the quantities of coffee that will be supplied per month at various prices, *ceteris paribus*. At a price of \$4 per pound, for example, producers are willing to supply 15 million pounds of coffee per month. A higher price, say \$6 per pound, induces sellers to supply a greater quantity—25 million pounds of coffee per month.

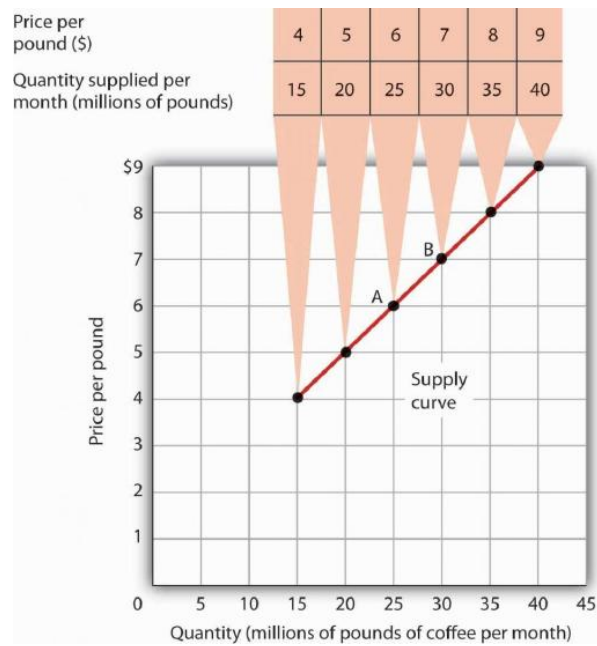


Figure 3.8 A Supply Schedule and a Supply Curve The supply schedule shows the quantity of coffee that will be supplied in the United States each month at particular prices, all other things unchanged. The same information is given graphically in the supply curve. The values given here suggest a positive relationship between price and quantity supplied.

A **supply curve** is a graphical representation of a supply schedule. It shows the relationship between price and quantity supplied during a particular period, all other things unchanged. Because the relationship between price and quantity supplied is generally positive, supply curves are generally upward sloping. The supply curve for coffee in Figure 3.8 shows graphically the values given in the supply schedule.

A change in price causes a movement *along* the supply curve; such a movement is called a **change in quantity supplied**. As is the case with a change in quantity demanded, a change in quantity supplied does not shift the supply curve. By definition, it is a movement along the supply curve. For example, if the price rises from \$6 per pound to \$7 per pound, the quantity supplied rises from 25 million pounds per month to 30 million pounds per month. That's a movement from point A to point B along the supply curve in Figure 3.8.

Changes in Supply

When we draw a supply curve, we assume that other variables that affect the willingness of sellers to supply a good or service are unchanged. It follows that a change in any of those variables will cause a **change in supply**, which is a shift in the supply curve. A change that increases the quantity of a good or service supplied at each price shifts the supply curve to the right. Suppose, for example, that the price of fertilizer falls. That will reduce the cost of producing coffee and thus increase the quantity of coffee producers will offer for sale at each price. The supply schedule in Figure 3.9 shows an increase in the quantity of coffee supplied at each price. We show that increase graphically as a shift in the supply curve from S_1 to S_2 . We see that the quantity supplied at each price increases by 10 million pounds of coffee per month. At point A on the original supply curve S_1 , for example, 25 million pounds of coffee per month are supplied at a price of \$6 per pound. After the increase in supply, 35 million pounds per month are supplied at the same price (point A' on curve S_2).

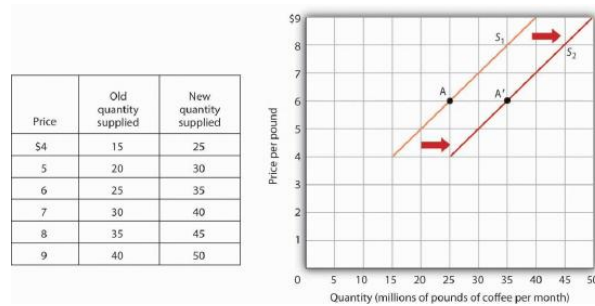


Figure 3.9 An Increase in Supply If there is a change in supply that increases the quantity supplied at each price, as is the case in the supply schedule here, the supply curve shifts to the right. At a price of \$6 per pound, for example, the quantity supplied rises from the previous level of 25 million pounds per month on supply curve S_1 (point A) to 35 million pounds per month on supply curve S_2 (point A').

An event that reduces the quantity supplied at each price shifts the supply curve to the left. An increase in production costs and excessive rain that reduces the yields from coffee plants are examples of events that might reduce supply. Figure 3.10 shows a reduction in the supply of coffee. We see in the supply schedule that the quantity of coffee supplied falls by 10 million pounds of coffee per month at each price. The supply curve thus shifts from S_1 to S_3 .

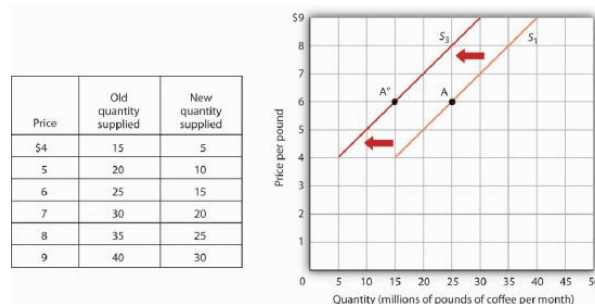


Figure 3.10 A Reduction in Supply A change in supply that reduces the quantity supplied at each price shifts the supply curve to the left. At a price of \$6 per pound, for example, the original quantity supplied was 25 million pounds of coffee per month (point A). With a new supply curve S_3 , the quantity supplied at that price falls to 15 million pounds of coffee per month (point A'').

A variable that can change the quantity of a good or service supplied at each price is called a **supply shifter**. Supply shifters include (1) prices of factors of production, (2) returns from alternative activities, (3) technology, (4) seller expectations, (5) natural events, and (6) the number of sellers. When these other variables change, the all-other-things-unchanged conditions behind the original supply curve no longer hold. Let us look at each of the supply shifters.

Prices of Factors of Production

A change in the price of labor or some other factor of production will change the cost of producing any given quantity of the good or service. This change in the cost of production will change the quantity that suppliers are willing to offer at any price. An increase in factor prices should decrease the quantity suppliers will offer at any price, shifting the supply curve to the left. A reduction in factor prices increases the quantity suppliers will offer at any price, shifting the supply curve to the right.

Suppose coffee growers must pay a higher wage to the workers they hire to harvest coffee or must pay more for fertilizer. Such increases in production cost will cause them to produce a smaller quantity at each price, shifting the supply curve for coffee to the left. A reduction in any of these costs increases supply, shifting the supply curve to the right.

Returns from Alternative Activities

To produce one good or service means forgoing the production of another. The concept of opportunity cost in economics suggests that the value of the activity forgone is the opportunity cost of the activity chosen; this cost should affect supply. For example, one opportunity cost of producing eggs is not selling chickens. An increase in the price people are willing to pay for fresh chicken would make it more profitable to sell chickens and would thus increase the opportunity cost of producing eggs. It would shift the supply curve for eggs to the left, reflecting a decrease in supply.

Technology

A change in technology alters the combinations of inputs or the types of inputs required in the production process. An improvement in technology usually means that fewer and/or less costly inputs are needed. If the cost of production is lower, the profits available at a given price will increase, and producers will produce more. With more produced at every price, the supply curve will shift to the right, meaning an increase in supply.

Impressive technological changes have occurred in the computer industry in recent years. Computers are much smaller and are far more powerful than they were only a few years ago—and they are much cheaper to produce. The result has been a huge increase in the supply of computers, shifting the supply curve to the right.

While we usually think of technology as enhancing production, declines in production due to problems in technology are also possible. Outlawing the use of certain equipment without pollution-control devices has increased the cost of production for many goods and services, thereby reducing profits available at any price and shifting these supply curves to the left.

Seller Expectations

All supply curves are based in part on seller expectations about future market conditions. Many decisions about production and selling are typically made long before a product is ready for sale. Those decisions necessarily depend on expectations. Changes in seller expectations can have important effects on price and quantity.

Consider, for example, the owners of oil deposits. Oil pumped out of the ground and used today will be unavailable in the future. If a change in the international political climate leads many owners to expect that oil prices will rise in the future, they may decide to leave their oil in the ground, planning to sell it later when the price is higher. Thus, there will be a decrease in supply; the supply curve for oil will shift to the left.

Natural Events

Storms, insect infestations, and drought affect agricultural production and thus the supply of agricultural goods. If something destroys a substantial part of an agricultural crop, the supply curve will shift to the left. The terrible cyclone that killed more than 50,000 people in Myanmar in 2008 also destroyed some of the country's prime rice growing land. That shifted the supply curve for rice to the left. If there is an unusually good harvest, the supply curve will shift to the right.

The Number of Sellers

The supply curve for an industry, such as coffee, includes all the sellers in the industry. A change in the number of sellers in an industry changes the quantity available at each price and thus changes supply. An increase in the number of sellers supplying a good or service shifts the supply curve to the right; a reduction in the number of sellers shifts the supply curve to the left.

The market for cellular phone service has been affected by an increase in the number of firms offering the service. Over the past decade, new cellular phone companies emerged, shifting the supply curve for cellular phone service to the right.

Heads Up!

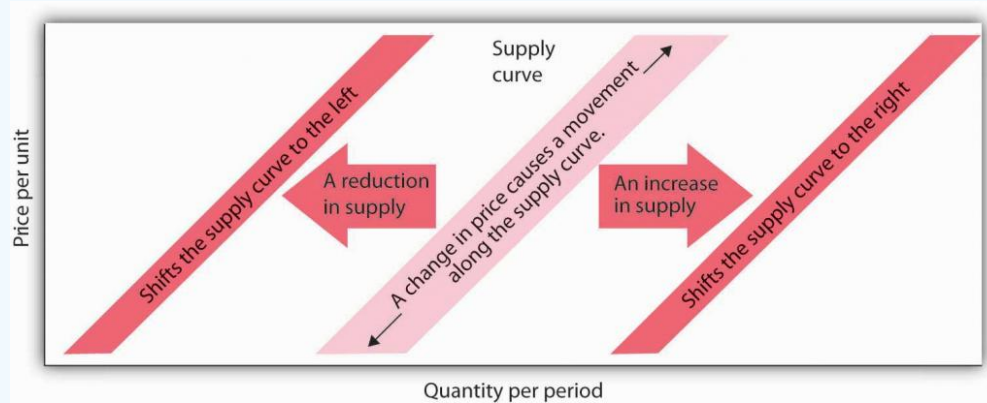
There are two special things to note about supply curves. The first is similar to the Heads Up! on demand curves: it is important to distinguish carefully between changes in supply and changes in quantity supplied. A change in supply results from a change in a supply shifter and implies a shift of the supply curve to the right or left. A change in price produces a change in quantity supplied and induces a movement along the supply curve. A change in price does not shift the supply curve.

The second caution relates to the interpretation of increases and decreases in supply. Notice that in Figure 3.9 an increase in supply is shown as a shift of the supply curve to the right; the curve shifts in the direction of increasing quantity with respect to the horizontal axis. In Figure 3.10 a reduction in supply is shown as a shift of the supply curve to the left; the curve shifts in the direction of decreasing quantity with respect to the horizontal axis.

Because the supply curve is upward sloping, a shift to the right produces a new curve that in a sense lies “below” the original curve. Students sometimes make the mistake of thinking of such a shift as a shift “down” and therefore as a reduction in supply. Similarly, it is easy to make the mistake of showing an increase in supply with a new curve that lies “above” the original curve. But that is a reduction in supply!

To avoid such errors, focus on the fact that an increase in supply is an increase in the quantity supplied at each price and shifts the supply curve in the direction of increased quantity on the horizontal axis. Similarly, a reduction in supply is a reduction in the quantity supplied at each price and shifts the supply curve in the direction of a lower quantity on the horizontal axis.

Figure 3.11



Key Takeaways

- The quantity supplied of a good or service is the quantity sellers are willing to sell at a particular price during a particular period, all other things unchanged.
- A supply schedule shows the quantities supplied at different prices during a particular period, all other things unchanged. A supply curve shows this same information graphically.
- A change in the price of a good or service causes a change in the quantity supplied—a movement *along* the supply curve.
- A change in a supply shifter causes a change in supply, which is shown as a *shift* of the supply curve. Supply shifters include prices of factors of production, returns from alternative activities, technology, seller expectations, natural events, and the number of sellers.
- An increase in supply is shown as a shift to the right of a supply curve; a decrease in supply is shown as a shift to the left.

Try It!

If all other things are unchanged, what happens to the supply curve for DVD rentals if there is (a) an increase in wages paid to DVD rental store clerks, (b) an increase in the price of DVD rentals, or (c) an increase in the number of DVD rental stores? Draw a graph that shows what happens to the supply curve in each circumstance. The supply curve can shift to the left or to the right, or stay where it is. Remember to label the axes and curves, and remember to specify the time period (e.g., “DVDs rented per week”).

Case in Point: The Monks of St. Benedict's Get Out of the Egg Business

Figure 3.12



Randy OHC – [Untitled](#) – CC BY 2.0.

It was cookies that lured the monks of St. Benedict's out of the egg business, and now private retreat sponsorship is luring them away from cookies.

St. Benedict's is a Benedictine monastery, nestled on a ranch high in the Colorado Rockies, about 20 miles down the road from Aspen. The monastery's 15 monks operate the ranch to support themselves and to provide help for poor people in the area. They lease out about 3,500 acres of their land to cattle and sheep grazers, produce cookies, and sponsor private retreats. They used to produce eggs.

Attracted by potential profits and the peaceful nature of the work, the monks went into the egg business in 1967. They had 10,000 chickens producing their Monastery Eggs brand. For a while, business was good. Very good. Then, in the late 1970s, the price of chicken feed started to rise rapidly.

"When we started in the business, we were paying \$60 to \$80 a ton for feed—delivered," recalls the monastery's abbot, Father Joseph Boyle. "By the late 1970s, our cost had more than doubled. We were paying \$160 to \$200 a ton. That really hurt, because feed represents a large part of the cost of producing eggs."

The monks adjusted to the blow. "When grain prices were lower, we'd pull a hen off for a few weeks to molt, then return her to laying. After grain prices went up, it was 12 months of laying and into the soup pot," Father Joseph says.

Grain prices continued to rise in the 1980s and increased the costs of production for all egg producers. It caused the supply of eggs to fall. Demand fell at the same time, as Americans worried about the cholesterol in eggs. Times got tougher in the egg business.

"We were still making money in the financial sense," Father Joseph says. "But we tried an experiment in 1985 producing cookies, and it was a success. We finally decided that devoting our time and energy to the cookies would pay off better than the egg business, so we quit the egg business in 1986."

The mail-order cookie business was good to the monks. They sold 200,000 ounces of Monastery Cookies in 1987.

By 1998, however, they had limited their production of cookies, selling only locally and to gift shops. Since 2000, they have switched to "providing private retreats for individuals and groups—about 40 people per month," according to Brother Charles.

The monks' calculation of their opportunity costs revealed that they would earn a higher return through sponsorship of private retreats than in either cookies or eggs. This projection has proved correct.

And there is another advantage as well.

"The chickens didn't stop laying eggs on Sunday," Father Joseph chuckles. "When we shifted to cookies we could take Sundays off. We weren't hemmed in the way we were with the chickens." The move to providing retreats is even better in this regard. Since

guests provide their own meals, most of the monastery's effort goes into planning and scheduling, which frees up even more of their time for other worldly as well as spiritual pursuits.

Source: Personal interviews.

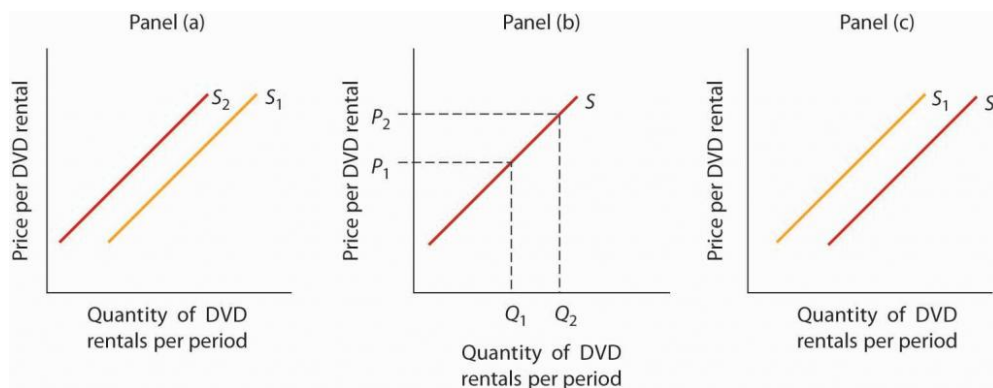
Answer to Try It! Problem

DVD rental store clerks are a factor of production in the DVD rental market. An increase in their wages raises the cost of production, thereby causing the supply curve of DVD rentals to shift to the left [Panel (a)]. (*Caution:* It is possible that you thought of the wage increase as an increase in income, a demand shifter, that would lead to an increase in demand, but this would be incorrect. The question refers only to wages of DVD rental store clerks. They may rent some DVD, but their impact on total demand would be negligible. Besides, we have no information on what has happened overall to incomes of people who rent DVDs. We do know, however, that the cost of a factor of production, which is a supply shifter, increased.)

An increase in the price of DVD rentals does not shift the supply curve at all; rather, it corresponds to a movement upward to the right along the supply curve. At a higher price of P_2 instead of P_1 , a greater quantity of DVD rentals, say Q_2 instead of Q_1 , will be supplied [Panel (b)].

An increase in the number of stores renting DVDs will cause the supply curve to shift to the right [Panel (c)].

Figure 3.13



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2.3: Demand, Supply, and Equilibrium

Learning Objective

1. Use demand and supply to explain how equilibrium price and quantity are determined in a market.
2. Understand the concepts of surpluses and shortages and the pressures on price they generate.
3. Explain the impact of a change in demand or supply on equilibrium price and quantity.
4. Explain how the circular flow model provides an overview of demand and supply in product and factor markets and how the model suggests ways in which these markets are linked.

In this section we combine the demand and supply curves we have just studied into a new model. The [model of demand and supply](#) uses demand and supply curves to explain the determination of price and quantity in a market.

The Determination of Price and Quantity

The logic of the model of demand and supply is simple. The demand curve shows the quantities of a particular good or service that buyers will be willing and able to purchase at each price during a specified period. The supply curve shows the quantities that sellers will offer for sale at each price during that same period. By putting the two curves together, we should be able to find a price at which the quantity buyers are willing and able to purchase equals the quantity sellers will offer for sale.

Figure 3.14 combines the demand and supply data introduced in Figure 3.1 and Figure 3.8. Notice that the two curves intersect at a price of \$6 per pound—at this price the quantities demanded and supplied are equal. Buyers want to purchase, and sellers are willing to offer for sale, 25 million pounds of coffee per month. The market for coffee is in equilibrium. Unless the demand or supply curve shifts, there will be no tendency for price to change. The [equilibrium price](#) in any market is the price at which quantity demanded equals quantity supplied. The equilibrium price in the market for coffee is thus \$6 per pound. The [equilibrium quantity](#) is the quantity demanded and supplied at the equilibrium price.

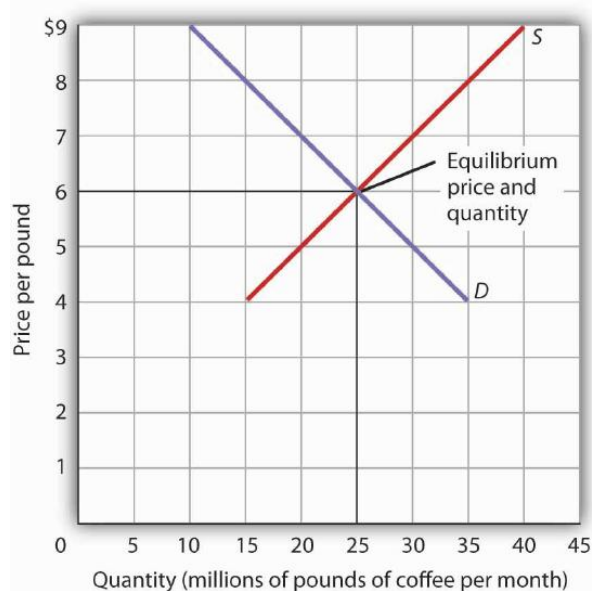


Figure 3.14 The Determination of Equilibrium Price and Quantity When we combine the demand and supply curves for a good in a single graph, the point at which they intersect identifies the equilibrium price and equilibrium quantity. Here, the equilibrium price is \$6 per pound. Consumers demand, and suppliers supply, 25 million pounds of coffee per month at this price.

With an upward-sloping supply curve and a downward-sloping demand curve, there is only a single price at which the two curves intersect. This means there is only one price at which equilibrium is achieved. It follows that at any price other than the equilibrium price, the market will not be in equilibrium. We next examine what happens at prices other than the equilibrium price.

Surpluses

Figure 3.15 shows the same demand and supply curves we have just examined, but this time the initial price is \$8 per pound of coffee. Because we no longer have a balance between quantity demanded and quantity supplied, this price is not the equilibrium price. At a price of \$8, we read over to the demand curve to determine the quantity of coffee consumers will be willing to buy—15 million pounds per month. The supply curve tells us what sellers will offer for sale—35 million pounds per month. The difference, 20 million pounds of coffee per month, is called a surplus. More generally, a **surplus** is the amount by which the quantity supplied exceeds the quantity demanded at the current price. There is, of course, no surplus at the equilibrium price; a surplus occurs only if the current price exceeds the equilibrium price.

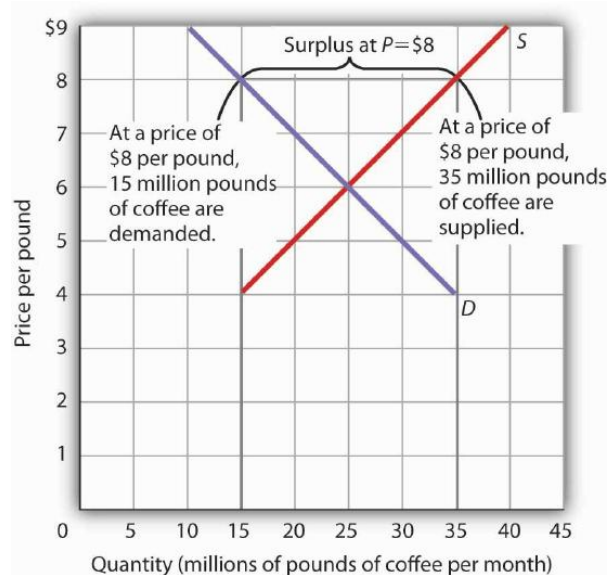


Figure 3.15 A Surplus in the Market for Coffee At a price of \$8, the quantity supplied is 35 million pounds of coffee per month and the quantity demanded is 15 million pounds per month; there is a surplus of 20 million pounds of coffee per month. Given a surplus, the price will fall quickly toward the equilibrium level of \$6.

A surplus in the market for coffee will not last long. With unsold coffee on the market, sellers will begin to reduce their prices to clear out unsold coffee. As the price of coffee begins to fall, the quantity of coffee supplied begins to decline. At the same time, the quantity of coffee demanded begins to rise. Remember that the reduction in quantity supplied is a movement *along* the supply curve—the curve itself does not shift in response to a reduction in price. Similarly, the increase in quantity demanded is a movement *along* the demand curve—the demand curve does not shift in response to a reduction in price. Price will continue to fall until it reaches its equilibrium level, at which the demand and supply curves intersect. At that point, there will be no tendency for price to fall further. In general, surpluses in the marketplace are short-lived. The prices of most goods and services adjust quickly, eliminating the surplus. Later on, we will discuss some markets in which adjustment of price to equilibrium may occur only very slowly or not at all.

Shortages

Just as a price above the equilibrium price will cause a surplus, a price below equilibrium will cause a shortage. A **shortage** is the amount by which the quantity demanded exceeds the quantity supplied at the current price.

Figure 3.16 shows a shortage in the market for coffee. Suppose the price is \$4 per pound. At that price, 15 million pounds of coffee would be supplied per month, and 35 million pounds would be demanded per month. When more coffee is demanded than supplied, there is a shortage.

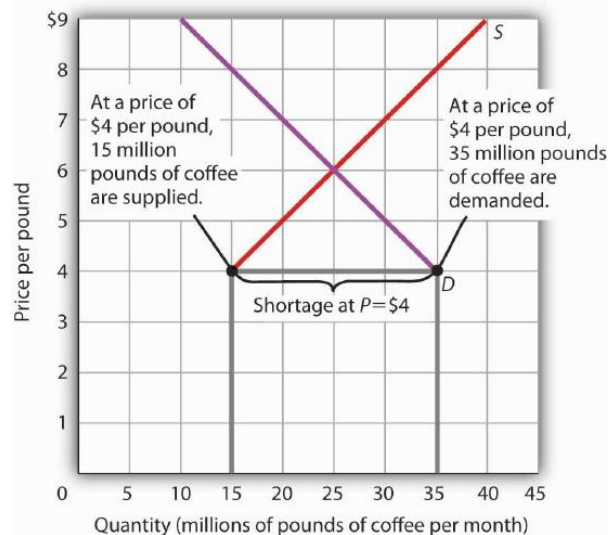


Figure 3.16 A Shortage in the Market for Coffee At a price of \$4 per pound, the quantity of coffee demanded is 35 million pounds per month and the quantity supplied is 15 million pounds per month. The result is a shortage of 20 million pounds of coffee per month.

In the face of a shortage, sellers are likely to begin to raise their prices. As the price rises, there will be an increase in the quantity supplied (but not a change in supply) and a reduction in the quantity demanded (but not a change in demand) until the equilibrium price is achieved.

Shifts in Demand and Supply

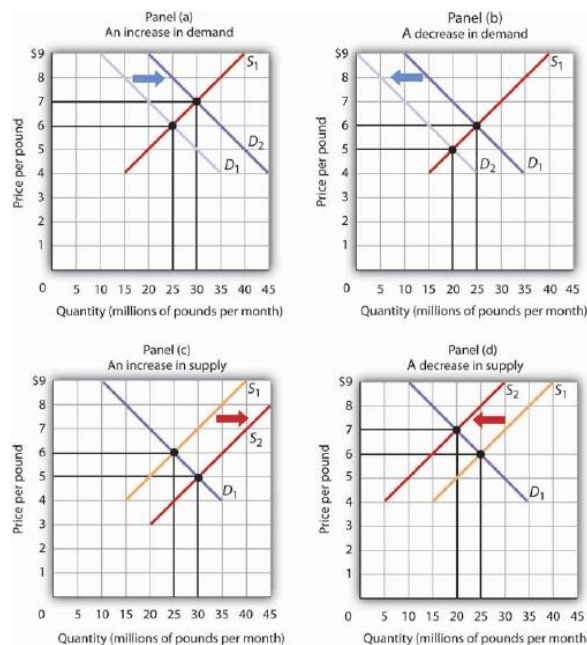


Figure 3.17 Changes in Demand and Supply A change in demand or in supply changes the equilibrium solution in the model. Panels (a) and (b) show an increase and a decrease in demand, respectively; Panels (c) and (d) show an increase and a decrease in supply, respectively.

A change in one of the variables (shifters) held constant in any model of demand and supply will create a change in demand or supply. A shift in a demand or supply curve changes the equilibrium price and equilibrium quantity for a good or service. Figure 3.17 combines the information about changes in the demand and supply of coffee presented in Figure 3.2, Figure 3.3, Figure 3.9, and Figure 3.10. In each case, the original equilibrium price is \$6 per pound, and the corresponding equilibrium quantity is 25 million pounds of coffee per month. Figure 3.17 shows what happens with an increase in demand, a reduction in demand, an increase in

supply, and a reduction in supply. We then look at what happens if both curves shift simultaneously. Each of these possibilities is discussed in turn below.

An Increase in Demand

An increase in demand for coffee shifts the demand curve to the right, as shown in Panel (a) of Figure 3.17. The equilibrium price rises to \$7 per pound. As the price rises to the new equilibrium level, the quantity supplied increases to 30 million pounds of coffee per month. Notice that the supply curve does not shift; rather, there is a movement along the supply curve.

Demand shifters that could cause an increase in demand include a shift in preferences that leads to greater coffee consumption; a lower price for a complement to coffee, such as doughnuts; a higher price for a substitute for coffee, such as tea; an increase in income; and an increase in population. A change in buyer expectations, perhaps due to predictions of bad weather lowering expected yields on coffee plants and increasing future coffee prices, could also increase current demand.

A Decrease in Demand

Panel (b) of Figure 3.17 shows that a decrease in demand shifts the demand curve to the left. The equilibrium price falls to \$5 per pound. As the price falls to the new equilibrium level, the quantity supplied decreases to 20 million pounds of coffee per month.

Demand shifters that could reduce the demand for coffee include a shift in preferences that makes people want to consume less coffee; an increase in the price of a complement, such as doughnuts; a reduction in the price of a substitute, such as tea; a reduction in income; a reduction in population; and a change in buyer expectations that leads people to expect lower prices for coffee in the future.

An Increase in Supply

An increase in the supply of coffee shifts the supply curve to the right, as shown in Panel (c) of Figure 3.17. The equilibrium price falls to \$5 per pound. As the price falls to the new equilibrium level, the quantity of coffee demanded increases to 30 million pounds of coffee per month. Notice that the demand curve does not shift; rather, there is movement along the demand curve.

Possible supply shifters that could increase supply include a reduction in the price of an input such as labor, a decline in the returns available from alternative uses of the inputs that produce coffee, an improvement in the technology of coffee production, good weather, and an increase in the number of coffee-producing firms.

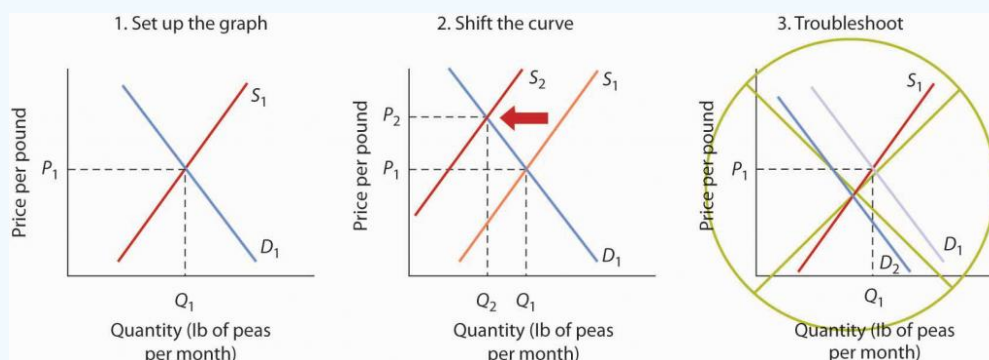
A Decrease in Supply

Panel (d) of Figure 3.17 shows that a decrease in supply shifts the supply curve to the left. The equilibrium price rises to \$7 per pound. As the price rises to the new equilibrium level, the quantity demanded decreases to 20 million pounds of coffee per month.

Possible supply shifters that could reduce supply include an increase in the prices of inputs used in the production of coffee, an increase in the returns available from alternative uses of these inputs, a decline in production because of problems in technology (perhaps caused by a restriction on pesticides used to protect coffee beans), a reduction in the number of coffee-producing firms, or a natural event, such as excessive rain.

Heads Up!

Figure 3.18



You are likely to be given problems in which you will have to shift a demand or supply curve.

Suppose you are told that an invasion of pod-crunching insects has gobbled up half the crop of fresh peas, and you are asked to use demand and supply analysis to predict what will happen to the price and quantity of peas demanded and supplied. Here are some suggestions.

Put the quantity of the good you are asked to analyze on the horizontal axis and its price on the vertical axis. Draw a downward-sloping line for demand and an upward-sloping line for supply. The initial equilibrium price is determined by the intersection of the two curves. Label the equilibrium solution. You may find it helpful to use a number for the equilibrium price instead of the letter “P.” Pick a price that seems plausible, say, 79¢ per pound. Do not worry about the precise positions of the demand and supply curves; you cannot be expected to know what they are.

Step 2 can be the most difficult step; the problem is to decide which curve to shift. The key is to remember the difference between a change in demand or supply and a change in quantity demanded or supplied. At each price, ask yourself whether the given event would change the quantity demanded. Would the fact that a bug has attacked the pea crop change the quantity demanded at a price of, say, 79¢ per pound? Clearly not; none of the demand shifters have changed. The event would, however, reduce the quantity supplied at this price, and the supply curve would shift to the left. There is a change in supply and a reduction in the quantity demanded. There is no change in demand.

Next check to see whether the result you have obtained makes sense. The graph in Step 2 makes sense; it shows price rising and quantity demanded falling.

It is easy to make a mistake such as the one shown in the third figure of this Heads Up! One might, for example, reason that when fewer peas are available, fewer will be demanded, and therefore the demand curve will shift to the left. This suggests the price of peas will fall—but that does not make sense. If only half as many fresh peas were available, their price would surely rise. The error here lies in confusing a change in quantity demanded with a change in demand. Yes, buyers will end up buying fewer peas. But no, they will not demand fewer peas at each price than before; the demand curve does not shift.

Simultaneous Shifts

As we have seen, when *either* the demand or the supply curve shifts, the results are unambiguous; that is, we know what will happen to both equilibrium price and equilibrium quantity, so long as we know whether demand or supply increased or decreased. However, in practice, several events may occur at around the same time that cause *both* the demand and supply curves to shift. To figure out what happens to equilibrium price and equilibrium quantity, we must know not only in which direction the demand and supply curves have shifted but also the relative amount by which each curve shifts. Of course, the demand and supply curves could shift in the same direction or in opposite directions, depending on the specific events causing them to shift.

For example, all three panels of Figure 3.19 show a decrease in demand for coffee (caused perhaps by a decrease in the price of a substitute good, such as tea) and a simultaneous decrease in the supply of coffee (caused perhaps by bad weather). Since reductions in demand and supply, considered separately, each cause the equilibrium quantity to fall, the impact of both curves shifting simultaneously to the left means that the new equilibrium quantity of coffee is less than the old equilibrium quantity. The effect on the equilibrium price, though, is ambiguous. Whether the equilibrium price is higher, lower, or unchanged depends on the extent to which each curve shifts.

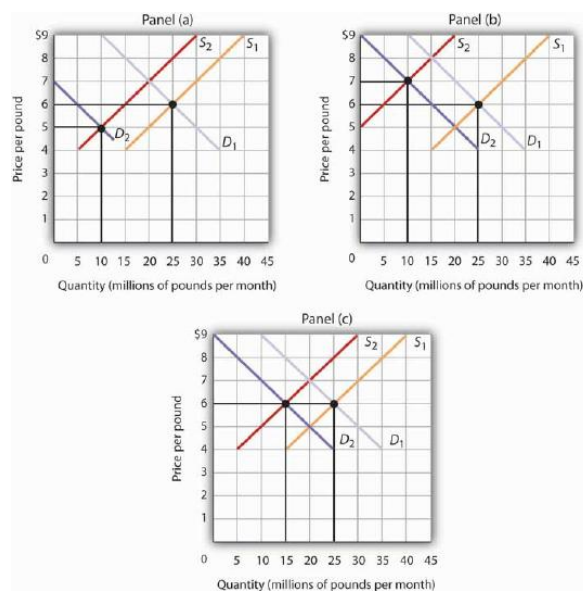


Figure 3.19 Simultaneous Decreases in Demand and Supply Both the demand and the supply of coffee decrease. Since decreases in demand and supply, considered separately, each cause equilibrium quantity to fall, the impact of both decreasing simultaneously means that a new equilibrium quantity of coffee must be less than the old equilibrium quantity. In Panel (a), the demand curve shifts farther to the left than does the supply curve, so equilibrium price falls. In Panel (b), the supply curve shifts farther to the left than does the demand curve, so the equilibrium price rises. In Panel (c), both curves shift to the left by the same amount, so equilibrium price stays the same.

If the demand curve shifts farther to the left than does the supply curve, as shown in Panel (a) of Figure 3.19, then the equilibrium price will be lower than it was before the curves shifted. In this case the new equilibrium price falls from \$6 per pound to \$5 per pound. If the shift to the left of the supply curve is greater than that of the demand curve, the equilibrium price will be higher than it was before, as shown in Panel (b). In this case, the new equilibrium price rises to \$7 per pound. In Panel (c), since both curves shift to the left by the same amount, equilibrium price does not change; it remains \$6 per pound.

Regardless of the scenario, changes in equilibrium price and equilibrium quantity resulting from two different events need to be considered separately. If both events cause equilibrium price or quantity to move in the same direction, then clearly price or quantity can be expected to move in that direction. If one event causes price or quantity to rise while the other causes it to fall, the extent by which each curve shifts is critical to figuring out what happens. Figure 3.20 summarizes what may happen to equilibrium price and quantity when demand and supply both shift.

		Shift in supply	
		Decrease in supply	Increase in supply
Shift in demand	Decrease in demand	Equilibrium price ? Equilibrium quantity ↓	Equilibrium price ↓ Equilibrium quantity ?
	Increase in demand	Equilibrium price ↑ Equilibrium quantity ?	Equilibrium price ? Equilibrium quantity ↑

Figure 3.20 Simultaneous Shifts in Demand and Supply If simultaneous shifts in demand and supply cause equilibrium price or quantity to move in the same direction, then equilibrium price or quantity clearly moves in that direction. If the shift in one of the curves causes equilibrium price or quantity to rise while the shift in the other curve causes equilibrium price or quantity to fall, then the relative amount by which each curve shifts is critical to figuring out what happens to that variable.

As demand and supply curves shift, prices adjust to maintain a balance between the quantity of a good demanded and the quantity supplied. If prices did not adjust, this balance could not be maintained.

Notice that the demand and supply curves that we have examined in this chapter have all been drawn as linear. This simplification of the real world makes the graphs a bit easier to read without sacrificing the essential point: whether the curves are linear or nonlinear, demand curves are downward sloping and supply curves are generally upward sloping. As circumstances that shift the demand curve or the supply curve change, we can analyze what will happen to price and what will happen to quantity.

An Overview of Demand and Supply: The Circular Flow Model

Implicit in the concepts of demand and supply is a constant interaction and adjustment that economists illustrate with the circular flow model. The [circular flow model](#) provides a look at how markets work and how they are related to each other. It shows flows of spending and income through the economy.

A great deal of economic activity can be thought of as a process of exchange between households and firms. Firms supply goods and services to households. Households buy these goods and services from firms. Households supply factors of production—labor, capital, and natural resources—that firms require. The payments firms make in exchange for these factors represent the incomes households earn.

The flow of goods and services, factors of production, and the payments they generate is illustrated in Figure 3.21. This circular flow model of the economy shows the interaction of households and firms as they exchange goods and services and factors of production. For simplicity, the model here shows only the private domestic economy; it omits the government and foreign sectors.

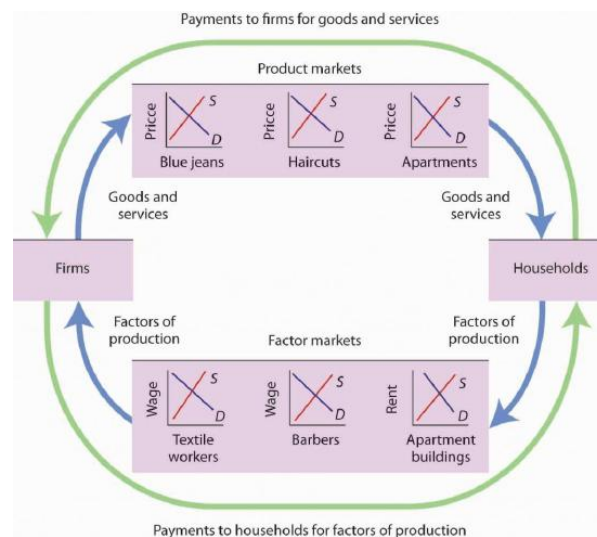


Figure 3.21 The Circular Flow of Economic Activity This simplified circular flow model shows flows of spending between households and firms through product and factor markets. The inner arrows show goods and services flowing from firms to households and factors of production flowing from households to firms. The outer flows show the payments for goods, services, and factors of production. These flows, in turn, represent millions of individual markets for products and factors of production.

The circular flow model shows that goods and services that households demand are supplied by firms in [product markets](#). The exchange for goods and services is shown in the top half of Figure 3.21. The bottom half of the exhibit illustrates the exchanges that take place in factor markets. [factor markets](#) are markets in which households supply factors of production—labor, capital, and natural resources—demanded by firms.

Our model is called a circular flow model because households use the income they receive from their supply of factors of production to buy goods and services from firms. Firms, in turn, use the payments they receive from households to pay for their factors of production.

The demand and supply model developed in this chapter gives us a basic tool for understanding what is happening in each of these product or factor markets and also allows us to see how these markets are interrelated. In Figure 3.21, markets for three goods and services that households want—blue jeans, haircuts, and apartments—create demands by firms for textile workers, barbers, and apartment buildings. The equilibrium of supply and demand in each market determines the price and quantity of that item. Moreover, a change in equilibrium in one market will affect equilibrium in related markets. For example, an increase in the demand for haircuts would lead to an increase in demand for barbers. Equilibrium price and quantity could rise in both markets. For some

purposes, it will be adequate to simply look at a single market, whereas at other times we will want to look at what happens in related markets as well.

In either case, the model of demand and supply is one of the most widely used tools of economic analysis. That widespread use is no accident. The model yields results that are, in fact, broadly consistent with what we observe in the marketplace. Your mastery of this model will pay big dividends in your study of economics.

Key Takeaways

- The equilibrium price is the price at which the quantity demanded equals the quantity supplied. It is determined by the intersection of the demand and supply curves.
- A surplus exists if the quantity of a good or service supplied exceeds the quantity demanded at the current price; it causes downward pressure on price. A shortage exists if the quantity of a good or service demanded exceeds the quantity supplied at the current price; it causes upward pressure on price.
- An increase in demand, all other things unchanged, will cause the equilibrium price to rise; quantity supplied will increase. A decrease in demand will cause the equilibrium price to fall; quantity supplied will decrease.
- An increase in supply, all other things unchanged, will cause the equilibrium price to fall; quantity demanded will increase. A decrease in supply will cause the equilibrium price to rise; quantity demanded will decrease.
- To determine what happens to equilibrium price and equilibrium quantity when both the supply and demand curves shift, you must know in which direction each of the curves shifts and the extent to which each curve shifts.
- The circular flow model provides an overview of demand and supply in product and factor markets and suggests how these markets are linked to one another.

Try It!

What happens to the equilibrium price and the equilibrium quantity of DVD rentals if the price of movie theater tickets increases and wages paid to DVD rental store clerks increase, all other things unchanged? Be sure to show all possible scenarios, as was done in Figure 3.19. Again, you do not need actual numbers to arrive at an answer. Just focus on the general position of the curve(s) before and after events occurred.

Case in Point: Demand, Supply, and Obesity

Figure 3.22



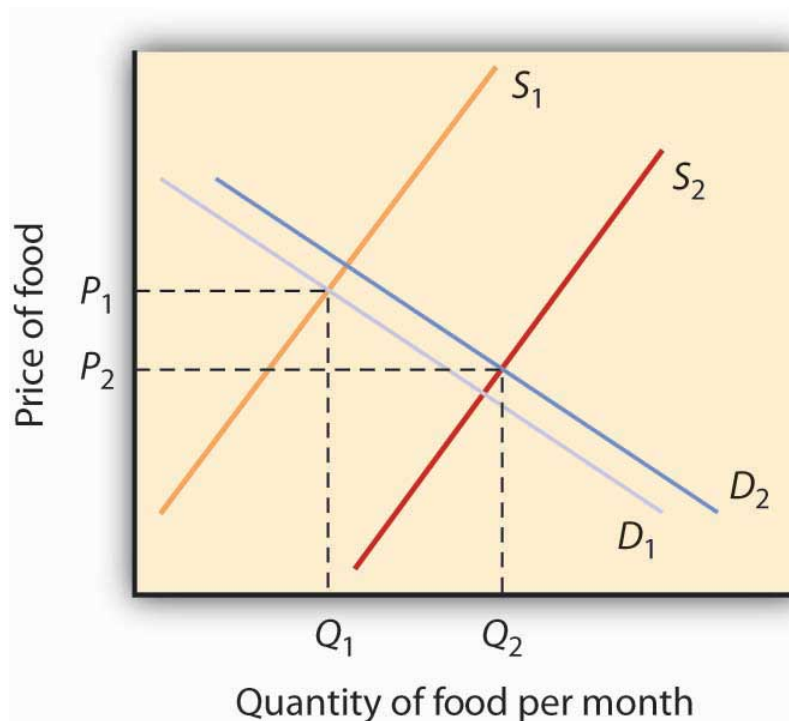
Rattopennugu – American fat beauty – CC BY-NC-ND 2.0.

Why are so many Americans fat? Put so crudely, the question may seem rude, but, indeed, the number of obese Americans has increased by more than 50% over the last generation, and obesity may now be the nation's number one health problem. According to Sturm Roland in a recent RAND Corporation study, "Obesity appears to have a stronger association with the occurrence of chronic medical conditions, reduced physical health-related quality of life and increased health care and medication expenditures than smoking or problem drinking."

Many explanations of rising obesity suggest higher demand for food. What more apt picture of our sedentary life style is there than spending the afternoon watching a ballgame on TV, while eating chips and salsa, followed by a dinner of a lavishly topped, take-out pizza? Higher income has also undoubtedly contributed to a rightward shift in the demand curve for food. Plus, any additional food intake translates into more weight increase because we spend so few calories preparing it, either directly or in the process of earning the income to buy it. A study by economists Darius Lakdawalla and Tomas Philipson suggests that about 60% of the recent growth in weight may be explained in this way—that is, demand has shifted to the right, leading to an increase in the equilibrium quantity of food consumed and, given our less strenuous life styles, even more weight gain than can be explained simply by the increased amount we are eating.

What accounts for the remaining 40% of the weight gain? Lakdawalla and Philipson further reason that a rightward shift in demand would by itself lead to an increase in the quantity of food as well as an increase in the price of food. The problem they have with this explanation is that over the post-World War II period, the relative price of food has declined by an average of 0.2 percentage points per year. They explain the fall in the price of food by arguing that agricultural innovation has led to a substantial rightward shift in the supply curve of food. As shown, lower food prices and a higher equilibrium quantity of food have resulted from simultaneous rightward shifts in demand and supply and that the rightward shift in the supply of food from S_1 to S_2 has been substantially larger than the rightward shift in the demand curve from D_1 to D_2 .

Figure 3.23



Sources: Roland, Sturm, "The Effects of Obesity, Smoking, and Problem Drinking on Chronic Medical Problems and Health Care Costs," *Health Affairs*, 2002; 21(2): 245–253. Lakdawalla, Darius and Tomas Philipson, "The Growth of Obesity and Technological Change: A Theoretical and Empirical Examination," National Bureau of Economic Research Working Paper no. w8946, May 2002.

Answer to Try It! Problem

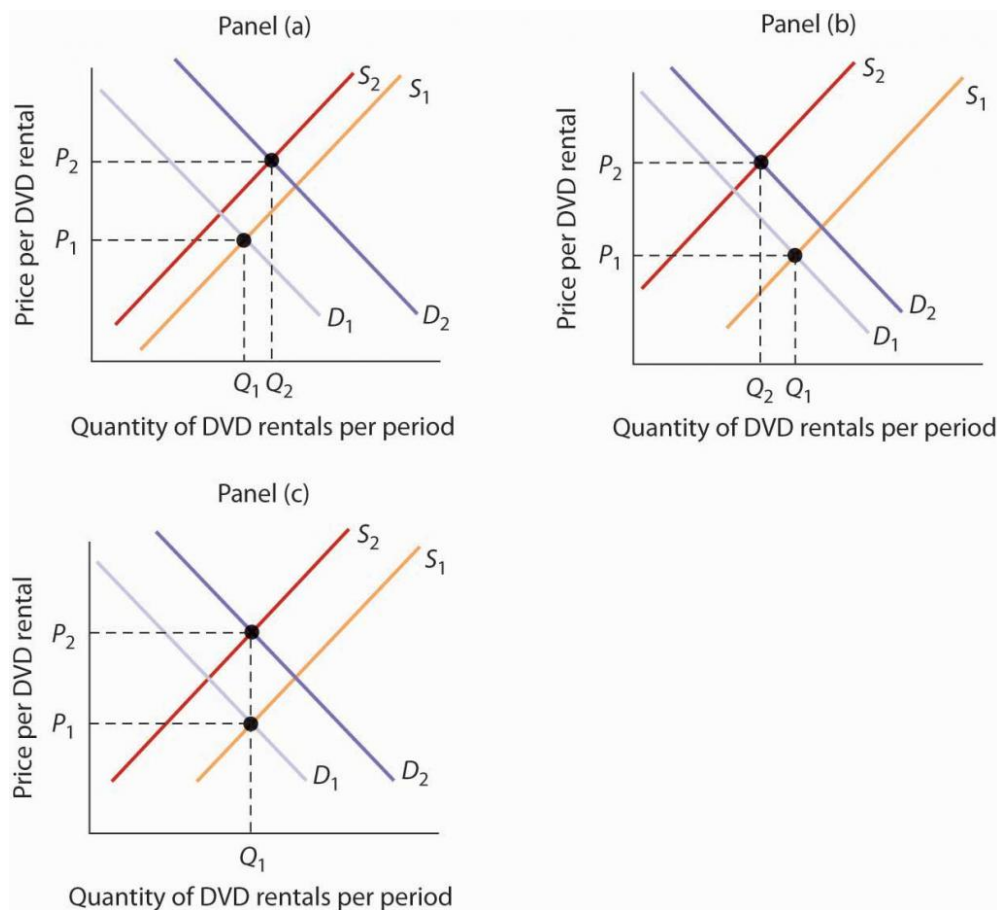
An increase in the price of movie theater tickets (a substitute for DVD rentals) will cause the demand curve for DVD rentals to shift to the right. An increase in the wages paid to DVD rental store clerks (an increase in the cost of a factor of production) shifts the supply curve to the left. Each event taken separately causes equilibrium price to rise. Whether equilibrium quantity will be higher or lower depends on which curve shifted more.

If the demand curve shifted more, then the equilibrium quantity of DVD rentals will rise [Panel (a)].

If the supply curve shifted more, then the equilibrium quantity of DVD rentals will fall [Panel (b)].

If the curves shifted by the same amount, then the equilibrium quantity of DVD rentals would not change [Panel (c)].

Figure 3.24



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2.4: Review and Practice

Summary

In this chapter we have examined the model of demand and supply. We found that a demand curve shows the quantity demanded at each price, all other things unchanged. The law of demand asserts that an increase in price reduces the quantity demanded and a decrease in price increases the quantity demanded, all other things unchanged. The supply curve shows the quantity of a good or service that sellers will offer at various prices, all other things unchanged. Supply curves are generally upward sloping: an increase in price generally increases the quantity supplied, all other things unchanged.

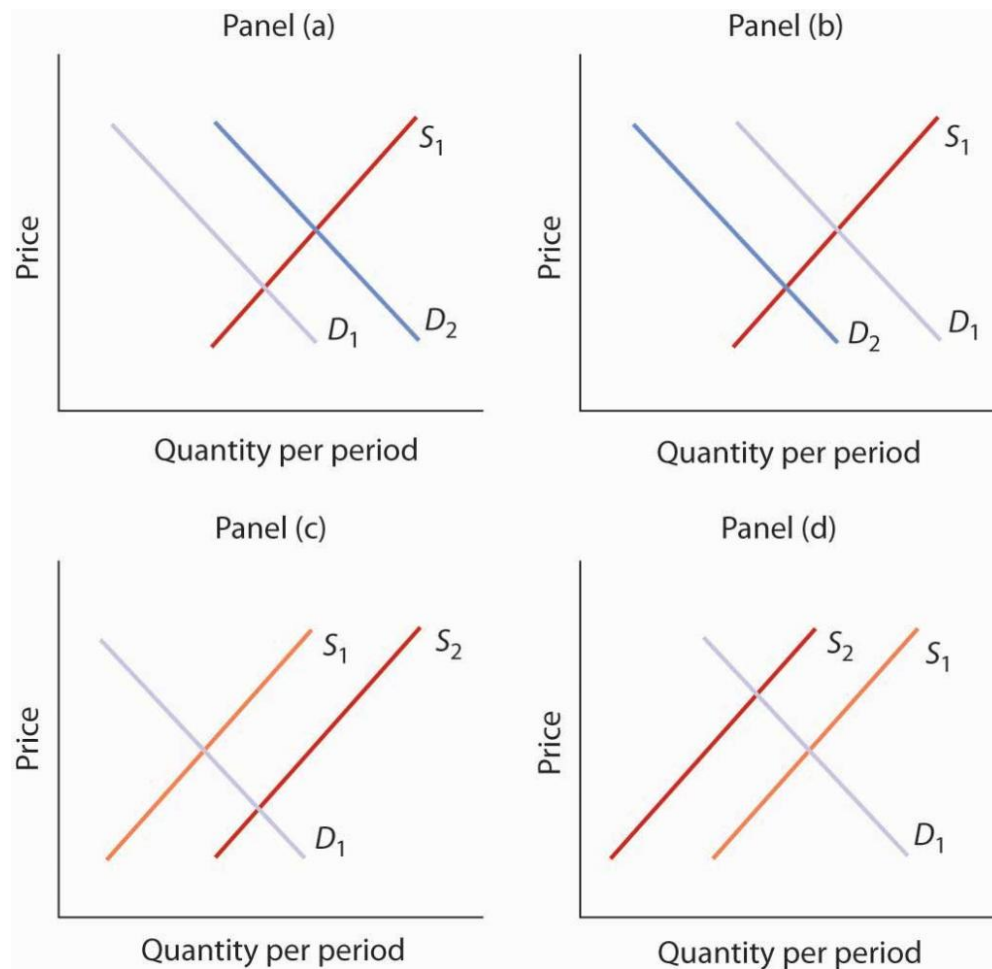
The equilibrium price occurs where the demand and supply curves intersect. At this price, the quantity demanded equals the quantity supplied. A price higher than the equilibrium price increases the quantity supplied and reduces the quantity demanded, causing a surplus. A price lower than the equilibrium price increases the quantity demanded and reduces the quantity supplied, causing a shortage. Usually, market surpluses and shortages are short-lived. Changes in demand or supply, caused by changes in the determinants of demand and supply otherwise held constant in the analysis, change the equilibrium price and output. The circular flow model allows us to see how demand and supply in various markets are related to one another.

Concept Problems

1. What do you think happens to the demand for pizzas during the Super Bowl? Why?
2. Which of the following goods are likely to be classified as normal goods or services? Inferior? Defend your answer.
 1. Beans
 2. Tuxedos
 3. Used cars
 4. Used clothing
 5. Computers
 6. Books reviewed in *The New York Times*
 7. Macaroni and cheese
 8. Calculators
 9. Cigarettes
 10. Caviar
 11. Legal services
3. Which of the following pairs of goods are likely to be classified as substitutes? Complements? Defend your answer.
 1. Peanut butter and jelly
 2. Eggs and ham
 3. Nike brand and Reebok brand sneakers
 4. IBM and Apple Macintosh brand computers
 5. Dress shirts and ties
 6. Airline tickets and hotels
 7. Gasoline and tires
 8. Beer and wine
 9. Faxes and first-class mail
 10. Cereal and milk
 11. Cereal and eggs
4. A study found that lower airfares led some people to substitute flying for driving to their vacation destinations. This reduced the demand for car travel and led to reduced traffic fatalities, since air travel is safer per passenger mile than car travel. Using the logic suggested by that study, suggest how each of the following events would affect the number of highway fatalities in any one year.
 1. An increase in the price of gasoline

2. A large reduction in rental rates for passenger vans
3. An increase in airfares
5. Children under age 2 are now allowed to fly free on U.S. airlines; they usually sit in their parents' laps. Some safety advocates have urged that they be required to be strapped in infant seats, which would mean their parents would have to purchase tickets for them. Some economists have argued that such a measure would actually increase infant fatalities. Can you say why?
6. The graphs below show four possible shifts in demand or in supply that could occur in particular markets. Relate each of the events described below to one of them.

Figure 3.25



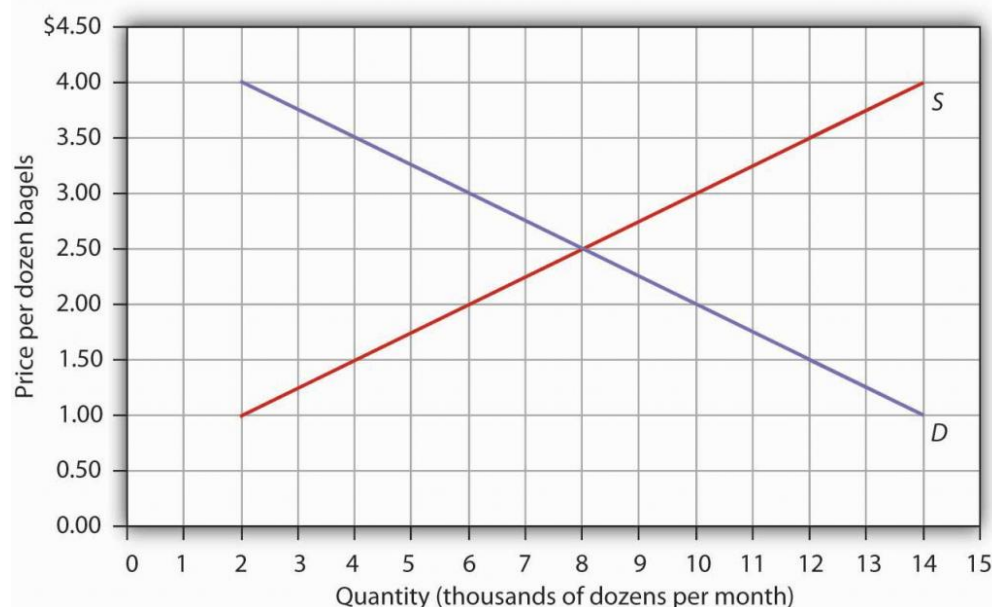
1. How did the heavy rains in South America in 1997 affect the market for coffee?
2. The Surgeon General decides french fries are not bad for your health after all and issues a report endorsing their use. What happens to the market for french fries?
3. How do you think rising incomes affect the market for ski vacations?
4. A new technique is discovered for manufacturing computers that greatly lowers their production cost. What happens to the market for computers?
5. How would a ban on smoking in public affect the market for cigarettes?
7. As low-carb diets increased in popularity, egg prices rose sharply. How might this affect the monks' supply of cookies or private retreats? (See the Case in Point on the Monks of St. Benedict's.)
8. Gasoline prices typically rise during the summer, a time of heavy tourist traffic. A "street talk" feature on a radio station sought tourist reaction to higher gasoline prices. Here was one response: "I don't like 'em [the higher prices] much. I think the gas companies just use any excuse to jack up prices, and they're doing it again now." How does this tourist's perspective differ from that of economists who use the model of demand and supply?

9. The introduction to the chapter argues that preferences for coffee changed in the 1990s and that excessive rain hurt yields from coffee plants. Show and explain the effects of these two circumstances on the coffee market.
10. With preferences for coffee remaining strong in the early part of the century, Vietnam entered the market as a major exporter of coffee. Show and explain the effects of these two circumstances on the coffee market.
11. The study on the economics of obesity discussed in the Case in Point in this chapter on that topic also noted that another factor behind rising obesity is the decline in cigarette smoking as the price of cigarettes has risen. Show and explain the effect of higher cigarette prices on the market for food. What does this finding imply about the relationship between cigarettes and food?
12. In 2004, *The New York Times* reported that India might be losing its outsourcing edge due to rising wages (Scheiber, N., 2004). The reporter noted that a recent report “projected that if India continued to produce college graduates at the current rate, demand would exceed supply by 20% in the main outsourcing markets by 2008.” Using the terminology you learned in this chapter, explain what he meant to say was happening in the market for Indian workers in outsourcing jobs. In particular, is demand for Indian workers increasing or decreasing? Is the supply of Indian workers increasing or decreasing? Which is shifting faster? How do you know?
13. For more than a century, milk producers have produced skim milk, which contains virtually no fat, along with regular milk, which contains 4% fat. But a century ago, skim milk accounted for only about 1% of total production, and much of it was fed to hogs. Today, skim and other reduced-fat milks make up the bulk of milk sales. What curve shifted, and what factor shifted it?
14. Suppose firms in the economy were to produce fewer goods and services. How do you think this would affect household spending on goods and services? (*Hint: Use the circular flow model to analyze this question.*)

Numerical Problems

Problems 1–5 are based on the graph below.

Figure 3.26



1. At a price of \$1.50 per dozen, how many bagels are demanded per month?
2. At a price of \$1.50 per dozen, how many bagels are supplied per month?
3. At a price of \$3.00 per dozen, how many bagels are demanded per month?
4. At a price of \$3.00 per dozen, how many bagels are supplied per month?
5. What is the equilibrium price of bagels? What is the equilibrium quantity per month?

Problems 6–9 are based on the model of demand and supply for coffee as shown in Figure 3.17. You can graph the initial demand and supply curves by using the following values, with all quantities in millions of pounds of coffee per month:

	Price	Quantity demanded	Quantity supplied
\$3		40	10
4		35	15
5		30	20
6		25	25
7		20	30
8		15	35
9		10	40

1. Suppose the quantity demanded rises by 20 million pounds of coffee per month at each price. Draw the initial demand and supply curves based on the values given in the table above. Then draw the new demand curve given by this change, and show the new equilibrium price and quantity.
2. Suppose the quantity demanded falls, relative to the values given in the above table, by 20 million pounds per month at prices between \$4 and \$6 per pound; at prices between \$7 and \$9 per pound, the quantity demanded becomes zero. Draw the new demand curve and show the new equilibrium price and quantity.
3. Suppose the quantity supplied rises by 20 million pounds per month at each price, while the quantities demanded retain the values shown in the table above. Draw the new supply curve and show the new equilibrium price and quantity.
4. Suppose the quantity supplied falls, relative to the values given in the table above, by 20 million pounds per month at prices above \$5; at a price of \$5 or less per pound, the quantity supplied becomes zero. Draw the new supply curve and show the new equilibrium price and quantity.

Problems 10–15 are based on the demand and supply schedules for gasoline below (all quantities are in thousands of gallons per week):

	Price per gallon	Quantity demanded	Quantity supplied
\$1		8	0
2		7	1
3		6	2
4		5	3
5		4	4
6		3	5
7		2	6
8		1	7

1. Graph the demand and supply curves and show the equilibrium price and quantity.
2. At a price of \$3 per gallon, would there be a surplus or shortage of gasoline? How much would the surplus or shortage be? Indicate the surplus or shortage on the graph.
3. At a price of \$6 per gallon, would there be a surplus or shortage of gasoline? How much would the surplus or shortage be? Show the surplus or shortage on the graph.
4. Suppose the quantity demanded increased by 2,000 gallons per month at each price. At a price of \$3 per gallon, how much would the surplus or shortage be? Graph the demand and supply curves and show the surplus or shortage.
5. Suppose the quantity supplied decreased by 2,000 gallons per month at each price for prices between \$4 and \$8 per gallon. At prices less than \$4 per gallon the quantity supplied becomes zero, while the quantities demanded retain the values shown in the

table. At a price of \$4 per gallon, how much would the surplus or shortage be? Graph the demand and supply curves and show the surplus or shortage.

6. If the demand curve shifts as in problem 13 and the supply curve shifts as in problem 14, without drawing a graph or consulting the data, can you predict whether equilibrium price increases or decreases? What about equilibrium quantity? Now draw a graph that shows what the new equilibrium price and quantity are.

References

Scheiber, N., "As a Center for Outsourcing, India Could Be Losing Its Edge," *New York Times*, May 9, 2004, p. BU3.

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CHAPTER OVERVIEW

3: Macroeconomics- The Big Picture

3.1: Role of Government

3.2: Growth of Real GDP and Business Cycles

3.3: Price-Level Changes

3.4: Unemployment

3.5: Review and Practice

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3.1: Role of Government

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3.2: Growth of Real GDP and Business Cycles

Learning Objective

1. Define real gross domestic product and explain how its calculation avoids both double-counting and the effects of changes in the price level.
2. Identify the phases of a business cycle.
3. Relate business cycles to the overall long-run trend in real GDP in the United States.

To determine whether the economy of a nation is growing or shrinking in size, economists use a measure of total output called real GDP. **Real GDP**, short for real gross domestic product, is the total value of all final goods and services produced during a particular year or period, adjusted to eliminate the effects of changes in prices. Let us break that definition up into parts.

Notice that only “final” goods and services are included in GDP. Many goods and services are purchased for use as inputs in producing something else. For example, a pizza parlor buys flour to make pizzas. If we counted the value of the flour and the value of the pizza, we would end up counting the flour twice and thus overstating the value of total production. Including only final goods avoids double-counting. If the flour is produced during a particular period but has not been sold, then it is a “final good” for that period and is counted.

We want to determine whether the economy’s output is growing or shrinking. If each final good or service produced, from hammers to haircuts, were valued at its current market price, and then we were to add the values of all such items produced, we would not know if the total had changed because output changed or because prices changed or both. The market value of all final goods and services produced can rise even if total output falls. To isolate the behavior of total output only, we must hold prices constant at some level. For example, if we measure the value of basketball output over time using a fixed price for valuing the basketballs, then only an increase in the number of basketballs produced could increase the value of the contribution made by basketballs to total output. By making such an adjustment for basketballs and all other goods and services, we obtain a value for real GDP. In contrast, **nominal GDP**, usually just referred to as gross domestic product (GDP), is the total value of final goods and services for a particular period valued in terms of prices for that period. For example, real GDP fell in the third quarter of 2008. But, because the price level in the United States was rising, nominal GDP rose 3.6%.

We will save a detailed discussion of the computation of GDP for another chapter. In this section, our goal is to use the concept of real GDP to look at the **business cycle**—the economy’s pattern of expansion, then contraction, then expansion again—and at growth of real GDP.

Phases of the Business Cycle

Figure 20.1 shows a stylized picture of a typical business cycle. It shows that economies go through periods of increasing and decreasing real GDP, but that over time they generally move in the direction of increasing levels of real GDP. A sustained period in which real GDP is rising is an **expansion**; a sustained period in which real GDP is falling is a **recession**. Typically, an economy is said to be in a recession when real GDP drops for two consecutive quarters, but in the United States, the responsibility of defining precisely when the economy is in recession is left to the Business Cycle Dating Committee of the National Bureau of Economic Research (NBER). The Committee defines a recession as a “significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales” (National Bureau of Economic Research, 2008).

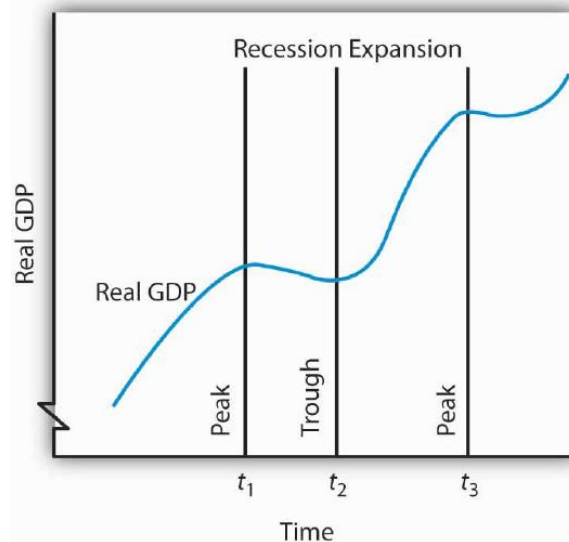


Figure 20.1 Phases of the Business Cycle The business cycle is a series of expansions and contractions in real GDP. The cycle begins at a peak and continues through a recession, a trough, and an expansion. A new cycle begins at the next peak. Here, the first peak occurs at time t_1 , the trough at time t_2 , and the next peak at time t_3 . Notice that there is a tendency for real GDP to rise over time.

At time t_1 in Figure 20.1, an expansion ends and real GDP turns downward. The point at which an expansion ends and a recession begins is called the **peak** of the business cycle. Real GDP then falls during a period of recession. Eventually it starts upward again (at time t_2). The point at which a recession ends and an expansion begins is called the **trough** of the business cycle. The expansion continues until another peak is reached at time t_3 . A complete business cycle is defined by the passage from one peak to the next.

Because the Business Cycle Dating Committee dates peaks and troughs by specific months, and because real GDP is estimated only on a quarterly basis by the Bureau of Economic Analysis, the committee relies on a variety of other indicators that are published monthly, including real personal income, employment, industrial production, and real wholesale and retail sales. The committee typically determines that a recession has happened long after it has actually begun and sometimes ended! In large part, that avoids problems when data released about the economy are revised, and the committee avoids having to reverse itself on its determination of when a recession begins or ends, something it has never done. In December 2008, the Committee announced that a recession in the United States had begun in December 2007. Interestingly, real GDP fell in the fourth quarter of 2007, grew in the first and second quarters of 2008, and shrank in the third quarter of 2008, so clearly the Committee was not using the two consecutive quarters of declining GDP rule-of-thumb. Rather, it was taking into account the behavior of a variety of other variables, such as employment and personal income.

Business Cycles and the Growth of Real GDP in the United States

Figure 20.2 shows movements in real GDP in the United States from 1960 to 2010. Over those years, the economy experienced eight recessions (including the current one), shown by the shaded areas in the chart. Although periods of expansion have been more prolonged than periods of recession, we see the cycle of economic activity that characterizes economic life.

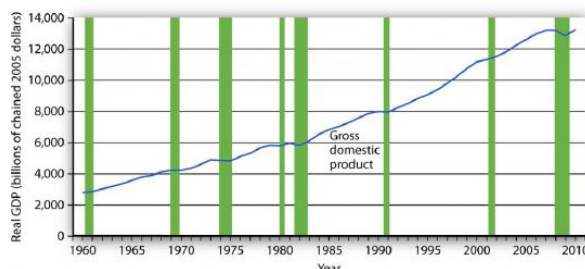


Figure 20.2 Expansions and Recessions, 1960–2010 The chart shows movements in real GDP since 1960. Recessions—periods of falling real

GDP—are shown as shaded areas. On average, the annual rate of growth of real GDP over the period was 3.2% per year.

Source: Bureau of Economic Analysis, NIPA

Table 1.1.6. Real Gross Domestic Product, Chained Dollars [Billions of chained (2005) dollars]. Seasonally adjusted at annual rates.

Data for 2010 is through 3rd quarter.

Real GDP clearly grew between 1960 and 2010. While the economy experienced expansions and recessions, its general trend during the period was one of rising real GDP. The average annual rate of growth of real GDP was about 3.2%.

During the post–World War II period, the average expansion has lasted 58 months, and the average recession has lasted about 11 months. The 2001 recession, which lasted eight months, was thus slightly shorter than the average. The 2007–2009 recession lasted 18 months; it was the longest of the post–World War II period.

Economists have sought for centuries to explain the forces at work in a business cycle. Not only are the currents that move the economy up or down intellectually fascinating but also an understanding of them is of tremendous practical importance. A business cycle is not just a movement along a curve in a textbook. It is new jobs for people, or the loss of them. It is new income, or the loss of it. It is the funds to build new schools or to provide better health care—or the lack of funds to do all those things. The story of the business cycle is the story of progress and plenty, of failure and sacrifice.

During the recent recession, the job outlook for college graduates deteriorated. According to a National Association of Colleges and Employers study, 20% of college graduates seeking jobs had one waiting after graduation in 2009. In 2010, that percent rose to 24% but the average salary had slipped 1.7% from the previous year. The unemployment rate for college graduates under age 25 rose from 3.7% in April 2007 to 8% in April 2010. The unemployment rate for high school graduates who never enrolled in college went from 11.4% to 24.5% over the same two-year period (Greenhouse, S., 2010).

The effects of recessions extend beyond the purely economic realm and influence the social fabric of society as well. Suicide rates and property crimes—burglary, larceny, and motor vehicle theft tend to rise during recessions. Even popular music appears to be affected. Terry F. Pettijohn II, a psychologist at Coastal Carolina University, has studied Billboard No. 1 songs from 1955–2003. He finds that during recessions, popular songs tend to be longer and slower, and to have more serious lyrics. “It’s ‘Bridge over Troubled Water’ or ‘That’s What Friends Are For’,” he says. During expansions, songs tend to be faster, shorter, and somewhat sillier, such as “At the Hop” or “My Sharona” (Lewin, T., 2008).

In our study of macroeconomics, we will gain an understanding of the forces at work in the business cycle. We will also explore policies through which the public sector might act to make recessions less severe and, perhaps, to prolong expansions. We turn next to an examination of price-level changes and unemployment.

Key Takeaways

- Real gross domestic product (real GDP) is a measure of the value of all final goods and services produced during a particular year or period, adjusted to eliminate the effects of price changes.
- The economy follows a path of expansion, then contraction, then expansion again. These fluctuations make up the business cycle.
- The point at which an expansion becomes a recession is called the peak of a business cycle; the point at which a recession becomes an expansion is called the trough.
- Over time, the general trend for most economies is one of rising real GDP. On average, real GDP in the United States has grown at a rate of over 3% per year since 1960.

Try It!

The data below show the behavior of real GDP in Turkey from the first quarter of 2001 through the third quarter of 2002. Use the data to plot real GDP in Turkey and indicate the phases of the business cycle.

Period	Real GDP (billions of New Turkish lira, 1987 prices)
First quarter, 2001	24.1
Second quarter, 2001	26.0
Third quarter, 2001	33.1
Fourth quarter, 2001	27.1
First quarter, 2002	24.6
Second quarter, 2002	28.3
Third quarter, 2002	35.7

Case in Point: The Art of Predicting Recessions

Figure 20.3



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People who make a living tracking the economy and trying to predict its future do not do a very good job at predicting turning points in economic activity. The 52 economists surveyed by the *Wall Street Journal* each month did predict that the economy would slip into a recession in the third quarter of 2008. They made that prediction, however, in October—after the third quarter had ended. In September, the last month of the third quarter, the average forecast among the 52 economists had the economy continuing to grow through the third and fourth quarters of 2008. That September survey was taken before the financial crisis hit, a crisis that took virtually everyone by surprise. Of course, as we have already noted, the third-quarter downturn had not been identified as a recession by the NBER's Business Cycle Dating Committee as of November of 2008.

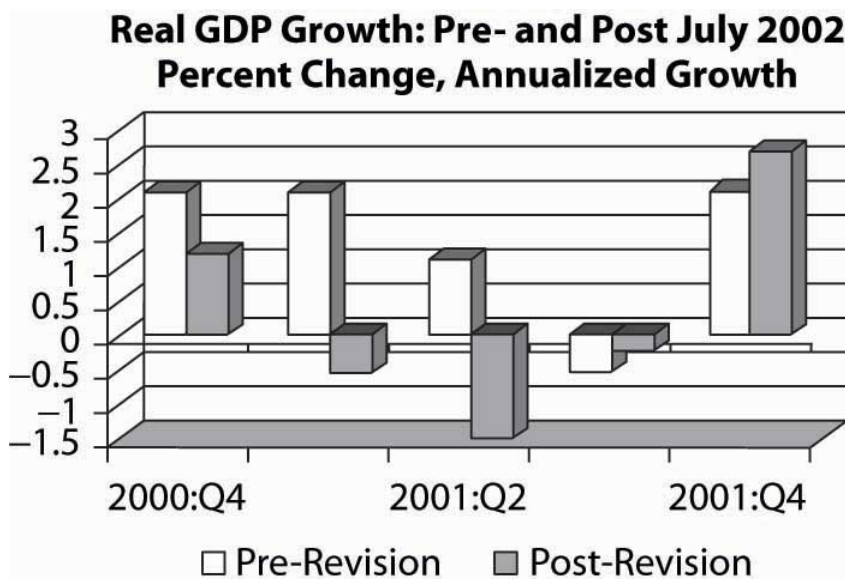
Predicting business cycle turning points has always been a tricky business. The experience of the recession of 2001 illustrates this. As the accompanying table shows, even as late as September 10, 2001, only 13 out of the 100 Blue Chip forecasters had answered in the affirmative to the question, “Has the United States slipped into a recession?” even though we now know the recession had begun the previous March. Comparing the data that were originally released by the U.S. Bureau of Economic Analysis shortly after the end of each quarter with the revised data that were released after July 2002 provides an important insight into explaining why the forecasters seem to have done so badly. As the graph on pre-revision and post-revision estimates of real GDP growth shows, the data released shortly after the end of each quarter showed an economy expanding through the second quarter of 2001, whereas the revised data show the economy contracting modestly in the first quarter of 2001 and then more forcefully in the second quarter. Only after the attacks on the World Trade Center in New York City and the Pentagon in Washington, D.C., on September 11, 2001, did most of the Blue Chip forecasters realize the economy was in recession.

The National Bureau of Economic Research (NBER) Business Cycle Dating Committee in November 2001 released a press announcement dating the onset of the recession as March 2001. The committee argued that “before the attacks of September 11, it is possible that the decline in the economy would have been too mild to qualify as a recession. The attacks clearly deepened the contraction and may have been an important factor in turning the episode into a recession.” While surprising at the time, the revised data suggest that the committee made a good call.

This episode in economic history also points out the difference between the common definition of a recession as two consecutive quarters of declining real GDP and the NBER Dating Committee’s continued insistence that it does not define a recession in this way. Rather the committee looks not only at real GDP but also at employment, income, and other factors. The behavior of employment during 2001 seems to have been an important factor in the November 2001 decision to proclaim March 2001 as the peak despite the misleading information on real GDP coming out of the Bureau of Economic Analysis at the time. The slow pickup in employment may also, though, have made it hesitate to call November 2001 the trough until July 2003.

Question posed: “Has the United States slipped into a recession?”		
Date	Percent of Blue Chip responders answering “Yes”	Percent of Blue Chip responders answering “No”
February 2001	5	95
June 2001	7	93
July 2001	13	87
August 2001	5	85
September 10, 2001	13	87
September 19, 2001	82	18

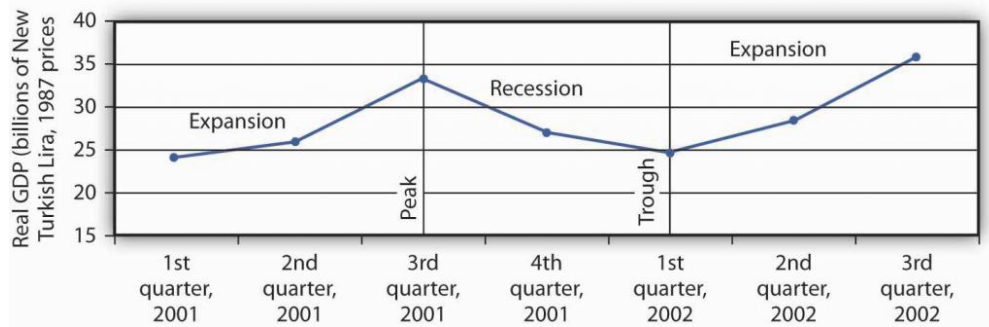
Figure 20.4 Real GDP Growth: Pre- and Post-July, 2002



Sources: Phil Izzo, “Economists Expect Crisis to Deepen,” *Wall Street Journal Online*, October 10, 2008; Kevin L. Kliesen, “The 2001 Recession: How Was It Different and What Developments May Have Caused It?” *Federal Reserve Bank of St. Louis Review*, September/October 2003: 23–37; <http://www.nber.org/cycles/>; “Press Release,” Business Cycle Dating Committee, National Bureau of Economic Research, press release, Cambridge, Massachusetts, July 17, 2002.

Answer to Try It! Problem

Figure 20.5



¹Some economists prefer to break the expansion phase into two parts. The recovery phase is said to be the period between the previous trough and the time when the economy achieves its previous peak level of real GDP. The “expansion” phase is from that point until the following peak.

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Greenhouse, S., “Job Market Gets Better for U.S. Graduates, But Only Slightly: Offers Will Increase 5% Over Last Year; Average Starting Salaries Are Down,” *The International Herald Tribune*, May 26, 2010, Finance 16.

Lewin, T., “A Hemline Index, Updated,” *New York Times*, October 19, 2008, Section WK, 1.

National Bureau of Economic Research, “The NBER’s Recession Dating Procedure,” January 7, 2008.

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3.3: Price-Level Changes

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3.4: Unemployment

Learning Objective

1. Explain how unemployment is measured in the United States.
2. Define three different types of unemployment.
3. Define and illustrate graphically what is meant by the natural level of employment. Relate the natural level of employment to the natural rate of unemployment.

For an economy to produce all it can and achieve a solution on its production possibilities curve, the factors of production in the economy must be fully employed. Failure to fully employ these factors leads to a solution inside the production possibilities curve in which society is not achieving the output it is capable of producing.

In thinking about the employment of society's factors of production, we place special emphasis on labor. The loss of a job can wipe out a household's entire income; it is a more compelling human problem than, say, unemployed capital, such as a vacant apartment. In measuring unemployment, we thus focus on labor rather than on capital and natural resources.

Measuring Unemployment

The Bureau of Labor Statistics defines a person as unemployed if he or she is not working but is looking for and available for work. The **labor force** is the total number of people working or unemployed. The **unemployment rate** is the percentage of the labor force that is unemployed.

To estimate the unemployment rate, government surveyors fan out across the country each month to visit roughly 60,000 households. At each of these randomly selected households, the surveyor asks about the employment status of each adult (everyone age 16 or over) who lives there. Many households include more than one adult; the survey gathers information on about roughly 100,000 adults. The surveyor asks if each adult is working. If the answer is yes, the person is counted as employed. If the answer is no, the surveyor asks if that person has looked for work at some time during the previous four weeks and is available for work at the time of the survey. If the answer to that question is yes, the person is counted as unemployed. If the answer is no, that person is not counted as a member of the labor force. Figure 20.8 shows the survey's results for the civilian (nonmilitary) population for November 2010. The unemployment rate is then computed as the number of people unemployed divided by the labor force—the sum of the number of people not working but available and looking for work plus the number of people working. In November 2010, the unemployment rate was 9.8%.

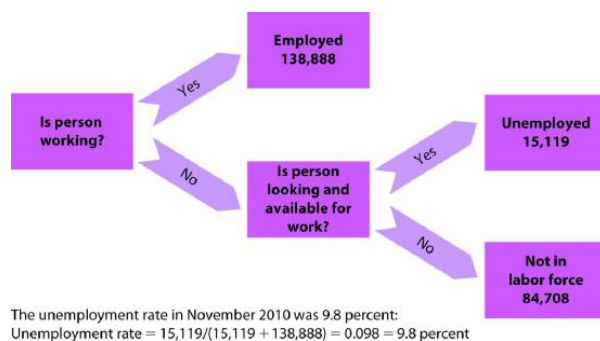


Figure 20.8 Computing the Unemployment Rate A monthly survey of households divides the civilian adult population into three groups. Those who have jobs are counted as employed; those who do not have jobs but are looking for them and are available for work are counted as unemployed; and those who are not working and are not looking for work are not counted as members of the labor force. The unemployment rate equals the number of people looking for work divided by the sum of the number of people looking for work and the number of people employed. Values are for November 2010. All numbers are in thousands.

There are several difficulties with the survey. The old survey, designed during the 1930s, put the “Are you working?” question differently depending on whether the respondent was a man or woman. A man was asked, “Last week, did you do any work for pay or profit?” A woman was asked, “What were you doing for work last week, keeping house or something else?” Consequently, many women who were looking for paid work stated that they were “keeping house”; those women were not counted as unemployed. The BLS did not get around to fixing the survey—asking women the same question it asked men—until 1994. The first time the

new survey question was used, the unemployment rate among women rose by 0.5 percentage point. More than 50 million women are in the labor force; the change added more than a quarter of a million workers to the official count of the unemployed ¹.

The problem of understating unemployment among women has been fixed, but others remain. A worker who has been cut back to part-time work still counts as employed, even if that worker would prefer to work full time. A person who is out of work, would like to work, has looked for work in the past year, and is available for work, but who has given up looking, is considered a discouraged worker. Discouraged workers are not counted as unemployed, but a tally is kept each month of the number of discouraged workers.

The official measures of employment and unemployment can yield unexpected results. For example, when firms expand output, they may be reluctant to hire additional workers until they can be sure the demand for increased output will be sustained. They may respond first by extending the hours of employees previously reduced to part-time work or by asking full-time personnel to work overtime. None of that will increase employment, because people are simply counted as “employed” if they are working, regardless of how much or how little they are working. In addition, an economic expansion may make discouraged workers more optimistic about job prospects, and they may resume their job searches. Engaging in a search makes them unemployed again—and increases unemployment. Thus, an economic expansion may have little effect initially on employment and may even increase unemployment.

Types of Unemployment

Workers may find themselves unemployed for different reasons. Each source of unemployment has quite different implications, not only for the workers it affects but also for public policy.

Figure 20.9 applies the demand and supply model to the labor market. The price of labor is taken as the real wage, which is the nominal wage divided by the price level; the symbol used to represent the real wage is the Greek letter omega, ω . The supply curve is drawn as upward sloping, though steep, to reflect studies showing that the quantity of labor supplied at any one time is nearly fixed. Thus, an increase in the real wage induces a relatively small increase in the quantity of labor supplied. The demand curve shows the quantity of labor demanded at each real wage. The lower the real wage, the greater the quantity of labor firms will demand. In the case shown here, the real wage, ω_e , equals the equilibrium solution defined by the intersection of the demand curve D_1 and the supply curve S_1 . The quantity of labor demanded, L_e , equals the quantity supplied. The employment level at which the quantity of labor demanded equals the quantity supplied is called the **natural level of employment**. It is sometimes referred to as full employment.

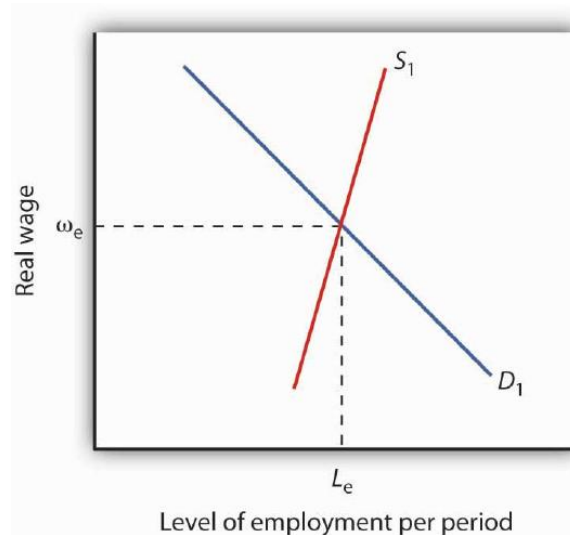


Figure 20.9 The Natural Level of Employment The employment level at which the quantity of labor demanded equals the quantity supplied is called the natural level of employment. Here, the natural level of employment is L_e , which is achieved at a real wage ω_e .

Even if the economy is operating at its natural level of employment, there will still be some unemployment. The rate of unemployment consistent with the natural level of employment is called the **natural rate of unemployment**. Business cycles may generate additional unemployment. We discuss these various sources of unemployment below.

Frictional Unemployment

Even when the quantity of labor demanded equals the quantity of labor supplied, not all employers and potential workers have found each other. Some workers are looking for jobs, and some employers are looking for workers. During the time it takes to match them up, the workers are unemployed. Unemployment that occurs because it takes time for employers and workers to find each other is called [frictional unemployment](#).

The case of college graduates engaged in job searches is a good example of frictional unemployment. Those who did not land a job while still in school will seek work. Most of them will find jobs, but it will take time. During that time, these new graduates will be unemployed. If information about the labor market were costless, firms and potential workers would instantly know everything they needed to know about each other and there would be no need for searches on the part of workers and firms. There would be no frictional unemployment. But information is costly. Job searches are needed to produce this information, and frictional unemployment exists while the searches continue.

The government may attempt to reduce frictional unemployment by focusing on its source: information costs. Many state agencies, for example, serve as clearinghouses for job market information. They encourage firms seeking workers and workers seeking jobs to register with them. To the extent that such efforts make labor-market information more readily available, they reduce frictional unemployment.

Structural Unemployment

Another reason there can be unemployment even if employment equals its natural level stems from potential mismatches between the skills employers seek and the skills potential workers offer. Every worker is different; every job has its special characteristics and requirements. The qualifications of job seekers may not match those that firms require. Even if the number of employees firms demand equals the number of workers available, people whose qualifications do not satisfy what firms are seeking will find themselves without work. Unemployment that results from a mismatch between worker qualifications and the characteristics employers require is called [structural unemployment](#).

Structural unemployment emerges for several reasons. Technological change may make some skills obsolete or require new ones. The widespread introduction of personal computers since the 1980s, for example, has lowered demand for typists who lacked computer skills.

Structural unemployment can occur if too many or too few workers seek training or education that matches job requirements. Students cannot predict precisely how many jobs there will be in a particular category when they graduate, and they are not likely to know how many of their fellow students are training for these jobs. Structural unemployment can easily occur if students guess wrong about how many workers will be needed or how many will be supplied.

Structural unemployment can also result from geographical mismatches. Economic activity may be booming in one region and slumping in another. It will take time for unemployed workers to relocate and find new jobs. And poor or costly transportation may block some urban residents from obtaining jobs only a few miles away.

Public policy responses to structural unemployment generally focus on job training and education to equip workers with the skills firms demand. The government publishes regional labor-market information, helping to inform unemployed workers of where jobs can be found. The North American Free Trade Agreement (NAFTA), which created a free trade region encompassing Mexico, the United States, and Canada, has created some structural unemployment in the three countries. In the United States, the legislation authorizing the pact also provided for job training programs for displaced U.S. workers.

Although government programs may reduce frictional and structural unemployment, they cannot eliminate it. Information in the labor market will always have a cost, and that cost creates frictional unemployment. An economy with changing demands for goods and services, changing technology, and changing production costs will always have some sectors expanding and others contracting—structural unemployment is inevitable. An economy at its natural level of employment will therefore have frictional and structural unemployment.

Cyclical Unemployment

Of course, the economy may not be operating at its natural level of employment, so unemployment may be above or below its natural level. In a later chapter we will explore what happens when the economy generates employment greater or less than the

natural level. **Cyclical unemployment** is unemployment in excess of the unemployment that exists at the natural level of employment.

Figure 20.10 shows the unemployment rate in the United States for the period from 1960 through November 2010. We see that it has fluctuated considerably. How much of it corresponds to the natural rate of unemployment varies over time with changing circumstances. For example, in a country with a demographic “bulge” of new entrants into the labor force, frictional unemployment is likely to be high, because it takes the new entrants some time to find their first jobs. This factor alone would raise the natural rate of unemployment. A demographic shift toward more mature workers would lower the natural rate. During recessions, highlighted in Figure 20.10, the part of unemployment that is cyclical unemployment grows. The analysis of fluctuations in the unemployment rate, and the government’s responses to them, will occupy center stage in much of the remainder of this book.

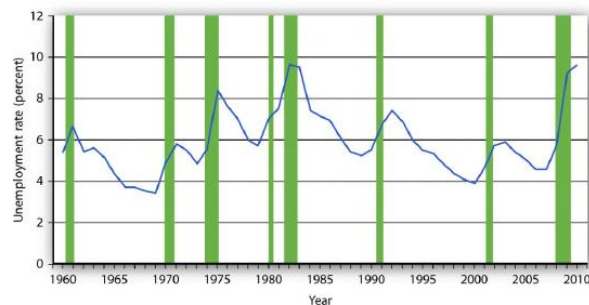


Figure 20.10 Unemployment Rate, 1960–2010 The chart shows the unemployment rate for each year from 1960 to 2010. Recessions are shown as shaded areas.

Source: *Economic Report of the President*, 2010, Table B-42. Data for 2010 is average of first eleven months from the Bureau of Labor Statistics home page.

Key Takeaways

- People who are not working but are looking and available for work at any one time are considered unemployed. The unemployment rate is the percentage of the labor force that is unemployed.
- When the labor market is in equilibrium, employment is at the natural level and the unemployment rate equals the natural rate of unemployment.
- Even if employment is at the natural level, the economy will experience frictional and structural unemployment. Cyclical unemployment is unemployment in excess of that associated with the natural level of employment.

Try It!

Given the data in the table, compute the unemployment rate in Year 1 and in Year 2. Explain why, in this example, both the number of people employed and the unemployment rate increased.

Year	Number employed (in millions)	Number unemployed (in millions)
1	20	2
2	21	2.4

Case in Point: Might Increased Structural Unemployment Explain the “Jobless Recovery” Following the 2001 Recession?

Figure 20.11



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The U.S. 2001 recession was mild by historical standards, but recovery in terms of increased employment seemed painfully slow in coming. Economists Erica Goshen and Simon Potter at the Federal Reserve Bank of New York think the reason for the slow recovery in jobs may have actually reflected structural changes in the U.S. economy. They argue that during the recession permanent rather than temporary layoffs predominated and that it takes longer for firms to hire workers into new positions than to hire them back into former jobs.

What is their evidence? When the layoff is temporary, the employer “suspends” the job, due to slack demand, and the employee expects to be recalled once demand picks up. With a permanent layoff, the employer eliminates the job. So, they looked at the contribution of temporary layoffs to the unemployment rate during the recent recession compared to the situation in the four recessions before 1990. In the earlier recessions, unemployment from temporary layoffs rose when the economy was shrinking and fell after the economy began to recover. In both the 1991 and 2001 recessions, temporary layoffs were minor. Then, the authors examined job flows in 70 industries. They classified layoffs in an industry as being cyclical in nature if the job losses during the recession were reversed during the recovery but structural if job losses for the industry continued during the recovery. Their analysis revealed that during the recession of the early 1980s, job losses were about evenly split between cyclical and structural changes. In the 1991 recession and then more strongly in the 2001 recession, structural changes dominated. “Most of the industries that lost jobs during the [2001] recession—for example, communications, electronic equipment, and securities and commodities brokers—[were] still losing jobs” in 2003. “The trend revealed . . . is one in which jobs are relocated from some industries to others, not reclaimed by the same industries that lost them earlier.”

The authors suggest three possible reasons for the recent increased role of structural change: (1) The structural decline in some industries could be the result of overexpansion in those industries during the 1990s. The high tech and telecommunications industries in particular could be examples of industries that were overbuilt before the 2001 recession. (2) Improved government policies may have reduced cyclical unemployment. Examination of macroeconomic policy in future chapters will return to this issue. (3) New management strategies to reduce costs may be promoting leaner staffing. For firms adopting such strategies, a recession may provide an opportunity to reorganize the production process permanently and reduce payrolls in the process.

Goshen and Potter point out that, for workers, finding new jobs is harder than simply returning to old ones. For firms, making decisions about the nature of new jobs is time consuming at best. The uncertainty created by the war in Iraq and the imposition of new accounting standards following the “Enron”-like scandals may have further prolonged the creation of new jobs.

Source: Erica L. Goshen and Simon Potter, “Has Structural Change Contributed to a Jobless Recovery?” *Federal Reserve Bank of New York Current Issues in Economics and Finance* 9, no. 8 (August 2003): 1–7.

Answer to Try It! Problem

In Year 1 the total labor force includes 22 million workers, and so the unemployment rate is $2/22 = 9.1\%$. In Year 2 the total labor force numbers 23.4 million workers; therefore the unemployment rate is $2.4/23.4 = 10.3\%$. In this example, both the number of

people employed and the unemployment rate rose, because more people ($23.4 - 22 = 1.4$ million) entered the labor force, of whom 1 million found jobs and 0.4 million were still looking for jobs.

¹For a description of the new survey and other changes introduced in the method of counting unemployment, see Janet L. Norwood and Judith M. Tanur, “Unemployment Measures for the Nineties,” *Public Opinion Quarterly* 58, no. 2 (Summer 1994): 277–94.

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3.5: Review and Practice

Summary

In this chapter we examined growth in real GDP and business cycles, price-level changes, and unemployment. We saw how these phenomena are defined and looked at their consequences.

Examining real GDP, rather than nominal GDP, over time tells us whether the economy is expanding or contracting. Real GDP in the United States shows a long upward trend, but with the economy going through phases of expansion and recession around that trend. These phases make up the business cycle. An expansion reaches a peak, and the economy falls into a recession. The recession reaches a trough and begins an expansion again.

Inflation is an increase in the price level and deflation is a decrease in the price level. The rate of inflation or deflation is the percentage rate of change in a price index. We looked at the calculation of the consumer price index (CPI) and the implicit price deflator. The CPI is widely used in the calculation of price-level changes. There are, however, biases in its calculation: the substitution bias, the new-product bias, the quality-change bias, and the outlet bias.

Inflation and deflation affect economic activity in several ways. They change the value of money and of claims on money. Unexpected inflation benefits borrowers and hurts lenders. Unexpected deflation benefits lenders and hurts borrowers. Both inflation and deflation create uncertainty and make it difficult for individuals and firms to enter into long-term financial commitments.

The unemployment rate is measured as the percentage of the labor force not working but seeking work. Frictional unemployment occurs because information about the labor market is costly; it takes time for firms seeking workers and workers seeking firms to find each other. Structural unemployment occurs when there is a mismatch between the skills offered by potential workers and the skills sought by firms. Both frictional and structural unemployment occur even if employment and the unemployment rate are at their natural levels. Cyclical unemployment is unemployment that is in excess of that associated with the natural level of employment.

Concept Problems

1. Describe the phases of a business cycle.
2. On the basis of recent news reports, what phase of the business cycle do you think the economy is in now? What is the inflation or deflation rate? The unemployment rate?
3. Suppose you compare your income this year and last year and find that your nominal income fell but your real income rose. How could this have happened?
4. Suppose you calculate a grocery price inflation rate. Using the arguments presented in the chapter, explain possible sources of upward bias in the rate you calculate, relative to the actual trend of food prices.
5. Name three items you have purchased during the past year that have increased in quality during the year. What kind of adjustment would you make in assessing their prices for the CPI?
6. Why do some people gain and other people lose from inflation and deflation?
7. Suppose unemployed people leave a state to obtain jobs in other states. What do you predict will happen to the unemployment rate in the state experiencing the out-migration? What might happen to the unemployment rates in the states experiencing in-migration?
8. Minority teenagers have the highest unemployment rates of any group. One reason for this phenomenon is high transportation costs for many minority teens. What form of unemployment (cyclical, frictional, or structural) do high transportation costs suggest?
9. Welfare reforms enacted in 1996 put more pressure on welfare recipients to look for work. The new law mandated cutting off benefits after a certain length of time. How do you think this provision might affect the unemployment rate?
10. American workers work more hours than their European counterparts. Should Congress legislate a shorter workweek?

Numerical Problems

1. Plot the quarterly data for real GDP for the last two years. (You can find the data in the *Survey of Current Business* or in *Current Economic Indicators* in the current periodicals section of your library. Alternatively, go to the White House, Economic Statistics Briefing Room at www.whitehouse.gov/fsbr/esbr.html. Relate recent changes in real GDP to the concept of the phases of the business cycle.)
2. Suppose that in 2009, the items in the market basket for our movie price index cost \$53.40. Use the information in the chapter to compute the price index for that year. How does the rate of movie price inflation from 2008 to 2009 compare with the rate from 2007 to 2008?
3. Recompute the movie price indexes for 2007 and 2008 using 2008 as the base year. Now compute the rate of inflation for the 2007–2008 period. Compare your result to the inflation rate calculated for that same period using 2007 as the base year.
4. Here are some statistics for August 2006. Compute the unemployment rate for that month (all figures are in thousands).

Population (Civilian, noninstitutional)	229,167
Civilian Labor Force	151,698
Participation Rate	66.2%
Not in Labor Force	77,469
Employed	144,579
Unemployed	7,119

5. Suppose an economy has 10,000 people who are not working but looking and available for work and 90,000 people who are working. What is its unemployment rate? Now suppose 4,000 of the people looking for work get discouraged and give up their searches. What happens to the unemployment rate? Would you interpret this as good news for the economy or bad news? Explain.
6. The average price of going to a baseball game in 2008, based on the observations in the Case in Point, was \$191.92. Using this average as the equivalent of a base year, compute fan price indexes for:
 1. The New York Yankees.
 2. The Chicago Cubs.
 3. The Boston Red Sox.
 4. The Tampa Bay Rays.
 5. The team of your choice.
7. Suppose you are given the following data for a small economy:

Number of unemployed workers: 1,000,000.

Labor force: 10,000,000.

Based on this data, answer following:

 1. What is the unemployment rate?
 2. Can you determine whether the economy is operating at its full employment level?
 3. Now suppose people who had been seeking jobs become discouraged, and give up their job searches. The labor force shrinks to 900,500 workers, and unemployment falls to 500,000 workers. What is the unemployment rate now? Has the economy improved?
8. Nominal GDP for an economy is \$10 trillion. Real GDP is \$9 trillion. What is the value of the implicit price deflator?
9. Suppose you are given the following data for an economy:

Month	Real GDP	Employment
1	\$10.0 trillion	100 million
2	\$10.4 trillion	104 million
3	\$10.5 trillion	105 million
4	\$10.3 trillion	103 million
5	\$10.2 trillion	102 million
6	\$10.3 trillion	103 million
7	\$10.6 trillion	106 million
8	\$10.7 trillion	107 million
9	\$10.6 trillion	106 million

1. Plot the data for real GDP, with the time period on the horizontal axis and real GDP on the vertical axis.
 2. There are two peaks. When do they occur?
 3. When does the trough occur?
10. The Consumer Price Index in Period 1 is 107.5. It is 103.8 in Period 2. Is this a situation of inflation for deflation? What is the rate?

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CHAPTER OVERVIEW

4: Measuring Total Output and Income

4.1: Measuring Total Output

4.2: Measuring Total Income

4.3: GDP and Economic Well-Being

4.4: Review and Practice

Thumbnail: <https://pixabay.com/illustrations/dollar-money-us-dollar-arrangement-1071788/>

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4.1: Measuring Total Output

Learning Objective

1. Define gross domestic product and its four major spending components and illustrate the various flows using the circular flow model.
2. Distinguish between measuring GDP as the sum of the values of final goods and services and as the sum of values added at each stage of production.
3. Distinguish between gross domestic product and gross national product.

An economy produces a mind-boggling array of goods and services. In 2007, for example, Domino's Pizza produced 400 million pizzas. The United States Steel Corporation, the nation's largest steel company, produced 23.6 million tons of steel. Strong Brothers Lumber Co., a Colorado firm, produced 2.1 million board feet of lumber. The Louisiana State University football team drew 722,166 fans to its home games—and won the national championship. Leonor Montenegro, a pediatric nurse in Los Angeles, delivered 387 babies and took care of 233 additional patients. A list of all the goods and services produced in any year would be virtually endless.

So—what kind of year was 2007? We would not get very far trying to wade through a list of all the goods and services produced that year. It is helpful to have instead a single number that measures total output in the economy; that number is GDP.

The Components of GDP

We can divide the goods and services produced during any period into four broad components, based on who buys them. These components of GDP are personal consumption (C), gross private domestic investment (I), government purchases (G), and net exports (X_n). Thus

Equation 21.1

$$GDP = \text{consumption } (C) + \text{private investment } (I) + \text{government purchases } (G) + \text{net exports } (X_n)$$

or

$$GDP = C + I + G + X_n$$

We will examine each of these components, and we will see how each fits into the pattern of macroeconomic activity. Before we begin, it will be helpful to distinguish between two types of variables: stocks and flows. A **flow variable** is a variable that is measured over a specific period of time. A **stock variable** is a variable that is independent of time. Income is an example of a flow variable. To say one's income is, for example, \$1,000 is meaningless without a time dimension. Is it \$1,000 per hour? Per day? Per week? Per month? Until we know the time period, we have no idea what the income figure means. The balance in a checking account is an example of a stock variable. When we learn that the balance in a checking account is \$1,000, we know precisely what that means; we do not need a time dimension. We will see that stock and flow variables play very different roles in macroeconomic analysis.

Personal Consumption

Personal consumption is a flow variable that measures the value of goods and services purchased by households during a time period. Purchases by households of groceries, health-care services, clothing, and automobiles—all are counted as consumption.

The production of consumer goods and services accounts for about 70% of total output. Because consumption is such a large part of GDP, economists seeking to understand the determinants of GDP must pay special attention to the determinants of consumption. In a later chapter we will explore these determinants and the impact of consumption on economic activity.

Personal consumption represents a demand for goods and services placed on firms by households. In the chapter on demand and supply, we saw how this demand could be presented in a circular flow model of the economy. Figure 21.1 presents a circular flow model for an economy that produces only personal consumption goods and services. (We will add the other components of GDP to the circular flow as we discuss them.) Spending for these goods flows from households to firms; it is the arrow labeled "Personal

consumption.” Firms produce these goods and services using factors of production: labor, capital, and natural resources. These factors are ultimately owned by households. The production of goods and services thus generates income to households; we see this income as the flow from firms to households labeled “Factor incomes” in the exhibit.

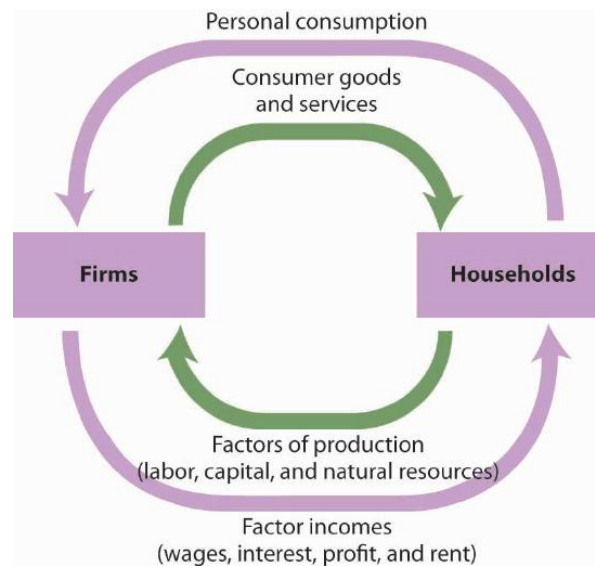


Figure 21.1 Personal Consumption in the Circular Flow Personal consumption spending flows from households to firms. In return, consumer goods and services flow from firms to households. To produce the goods and services households demand, firms employ factors of production owned by households. There is thus a flow of factor services from households to firms, and a flow of payments of factor incomes from firms to households.

In exchange for payments that flow from households to firms, there is a flow of consumer goods and services from firms to households. This flow is shown in Figure 21.1 as an arrow going from firms to households. When you buy a soda, for example, your payment to the store is part of the flow of personal consumption; the soda is part of the flow of consumer goods and services that goes from the store to a household—yours.

Similarly, the lower arrow in Figure 21.1 shows the flow of factors of production—labor, capital, and natural resources—from households to firms. If you work for a firm, your labor is part of this flow. The wages you receive are part of the factor incomes that flow from firms to households.

There is a key difference in our interpretation of the circular flow picture in Figure 21.1 from our analysis of the same model in the demand and supply chapter. There, our focus was microeconomics, which examines individual units of the economy. In thinking about the flow of consumption spending from households to firms, we emphasized demand and supply in particular markets—markets for such things as blue jeans, haircuts, and apartments. In thinking about the flow of income payments from firms to households, we focused on the demand and supply for particular factors of production, such as textile workers, barbers, and apartment buildings. Because our focus now is macroeconomics, the study of aggregates of economic activity, we will think in terms of the *total* of personal consumption and the *total* of payments to households.

Private Investment

Gross private domestic investment is the value of all goods produced during a period for use in the production of other goods and services. Like personal consumption, gross private domestic investment is a flow variable. It is often simply referred to as “private investment.” A hammer produced for a carpenter is private investment. A printing press produced for a magazine publisher is private investment, as is a conveyor-belt system produced for a manufacturing firm. Capital includes all the goods that have been produced for use in producing other goods; it is a stock variable. Private investment is a flow variable that adds to the stock of capital during a period.

Heads Up!

The term “*investment*” can generate confusion. In everyday conversation, we use the term “*investment*” to refer to uses of money to earn income. We say we have invested in a stock or invested in a bond. Economists, however, restrict “*investment*” to activities that increase the economy’s stock of capital. The purchase of a share of stock does not add to the capital stock; it is

not investment in the economic meaning of the word. We refer to the exchange of financial assets, such as stocks or bonds, as financial investment to distinguish it from the creation of capital that occurs as the result of investment. Only when new capital is produced does investment occur. Confusing the economic concept of private investment with the concept of financial investment can cause misunderstanding of the way in which key components of the economy relate to one another.

Gross private domestic investment includes three flows that add to or maintain the nation's capital stock: expenditures by business firms on new buildings, plants, tools, equipment, and software that will be used in the production of goods and services; expenditures on new residential housing; and changes in business inventories. Any addition to a firm's inventories represents an addition to investment; a reduction subtracts from investment. For example, if a clothing store stocks 1,000 pairs of jeans, the jeans represent an addition to inventory and are part of gross private domestic investment. As the jeans are sold, they are subtracted from inventory and thus subtracted from investment.

By recording additions to inventories as investment and reductions from inventories as subtractions from investment, the accounting for GDP records production in the period in which it occurs. Suppose, for example, that Levi Strauss manufactures 1 million pairs of jeans late in 2007 and distributes them to stores at the end of December. The jeans will be added to inventory; they thus count as investment in 2007 and enter GDP for that year. Suppose they are sold in January 2008. They will be counted as consumption in GDP for 2008 but subtracted from inventory, and from investment. Thus, the production of the jeans will add to GDP in 2007, when they were produced. They will not count in 2008, save for any increase in the value of the jeans resulting from the services provided by the retail stores that sold them.

Private investment accounts for about 16% of GDP and at times even less. Despite its relatively small share of total economic activity, private investment plays a crucial role in the macroeconomy for two reasons:

1. Private investment represents a choice to forgo current consumption in order to add to the capital stock of the economy. Private investment therefore adds to the economy's capacity to produce and shifts its production possibilities curve outward. Investment is thus one determinant of economic growth, which is explored in another chapter.
2. Private investment is a relatively volatile component of GDP; it can change dramatically from one year to the next. Fluctuations in GDP are often driven by fluctuations in private investment. We will examine the determinants of private investment in a chapter devoted to the study of investment.

Private investment represents a demand placed on firms for the production of capital goods. While it is a demand placed on firms, it flows from firms. In the circular flow model in Figure 21.2, we see a flow of investment going from firms to firms. The production of goods and services for consumption generates factor incomes to households; the production of capital goods for investment generates income to households as well.

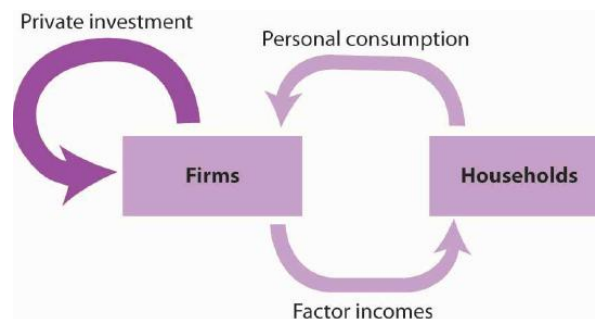


Figure 21.2 Private Investment in the Circular Flow Private investment constitutes a demand placed on firms by other firms. It also generates factor incomes for households. To simplify the diagram, only the spending flows are shown—the corresponding flows of goods and services have been omitted.

Figure 21.2 shows only spending flows and omits the physical flows represented by the arrows in Figure 21.1. This simplification will make our analysis of the circular flow model easier. It will also focus our attention on spending flows, which are the flows we will be studying.

Government Purchases

Government agencies at all levels purchase goods and services from firms. They purchase office equipment, vehicles, buildings, janitorial services, and so on. Many government agencies also produce goods and services. Police departments produce police

protection. Public schools produce education. The National Aeronautics and Space Administration (NASA) produces space exploration.

Government purchases are the sum of purchases of goods and services from firms by government agencies plus the total value of output produced by government agencies themselves during a time period. Government purchases make up about 20% of GDP.

Government purchases are not the same thing as government spending. Much government spending takes the form of **transfer payments**, which are payments that do not require the recipient to produce a good or service in order to receive them. Transfer payments include Social Security and other types of assistance to retired people, welfare payments to poor people, and unemployment compensation to people who have lost their jobs. Transfer payments are certainly significant—they account for roughly half of all federal government spending in the United States. They do not count in a nation's GDP, because they do not reflect the production of a good or service.

Government purchases represent a demand placed on firms, represented by the flow shown in Figure 21.3. Like all the components of GDP, the production of goods and services for government agencies creates factor incomes for households.

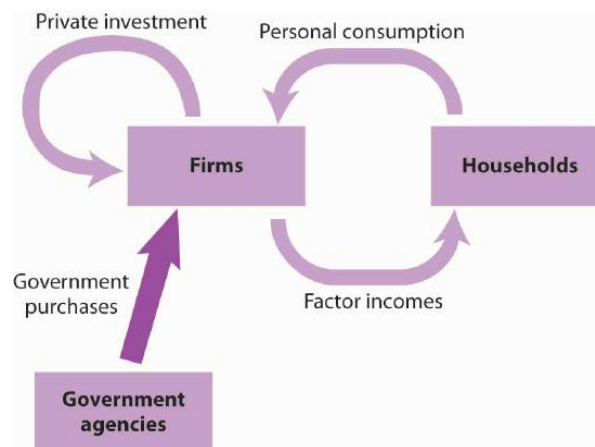


Figure 21.3 Government Purchases in the Circular Flow Purchases of goods and services by government agencies create demands on firms. As firms produce these goods and services, they create factor incomes for households.

Net Exports

Sales of a country's goods and services to buyers in the rest of the world during a particular time period represent its **exports**. A purchase by a Japanese buyer of a Ford Taurus produced in the United States is a U.S. export. Exports also include such transactions as the purchase of accounting services from a New York accounting firm by a shipping line based in Hong Kong or the purchase of a ticket to Disney World by a tourist from Argentina. **Imports** are purchases of foreign-produced goods and services by a country's residents during a period. United States imports include such transactions as the purchase by Americans of cars produced in Japan or tomatoes grown in Mexico or a stay in a French hotel by a tourist from the United States. Subtracting imports from exports yields **net exports**.

Equation 21.2

$$Exports(X) - imports(M) = netexports(X_n)$$

In the third quarter of 2010, foreign buyers purchased \$1,847.0 billion worth of goods and services from the United States. In the same year, U.S. residents, firms, and government agencies purchased \$2,339.1 billion worth of goods and services from foreign countries. The difference between these two figures, −\$552.2 billion, represented the net exports of the U.S. economy in the third quarter of 2010. Net exports were negative because imports exceeded exports. Negative net exports constitute a **trade deficit**. The amount of the deficit is the amount by which imports exceed exports. When exports exceed imports there is a **trade surplus**. The magnitude of the surplus is the amount by which exports exceed imports.

The United States has recorded more deficits than surpluses since World War II, but the amounts have typically been relatively small, only a few billion dollars. The trade deficit began to soar, however, in the 1980s and again in the 2000s. We will examine the reasons for persistent trade deficits in another chapter. The rest of the world plays a key role in the domestic economy and, as we

will see later in the book, there is nothing particularly good or bad about trade surpluses or deficits. Goods and services produced for export represent roughly 13% of GDP, and the goods and services the United States imports add significantly to our standard of living.

In the circular flow diagram in Figure 21.4, net exports are shown with an arrow connecting firms to the rest of the world. The balance between the flows of exports and imports is net exports. When there is a trade surplus, net exports are positive and add spending to the circular flow. A trade deficit implies negative net exports; spending flows from firms to the rest of the world.

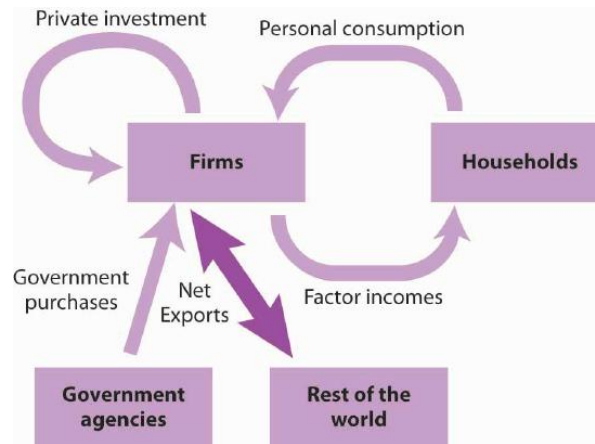


Figure 21.4 Net Exports in the Circular Flow Net exports represent the balance between exports and imports. Net exports can be positive or negative. If they are positive, net export spending flows from the rest of the world to firms. If they are negative, spending flows from firms to the rest of the world.

The production of goods and services for personal consumption, private investment, government purchases, and net exports makes up a nation's GDP. Firms produce these goods and services in response to demands from households (personal consumption), from other firms (private investment), from government agencies (government purchases), and from the rest of the world (net exports). All of this production creates factor income for households. Figure 21.5 shows the circular flow model for all the spending flows we have discussed. Each flow is numbered for use in the exercise at the end of this section.

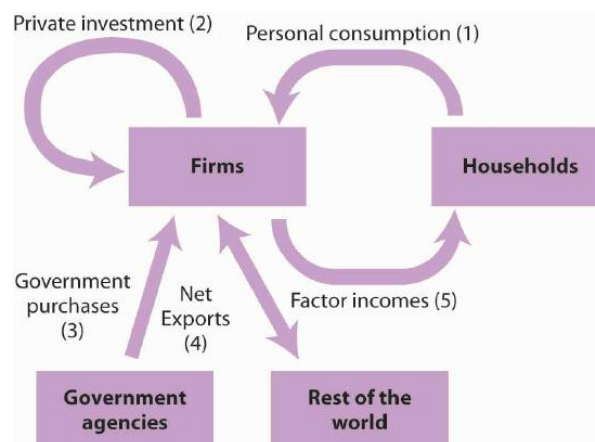


Figure 21.5 Spending in the Circular Flow Model GDP equals the sum of production by firms of goods and services for personal consumption (1), private investment (2), government purchases (3), and net exports (4). The circular flow model shows these flows and shows that the production of goods and services generates factor incomes (5) to households.

The circular flow model identifies some of the forces at work in the economy, forces that we will be studying in later chapters. For example, an increase in any of the flows that place demands on firms (personal consumption, private investment, government purchases, and exports) will induce firms to expand their production. This effect is characteristic of the expansion phase of the business cycle. An increase in production will require firms to employ more factors of production, which will create more income for households. Households are likely to respond with more consumption, which will induce still more production, more income, and still more consumption. Similarly, a reduction in any of the demands placed on firms will lead to a reduction in output, a reduction in firms' use of factors of production, a reduction in household incomes, a reduction in income, and so on. This sequence

of events is characteristic of the contraction phase of the business cycle. Much of our work in macroeconomics will involve an analysis of the forces that prompt such changes in demand and an examination of the economy's response to them.

Figure 21.6 shows the size of the components of GDP in 2010. We see that the production of goods and services for personal consumption accounted for about 70% of GDP. Imports exceeded exports, so net exports were negative.

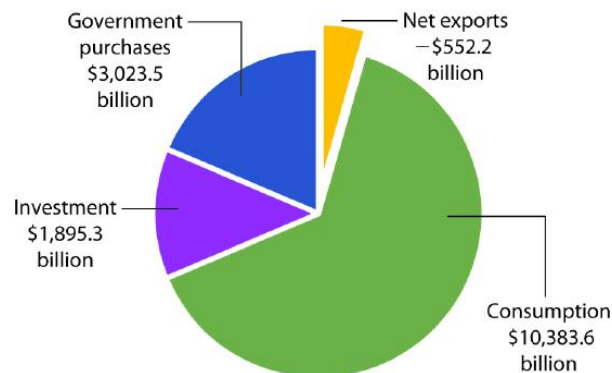


Figure 21.6 Components of GDP, 2010 (Q3) in Billions of Dollars Consumption makes up the largest share of GDP. Net exports were negative in 2010. Total GDP—the sum of personal consumption, private investment, government purchases, and net exports—equaled \$14,750.2 billion in 2010.

Source:

Bureau of Economic Analysis, National Income and Product Accounts, Table 1.1.5 (December 2010)

Final Goods and Value Added

GDP is the total value of all *final* goods and services produced during a particular period valued at prices in that period. That is not the same as the total value of all goods and services produced during a period. This distinction gives us another method of estimating GDP in terms of output.

Suppose, for example, that a logger cuts some trees and sells the logs to a sawmill. The mill makes lumber and sells it to a construction firm, which builds a house. The market price for the lumber includes the value of the logs; the price of the house includes the value of the lumber. If we try to estimate GDP by adding the value of the logs, the lumber, and the house, we would be counting the lumber twice and the logs three times. This problem is called “double counting,” and the economists who compute GDP seek to avoid it.

In the case of logs used for lumber and lumber produced for a house, GDP would include the value of the house. The lumber and the logs would not be counted as additional production because they are intermediate goods that were produced for use in building the house.

Another approach to estimating the value of final production is to estimate for each stage of production the *value added*, the amount by which the value of a firm's output exceeds the value of the goods and services the firm purchases from other firms. Table 21.1 “Final Value and Value Added” illustrates the use of value added in the production of a house.

Table 21.1 Final Value and Value Added

Good	Produced by	Purchased by	Price	Value Added
Logs	Logger	Sawmill	\$12,000	\$12,000
Lumber	Sawmill	Construction firm	\$25,000	\$13,000
House	Construction firm	Household	\$125,000	\$100,000
		Final Value	\$125,000	
		Sum of Values Added		\$125,000

If we sum the value added at each stage of the production of a good or service, we get the final value of the item. The example shown here involves the construction of a house, which is produced from lumber that is, in turn, produced from logs.

Suppose the logs produced by the logger are sold for \$12,000 to a mill, and that the mill sells the lumber it produces from these logs for \$25,000 to a construction firm. The construction firm uses the lumber to build a house, which it sells to a household for \$125,000. (To simplify the example, we will ignore inputs other than lumber that are used to build the house.) The value of the final product, the house, is \$125,000. The value added at each stage of production is estimated as follows:

1. The logger adds \$12,000 by cutting the logs.
2. The mill adds \$13,000 (\$25,000 – \$12,000) by cutting the logs into lumber.
3. The construction firm adds \$100,000 (\$125,000 – \$25,000) by using the lumber to build a house.

The sum of values added at each stage (\$12,000 + \$13,000 + \$100,000) equals the final value of the house, \$125,000.

The value of an economy's output in any period can thus be estimated in either of two ways. The values of final goods and services produced can be added directly, or the values added at each stage in the production process can be added. The Commerce Department uses both approaches in its estimate of the nation's GDP.

GNP: An Alternative Measure of Output

While GDP represents the most commonly used measure of an economy's output, economists sometimes use an alternative measure. **Gross national product (GNP)** is the total value of final goods and services produced during a particular period with factors of production owned by the residents of a particular country.

The difference between GDP and GNP is a subtle one. The GDP of a country equals the value of final output produced within the borders of that country; the GNP of a country equals the value of final output produced using factors owned by residents of the country. Most production in a country employs factors of production owned by residents of that country, so the two measures overlap. Differences between the two measures emerge when production in one country employs factors of production *owned* by residents of other countries.

Suppose, for example, that a resident of Bellingham, Washington, owns and operates a watch repair shop across the Canadian–U.S. border in Victoria, British Columbia. The value of watch repair services produced at the shop would be counted as part of Canada's GDP because they are produced in Canada. That value would not, however, be part of U.S. GDP. But, because the watch repair services were produced using capital and labor provided by a resident of the United States, they would be counted as part of GNP in the United States and not as part of GNP in Canada.

Because most production fits in both a country's GDP as well as its GNP, there is seldom much difference between the two measures. The relationship between GDP and GNP is given by

Equation 21.3

$$\text{GDP} + \text{net income received from abroad by residents of a nation} = \text{GNP}$$

In the third quarter of 2010, for example, GDP equaled \$14,750.2 billion. We add income receipts earned by residents of the United States from the rest of the world of \$706.0 billion and then subtract income payments that went from the United States to the rest of the world of \$516.1 billion to get GNP of \$14,940.0 billion for the third quarter of 2010. GNP is often used in international comparisons of income; we shall examine those later in this chapter.

Key Takeaways

- GDP is the sum of final goods and services produced for consumption (C), private investment (I), government purchases (G), and net exports (X_n). Thus $\text{GDP} = C + I + G + X_n$.
- GDP can be viewed in the context of the circular flow model. Consumption goods and services are produced in response to demands from households; investment goods are produced in response to demands for new capital by firms; government purchases include goods and services purchased by government agencies; and net exports equal exports less imports.
- Total output can be measured two ways: as the sum of the values of final goods and services produced and as the sum of values added at each stage of production.

- GDP plus net income received from other countries equals GNP. GNP is the measure of output typically used to compare incomes generated by different economies.

Try It!

Here is a two-part exercise.

1. Suppose you are given the following data for an economy:

Personal consumption	\$1,000
Home construction	100
Increase in inventories	40
Equipment purchases by firms	60
Government purchases	100
Social Security payments to households	40
Government welfare payments	100
Exports	50
Imports	150

Identify the number of the flow in Figure 21.5 to which each of these items corresponds. What is the economy's GDP?

2. Suppose a dairy farm produces raw milk, which it sells for \$1,000 to a dairy. The dairy produces cream, which it sells for \$3,000 to an ice cream manufacturer. The ice cream manufacturer uses the cream to make ice cream, which it sells for \$7,000 to a grocery store. The grocery store sells the ice cream to consumers for \$10,000. Compute the value added at each stage of production, and compare this figure to the final value of the product produced. Report your results in a table similar to that given in Table 21.1 "Final Value and Value Added".

Case in Point: The Spread of the Value Added Tax

Figure 21.7



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Outside the United States, the value added tax (VAT) has become commonplace. Governments of more than 120 countries use it as their primary means of raising revenue. While the concept of the VAT originated in France in the 1920s, no country adopted it until

after World War II. In 1948, France became the first country in the world to use the VAT. In 1967, Brazil became the first country in the Western Hemisphere to do so. The VAT spread to other western European and Latin American countries in the 1970s and 1980s and then to countries in the Asia/Pacific region, central European and former Soviet Union area, and Africa in the 1990s and early 2000s.

What is the VAT? It is equivalent to a sales tax on final goods and services but is collected at each stage of production.

Take the example given in Table 21.1 “Final Value and Value Added”, which is a simplified illustration of a house built in three stages. If there were a sales tax of 10% on the house, the household buying it would pay \$137,500, of which the construction firm would keep \$125,000 of the total and turn \$12,500 over to the government.

With a 10% VAT, the sawmill would pay the logger \$13,200, of which the logger would keep \$12,000 and turn \$1,200 over to the government. The sawmill would sell the lumber to the construction firm for \$27,500—keeping \$26,200, which is the \$25,000 for the lumber itself and \$1,200 it already paid in tax. The government at this stage would get \$1,300, the difference between the \$2,500 the construction firm collected as tax and the \$1,200 the sawmill already paid in tax to the logger at the previous stage. The household would pay the construction firm \$137,500. Of that total, the construction firm would turn over to the government \$10,000, which is the difference between the \$12,500 it collected for the government in tax from the household and the \$2,500 in tax that it already paid when it bought the lumber from the sawmill. The table below shows that in the end, the tax revenue generated by a 10% VAT is the same as that generated by a 10% tax on final sales.

Why bother to tax in stages instead of just on final sales? One reason is simply record keeping, since it may be difficult to determine in practice if any particular sale is the final one. In the example, the construction firm does not need to know if it is selling the house to a household or to some intermediary business.

Also, the VAT may lead to higher revenue collected. For example, even if somehow the household buying the house avoided paying the tax, the government would still have collected some tax revenue at earlier stages of production. With a tax on retail sales, it would have collected nothing. The VAT has another advantage from the point of view of government agencies. It has the appearance at each stage of taking a smaller share. The individual amounts collected are not as obvious to taxpayers as a sales tax might be.

Good	Price	Value Added	Tax Collected	– Tax Already Paid	= Value Added Tax
Logs	\$12,000	\$12,000	\$1,200	– \$0	= \$1,200
Lumber	\$25,000	\$13,000	\$2,500	– \$1,200	= \$1,300
House	\$125,000	\$100,000	\$12,500	– \$2,500	= \$10,000
Total			\$16,200	–\$3,700	= \$12,500

Answer to Try It! Problem

1. GDP equals \$1,200 and is computed as follows (the numbers in parentheses correspond to the flows in Figure 21.5):

Personal consumption (1)		\$1,000
Private investment (2)		200
	Housing	100
	Equipment and software	60
	Inventory change	40
Government purchases (3)		100
Net exports (4)		−100
GDP		\$1,200

Notice that neither welfare payments nor Social Security payments to households are included. These are transfer payments, which are not part of the government purchases component of GDP.

2. Here is the table of value added.

Good	Produced by	Purchased by	Price	Value Added
Raw milk	Dairy farm	Dairy	\$1,000	\$1,000
Cream	Dairy	Ice cream maker	3,000	2,000
Ice cream	Ice cream manufacturer	Grocery store	7,000	4,000
Retail ice cream	Grocery store	Consumer	10,000	3,000
		Final Value	\$10,000	
		Sum of Values Added		\$10,000

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4.2: Measuring Total Income

Learning Objective

1. Define gross domestic income and explain its relationship to gross domestic product.
2. Discuss the components of gross domestic income.
3. Define disposable personal income and explain how to calculate it from GDP.

We saw in the last section that the production of goods and services generates factor incomes to households. The production of a given value of goods and services generates an equal value of total income. **Gross domestic income (GDI)** equals the total income generated in an economy by the production of final goods and services during a particular period. It is a flow variable. Because an economy's total output equals the total income generated in producing that output, $GDP = GDI$. We can estimate GDP either by measuring total output or by measuring total income.

Consider a \$4 box of Cheerios. It is part of total output and thus is part of GDP. Who gets the \$4? Part of the answer to that question can be found by looking at the cereal box. Cheerios are made from oat flour, wheat starch, sugar, salt, and a variety of vitamins and minerals. Therefore, part of the \$4 goes to the farmers who grew the oats, the wheat, and the beets or cane from which the sugar was extracted. Workers and machines at General Mills combined the ingredients, crafted all those little O's, toasted them, and put them in a box. The workers were paid part of the \$4 as wages. The owners of General Mills and the capital it used received part of the \$4 as profit. The box containing the Cheerios was made from a tree, so a lumber company somewhere received part of the \$4. The truck driver who brought the box of cereal to the grocery store got part of the \$4, as did the owner of the truck itself and the owner of the oil that fueled the truck. The clerk who rang up the sale at the grocery store was paid part of the \$4. And so on.

How much of the \$4 was income generated in the production of the Cheerios? The answer is simple: all of it. Some of the money went to workers as wages. Some went to owners of the capital and natural resources used to produce it. Profits generated along the way went to the owners of the firms involved. All these items represent costs of producing the Cheerios and also represent income to households.

Part of the \$4 cost of the Cheerios, while it makes up a portion of GDI, does not represent ordinary income actually earned by households. That part results from two other production costs: depreciation and taxes related to the production of the Cheerios. Nevertheless, they are treated as a kind of income; we will examine their role in GDI below.

As it is with Cheerios, so it is with everything else. The value of output equals the income generated as the output is produced.

The Components of GDI

Employee compensation is the largest among the components of factor income. Factor income also includes profit, rent, and interest. In addition, GDI includes charges for depreciation and taxes associated with production. Depreciation and production-related taxes, such as sales taxes, make up part of the cost of producing goods and services and must be accounted for in estimating GDI. We will discuss each of these components of GDI next.

Employee Compensation

Compensation of employees in the form of wages, salaries, and benefits makes up the largest single component of income generated in the production of GDP. In the second quarter of 2008, employee compensation represented 57% of GDI.

The structure of employee compensation has changed dramatically in the last several decades. In 1950, virtually all employee compensation—95% of it—came in the form of wages and salaries. The remainder, about 5%, came in the form of additional benefits such as employer contributions to retirement programs and health insurance. In 2008, the share of benefits was roughly 20% of total employee compensation.

Profits

The profit component of income earned by households equals total revenues of firms less costs as measured by conventional accounting. Profits amounted to about 16% of GDI, or \$2,332.2 billion in 2010, down sharply from five decades earlier, when profits represented about 25% of the income generated in GDI¹.

Profits are the reward the owners of firms receive for being in business. The opportunity to earn profits is the driving force behind production in a market economy.

Rental Income

Rental income, such as the income earned by owners of rental housing or payments for the rent of natural resources, is the smallest component of GDI (about 2%); it is the smallest of the income flows to households. The meaning of rent in the computation of GDI is the same as its meaning in conventional usage; it is a charge for the temporary use of some capital asset or natural resource².

Net Interest

Businesses both receive and pay interest. GDI includes net interest, which equals interest paid less interest received by domestic businesses, plus interest received from foreigners less interest paid to foreigners. Interest payments on mortgage and home improvement loans are counted as interest paid by business, because homeowners are treated as businesses in the income accounts. In 2010 net interest accounted for 6.3% of GDI.

Depreciation

Over time the machinery and buildings that are used to produce goods and services wear out or become obsolete. A farmer's tractor, for example, wears out as it is used. A technological change may make some equipment obsolete. The introduction of personal computers, for example, made the electric typewriters used by many firms obsolete. **Depreciation** is a measure of the amount of capital that wears out or becomes obsolete during a period. Depreciation is referred to in official reports as the consumption of fixed capital.

Depreciation is a cost of production, so it represents part of the price charged for goods and services. It is therefore counted as part of the income generated in the production of those goods and services. Depreciation represented about 13% of GDI in 2008.

Indirect Taxes

The final component of the income measure of GDI is indirect business taxes³. **Indirect taxes** are taxes imposed on the production or sale of goods and services or on other business activity. (By contrast, a **direct tax** is a tax imposed directly on income; the personal income and corporate income taxes are direct taxes.) Indirect taxes, which include sales and excise taxes and property taxes, make up part of the cost to firms of producing goods and services. Like depreciation, they are part of the price of those goods and services and are therefore treated as part of the income generated in their production. Indirect business taxes amounted to 7.7% of GDI in 2010.

Table 21.2 "GDP and GDI, 2010" shows the components of GDI in 2010. Employee compensation represented the largest share of GDI. The exhibit also shows the components of GDP for the same year.

In principle, GDP and GDI should be equal, but their estimated values never are, because the data come from different sources. Output data from a sample of firms are used to estimate GDP, while income data from a sample of households are used to estimate GDI. The difference is the statistical discrepancy shown in the right-hand column of Table 21.2 "GDP and GDI, 2010". Some of the difficulties with these data are examined in the Case in Point feature on discrepancies between GDP and GDI.

Table 21.2 GDP and GDI, 2010

Gross domestic product	\$14,750.2	Gross Domestic Income	\$14,584.8
Personal Consumption Expenditures	10,383.6	Compensation of Employees	8,040.8
Gross Private Domestic Investment	1,895.3	Profits ⁴	2,332.3
Government consumption expenditures and gross investment	3,023.5	Rental income of persons	304.7
Net exports of goods and services	– 552.2	Net interest	913.9
		Taxes on production and imports ⁵	1,121.0
		Consumption of fixed capital (depreciation)	1872.1
		Statistical discrepancy	165.4

The table shows the composition of GDP and GDI in the third quarter of 2010 (in billions of dollars at an annual rate). Notice the rough equality of the two measures. (They are not quite equal because of measurement errors; the difference is due to a statistical discrepancy and is reduced significantly over time as the data are revised.)

Sources: Bureau of Economic Analysis National Income and Product Accounts, Tables 1.10 and 1.1.5 (December, 2010). See Brent R. Moulton and Eugene P. Seskin, “Preview of the 2003 Comprehensive Revision of the National Income and Product Accounts,” Bureau of Economic Analysis, *Survey of Current Business*, June 2003, pp. 17–34.

Tracing Income from the Economy to Households

We have seen that the production of goods and services generates income for households. Thus, the value of total output equals the value of total income in an economy. But we have also seen that our measure of total income, GDI, includes such things as depreciation and indirect business taxes that are not actually received by households. Households also receive some income, such as transfer payments, that does not count as part of GDP or GDI. Because the income households actually receive plays an important role in determining their consumption, it is useful to examine the relationship between a nation’s total output and the income households actually receive.

Table 21.3 “From GDP to Disposable Personal Income” traces the path we take in going from GDP to **disposable personal income**, which equals the income households have available to spend on goods and services. We first convert GDP to GNP and then subtract elements of GNP that do not represent income received by households and add payments such as transfer payments that households receive but do not earn in the production of GNP. Disposable personal income is either spent for personal consumption or saved by households.

Table 21.3 From GDP to Disposable Personal Income

GDP + net factor earnings from abroad	=	gross national product (GNP)
GNP – depreciation (consumption of fixed capital)	=	net national product (NNP)
NNP – statistical discrepancy	=	national income (NI)
NI – income earned but not received [e.g., taxes on production and imports, social security payroll taxes, corporate profit taxes, and retained earnings] + transfer payments and other income received but not earned in the production of GNP	=	personal income (PI)
PI – personal income taxes	=	disposable personal income (DPI)

GDP, a measure of total output, equals GDI, the total income generated in the production of goods and services in an economy. The chart traces the path from GDP to disposable personal income, which equals the income households actually receive. We first convert GDP to GNP. Then, we subtract depreciation to obtain net national product and subtract the statistical discrepancy to arrive at national income (i.e., gross national income [GNI] net of depreciation and the statistical discrepancy). Next, we subtract components of GNP and GNI that do not represent income actually received by households, such as taxes on production and imports, corporate profit and payroll taxes (contributions to social insurance), and corporate retained earnings. We add items such as transfer payments that are income to households but are not part of GNP and GNI. The adjustments shown are the most important adjustments in going from GNP and GNI to disposable personal income; several smaller adjustments (e.g., subsidies, business current transfer payments [net], and current surplus of government enterprises) have been omitted.

Key Takeaways

- Gross domestic product, GDP, equals gross domestic income, GDI, which includes compensation, profits, rental income, indirect taxes, and depreciation.
- We can use GDP, a measure of total output, to compute disposable personal income, a measure of income received by households and available for them to spend.

Try It!

The following income data refer to the same economy for which you had output data in the first part of the previous Try It! Compute GDI from the data below and confirm that your result equals the GDP figure you computed in the previous Try It! Assume that GDP = GNP for this problem (that is, assume all factor incomes are earned and paid in the domestic economy).

Employee compensation	\$700
Social Security payments to households	40
Welfare payments	100
Profits	200
Rental income	50
Net interest	25
Depreciation	50
Indirect taxes	175

Case in Point: The GDP–GDI Gap

Figure 21.8



Jorge Franganillo – [Calculator](#) – CC BY 2.0.

GDP equals GDI; at least, that is the way it is supposed to work. But in an enormously complex economy, the measurement of these two variables inevitably goes awry. Estimates of the two are never quite equal. In recent years, the absolute value of the gap has been quite sizable. For 2007 and 2008, for example, GDI has differed from GDP by $-\$81.4$ and $\$160.5$ billion per year, respectively.

Although the gap seems large, it represents a remarkably small fraction of measured activity—around 1% or less. Of course, 1% of a big number is still a big number. But it is important to remember that, relative to the size of the economy, the gap between GDI and GDP is not large. The gap is listed as a “statistical discrepancy” in the Department of Commerce reporting of the two numbers.

Why does the gap exist? From an accounting point of view, it should not. The total value of final goods and services produced must be equal to the total value of income generated in that production. But output is measured from sales and inventory figures collected from just 10% of commercial establishments. Preliminary income figures are obtained from household surveys, but these represent a tiny fraction of households. More complete income data are provided by income tax returns, but these are available to the economists who estimate GDI only after a two- to four-year delay.

The Department of Commerce issues revisions of its GDP and GDI estimates as more complete data become available. With each revision, the gap between GDP and GDI estimates is significantly reduced.

While GDP and GDI figures cannot provide precise measures of economic activity, they come remarkably close. Indeed, given that the numbers come from entirely different sources, the fact that they come as close as they do provides an impressive check of the accuracy of the department’s estimates of GDP and GDI.

Answer to Try It! Problem

GDI equals \$1,200. Note that this value equals the value for GDP obtained from the estimate of output in the first part of the previous Try It! Here is the computation:

Employee compensation	\$700
Profits	200
Rental income	50
Net interest	25
Depreciation	50
Indirect taxes	175
GDI	\$1,200

Once again, note that Social Security and welfare payments to households are transfer payments. They do not represent payments to household factors of production for current output of goods and services, and therefore are not included in GDI.

¹Although reported separately by the Department of Commerce, we have combined proprietors' income (typically independent business owners and farmers) with corporate profits to simplify the discussion.

²If you have studied microeconomics, you know that the term "*rent*" in economics has a quite different meaning. The national income and product accounts use the accounting, not the economic, meaning of "*rent*."

³The adjustment for indirect business taxes includes two other minor elements: transfer payments made by business firms and surpluses or deficits of government enterprises.

⁴Profit is corporate profit (\$1,274.7) plus proprietors' income (\$1,057.6), both with inventory valuation and capital consumption adjustment.

⁵Indirect taxes include taxes on production and imports of \$1,060.6 plus business transfer payments (\$133.1) less subsidies (\$58.5) and current surplus of government enterprise (\$14.1). Prior to the 2003 National Income and Product Accounts (NIPA) revisions, the category "taxes on production and imports" was, with some technical and other minor adjustments, referred to as "indirect business taxes." See Brent R. Moulton and Eugene P. Seskin, "Preview of the 2003 Comprehensive Revision of the National Income and Product Accounts," Bureau of Economic Analysis, *Survey of Current Business*, June 2003, pp. 17-34.

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4.3: GDP and Economic Well-Being

Learning Objective

1. Discuss and give examples of measurement and conceptual problems in using real GDP as a measure of economic performance and of economic well-being.
2. Explain the use of per capita real GNP or GDP to compare economic performance across countries and discuss its limitations.

GDP is the measure most often used to assess the economic well-being of a country. Besides measuring the pulse of a country, it is the figure used to compare living standards in different countries.

Of course, to use GDP as an indicator of overall economic performance, we must convert nominal GDP to real GDP, since nominal values can rise or fall simply as a result of changes in the price level. For example, the movie *Titanic*, released in 1997, brought in \$601 million—the highest amount ever in gross box office receipts, while *Gone with the Wind*, released in 1939, earned only \$199 million and ranks 49th in terms of nominal receipts. But does that mean that *Titanic* actually did better than *Gone with the Wind*? After all, the average price of a movie ticket in 1939 was 25 cents. At the time of *Titanic*, the average ticket price was about \$5. A better way to compare these two movies in terms of popularity is to control for the price of movie tickets—the same strategy that economists use with real GDP in order to determine whether output is rising or falling. Adjusting the nominal box-office receipts using 1998 movie prices to obtain real revenue reveals that in real terms *Gone with the Wind* continues to be the top real grosser of all time with real box-office receipts of about \$1.3 billion. As illustrated by this example on revenues from popular movies, we might draw erroneous conclusions about performance if we base them on nominal values instead of on real values. In contrast, real GDP, despite the problems with price indexes that were explained in another chapter, provides a reasonable measure of the total output of an economy, and changes in real GDP provide an indication of the direction of movement in total output.

We begin this section by noting some of the drawbacks of using real GDP as a measure of the economic welfare of a country. Despite these shortcomings, we will see that it probably remains our best single indicator of macroeconomic performance.

Measurement Problems in Real GDP

There are two measurement problems, other than those associated with adjusting for price level changes, in using real GDP to assess domestic economic performance.

Revisions

The first estimate of real GDP for a calendar quarter is called the advance estimate. It is issued about a month after the quarter ends. To produce a measure so quickly, officials at the Department of Commerce must rely on information from relatively few firms and households. One month later, it issues a revised estimate, and a month after that it issues its final estimate. Often the advance estimate of GDP and the final estimate do not correspond. The recession of 2001, for example, began in March of that year. But the first estimates of real GDP for the second and third quarters of 2001 showed output continuing to rise. It was not until later revisions that it became clear that a recession had been under way.

But the revision story does not end there. Every summer, the Commerce Department issues revised figures for the previous two or three years. Once every five years, the department conducts an extensive analysis that traces flows of inputs and outputs throughout the economy. It focuses on the outputs of some firms that are inputs to other firms. In the process of conducting this analysis, the department revises real GDP estimates for the previous five years. Sometimes the revisions can paint a picture of economic activity that is quite different from the one given even by the revised estimates of GDP. For example, revisions of the data for the 1990–1991 recession issued several years later showed that the recession had been much more serious than had previously been apparent, and the recovery was more pronounced.

The Service Sector

Another problem lies in estimating production in the service sector. The output of goods in an economy is relatively easy to compute. There are so many bushels of corn, so many pounds of beef. But what is the output of a bank? Of a hospital? It is easy to record the dollar value of output to enter in nominal GDP, but estimating the quantity of output to use in real GDP is quite another

matter. In some cases, the Department of Commerce estimates service sector output based on the quantity of labor used. For example, if this technique were used in the banking industry and banking used 10% more labor, the department would report that production has risen 10%. If the number of employees remains unchanged, reported output remains unchanged. In effect, this approach assumes that output per worker—productivity—in those sectors remains constant when studies have indicated that productivity has increased greatly in the service sector. Since 1990 progress has been made in measurement in this area, which allows in particular for better estimation of productivity changes and price indexes for different service sector industries, but more remains to be done in this large sector of the U.S. economy (Triplett & Bosworth, 2008).

Conceptual Problems with Real GDP

A second set of limitations of real GDP stems from problems inherent in the indicator itself. Real GDP measures market activity. Goods and services that are produced and exchanged in a market are counted; goods and services that are produced but that are not exchanged in markets are not¹.

Household Production

Suppose you are considering whether to eat at home for dinner tonight or to eat out. You could cook dinner for yourself at a cost of \$5 for the ingredients plus an hour or so of your time. Alternatively, you could buy an equivalent meal at a restaurant for perhaps \$15. Your decision to eat out rather than cook would add \$10 to the GDP.

But that \$10 addition would be misleading. After all, if you had stayed home you might have produced an equivalent meal. The only difference is that the value of your time would not have been counted. But surely your time is not worthless; it is just not counted. Similarly, GDP does not count the value of your efforts to clean your own house, to wash your own car, or to grow your own vegetables. In general, GDP omits the entire value added by members of a household who do household work themselves.

There is reason to believe this omission is serious. Economists J. Steven Landefeld and Stephanie H. McCulla of the U.S. Bureau of Economic Analysis estimated in a 2000 paper the value of household output from 1946 to 1997. Their estimate of household output in 1946 was 50% of reported GDP. Since then, that percentage has fallen, because more women have entered the workforce, so that more production that once took place in households now occurs in the market. Households now eat out more, purchase more prepared foods at the grocery store, hire out child-care services they once performed themselves, and so on. Their estimate for 1997, for example, suggests that household production amounted to 36% of reported GDP (Landefeld & McCulla, 2000).

This problem is especially significant when GDP is used to make comparisons across countries. In low-income countries, a much greater share of goods and services is not exchanged in a market. Estimates of GDP in such countries are adjusted to reflect nonmarket production, but these adjustments are inevitably imprecise.

Underground and Illegal Production

Some production goes unreported in order to evade taxes or the law. It is not likely to be counted in GDP. Legal production for which income is unreported in order to evade taxes generally takes place in what is known as the “underground economy.” For example, a carpenter might build a small addition to a dentist’s house in exchange for orthodontic work for the carpenter’s children. Although income has been earned and output generated in this example of bartering, the transaction is unlikely to be reported for income tax or other purposes and thus is not counted in GDP. Illegal activities are not reported for income taxes for obvious reasons and are thus difficult to include in GDP.

Leisure

Leisure is an economic good. All other things being equal, more leisure is better than less leisure.

But all other things are not likely to be equal when it comes to consuming leisure. Consuming more leisure means supplying less work effort. And that means producing less GDP. If everyone decided to work 10% fewer hours, GDP would fall. But that would not mean that people were worse off. In fact, their choice of more leisure would suggest they prefer the extra leisure to the goods and services they give up by consuming it. Consequently, a reduction in GDP would be accompanied by an increase in satisfaction, not a reduction.

The GDP Accounts Ignore “Bads”

Suppose a wave of burglaries were to break out across the United States. One would expect people to respond by buying more and louder burglar alarms, better locks, fiercer German shepherds, and more guard services than they had before. To the extent that they pay for these by dipping into savings rather than replacing other consumption, GDP increases. An epidemic might have much the same effect on GDP by driving up health-care spending. But that does not mean that crime and disease are good things; it means only that crime and disease may force an increase in the production of goods and services counted in the GDP.

Similarly, the GDP accounts ignore the impact of pollution on the environment. We might produce an additional \$200 billion in goods and services but create pollution that makes us feel worse off by, say, \$300 billion. The GDP accounts simply report the \$200 billion in increased production. Indeed, some of the environmental degradation might itself boost GDP. Dirtier air may force us to wash clothes more often, to paint buildings more often, and to see the doctor more often, all of which will tend to increase GDP!

Conclusion: GDP and Human Happiness

More GDP cannot necessarily be equated with more human happiness. But more GDP does mean more of the goods and services we measure. It means more jobs. It means more income. And most people seem to place a high value on these things. For all its faults, GDP does measure the production of most goods and services. And goods and services get produced, for the most part, because we want them. We might thus be safe in giving two cheers for GDP—and holding back the third in recognition of the conceptual difficulties that are inherent in using a single number to summarize the output of an entire economy.

International Comparisons of Real GDP and GNP

Real GDP or GNP estimates are often used in comparing economic performance among countries. In making such comparisons, it is important to keep in mind the general limitations to these measures of economic performance that we noted earlier. Further, countries use different methodologies for collecting and compiling data.

Three other issues are important in comparing real GDP or GNP for different countries: the adjustment of these figures for population, adjusting to a common currency, and the incorporation of nonmarket production.

In international comparisons of real GNP or real GDP, economists generally make comparisons not of real GNP or GDP but of **per capita real GNP or GDP**, which equals a country’s real GNP or GDP divided by its population. In 2009, for example, Japan had a real GDP of about \$4,000 billion and Luxembourg had a real GDP of about \$29 billion. We can conclude that Japan’s economy produced far more goods and services than did Luxembourg’s. But Japan had almost 300 times as many people as did Luxembourg. Japan’s per capita real GDP in 2009 was \$33,280; Luxembourg’s was \$57,640, the highest in the world that year.

Figure 21.9 compares per capita real GNP for 11 countries in 2009. It is based on data that uses a measure called “international dollars” in order to correct for differences in the purchasing power of \$1 across countries. The data also attempt to adjust for nonmarket production (such as that of rural families that grow their own food, make their own clothing, and produce other household goods and services themselves).

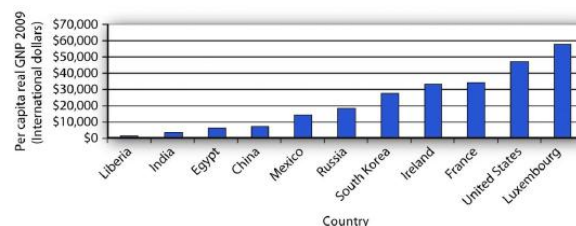


Figure 21.9 Comparing Per Capita Real GNP, 2009 There is a huge gap between per capita income in one of the poorest countries in the world, Liberia, and wealthier nations such as the United States and Luxembourg.

Source: World Bank, World Development Indicators Online

The disparities in income are striking; Luxembourg, the country with the highest per capita real GNP, had an income level more than 200 times greater than Liberia, the country with the lowest per capita real GNP.

What can we conclude about international comparisons in levels of GDP and GNP? Certainly we must be cautious. There are enormous difficulties in estimating any country’s total output. Comparing one country’s output to another presents additional

challenges. But the fact that a task is difficult does not mean it is impossible. When the data suggest huge disparities in levels of GNP per capita, for example, we observe real differences in living standards.

Key Takeaways

- Real GDP or real GNP is often used as an indicator of the economic well-being of a country.
- Problems in the measurement of real GDP, in addition to problems encountered in converting from nominal to real GDP, stem from revisions in the data and the difficulty of measuring output in some sectors, particularly the service sector.
- Conceptual problems in the use of real GDP as a measure of economic well-being include the facts that it does not include nonmarket production and that it does not properly adjust for “bads” produced in the economy.
- Per capita real GDP or GNP can be used to compare economic performance in different countries.

Try It!

What impact would each of the following have on real GDP? Would economic well-being increase or decrease as a result?

1. On average, people in a country decide to increase the number of hours they work by 5%.
2. Spending on homeland security increases in response to a terrorist attack.
3. The price level and nominal GDP increase by 10%.

Case in Point: Per Capita Real GDP and Olympic Medal Counts

Figure 21.10



Aurelien Guichard – Olympics – CC BY-SA 2.0.

In the popular lore, the Olympics provide an opportunity for the finest athletes in the world to compete with each other head-to-head on the basis of raw talent and hard work. And yet, contenders from Laos tend to finish last or close to it in almost any event in which they compete. One Laotian athlete garnered the unenviable record of having been the slowest entrant in the nearly half-century long history of the 20-kilometer walk. In contrast, U.S. athletes won 103 medals at the 2004 Athens Olympics and 110 medals at the 2008 Beijing Olympics. Why do Laotians fare so poorly and Americans so well, with athletes from other countries falling in between?

Economists Daniel K. N. Johnson and Ayfer Ali have been able to predict with astonishing accuracy the number of medals different countries will win on the basis of a handful of factors, including population, climate, political structure, and real per capita GDP. For example, they predicted that the United States would win 103 medals in Athens and that is precisely how many the United States won. They predicted 103 medals for the United States in Beijing; 110 were won. They did not expect the Laotians to win any medals in either Athens or Beijing, and that was indeed the outcome.

Johnson and Ali estimated that summer game participant nations average one more medal per additional \$1,000 of per capita real GDP. With per capita real GDP in Laos less than the equivalent of \$500 compared to per capita real GDP in the United States of

about \$38,000, the results for these two nations could be considered a foregone conclusion. According to Johnson and Ali, “High productive capacity or income per person displays an ability to pay the costs necessary to send athletes to the Games, and may also be associated with a higher quality of training and better equipment.” For example, a Laotian swimmer at Athens, Vilayphone Vongphachanh, had never practiced in an Olympic-size pool, and a runner, Sirivanh Ketavong, had worn the same running shoes for four years.

The good news is that as the per capita real GDP in some relatively poor countries has risen, the improved living standards have led to increased Olympic medal counts. China, for instance, won 28 medals in 1988 and 63 in 2004. As the host for the 2008 games, it won an impressive total of 100 medals.

While not a perfect measure of the well-being of people in a country, per capita real GDP does tell us about the opportunities available to the average citizen in a country. Americans would surely find it hard to imagine living at the level of consumption of the average Laotian. In *The Progress Paradox: How Life Gets Better While People Feel Worse*, essayist Gregg Easterbrook notes that a higher material standard of living is not associated with higher reported happiness. But, he concludes, the problems of prosperity seem less serious than those of poverty, and prosperity gives people and nations the means to address problems. The Olympic medal count for each nation strongly reflects its average standard of living and hence the opportunities available to its citizens.

Sources: Gregg Easterbrook, *The Progress Paradox: How Life Gets Better While People Feel Worse* (New York: Random House, 2003); Daniel K. N. Johnson and Ayfer Ali, “A Tale of Two Seasons: Participation and Medal Counts at the Summer and Winter Olympic Games,” *Social Science Quarterly* 84, no. 4 (December 2004): 974–93; David Wallechinsky, “Why I’ll Cheer for Laos,” *Parade Magazine*, August 8, 2004, p. 8.

Answer to Try It! Problem

1. Real GDP would increase. Assuming the people chose to increase their work effort and forgo the extra leisure, economic well-being would increase as well.
2. Real GDP would increase, but the extra expenditure in the economy was due to an increase in something “bad,” so economic well-being would likely be lower.
3. No change in real GDP. For some people, economic well-being might increase and for others it might decrease, since inflation does not affect each person in the same way.

¹There are two exceptions to this rule. The value of food produced and consumed by farm households is counted in GDP. More important, an estimate of the rental values of owner-occupied homes is included. If a family rents a house, the rental payments are included in GDP. If a family lives in a house it owns, the Department of Commerce estimates what the house would rent for and then includes that rent in the GDP estimate, even though the house’s services were not exchanged in the marketplace.

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4.4: Review and Practice

Summary

This chapter focused on the measurement of GDP. The total value of output (GDP) equals the total value of income generated in producing that output (GDI). We can illustrate the flows of spending and income through the economy with the circular flow model. Firms produce goods and services in response to demands from households (personal consumption), other firms (private investment), government agencies (government purchases), and the rest of the world (net exports). This production, in turn, creates a flow of factor incomes to households. Thus, GDP can be estimated using two types of data: (1) data that show the total value of output and (2) data that show the total value of income generated by that output.

In looking at GDP as a measure of output, we divide it into four components: consumption, investment, government purchases, and net exports. GDP equals the sum of final values produced in each of these areas. It can also be measured as the sum of values added at each stage of production. The components of GDP measured in terms of income (GDI) are employee compensation, profits, rental income, net interest, depreciation, and indirect taxes.

We also explained other measures of income such as GNP and disposable personal income. Disposable personal income is an important economic indicator, because it is closely related to personal consumption, the largest component of GDP.

GDP is often used as an indicator of how well off a country is. Of course, to use it for this purpose, we must be careful to use real GDP rather than nominal GDP. Still, there are problems with our estimate of real GDP. Problems encountered in converting nominal GDP to real GDP were discussed in the previous chapter. In this chapter we looked at additional measurement problems and conceptual problems.

Frequent revisions in the data sometimes change our picture of the economy considerably. Accounting for the service sector is quite difficult. Conceptual problems include the omission of nonmarket production and of underground and illegal production. GDP ignores the value of leisure and includes certain “bads.”

We cannot assert with confidence that more GDP is a good thing and that less is bad. However, real GDP remains our best single indicator of economic performance. It is used not only to indicate how any one economy is performing over time but also to compare the economic performance of different countries.

Concept Problems

1. GDP is used as a measure of macroeconomic performance. What, precisely, does it measure?
2. Many economists have attempted to create a set of social accounts that would come closer to measuring the economic well-being of the society than does GDP. What modifications of the current approach would you recommend to them?
3. Every good produced creates income for the owners of the factors of production that created the product or service. For a recent purchase you made, try to list all the types of factors of production involved in making the product available, and try to determine who received income as a result of your purchase.
4. Explain how the sale of used textbooks in your campus bookstore affects the GDP calculation.
5. Look again at the circular flow diagram in Figure 21.5 and assume it is drawn for the United States. State the flows in which each of the following transactions would be entered.
 1. A consumer purchases fresh fish at a local fish market.
 2. A grocery store acquires 1,000 rolls of paper towels for later resale.
 3. NASA purchases a new Saturn rocket.
 4. People in France flock to see the latest Brad Pitt movie.
 5. A construction firm builds a new house.
 6. A couple from Seattle visits Guadalajara and stays in a hotel there.
 7. The city of Dallas purchases computer paper from a local firm.
6. Suggest an argument for and an argument against counting in GDP all household-produced goods and services that are not sold, such as the value of child care or home-cooked meals.

7. Suppose a nation's firms make heavy use of factors of production owned by residents of foreign countries, while foreign firms make relatively little use of factors owned by residents of that nation. How does the nation's GDP compare to its GNP?
8. Suppose Country A has the same GDP as Country B, and that neither nation's residents own factors of production used by foreign firms, nor do either nation's firms use factors of production owned by foreign residents. Suppose that, relative to Country B, depreciation, indirect business taxes, and personal income taxes in Country A are high, while welfare and Social Security payments to households in Country A are relatively low. Which country has the higher disposable personal income? Why?
9. Suppose that virtually everyone in the United States decides to take life a little easier, and the length of the average workweek falls by 25%. How will that affect GDP? Per capita GDP? How will it affect economic welfare?
10. Comment on the following statement: "It does not matter that the value of the labor people devote to producing things for themselves is not counted in GDP; because we make the same 'mistake' every year, relative values are unaffected."
11. Name some of the services, if any, you produced at home that do get counted in GDP. Are there any goods you produce that are not counted?
12. Marijuana is sometimes estimated to be California's largest cash crop. It is not included in estimates of GDP. Should it be?

Numerical Problems

1. Given the following nominal data, compute GDP. Assume net factor incomes from abroad = 0 (that is, GDP = GNP).

Nominal Data for GDP and NNP		\$ Billions
Consumption		2,799.8
Depreciation		481.6
Exports		376.2
Gross private domestic investment		671.0
Indirect taxes		331.4
Government purchases		869.7
Government transfer payments		947.8
Imports		481.7

2. Find data for each of the following countries on real GDP and population. Use the data to calculate the GDP per capita for each of the following countries:
 1. Mozambique
 2. India
 3. Pakistan
 4. United States
 5. Canada
 6. Russia
 7. Brazil
 8. Iran
 9. Colombia
3. Now construct a bar graph showing your results in the previous problem, organizing the countries from the highest to the lowest GNP per capita, with countries on the horizontal axis and GNP per capita on the vertical axis.
4. Suppose Country A has a GDP of \$4 trillion. Residents of this country earn \$500 million from assets they own in foreign countries. Residents of foreign countries earn \$300 million from assets they own in Country A. Compute:
 1. Country A's net foreign income.
 2. Country A's GNP.

5. Suppose a country's GDP equals \$500 billion for a particular year. Economists in the country estimate that household production equals 40% of GDP.
1. What is the value of the country's household production for that year?
 2. Counting both GDP and household production, what is the country's total output for the year?
6. A miner extracts iron from the earth. A steel mill converts the iron to steel beams for use in construction. A construction company uses the steel beams to make a building. Assume that the total product of these firms represents the only components of the building and that they will have no other uses. Complete the following table:

Company	Product	Total Sales	Value Added
Acme Mining	iron ore	\$100,000	?
Fuller Mill	steel beams	\$175,000	?
Crane Construction	building	\$1,100,000	?
Total Value Added			?

7. You are given the data below for 2008 for the imaginary country of Amagre, whose currency is the G.

Consumption	350 billion G
Transfer payments	100 billion G
Investment	100 billion G
Government purchases	200 billion G
Exports	50 billion G
Imports	150 billion G
Bond purchases	200 billion G
Earnings on foreign investments	75 billion G
Foreign earnings on Amagre investment	25 billion G

1. Compute net foreign investment.
2. Compute net exports.
3. Compute GDP.
4. Compute GNP.

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SECTION OVERVIEW

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5.1.1: Introduction to Unemployment

Out of Business



Figure 1: Borders was one of the many companies unable to recover from the economic recession of 2008-2009. (Credit: modification of work by Luis Villa del Campo/Flickr Creative Commons)

Note: The Mysterious Case of the Missing Candidates

Nearly eight million U.S. jobs were lost during the Great Recession of 2008-2009, with unemployment peaking at 10% in October 2009, according to the Bureau of Labor Statistics (BLS). That is a huge number of positions gone. During the tepid recovery, some positions were added, but as of summer 2013, unemployment had remained persistently higher than the pre-recession rate of less than 5%. Some economists and policymakers worried the recovery would be “jobless.” With the economy growing, albeit slowly, why wasn’t the unemployment number falling? Why were firms not hiring?

Peter Cappelli, noted Wharton management professor and Director of Wharton’s Center for Human Resources, does not believe the job search process is akin to what he terms the “Home Depot” view of hiring. According to him, this view “basically says that filling a job is like replacing a part in a washing machine. You simply find someone who does the exact same job as that broken part, plug him or her into the washing machine and that is it.” The job search, for both the prospective employee and the employer, is more complex than that.

In a hiring situation, employers hold all the cards. They write the job descriptions, determine the salaries, decide when and how to advertise positions, and set the controls on employment application screening software. Advertising for positions has increased as the economic recovery progresses, yet here’s the kicker: Employers say there are no applicants out there who meet their needs. While the unemployment rate is now below 6% as of the beginning of 2015, many economists and policymakers (including the Chair of the Federal Reserve, Janet Yellen) are still concerned about “slack” in the labor market. So the question arises: where are the job candidates?

That question leads us to the topic of this chapter—unemployment. What constitutes it? How is it measured? And if the economy is growing, why isn’t the pool of job openings growing along with it? Sounds like the economy has a case of “missing” candidates.

Note: Introduction to Unemployment

In this chapter, you will learn about:

- How the Unemployment Rate is Defined and Computed
- Patterns of Unemployment
- What Causes Changes in Unemployment over the Short Run

- What Causes Changes in Unemployment over the Long Run

Unemployment can be a terrible and wrenching life experience—like a serious automobile accident or a messy divorce—whose consequences can be fully understood only by someone who has gone through it. For unemployed individuals and their families, there is the day-to-day financial stress of not knowing where the next paycheck is coming from. There are painful adjustments, like watching your savings account dwindle, selling a car and buying a cheaper one, or moving to a less expensive place to live. Even when the unemployed person finds a new job, it may pay less than the previous one. For many people, their job is an important part of their self worth. When unemployment separates people from the workforce, it can affect family relationships as well as mental and physical health.

The human costs of unemployment alone would justify making a low level of unemployment an important public policy priority. But unemployment also includes economic costs to the broader society. When millions of unemployed but willing workers cannot find jobs, an economic resource is going unused. An economy with high unemployment is like a company operating with a functional but unused factory. The **opportunity cost** of unemployment is the output that could have been produced by the unemployed workers.

This chapter will discuss how the unemployment rate is defined and computed. It will examine the patterns of unemployment over time, for the U.S. economy as a whole, for different demographic groups in the U.S. economy, and for other countries. It will then consider an economic explanation for unemployment, and how it explains the patterns of unemployment and suggests public policies for reducing it.

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5.1.2: How the Unemployment Rate is Defined and Computed

Unemployment is typically described in newspaper or television reports as a percentage or a rate. A recent report might have said, for example, *from August 2009 to November 2009, the U.S. unemployment rate rose from 9.7% to 10.0%, but by June 2010, it had fallen to 9.5%*. At a glance, the changes between the percentages may seem small. But remember that the U.S. economy has about 155 million adults who either have jobs or are looking for them. A rise or fall of just 0.1% in the unemployment rate of 155 million potential workers translates into 155,000 people, which is roughly the total population of a city like Syracuse, New York, Brownsville, Texas, or Pasadena, California. Large rises in the unemployment rate mean large numbers of job losses. In November 2009, at the peak of the recession, about 15 million people were out of work. Even with the unemployment rate now at 5.5% as of February 2015, about 8 million people total are out of work.

Note

The Bureau of Labor Statistics tracks and reports all data related to unemployment.

Who's In or Out of the Labor Force?

Should everyone without a job be counted as unemployed? Of course not. Children, for example, should not be counted as unemployed. Surely, the retired should not be counted as unemployed. Many full-time college students have only a part-time job, or no job at all, but it seems inappropriate to count them as suffering the pains of unemployment. Some people are not working because they are rearing children, ill, on vacation, or on parental leave.

The point is that the adult population is not just divided into employed and unemployed. A third group exists: people who do not have a job, and for some reason—retirement, looking after children, taking a voluntary break before a new job—are not interested in having a job, either. It also includes those who do want a job but have quit looking, often due to being discouraged by their inability to find suitable employment. Economists refer to this third group of those who are not working and not looking for work as **out of the labor force** or not in the labor force.

The U.S. unemployment rate, which is based on a monthly survey carried out by the U.S. Bureau of the Census, asks a series of questions to divide up the adult population into employed, unemployed, or not in the labor force. To be classified as unemployed, a person must be without a job, currently available to work, and actively looking for work in the previous four weeks. Thus, a person who does not have a job but who is not currently available to work or has not actively looked for work in the last four weeks is counted as out of the labor force.

Employed: currently working for pay

Unemployed: Out of work and actively looking for a job

Out of the labor force: Out of paid work and not actively looking for a job

Labor force: the number of employed plus the unemployed

Calculating the Unemployment Rate

Figure 1 shows the three-way division of the over-16 adult population. In February 2015, about 62.8% of the adult population was "in the labor force"; that is, people are either employed or without a job but looking for work. Those in the labor force can be divided into the employed and the unemployed. These values are also shown in Table 1. The unemployment rate is not the percentage of the total adult population without jobs, but rather the percentage of adults who are in the labor force but who do not have jobs:

$$\text{Unemployment rate} = \frac{\text{Unemployed people}}{\text{Total labor force}} \times 100 \quad (5.1.2.1)$$

Employed, Unemployed, and Out of the Labor Force Distribution of Adult Population (age 16 and older), February 2015

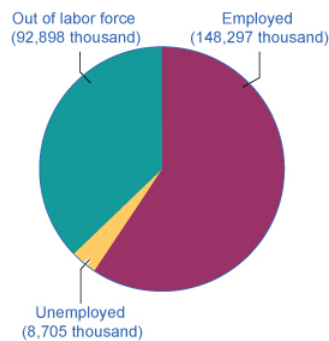


Figure 1: The total adult, working-age population in February 2015 was 249.9 million. Out of this total population, 148.3 were classified as employed, and 8.7 million were classified as unemployed. The remaining 92.9 were classified as out of the labor force. As you will learn, however, this seemingly simple chart does not tell the whole story.

Total adult population over the age of 16	249.9 million
In the labor force	157 million (62.8%)
Employed	148.3 million
Unemployed	8.7 million
Out of the labor force	92.9 million (37.2%)

Table 1: U.S. Employment and Unemployment, February 2015(Source: www.bls.gov/news.release/empsit.t01.htm)

In this example, the unemployment rate can be calculated as 8.7 million unemployed people divided by 157 million people in the labor force, which works out to a 5.5% rate of unemployment. The following Work It Out feature will walk you through the steps of this calculation.

Note: Calculating Labor Force Percentages

So how do economists arrive at the percentages in and out of the labor force and the unemployment rate? We will use the values in Table 1 to illustrate the steps.

To determine the percentage in the labor force:

Step 1. Divide the number of people in the labor force (157 million) by the total adult (working-age) population (249.9 million).

Step 2. Multiply by 100 to obtain the percentage.

$$\text{Percentage in the labor force} = \frac{157}{249.9} \quad (5.1.2.2)$$

$$= 0.6282 \quad (5.1.2.3)$$

$$= 62.8\% \quad (5.1.2.4)$$

To determine the percentage out of the labor force:

Step 1. Divide the number of people out the labor force (92.9 million) by the total adult (working-age) population (249.9 million).

Step 2. Multiply by 100 to obtain the percentage.

$$\text{Percentage in the labor force} = \frac{92.9}{249.9} \quad (5.1.2.5)$$

$$= 0.3717 \quad (5.1.2.6)$$

$$= 37.2\% \quad (5.1.2.7)$$

To determine the unemployment rate:

Step 1. Divide the number of unemployed people (8.7 million) by the total labor force (157 million).

Step 2. Multiply by 100 to obtain the rate.

$$\text{Unemployment rate} = \frac{8.7}{157} \quad (5.1.2.8)$$

$$= 0.0554 \quad (5.1.2.9)$$

$$= 5.5\% \quad (5.1.2.10)$$

Hidden Unemployment

Even with the “out of the labor force” category, there are still some people that are mislabeled in the categorization of employed, unemployed, or out of the labor force. There are some people who have only part time or temporary jobs and who are looking for full time and permanent employment that are counted as employed, though they are not employed in the way they would like or need to be. Additionally, there are individuals who are **underemployed**. This includes those that are trained or skilled for one type or level of work who are working in a lower paying job or one that does not utilize their skills. For example, an individual with a college degree in finance who is working as a sales clerk would be considered underemployed. They are, however, also counted in the employed group. All of these individuals fall under the umbrella of the term “**hidden unemployment**.” **Discouraged workers**, those who have stopped looking for employment and, hence, are no longer counted in the unemployed also fall into this group

Labor Force Participation Rate

Another important statistic is the **labor force participation rate**. This is the percentage of adults in an economy who are either employed or who are unemployed and looking for a job. So, using the data in Figure 1 and Table 1, those included in this calculation would be the 157 million individuals in the labor force. The rate is calculated by taking the number of people in the labor force, that is, the number employed and the number unemployed, divided by the total adult population and multiplying by 100 to get the percentage. For the data from February 2015, the labor force participation rate is 62.8%. Historically, the civilian labor force participation rate in the United States climbed beginning in the 1960s as women increasingly entered the workforce, and it peaked at around 68% in late 1999 to early 2000. Since then, the labor force participation rate has steadily declined.

The Establishment Payroll Survey

When the unemployment report comes out each month, the Bureau of Labor Statistics (BLS) also reports on the number of jobs created—which comes from the establishment payroll survey. The payroll survey is based on a survey of about 140,000 businesses and government agencies throughout the United States. It generates payroll employment estimates by the following criteria: all employees, average weekly hours worked, and average hourly, weekly, and overtime earnings. One of the criticisms of this survey is that it does not count the self-employed. It also does not make a distinction between new, minimum wage, part time or temporary jobs and full time jobs with “decent” pay.

How Is the U.S. Unemployment Data Collected?

The unemployment rate announced by the U.S. Bureau of Labor Statistics each month is based on the Current Population Survey (CPS), which has been carried out every month since 1940. Great care is taken to make this survey representative of the country as a whole. The country is first divided into 3,137 areas. The U.S. Bureau of the Census then selects 729 of these areas to survey. The 729 areas are then divided into districts of about 300 households each, and each district is divided into clusters of about four dwelling units. Every month, Census Bureau employees call about 15,000 of the four-household clusters, for a total of 60,000 households. Households are interviewed for four consecutive months, then rotated out of the survey for eight months, and then interviewed again for the same four months the following year, before leaving the sample permanently.

Based on this survey, unemployment rates are calculated by state, industry, urban and rural areas, gender, age, race or ethnicity, and level of education. A wide variety of other information is available, too. For example, how long have people been unemployed? Did they become unemployed because they quit, or were laid off, or their employer went out of business? Is the unemployed person the

only wage earner in the family? The Current Population Survey is a treasure trove of information about employment and unemployment. If you are wondering what the difference is between the CPS and EPS, read the following Clear it Up feature.

Note: What is the Difference Between CPS and EPS?

The Current Population Survey (CPS) conducted by the United States Census Bureau measures the percentage of the labor force that is unemployed. The establishment payroll survey (EPS) by the Bureau of Labor Statistics is a payroll survey that measures the net change in jobs created for the month.

Criticisms of Measuring Unemployment

There are always complications in measuring the number of unemployed. For example, what about people who do not have jobs and would be available to work, but have gotten discouraged at the lack of available jobs in their area and stopped looking? Such people, and their families, may be suffering the pains of unemployment. But the survey counts them as out of the labor force because they are not actively looking for work. Other people may tell the Census Bureau that they are ready to work and looking for a job but, truly, they are not that eager to work and are not looking very hard at all. They are counted as unemployed, although they might more accurately be classified as out of the labor force. Still other people may have a job, perhaps doing something like yard work, child care, or cleaning houses, but are not reporting the income earned to the tax authorities. They may report being unemployed, when they actually are working.

Although the unemployment rate gets most of the public and media attention, economic researchers at the Bureau of Labor Statistics publish a wide array of surveys and reports that try to measure these kinds of issues and to develop a more nuanced and complete view of the labor market. It is not exactly a hot news flash that economic statistics are imperfect. Even imperfect measures like the unemployment rate, however, can still be quite informative, when interpreted knowledgeably and sensibly.

Note

[Click here to learn more about the CPS to read frequently asked questions about employment and labor.](#)

Key Concepts and Summary

Unemployment imposes high costs. Unemployed individuals suffer from loss of income and from stress. An economy with high unemployment suffers an opportunity cost of unused resources. The adult population can be divided into those in the labor force and those out of the labor force. In turn, those in the labor force are divided into employed and unemployed. A person without a job must be willing and able to work and actively looking for work to be counted as unemployed; otherwise, a person without a job is counted as being out of the labor force. The unemployment rate is defined as the number of unemployed persons divided by the number of persons in the labor force (not the overall adult population). The Current Population Survey (CPS) conducted by the United States Census Bureau measures the percentage of the labor force that is unemployed. The establishment payroll survey by the Bureau of Labor Statistics measures the net change in jobs created for the month.

Glossary

discouraged workers

those who have stopped looking for employment due to the lack of suitable positions available

labor force participation rate

this is the percentage of adults in an economy who are either employed or who are unemployed and looking for a job

out of the labor force

those who are not working and not looking for work—whether they want employment or not; also termed “not in the labor force”

underemployed

individuals who are employed in a job that is below their skills

unemployment rate

the percentage of adults who are in the labor force and thus seeking jobs, but who do not have jobs

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5.1.3: Patterns of Unemployment

Let's look at how unemployment rates have changed over time and how various groups of people are affected by unemployment differently.

The Historical U.S. Unemployment Rate

Figure 1 shows the historical pattern of U.S. unemployment since 1955.

The U.S. Unemployment Rate, 1955–2015

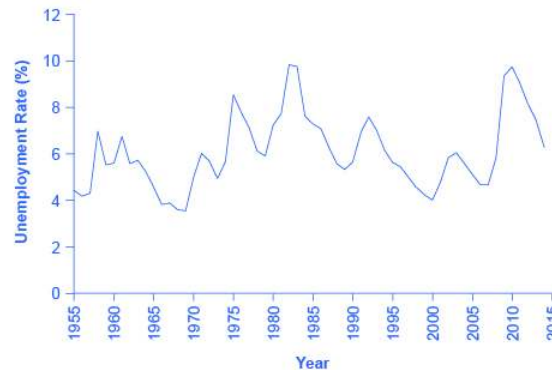


Figure 1: The U.S. unemployment rate moves up and down as the economy moves in and out of recessions. But over time, the unemployment rate seems to return to a range of 4% to 6%. There does not seem to be a long-term trend toward the rate moving generally higher or generally lower. (Source: **Federal Reserve Economic Data (FRED)** research.stlouisfed.org/fred...UN64TTUSA156S0)

As we look at this data, several patterns stand out:

1. Unemployment rates do fluctuate over time. During the deep recessions of the early 1980s and of 2007–2009, unemployment reached roughly 10%. For comparison, during the Great Depression of the 1930s, the unemployment rate reached almost 25% of the labor force.
2. Unemployment rates in the late 1990s and into the mid-2000s were rather low by historical standards. The unemployment rate was below 5% from 1997 to 2000 and near 5% during almost all of 2006–2007. The previous time unemployment had been less than 5% for three consecutive years was three decades earlier, from 1968 to 1970.
3. The unemployment rate never falls all the way to zero. Indeed, it never seems to get below 3%—and it stays that low only for very short periods. (Reasons why this is the case are discussed later in this chapter.)
4. The timing of rises and falls in unemployment matches fairly well with the timing of upswings and downswings in the overall economy. During periods of **recession** and **depression**, unemployment is high. During periods of economic growth, unemployment tends to be lower.
5. No significant upward or downward trend in unemployment rates is apparent. This point is especially worth noting because the U.S. population nearly quadrupled from 76 million in 1900 to over 314 million by 2012. Moreover, a higher proportion of U.S. adults are now in the paid workforce, because women have entered the paid labor force in significant numbers in recent decades. Women composed 18% of the paid workforce in 1900 and nearly half of the paid workforce in 2012. But despite the increased number of workers, as well as other economic events like globalization and the continuous invention of new technologies, the economy has provided jobs without causing any long-term upward or downward trend in unemployment rates.

Unemployment Rates by Group

Unemployment is not distributed evenly across the U.S. population. Figure 2 shows unemployment rates broken down in various ways: by gender, age, and race/ethnicity.

Unemployment Rate by Demographic Group

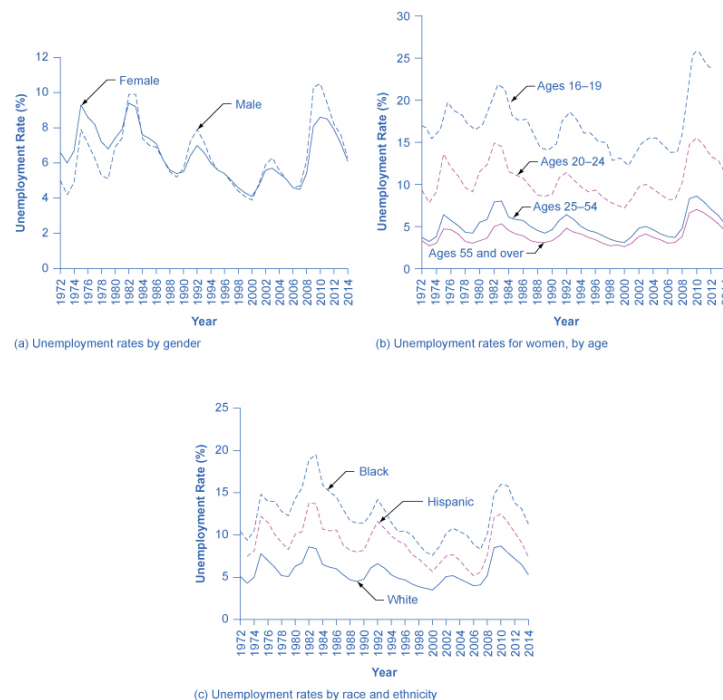


Figure 2: (a) By gender, 1972–2014. Unemployment rates for men used to be lower than unemployment rates for women, but in recent decades, the two rates have been very close, often with the unemployment rate for men somewhat higher. (b) By age, 1972–2014. Unemployment rates are highest for the very young and become lower with age. (c) By race and ethnicity, 1972–2014. Although unemployment rates for all groups tend to rise and fall together, the unemployment rate for whites has been lower than the unemployment rate for blacks and Hispanics in recent decades. (Source: www.bls.gov)

The unemployment rate for women had historically tended to be higher than the unemployment rate for men, perhaps reflecting the historical pattern that women were seen as “secondary” earners. By about 1980, however, the unemployment rate for women was essentially the same as that for men, as shown in Figure 2 (a). During the recession of 2008–2009, the unemployment rate for men exceeded the unemployment rate for women. Through 2014, this pattern has remained, although the gap is narrowing.

Note

Read this report for detailed information on the recession of 2008–2009. It also provides some very useful information on the statistics of unemployment.

Younger workers tend to have higher unemployment, while middle-aged workers tend to have lower unemployment, probably because the middle-aged workers feel the responsibility of needing to have a job more heavily. Younger workers move in and out of jobs (and in and out of the labor force) more easily. Elderly workers have extremely low rates of unemployment, because those who do not have jobs often exit the labor force by retiring, and thus are not counted in the unemployment statistics. Figure 2 (b) shows unemployment rates for women divided by age; the pattern for men is similar.

The unemployment rate for African-Americans is substantially higher than the rate for other racial or ethnic groups, a fact that surely reflects, to some extent, a pattern of discrimination that has constrained blacks’ labor market opportunities. However, the gaps between unemployment rates for whites and for blacks and Hispanics diminished in the 1990s, as shown in Figure 2 (c). In fact, unemployment rates for blacks and Hispanics were at the lowest levels for several decades in the mid-2000s before rising during the recent Great Recession.

Finally, those with less education typically suffer higher unemployment. In February 2015, for example, the unemployment rate for those with a college degree was 2.7%; for those with some college but not a four year degree, the unemployment rate was 5.1%; for high school graduates with no additional degree, the unemployment rate was 5.4%; and for those without a high school diploma, the unemployment rate was 8.4%. This pattern may arise because additional education offers better connections to the labor market and higher demand, or it may occur because the labor market opportunities for low-skilled workers are less attractive than the opportunities for the more highly-skilled. Because of lower pay, low-skilled workers may be less motivated to find jobs.

Breaking Down Unemployment in Other Ways

The Bureau of Labor Statistics also gives information about the reasons for being unemployed as well as the length of time individuals have been unemployed. Table 1, for example, shows the four reasons for being unemployed and the percentages of the currently unemployed that fall into each category. Table 2 shows the length of unemployment. For both of these, the data is from February of 2015. (bls.gov)

Reason	Percentage
New Entrants	11.2%
Re-entrants	30.5%
Job Leavers	10.2%
Job Losers: Temporary	11.7%
Job Losers: Non Temporary	36.3%

Table 1: Reasons for Being Unemployed, February 2015

Length of Time	Percentage
Under 5 weeks	27.9%
5 to 14 weeks	25.6%
15 to 26 weeks	15.4%
Over 27 weeks	31.1%

Table 2: Length of Unemployment, February 2015

Note

Watch this speech on the impact of droids on the labor market.

International Unemployment Comparisons

From an international perspective, the U.S. unemployment rate typically has looked a little better than average. Table 3 compares unemployment rates for 1991, 1996, 2001, 2006 (just before the recession), and 2012 (somewhat after the recession) from several other high-income countries.

Country	1991	1996	2001	2006	2012
United States	6.8%	5.4%	4.8%	4.4%	8.1%
Canada	9.8%	8.8%	6.4%	6.2%	6.3%
Japan	2.1%	3.4%	5.1%	4.5%	3.9%
France	9.5%	12.5%	8.7%	10.1%	10.0%
Germany	5.6%	9.0%	8.9%	9.8%	5.5%
Italy	6.9%	11.7%	9.6%	7.8%	10.8%
Sweden	3.1%	9.9%	5.0%	5.2%	7.9%
United Kingdom	8.8%	8.1%	5.1%	5.5%	8.0%

Table 3: International Comparisons of Unemployment Rates

However, cross-country comparisons of unemployment rates need to be treated with care, because each country has slightly different survey tools for measuring unemployment and also different labor markets. For example, Japan's unemployment rates appear quite low, but Japan's economy has been mired in slow growth and recession since the late 1980s, and Japan's unemployment rate probably paints too rosy a picture of its labor market. In Japan, workers who lose their jobs are often quick to exit the labor force and not look for a new job, in which case they are not counted as unemployed. In addition, Japanese firms are often quite reluctant to fire workers, and so firms have substantial numbers of workers who are on reduced hours or officially employed, but doing very little. This Japanese pattern is perhaps best viewed as an unusual method for society to provide support for the unemployed, rather than a sign of a healthy economy.

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Comparing unemployment rates in the United States and other high-income economies with unemployment rates in Latin America, Africa, Eastern Europe, and Asia is very difficult. One reason is that the statistical agencies in many poorer countries lack the resources and technical capabilities of the U.S. Bureau of the Census. But a more difficult problem with international comparisons is that in many **low-income countries**, most workers are not involved in the labor market through an employer who pays them regularly. Instead, workers in these countries are engaged in short-term work, subsistence activities, and barter. Moreover, the effect of unemployment is very different in high-income and low-income countries. Unemployed workers in the developed economies have access to various government programs like unemployment insurance, welfare, and food stamps; such programs may barely exist in poorer countries. Although unemployment is a serious problem in many low-income countries, it manifests itself in a different way than in high-income countries.

Key Concepts and Summary

The U.S. unemployment rate rises during periods of recession and depression, but falls back to the range of 4% to 6% when the economy is strong. The unemployment rate never falls to zero. Despite enormous growth in the size of the U.S. population and labor force in the twentieth century, along with other major trends like globalization and new technology, the unemployment rate shows no long-term rising trend.

Unemployment rates differ by group: higher for African-Americans and Hispanics than for whites; higher for less educated than more educated; higher for the young than the middle-aged. Women's unemployment rates used to be higher than men's, but in recent years men's and women's unemployment rates have been very similar. In recent years, unemployment rates in the United States have compared favorably with unemployment rates in most other high-income economies.

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5.1.4: What Causes Changes in Unemployment over the Short Run

We have seen that unemployment varies across times and places. What causes changes in unemployment? There are different answers in the short run and in the long run. Let's look at the short run first.

Cyclical Unemployment

Let's make the plausible assumption that in the short run, from a few months to a few years, the quantity of hours that the average person is willing to work for a given wage does not change much, so the labor supply curve does not shift much. In addition, make the standard *ceteris paribus* assumption that there is no substantial short-term change in the age structure of the labor force, institutions and laws affecting the labor market, or other possibly relevant factors.

One primary determinant of the demand for labor from firms is how they perceive the state of the **macro economy**. If firms believe that business is expanding, then at any given wage they will desire to hire a greater quantity of labor, and the labor demand curve shifts to the right. Conversely, if firms perceive that the economy is slowing down or entering a recession, then they will wish to hire a lower quantity of labor at any given wage, and the labor demand curve will shift to the left. The variation in unemployment caused by the economy moving from expansion to recession or from recession to expansion (i.e. the business cycle) is known as **cyclical unemployment**.

From the standpoint of the supply-and-demand model of competitive and flexible labor markets, unemployment represents something of a puzzle. In a supply-and-demand model of a labor market, as illustrated in Figure 1, the **labor market** should move toward an equilibrium wage and quantity. At the equilibrium wage (W_e), the equilibrium quantity (Q_e) of labor supplied by workers should be equal to the quantity of labor demanded by employers.

The Unemployment and Equilibrium in the Labor Market

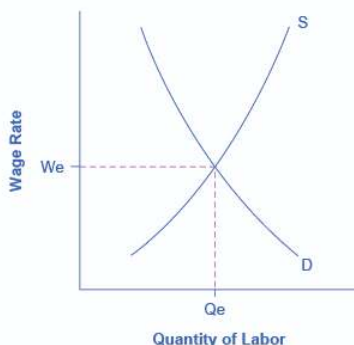


Figure 1: In a labor market with flexible wages, the equilibrium will occur at wage W_e and quantity Q_e , where the number of people looking for jobs (shown by S) equals the number of jobs available (shown by D).

One possibility for unemployment is that people who are unemployed are those who are not willing to work at the current equilibrium wage, say \$10 an hour, but would be willing to work at a higher wage, like \$20 per hour. The monthly Current Population Survey would count these people as unemployed, because they say they are ready and looking for work (at \$20 per hour). But from an economist's point of view, these people are choosing to be unemployed.

Probably a few people are unemployed because of unrealistic expectations about wages, but they do not represent the majority of the unemployed. Instead, unemployed people often have friends or acquaintances of similar skill levels who are employed, and the unemployed would be willing to work at the jobs and wages similar to what is being received by those people. But the employers of their friends and acquaintances do not seem to be hiring. In other words, these people are involuntarily unemployed. What causes **involuntary unemployment**?

Why Wages Might Be Sticky Downward

If a labor market model with flexible wages does not describe unemployment very well—because it predicts that anyone willing to work at the going wage can always find a job—then it may prove useful to consider economic models in which wages are not flexible or adjust only very slowly. In particular, even though wage increases may occur with relative ease, wage decreases are few and far between.

One set of reasons why wages may be “sticky downward,” as economists put it, involves economic laws and institutions. For low-skilled workers being paid the **minimum wage**, it is illegal to reduce their wages. For union workers operating under a multiyear contract with a company, wage cuts might violate the contract and create a labor dispute or a strike. However, minimum wages and union contracts are not a sufficient reason why wages would be sticky downward for the U.S. economy as a whole. After all, out of the 150 million or so workers in the U.S. economy, only about 1.4 million—less than 2% of the total—are paid the minimum wage. Similarly, only about 12% of American wage and salary workers are represented by a labor union. In other high-income countries, more workers may have their wages determined by unions or the minimum wage may be set at a level that applies to a larger share of workers. But for the United States, these two factors combined affect only about one-fifth or less of the labor force.

Economists looking for reasons why wages might be **sticky** downwards have focused on factors that may characterize most labor relationships in the economy, not just a few. A number of different theories have been proposed, but they share a common tone.

One argument is that even employees who are not union members often work under an **implicit contract**, which is that the employer will try to keep wages from falling when the economy is weak or the business is having trouble, and the employee will not expect huge salary increases when the economy or the business is strong. This wage-setting behavior acts like a form of insurance: the employee has some protection against wage declines in bad times, but pays for that protection with lower wages in good times. Clearly, this sort of implicit contract means that firms will be hesitant to cut wages, lest workers feel betrayed and work less hard or even leave the firm.

Efficiency wage theory argues that the productivity of workers depends on their pay, and so employers will often find it worthwhile to pay their employees somewhat more than market conditions might dictate. One reason is that employees who are paid better than others will be more productive because they recognize that if they were to lose their current jobs, they would suffer a decline in salary. As a result, they are motivated to work harder and to stay with the current employer. In addition, employers know that it is costly and time-consuming to hire and train new employees, so they would prefer to pay workers a little extra now rather than to lose them and have to hire and train new workers. Thus, by avoiding wage cuts, the employer minimizes costs of training and hiring new workers, and reaps the benefits of well-motivated employees.

The **adverse selection of wage cuts argument** points out that if an employer reacts to poor business conditions by reducing wages for all workers, then the best workers, those with the best employment alternatives at other firms, are the most likely to leave. The least attractive workers, with fewer employment alternatives, are more likely to stay. Consequently, firms are more likely to choose which workers should depart, through layoffs and firings, rather than trimming wages across the board. Sometimes companies that are going through tough times can persuade workers to take a pay cut for the short term, and still retain most of the firm’s workers. But these stories are notable because they are so uncommon. It is far more typical for companies to lay off some workers, rather than to cut wages for everyone.

The **insider-outsider model** of the labor force, in simple terms, argues that those already working for firms are “insiders,” while new employees, at least for a time, are “outsiders.” A firm depends on its insiders to grease the wheels of the organization, to be familiar with routine procedures, to train new employees, and so on. However, cutting wages will alienate the insiders and damage the firm’s productivity and prospects.

Finally, the **relative wage coordination argument** points out that even if most workers were hypothetically willing to see a decline in their own wages in bad economic times as long as everyone else also experiences such a decline, there is no obvious way for a decentralized economy to implement such a plan. Instead, workers confronted with the possibility of a wage cut will worry that other workers will not have such a wage cut, and so a wage cut means being worse off both in absolute terms and relative to others. As a result, workers fight hard against wage cuts.

These theories of why wages tend not to move downward differ in their logic and their implications, and figuring out the strengths and weaknesses of each theory is an ongoing subject of research and controversy among economists. All tend to imply that wages will decline only very slowly, if at all, even when the economy or a business is having tough times. When wages are inflexible and unlikely to fall, then either short-run or long-run unemployment can result. This can be seen in Figure 2.

Sticky Wages in the Labor Market

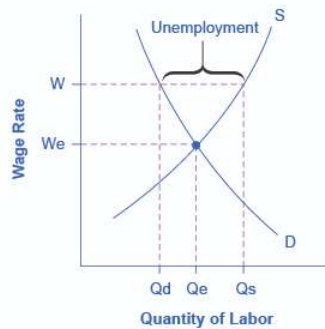


Figure 2: Because the wage rate is stuck at W , above the equilibrium, the number of job seekers (Q_s) is greater than the number of job openings (Q_d). The result is unemployment, shown by the bracket in the figure.

The interaction between shifts in labor demand and wages that are sticky downward are shown in Figure 3. Figure 3 (a) illustrates the situation in which the demand for labor shifts to the right from D_0 to D_1 . In this case, the equilibrium wage rises from W_0 to W_1 and the equilibrium quantity of labor hired increases from Q_0 to Q_1 . It does not hurt employee morale at all for wages to rise.

Figure 3 (b) shows the situation in which the demand for labor shifts to the left, from D_0 to D_1 , as it would tend to do in a recession. Because wages are sticky downward, they do not adjust toward what would have been the new equilibrium wage (Q_1), at least not in the short run. Instead, after the shift in the labor demand curve, the same quantity of workers is willing to work at that wage as before; however, the quantity of workers demanded at that wage has declined from the original equilibrium (Q_0) to Q_2 . The gap between the original equilibrium quantity (Q_0) and the new quantity demanded of labor (Q_2) represents workers who would be willing to work at the going wage but cannot find jobs. The gap represents the economic meaning of unemployment.

Rising Wage and Low Unemployment: Where Is the Unemployment in Supply and Demand?

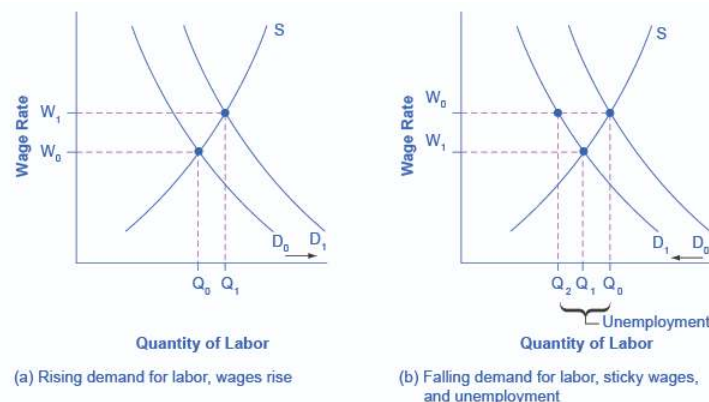


Figure 3: (a) In a labor market where wages are able to rise, an increase in the demand for labor from D_0 to D_1 leads to an increase in equilibrium quantity of labor hired from Q_0 to Q_1 and a rise in the equilibrium wage from W_0 to W_1 . (b) In a labor market where wages do not decline, a fall in the demand for labor from D_0 to D_1 leads to a decline in the quantity of labor demanded at the original wage (W_0) from Q_0 to Q_2 . These workers will want to work at the prevailing wage (W_0), but will not be able to find jobs.

This analysis helps to explain the connection noted earlier: that unemployment tends to rise in recessions and to decline during expansions. The overall state of the economy shifts the labor demand curve and, combined with wages that are sticky downwards, unemployment changes. The rise in unemployment that occurs because of a recession is cyclical unemployment.

Note

The St. Louis Federal Reserve Bank is the best resource for macroeconomic time series data, known as the Federal Reserve Economic Data (FRED). FRED provides complete data sets on various measures of the unemployment rate as well as the monthly Bureau of Labor Statistics report on the results of the household and employment surveys.

Key Concepts and Summary

Cyclical unemployment rises and falls with the business cycle. In a labor market with flexible wages, wages will adjust in such a market so that quantity demanded of labor always equals the quantity supplied of labor at the equilibrium wage. Many theories have been proposed for why wages might not be flexible, but instead may adjust only in a “sticky” way, especially when it comes to downward adjustments: implicit contracts, efficiency wage theory, adverse selection of wage cuts, insider-outsider model, and relative wage coordination.

Glossary

adverse selection of wage cuts argument

if employers reduce wages for all workers, the best will leave

cyclical unemployment

unemployment closely tied to the business cycle, like higher unemployment during a recession

efficiency wage theory

the theory that the productivity of workers, either individually or as a group, will increase if they are paid more

implicit contract

an unwritten agreement in the labor market that the employer will try to keep wages from falling when the economy is weak or the business is having trouble, and the employee will not expect huge salary increases when the economy or the business is strong

insider-outsider model

those already working for the firm are “insiders” who know the procedures; the other workers are “outsiders” who are recent or prospective hires

relative wage coordination argument

across-the-board wage cuts are hard for an economy to implement, and workers fight against them

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5.1.5: What Causes Changes in Unemployment over the Long Run

Cyclical unemployment explains why unemployment rises during a recession and falls during an economic expansion. But what explains the remaining level of unemployment even in good economic times? Why is the unemployment rate never zero? Even when the U.S. economy is growing strongly, the unemployment rate only rarely dips as low as 4%. Moreover, the discussion earlier in this chapter pointed out that unemployment rates in many European countries like Italy, France, and Germany have often been remarkably high at various times in the last few decades. Why does some level of unemployment persist even when economies are growing strongly? Why are unemployment rates continually higher in certain economies, through good economic years and bad? Economists have a term to describe the remaining level of unemployment that occurs even when the economy is healthy: it is called the **natural rate of unemployment**.

The Long Run: The Natural Rate of Unemployment

The natural rate of unemployment is not “natural” in the sense that water freezes at 32 degrees Fahrenheit or boils at 212 degrees Fahrenheit. It is not a physical and unchanging law of nature. Instead, it is only the “natural” rate because it is the unemployment rate that would result from the combination of economic, social, and political factors that exist at a time—assuming the economy was neither booming nor in recession. These forces include the usual pattern of companies expanding and contracting their workforces in a dynamic economy, social and economic forces that affect the labor market, or public policies that affect either the eagerness of people to work or the willingness of businesses to hire. Let’s discuss these factors in more detail.

Frictional Unemployment

In a **market economy**, some companies are always going broke for a variety of reasons: old technology; poor management; good management that happened to make bad decisions; shifts in tastes of consumers so that less of the firm’s product is desired; a large customer who went broke; or tough domestic or foreign competitors. Conversely, other companies will be doing very well for just the opposite reasons and looking to hire more employees. In a perfect world, all of those who lost jobs would immediately find new ones. But in the real world, even if the number of job seekers is equal to the number of job vacancies, it takes time to find out about new jobs, to interview and figure out if the new job is a good match, or perhaps to sell a house and buy another in proximity to a new job. The unemployment that occurs in the meantime, as workers move between jobs, is called **frictional unemployment**. Frictional unemployment is not inherently a bad thing. It takes time on part of both the employer and the individual to match those looking for employment with the correct job openings. For individuals and companies to be successful and productive, you want people to find the job for which they are best suited, not just the first job offered.

In the mid-2000s, before the recession of 2008–2009, it was true that about 7% of U.S. workers saw their jobs disappear in any three-month period. But in periods of economic growth, these destroyed jobs are counterbalanced for the economy as a whole by a larger number of jobs created. In 2005, for example, there were typically about 7.5 million unemployed people at any given time in the U.S. economy. Even though about two-thirds of those unemployed people found a job in 14 weeks or fewer, the unemployment rate did not change much during the year, because those who found new jobs were largely offset by others who lost jobs.

Of course, it would be preferable if people who were losing jobs could immediately and easily move into the new jobs being created, but in the real world, that is not possible. Someone who is laid off by a textile mill in South Carolina cannot turn around and immediately start working for a textile mill in California. Instead, the adjustment process happens in ripples. Some people find new jobs near their old ones, while others find that they must move to new locations. Some people can do a very similar job with a different company, while others must start new career paths. Some people may be near retirement and decide to look only for part-time work, while others want an employer that offers a long-term career path. The frictional unemployment that results from people moving between jobs in a dynamic economy may account for one to two percentage points of total unemployment.

The level of frictional unemployment will depend on how easy it is for workers to learn about alternative jobs, which may reflect the ease of communications about job prospects in the economy. The extent of frictional unemployment will also depend to some extent on how willing people are to move to new areas to find jobs—which in turn may depend on history and culture.

Frictional unemployment and the natural rate of unemployment also seem to depend on the age distribution of the population. Figure 8.2.2 (b) showed that unemployment rates are typically lower for people between 25–54 years of age than they are for those who are either younger or older. “Prime-age workers,” as those in the 25–54 age bracket are sometimes called, are typically at a

place in their lives when they want to have a job and income arriving at all times. But some proportion of those who are under 30 may still be trying out jobs and life options and some proportion of those over 55 are eyeing retirement. In both cases, the relatively young or old tend to worry less about unemployment than those in-between, and their periods of frictional unemployment may be longer as a result. Thus, a society with a relatively high proportion of relatively young or old workers will tend to have a higher unemployment rate than a society with a higher proportion of its workers in middle age.

Structural Unemployment

Another factor that influences the natural rate of unemployment is the amount of **structural unemployment**. The structurally unemployed are individuals who have no jobs because they lack skills valued by the labor market, either because demand has shifted away from the skills they do have, or because they never learned any skills. An example of the former would be the unemployment among aerospace engineers after the U.S. space program downsized in the 1970s. An example of the latter would be high school dropouts.

Some people worry that technology causes structural unemployment. In the past, new technologies have put lower skilled employees out of work, but at the same time they create demand for higher skilled workers to use the new technologies. Education seems to be the key in minimizing the amount of structural unemployment. Individuals who have degrees can be retrained if they become structurally unemployed. For people with no skills and little education, that option is more limited.

Natural Unemployment and Potential Real GDP

The natural unemployment rate is related to two other important concepts: full employment and potential real GDP. The economy is considered to be at full employment when the actual unemployment rate is equal to the natural unemployment rate. When the economy is at full employment, real GDP is equal to potential real GDP. By contrast, when the economy is below full employment, the unemployment rate is greater than the natural unemployment rate and real GDP is less than potential. Finally, when the economy is above full employment, then the unemployment rate is less than the natural unemployment rate and real GDP is greater than potential. Operating above potential is only possible for a short while, since it is analogous to all workers working overtime.

Productivity Shifts and the Natural Rate of Unemployment

Unexpected shifts in productivity can have a powerful effect on the natural rate of unemployment. Over time, the level of wages in an economy will be determined by the productivity of workers. After all, if a business paid workers more than could be justified by their productivity, the business will ultimately lose money and go bankrupt. Conversely, if a business tries to pay workers less than their productivity then, in a competitive labor market, other businesses will find it worthwhile to hire away those workers and pay them more.

However, adjustments of wages to productivity levels will not happen quickly or smoothly. **Wages** are typically reviewed only once or twice a year. In many modern jobs, it is difficult to measure productivity at the individual level. For example, how precisely would one measure the quantity produced by an accountant who is one of many people working in the tax department of a large corporation? Because productivity is difficult to observe, wage increases are often determined based on recent experience with productivity; if productivity has been rising at, say, 2% per year, then wages rise at that level as well. However, when productivity changes unexpectedly, it can affect the natural rate of unemployment for a time.

The U.S. economy in the 1970s and 1990s provides two vivid examples of this process. In the 1970s, productivity growth slowed down unexpectedly (as discussed in Economic Growth). For example, output per hour of U.S. workers in the business sector increased at an annual rate of 3.3% per year from 1960 to 1973, but only 0.8% from 1973 to 1982. Figure 1 (a) illustrates the situation where the demand for labor—that is, the quantity of labor that business is willing to hire at any given wage—has been shifting out a little each year because of rising productivity, from D_0 to D_1 to D_2 . As a result, equilibrium wages have been rising each year from W_0 to W_1 to W_2 . But when productivity unexpectedly slows down, the pattern of wage increases does not adjust right away. Wages keep rising each year from W_2 to W_3 to W_4 . But the demand for labor is no longer shifting up. A gap opens where the quantity of labor supplied at wage level W_4 is greater than the quantity demanded. The natural rate of unemployment rises; indeed, in the aftermath of this unexpectedly low productivity in the 1970s, the national unemployment rate did not fall below 7% from May, 1980 until 1986. Over time, the rise in wages will adjust to match the slower gains in productivity, and the unemployment rate will ease back down. But this process may take years.

Unexpected Productivity Changes and Unemployment

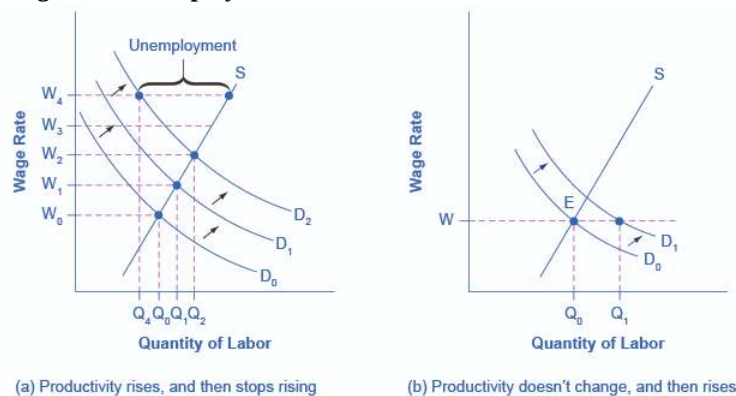


Figure 1: (a) Productivity is rising, increasing the demand for labor. Employers and workers become used to the pattern of wage increases. Then productivity suddenly stops increasing. However, the expectations of employers and workers for wage increases do not shift immediately, so wages keep rising as before. But the demand for labor has not increased, so at wage W_4 , unemployment exists where the quantity supplied of labor exceeds the quantity demanded. (b) The rate of productivity increase has been zero for a time, so employers and workers have come to accept the equilibrium wage level (W). Then productivity increases unexpectedly, shifting demand for labor from D_0 to D_1 . At the wage (W), this means that the quantity demanded of labor exceeds the quantity supplied, and with job offers plentiful, the unemployment rate will be low.

The late 1990s provide an opposite example: instead of the surprise decline in productivity in the 1970s, productivity unexpectedly rose in the mid-1990s. The annual growth rate of real output per hour of labor increased from 1.7% from 1980–1995, to an annual rate of 2.6% from 1995–2001. Let's simplify the situation a bit, so that the economic lesson of the story is easier to see graphically, and say that productivity had not been increasing at all in earlier years, so the intersection of the labor market was at point E in Figure 1 (b), where the demand curve for labor (D_0) intersects the supply curve for labor. As a result, real wages were not increasing. Now, productivity jumps upward, which shifts the demand for labor out to the right, from D_0 to D_1 . At least for a time, however, wages are still being set according to the earlier expectations of no productivity growth, so wages do not rise. The result is that at the prevailing wage level (W), the quantity of labor demanded (Q_d) will for a time exceed the quantity of labor supplied (Q_s), and unemployment will be very low—actually below the natural level of unemployment for a time. This pattern of unexpectedly high productivity helps to explain why the unemployment rate stayed below 4.5%—quite a low level by historical standards—from 1998 until after the U.S. economy had entered a recession in 2001.

Average levels of unemployment will tend to be somewhat higher on average when productivity is unexpectedly low, and conversely, will tend to be somewhat lower on average when productivity is unexpectedly high. But over time, wages do eventually adjust to reflect productivity levels.

Public Policy and the Natural Rate of Unemployment

Public policy can also have a powerful effect on the natural rate of unemployment. On the supply side of the labor market, public policies to assist the unemployed can affect how eager people are to find work. For example, if a worker who loses a job is guaranteed a generous package of unemployment insurance, welfare benefits, food stamps, and government medical benefits, then the opportunity cost of being unemployed is lower and that worker will be less eager to seek a new job.

What seems to matter most is not just the amount of these benefits, but how long they last. A society that provides generous help for the unemployed that cuts off after, say, six months, may provide less of an incentive for unemployment than a society that provides less generous help that lasts for several years. Conversely, government assistance for job search or retraining can in some cases encourage people back to work sooner. See the Clear it Up to learn how the U.S. handles unemployment insurance.

Note: How Does U.S. Unemployment Insurance Work?

Unemployment insurance is a joint federal–state program, established by federal law in 1935. The federal government sets minimum standards for the program, but most of the administration is done by state governments.

The funding for the program is a federal tax collected from employers. The federal government requires that the tax be collected on the first \$7,000 in wages paid to each worker; however, states can choose to collect the tax on a higher amount if

they wish, and 41 states have set a higher limit. States can choose the length of time that benefits will be paid, although most states limit unemployment benefits to 26 weeks—with extensions possible in times of especially high unemployment. The fund is then used to pay benefits to those who become unemployed. Average unemployment benefits are equal to about one-third of the wage earned by the person in his or her previous job, but the level of unemployment benefits varies considerably across states.

Bottom 10 States That Pay the Lowest Benefit per Week		Top 10 States That Pay the Highest Benefit per Week	
Delaware	\$330	Massachusetts	\$674
Georgia	\$330	Minnesota	\$629
South Carolina	\$326	New Jersey	\$624
Missouri	\$320	Washington	\$624
Florida	\$275	Connecticut	\$590
Tennessee	\$275	Pennsylvania	\$573
Alabama	\$265	Rhode Island	\$566
Louisiana	\$247	Ohio	\$564
Arizona	\$240	Hawaii	\$560
Mississippi	\$235	Oregon	\$538

Table 1: Maximum Weekly Unemployment Benefits by State in 2014(Source: jobsearch.about.com/od/unempl...state-2014.htm)

One other interesting thing to note about the classifications of unemployment—an individual does not have to collect unemployment benefits to be classified as unemployed. While there are statistics kept and studied relating to how many people are collecting unemployment insurance, this is not the source of unemployment rate information.

Note

View this article for an explanation of exactly who is eligible for unemployment benefits.

On the demand side of the labor market, government rules social institutions, and the presence of unions can affect the willingness of firms to hire. For example, if a government makes it hard for businesses to start up or to expand, by wrapping new businesses in bureaucratic red tape, then businesses will become more discouraged about hiring. Government regulations can make it harder to start a business by requiring that a new business obtain many permits and pay many fees, or by restricting the types and quality of products that can be sold. Other government regulations, like zoning laws, may limit where business can be done, or whether businesses are allowed to be open during evenings or on Sunday.

Whatever defenses may be offered for such laws in terms of social value—like the value some Christians place on not working on Sunday—these kinds of restrictions impose a barrier between some willing workers and other willing employers, and thus contribute to a higher natural rate of unemployment. Similarly, if government makes it difficult to fire or lay off workers, businesses may react by trying not to hire more workers than strictly necessary—since laying these workers off would be costly and difficult. High minimum wages may discourage businesses from hiring low-skill workers. Government rules may encourage and support powerful unions, which can then push up wages for union workers, but at a cost of discouraging businesses from hiring those workers.

The Natural Rate of Unemployment in Recent Years

The underlying economic, social, and political factors that determine the natural rate of unemployment can change over time, which means that the natural rate of unemployment can change over time, too.

Estimates by economists of the natural rate of unemployment in the U.S. economy in the early 2000s run at about 4.5 to 5.5%. This is a lower estimate than earlier. Three of the common reasons proposed by economists for this change are outlined below.

1. The Internet has provided a remarkable new tool through which job seekers can find out about jobs at different companies and can make contact with relative ease. An Internet search is far easier than trying to find a list of local employers and then hunting up phone numbers for all of their human resources departments, requesting a list of jobs and application forms, and so on. Social networking sites such as LinkedIn have changed how people find work as well.
2. The growth of the temporary worker industry has probably helped to reduce the natural rate of unemployment. In the early 1980s, only about 0.5% of all workers held jobs through temp agencies; by the early 2000s, the figure had risen above 2%. Temp agencies can provide jobs for workers while they are looking for permanent work. They can also serve as a clearinghouse, helping workers find out about jobs with certain employers and getting a tryout with the employer. For many workers, a temp job is a stepping-stone to a permanent job that they might not have heard about or gotten any other way, so the growth of temp jobs will also tend to reduce frictional unemployment.
3. The aging of the “baby boom generation”—the especially large generation of Americans born between 1946 and 1963—meant that the proportion of young workers in the economy was relatively high in the 1970s, as the boomers entered the labor market, but is relatively low today. As noted earlier, middle-aged workers are far more likely to keep steady jobs than younger workers, a factor that tends to reduce the natural rate of unemployment.

The combined result of these factors is that the natural rate of unemployment was on average lower in the 1990s and the early 2000s than in the 1980s. The Great Recession of 2008–2009 pushed monthly unemployment rates above 10% in late 2009. But even at that time, the Congressional Budget Office was forecasting that by 2015, unemployment rates would fall back to about 5%—lower than it currently is, though not by much. As of early 2015, policymakers still think that unemployment has not yet reached its natural rate.

The Natural Rate of Unemployment in Europe

By the standards of other high-income economies, the natural rate of unemployment in the U.S. economy appears relatively low. Through good economic years and bad, many European economies have had unemployment rates hovering near 10%, or even higher, since the 1970s. European rates of unemployment have been higher not because recessions in Europe have been deeper, but rather because the conditions underlying supply and demand for labor have been different in Europe, in a way that has created a much higher natural rate of unemployment.

Many European countries have a combination of generous welfare and unemployment benefits, together with nests of rules that impose additional costs on businesses when they hire. In addition, many countries have laws that require firms to give workers months of notice before laying them off and to provide substantial severance or retraining packages after laying them off. The legally required notice before laying off a worker can be more than three months in Spain, Germany, Denmark, and Belgium, and the legally required severance package can be as high as a year’s salary or more in Austria, Spain, Portugal, Italy, and Greece. Such laws will surely discourage laying off or firing current workers. But when companies know that it will be difficult to fire or lay off workers, they also become hesitant about hiring in the first place.

The typically higher levels of unemployment in many European countries in recent years, which have prevailed even when economies are growing at a solid pace, are attributable to the fact that the sorts of laws and regulations that lead to a high natural rate of unemployment are much more prevalent in Europe than in the United States.

A Preview of Policies to Fight Unemployment

The Government Budgets and Fiscal Policy and Macroeconomic Policy Around the World chapters provide a detailed discussion of how to fight unemployment, when these policies can be discussed in the context of the full array of macroeconomic goals and frameworks for analysis. But even at this preliminary stage, it is useful to preview the main issues concerning policies to fight unemployment.

The remedy for unemployment will depend on the diagnosis. Cyclical unemployment is a short-term problem, caused because the economy is in a recession. Thus, the preferred solution will be to avoid or minimize recessions. As Government Budgets and Fiscal Policy discusses, this policy can be enacted by stimulating the overall buying power in the economy, so that firms perceive that sales and profits are possible, which makes them eager to hire.

Dealing with the natural rate of unemployment is trickier. There is not much to be done about the fact that in a market-oriented economy, firms will hire and fire workers. Nor is there much to be done about how the evolving age structure of the economy, or unexpected shifts in productivity, will affect the natural rate of unemployment for a time. However, as the example of high ongoing unemployment rates for many European countries illustrates, government policy clearly can affect the natural rate of unemployment that will persist even when GDP is growing.

When a government enacts policies that will affect workers or employers, it must examine how these policies will affect the information and incentives employees and employers have to seek each other out. For example, the government may have a role to play in helping some of the unemployed with job searches. The design of government programs that offer assistance to unemployed workers and protections to employed workers may need to be rethought so that they will not unduly discourage the supply of labor. Similarly, rules that make it difficult for businesses to begin or to expand may need to be redesigned so that they will not unduly discourage the demand for labor. The message is not that all laws affecting labor markets should be repealed, but only that when such laws are enacted, a society that cares about unemployment will need to consider the tradeoffs involved.

Note: The Mysterious Case of the Missing Candidates

After reading the chapter you might think the current unemployment conundrum may be due to structural unemployment. Indeed, there is a mismatch between the skills employers are seeking and the skills the unemployed possess. But Peter Cappelli has a slightly different view on this—it is called the purple squirrel. The what?

In human resource parlance, a purple squirrel is a job candidate who is a perfect fit for all of the many different responsibilities of a position. A purple squirrel candidate could step into a multi-faceted position with no training and permit the firm to higher fewer people because the worker is so versatile. During the Great Recession, Human Resources (HR) positions were reduced. This means today's hiring managers are drafting job descriptions and requirements without much, if any HR feedback. "It turns out it's typically the case that employers' requirements are crazy, they're not paying enough, or their applicant screening is so rigid that nobody gets through," Cappelli stated in a 2012 Knowledge@Wharton interview about the findings in his book, *Why Good People Can't Find Jobs: Chasing After the Purple Squirrel*. In short, managers are searching for "purple squirrels" when what they really need are just versatile workers. There really is not a shortage of "normal squirrels"—candidates who are versatile workers. The managers just cannot find them because their requirements, screening processes, and compensation will filter out all but the "purple" ones.

Key Concepts and Summary

The natural rate of unemployment is the rate of unemployment that would be caused by the economic, social, and political forces in the economy even when the economy is not in a recession. These factors include the frictional unemployment that occurs when people are put out of work for a time by the shifts of a dynamic and changing economy and any laws concerning conditions of hiring and firing have the undesired side effect of discouraging job formation. They also include structural unemployment, which occurs when demand shifts permanently away from a certain type of job skill.

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Glossary

frictional unemployment

unemployment that occurs as workers move between jobs

natural rate of unemployment

the unemployment rate that would exist in a growing and healthy economy from the combination of economic, social, and political factors that exist at a given time

structural unemployment

unemployment that occurs because individuals lack skills valued by employers

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SECTION OVERVIEW

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5.2.2: Tracking Inflation

5.2.3: How Changes in the Cost of Living are Measured

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5.2.1: Introduction to Inflation

Big Bucks in Zimbabwe



Figure 1: This bill was worth 100 billion Zimbabwean dollars when issued in 2008. There were even bills issued with a face value of 100 trillion Zimbabwean dollars. The bills had \$100,000,000,000,000 written on them. Unfortunately, they were almost worthless. At one point, 621,984,228 Zimbabwean dollars were equal to one U.S. dollar. Eventually, the country abandoned its own currency and allowed foreign currency to be used for purchases. (Credit: modification of work by Samantha Marx/Flickr Creative Commons)

Note: A \$550 Million Loaf of Bread?

If you were born within the last three decades in the United States, Canada, or many other countries in the developed world, you probably have no real experience with a high rate of inflation. Inflation is when most prices in an entire economy are rising. But there is an extreme form of inflation called hyperinflation. This occurred in Germany between 1921 and 1928, and more recently in Zimbabwe between 2008 and 2009. In November of 2008, Zimbabwe had an inflation rate of 79.6 billion percent. In contrast, in 2014, the United States had an average annual rate of inflation of 1.6%.

Zimbabwe's inflation rate was so high it is difficult to comprehend. So, let's put it into context. It is equivalent to price increases of 98% per day. This means that, from one day to the next, prices essentially double. What is life like in an economy afflicted with hyperinflation? Not like anything you are familiar with. Prices for commodities in Zimbabwean dollars were adjusted several times *each day*. There was no desire to hold on to currency since it lost value by the minute. The people there spent a great deal of time getting rid of any cash they acquired by purchasing whatever food or other commodities they could find. At one point, a loaf of bread cost 550 million Zimbabwean dollars. Teachers were paid in the trillions a month; however this was equivalent to only one U.S. dollar a day. At its height, it took 621,984,228 Zimbabwean dollars to purchase one U.S. dollar.

Government agencies had no money to pay their workers so they started printing money to pay their bills rather than raising taxes. Rising prices caused the government to enact price controls on private businesses, which led to shortages and the emergence of black markets. In 2009, the country abandoned its currency and allowed foreign currencies to be used for purchases.

How does this happen? How can both government and the economy fail to function at the most basic level? Before we consider these extreme cases of hyperinflation, let's first look at inflation itself.

Note

In this chapter, you will learn about:

- Tracking Inflation
- How Changes in the Cost of Living are Measured
- How the U.S. and Other Countries Experience Inflation

- The Confusion Over Inflation
- Indexing and Its Limitations

Inflation is a general and ongoing rise in the level of prices in an entire economy. Inflation does not refer to a change in relative prices. A relative price change occurs when you see that the price of tuition has risen, but the price of laptops has fallen. Inflation, on the other hand, means that there is pressure for prices to rise in most markets in the economy. In addition, price increases in the supply-and-demand model were one-time events, representing a shift from a previous equilibrium to a new one. Inflation implies an ongoing rise in prices. If inflation happened for one year and then stopped—well, then it would not be inflation any more.

This chapter begins by showing how to combine prices of individual goods and services to create a measure of overall inflation. It discusses the historical and recent experience of inflation, both in the United States and in other countries around the world. Other chapters have sometimes included a note under an exhibit or a parenthetical reminder in the text saying that the numbers have been adjusted for inflation. In this chapter, it is time to show how to use inflation statistics to adjust other economic variables, so that you can tell how much of, say, the rise in GDP over different periods of time can be attributed to an actual increase in the production of goods and services and how much should be attributed to the fact that prices for most things have risen.

Inflation has consequences for people and firms throughout the economy, in their roles as lenders and borrowers, wage-earners, taxpayers, and consumers. The chapter concludes with a discussion of some imperfections and biases in the inflation statistics, and a preview of policies for fighting inflation that will be discussed in other chapters.

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5.2.2: Tracking Inflation

Dinner table conversations where you might have heard about inflation usually entail reminiscing about when “everything seemed to cost so much less. You used to be able to buy three gallons of gasoline for a dollar and then go see an afternoon movie for another dollar.” Table 1 compares some prices of common goods in 1970 and 2014. Of course, the average prices shown in this table may not reflect the prices where you live. The cost of living in New York City is much higher than in Houston, Texas, for example. In addition, certain products have evolved over recent decades. A new car in 2014, loaded with antipollution equipment, safety gear, computerized engine controls, and many other technological advances, is a more advanced machine (and more fuel efficient) than your typical 1970s car. However, put details like these to one side for the moment, and look at the overall pattern. The primary reason behind the price rises in Table 1—and all the price increases for the other products in the economy—is not specific to the market for housing or cars or gasoline or movie tickets. Instead, it is part of a general rise in the level of all prices. In 2014, \$1 had about the same purchasing power in overall terms of goods and services as 18 cents did in 1972, because of the amount of inflation that has occurred over that time period.

Table 1: Price Comparisons, 1970 and 2014(Sources: See chapter References at end of book.)

Items	1970	
Pound of ground beef	\$0.66	\$0.66
Pound of butter	\$0.87	\$0.87
Movie ticket	\$1.55	\$1.55
Sales price of new home (median)	\$22,000	\$22,000
New car	\$3,000	\$3,000
Gallon of gasoline	\$0.36	\$0.36
Average hourly wage for a manufacturing worker	\$3.23	\$3.23
Per capita GDP	\$5,069	\$5,069

Moreover, the power of inflation does not affect just goods and services, but **wages** and income levels, too. The second-to-last row of Table 1 shows that the average hourly wage for a manufacturing worker increased nearly six-fold from 1970 to 2014. Sure, the average worker in 2014 is better educated and more productive than the average worker in 1970—but not six times more productive. Sure, **per capita GDP** increased substantially from 1970 to 2014, but is the average person in the U.S. economy really more than eight times better off in just 44 years? Not likely.

A modern economy has millions of goods and services whose prices are continually quivering in the breezes of supply and demand. How can all of these shifts in price be boiled down to a single inflation rate? As with many problems in economic measurement, the conceptual answer is reasonably straightforward: Prices of a variety of goods and services are combined into a single price level; the inflation rate is simply the percentage change in the price level. Applying the concept, however, involves some practical difficulties.

The Price of a Basket of Goods

To calculate the **price level**, economists begin with the concept of a **basket of goods and services**, consisting of the different items individuals, businesses, or organizations typically buy. The next step is to look at how the prices of those items change over time. In thinking about how to combine individual prices into an overall price level, many people find that their first impulse is to calculate the average of the prices. Such a calculation, however, could easily be misleading because some products matter more than others.

Changes in the prices of goods for which people spend a larger share of their incomes will matter more than changes in the prices of goods for which people spend a smaller share of their incomes. For example, an increase of 10% in the rental rate on housing matters more to most people than whether the price of carrots rises by 10%. To construct an overall measure of the price level, economists compute a weighted average of the prices of the items in the basket, where the weights are based on the actual quantities of goods and services people buy. The following Work It Out feature walks you through the steps of calculating the annual rate of inflation based on a few products.

Note: Calculating an Annual Rate of Inflation

Consider the simple basket of goods with only three items, represented in Table 2. Say that in any given month, a college student spends money on 20 hamburgers, one bottle of aspirin, and five movies. Prices for these items over four years are given in the table through each time period (Pd). Prices of some goods in the basket may rise while others fall. In this example, the price of aspirin does not change over the four years, while movies increase in price and hamburgers bounce up and down. Each year, the cost of buying the given basket of goods at the prices prevailing at that time is shown.

	Items		Hamburger		Aspirin		Movies		Total		Inflation Rate
	Qty	20	1 bottle	5	-	-	-	-			
	(Pd 1) Price	\$3.00	\$10.00	\$6.00	-	-	-	-			
	(Pd 1) Amount Spent	\$60.00	\$10.00	\$30.00	\$100.00	-	-	-			
	(Pd 2) Price	\$3.20	\$10.00	\$6.50	-	-	-	-			
	(Pd 2) Amount Spent	\$64.00	\$10.00	\$32.50	\$106.50	6.5%	-	-			
	(Pd 3) Price	\$3.10	\$10.00	\$7.00	-	-	-	-			
	(Pd 3) Amount Spent	\$62.00	\$10.00	\$35.00	\$107.00	0.5%	-	-			
	(Pd 4) Price	\$3.50	\$10.00	\$7.50	-	-	-	-			
	(Pd 4) Amount Spent	\$70.00	\$10.00	\$37.50	\$117.50	9.8%	-	-			

Table 2: A College Student's Basket of Goods

To calculate the annual rate of inflation in this example:

Step 1. Find the **percentage change** in the cost of purchasing the overall basket of goods between the time periods. The general equation for percentage changes between two years, whether in the context of inflation or in any other calculation, is:

$$\frac{(\text{Level in new year} - \text{Level in previous year})}{\text{Level in previous year}} = \text{Percentage change} \quad (5.2.2.1)$$

Step 2. From period 1 to period 2, the total cost of purchasing the basket of goods in Table 2 rises from \$100 to \$106.50. Therefore, the percentage change over this time—the inflation rate—is:

$$\frac{(106.50 - 100)}{100.0} = 0.065 = 6.5\% \quad (5.2.2.2)$$

Step 3. From period 2 to period 3, the overall change in the cost of purchasing the basket rises from \$106.50 to \$107. Thus, the inflation rate over this time, again calculated by the percentage change, is approximately:

$$\frac{(107 - 106.50)}{106.50} = 0.0047 = .47\% \quad (5.2.2.3)$$

Step 4. From period 3 to period 4, the overall cost rises from \$107 to \$117.50. The inflation rate is thus:

$$\frac{(117.50 - 107)}{107} = 0.098 = 9.8\% \quad (5.2.2.4)$$

This calculation of the change in the total cost of purchasing a basket of goods takes into account how much is spent on each good. Hamburgers are the lowest-priced good in this example, and aspirin is the highest-priced. If an individual buys a greater quantity of a low-price good, then it makes sense that changes in the price of that good should have a larger impact on the buying power of that person's money. The larger impact of hamburgers shows up in the "amount spent" row, where, in all time periods, hamburgers are the largest item within the amount spent row.

Index Numbers

The numerical results of a calculation based on a basket of goods can get a little messy. The simplified example in Table 2 has only three goods and the prices are in even dollars, not numbers like 79 cents or \$124.99. If the list of products was much longer, and more realistic prices were used, the total quantity spent over a year might be some messy-looking number like \$17,147.51 or \$27,654.92.

To simplify the task of interpreting the price levels for more realistic and complex baskets of goods, the price level in each period is typically reported as an **index number**, rather than as the dollar amount for buying the basket of goods. Price indices are created to calculate an overall average change in relative prices over time. To convert the money spent on the basket to an index number, economists arbitrarily choose one year to be the base year, or starting point from which we measure changes in prices. The **base year**, by definition, has an index number equal to 100. This sounds complicated, but it is really a simple math trick. In the example above, say that time period 3 is chosen as the base year. Since the total amount of spending in that year is \$107, we divide that amount by itself (\$107) and multiply by 100. Mathematically, that is equivalent to dividing \$107 by 100, or \$1.07. Doing either will give us an index in the base year of 100. Again, this is because the index number in the base year *always* has to have a value of 100. Then, to figure out the values of the index number for the other years, we divide the dollar amounts for the other years by 1.07 as well. Note also that the dollar signs cancel out so that index numbers have no units.

Calculations for the other values of the index number, based on the example presented in Table 2 are shown in Table 3. Because the index numbers are calculated so that they are in exactly the same proportion as the total dollar cost of purchasing the basket of goods, the inflation rate can be calculated based on the index numbers, using the percentage change formula. So, the inflation rate from period 1 to period 2 would be

$$\frac{(99.5 - 93.4)}{93.4} = 0.065 = 6.5\% \quad (5.2.2.5)$$

This is the same answer that was derived when measuring inflation based on the dollar cost of the basket of goods for the same time period.

Table 3: Calculating Index Numbers When Period 3 is the Base Year

	Total Spending	Index Number	Inflation Rate Since Previous Period
Period 1	\$100	$\frac{100}{1.07} = 93.4$ (5.2.2.6)	
Period 2	\$106.50	$\frac{106.50}{1.07} = 99.5$ (5.2.2.7)	$\frac{(99.5 - 93.4)}{93.4} = 0.065 = 6.5\%$ (5.2.2.8)
Period 3	\$107	$\frac{107}{1.07} = 100.0$ (5.2.2.9)	$\frac{(100 - 99.5)}{99.5} = 0.005 = 0.5\%$ (5.2.2.10)
Period 4	\$117.50	$\frac{117.50}{1.07} = 109.8$ (5.2.2.11)	$\frac{(109.8 - 100)}{100} = 0.098 = 9.8\%$ (5.2.2.12)

If the inflation rate is the same whether it is based on dollar values or index numbers, then why bother with the index numbers? The advantage is that indexing allows easier eyeballing of the inflation numbers. If you glance at two index numbers like 107 and 110, you know automatically that the rate of inflation between the two years is about, but not quite exactly equal to, 3%. By contrast, imagine that the price levels were expressed in absolute dollars of a large basket of goods, so that when you looked at the data, the numbers were \$19,493.62 and \$20,009.32. Most people find it difficult to eyeball those kinds of numbers and say that it is a change of about 3%. However, the two numbers expressed in absolute dollars are exactly in the same proportion of 107 to 110 as the previous example. If you're wondering why simple subtraction of the index numbers wouldn't work, read the following Clear It Up feature.

Note: Why do You Not Just Subtract Index Numbers?

A word of warning: When a price index moves from, say, 107 to 110, the rate of inflation is not *exactly* 3%. Remember, the inflation rate is not derived by subtracting the index numbers, but rather through the percentage-change calculation. The precise inflation rate as the price index moves from 107 to 110 is calculated as $(110 - 107) / 107 = 0.028 = 2.8\%$. When the base year is fairly close to 100, a quick subtraction is not a terrible shortcut to calculating the inflation rate—but when precision matters down to tenths of a percent, subtracting will not give the right answer.

Two final points about index numbers are worth remembering. First, index numbers have no dollar signs or other units attached to them. Although index numbers can be used to calculate a percentage inflation rate, the index numbers themselves do not have percentage signs. Index numbers just mirror the proportions found in other data. They transform the other data so that the data are easier to work with.

Second, the choice of a base year for the index number—that is, the year that is automatically set equal to 100—is arbitrary. It is chosen as a starting point from which changes in prices are tracked. In the official inflation statistics, it is common to use one base year for a few years, and then to update it, so that the base year of 100 is relatively close to the present. But any base year that is chosen for the index numbers will result in exactly the same inflation rate. To see this in the previous example, imagine that period 1, when total spending was \$100, was also chosen as the base year, and given an index number of 100. At a glance, you can see that the index numbers would now exactly match the dollar figures, the inflation rate in the first period would be 6.5%, and so on.

Now that we see how indexes work to track inflation, the next module will show us how the cost of living is measured.



Watch this video from the cartoon *Duck Tales* to view a mini-lesson on inflation.

Key Concepts and Summary

The price level is measured by using a basket of goods and services and calculating how the total cost of buying that basket of goods will increase over time. The price level is often expressed in terms of index numbers, which transform the cost of buying the basket of goods and services into a series of numbers in the same proportion to each other, but with an arbitrary base year of 100. The rate of inflation is measured as the percentage change between price levels or index numbers over time.

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Glossary

base year

arbitrary year whose value as an index number is defined as 100; inflation from the base year to other years can easily be seen by comparing the index number in the other year to the index number in the base year—for example, 100; so, if the index number for a year is 105, then there has been exactly 5% inflation between that year and the base year

basket of goods and services

a hypothetical group of different items, with specified quantities of each one meant to represent a “typical” set of consumer purchases, used as a basis for calculating how the price level changes over time

index number

a unit-free number derived from the price level over a number of years, which makes computing inflation rates easier, since the index number has values around 100

inflation

a general and ongoing rise in the level of prices in an economy

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5.2.3: How Changes in the Cost of Living are Measured

The most commonly cited measure of inflation in the United States is the **Consumer Price Index (CPI)**. The CPI is calculated by government statisticians at the U.S. Bureau of Labor Statistics based on the prices in a fixed basket of goods and services that represents the purchases of the average family of four. In recent years, the statisticians have paid considerable attention to a subtle problem: that the change in the total cost of buying a fixed basket of goods and services over time is conceptually not quite the same as the change in the cost of living, because the **cost of living** represents how much it costs for a person to feel that his or her consumption provides an equal level of satisfaction or utility.

To understand the distinction, imagine that over the past 10 years, the cost of purchasing a fixed basket of goods increased by 25% and your salary also increased by 25%. Has your personal standard of living held constant? If you do not necessarily purchase an identical fixed basket of goods every year, then an inflation calculation based on the cost of a fixed basket of goods may be a misleading measure of how your cost of living has changed. Two problems arise here: substitution bias and quality/new goods bias.

When the price of a good rises, consumers tend to purchase less of it and to seek out substitutes instead. Conversely, as the price of a good falls, people will tend to purchase more of it. This pattern implies that goods with generally rising prices should tend over time to become less important in the overall basket of goods used to calculate inflation, while goods with falling prices should tend to become more important. Consider, as an example, a rise in the price of peaches by \$100 per pound. If consumers were utterly inflexible in their demand for peaches, this would lead to a big rise in the price of food for consumers. Alternatively, imagine that people are utterly indifferent to whether they have peaches or other types of fruit. Now, if peach prices rise, people completely switch to other fruit choices and the average price of food does not change at all. A fixed and unchanging basket of goods assumes that consumers are locked into buying exactly the same goods, regardless of price changes—not a very likely assumption. Thus, **substitution bias**—the rise in the price of a fixed basket of goods over time—tends to overstate the rise in a consumer's true cost of living, because it does not take into account that the person can substitute away from goods whose relative prices have risen.

The other major problem in using a fixed basket of goods as the basis for calculating inflation is how to deal with the arrival of improved versions of older goods or altogether new goods. Consider the problem that arises if a cereal is improved by adding 12 essential vitamins and minerals—and also if a box of the cereal costs 5% more. It would clearly be misleading to count the entire resulting higher price as inflation, because the new price is being charged for a product of higher (or at least different) quality. Ideally, one would like to know how much of the higher price is due to the quality change, and how much of it is just a higher price. The Bureau of Labor Statistics, which is responsible for the computation of the Consumer Price Index, must deal with these difficulties in adjusting for quality changes.

Note

Visit this website to view a list of Ford car prices between 1909 and 1927. Consider how these prices compare to today's models. Is the product today of a different quality?

A new product can be thought of as an extreme improvement in quality—from something that did not exist to something that does. However, the basket of goods that was fixed in the past obviously does not include new goods created since then. The basket of goods and services used in the Consumer Price Index (CPI) is revised and updated over time, and so new products are gradually included. But the process takes some time. For example, room air conditioners were widely sold in the early 1950s, but were not introduced into the basket of goods behind the Consumer Price Index until 1964. The VCR and personal computer were available in the late 1970s and widely sold by the early 1980s, but did not enter the CPI basket of goods until 1987. By 1996, there were more than 40 million cellular phone subscribers in the United States—but cell phones were not yet part of the CPI basket of goods. The parade of inventions has continued, with the CPI inevitably lagging a few years behind.

The arrival of new goods creates problems with respect to the accuracy of measuring inflation. The reason people buy new goods, presumably, is that the new goods offer better value for money than existing goods. Thus, if the price index leaves out new goods, it overlooks one of the ways in which the cost of living is improving. In addition, the price of a new good is often higher when it is first introduced and then declines over time. If the new good is not included in the CPI for some years, until its price is already lower, the CPI may miss counting this price decline altogether. Taking these arguments together, the **quality/new goods bias** means that the rise in the price of a fixed basket of goods over time tends to overstate the rise in a consumer's true cost of living, because

it does not take into account how improvements in the quality of existing goods or the invention of new goods improves the standard of living. The following Clear It Up feature is a must-read on how the CPI is comprised and calculated.

Note: How do U.S. Government Statisticians Measure the Consumer Price Index?

When the U.S. Bureau of Labor Statistics (BLS) calculates the Consumer Price Index, the first task is to decide on a basket of goods that is representative of the purchases of the average household. This is done by using the Consumer Expenditure Survey, a national survey of about 7,000 households, which provides detailed information on spending habits. Consumer expenditures are broken up into eight major groups, shown below, which in turn are broken up into more than 200 individual item categories. The BLS currently uses 1982–1984 as the base period.

For each of the 200 individual expenditure items, the BLS chooses several hundred very specific examples of that item and looks at the prices of those examples. So, in figuring out the “breakfast cereal” item under the overall category of “foods and beverages,” the BLS picks several hundred examples of breakfast cereal. One example might be the price of a 24-oz. box of a particular brand of cereal sold at a particular store. The specific products and sizes and stores chosen are statistically selected to reflect what people buy and where they shop. The basket of goods in the Consumer Price Index thus consists of about 80,000 products; that is, several hundred specific products in over 200 broad-item categories. About one-quarter of these 80,000 specific products are rotated out of the sample each year, and replaced with a different set of products.

The next step is to collect data on prices. Data collectors visit or call about 23,000 stores in 87 urban areas all over the United States every month to collect prices on these 80,000 specific products. A survey of 50,000 landlords or tenants is also carried out to collect information about rents.

The Consumer Price Index is then calculated by taking the 80,000 prices of individual products and combining them, using weights (as shown in Figure 1) determined by the quantities of these products that people buy and allowing for factors like substitution between goods and quality improvements, into price indices for the 200 or so overall items. Then, the price indices for the 200 items are combined into an overall Consumer Price Index. According the Consumer Price Index website, there are eight categories used by data collectors:

The Eight Major Categories in the Consumer Price Index

1. Food and beverages (breakfast cereal, milk, coffee, chicken, wine, full-service meals, and snacks)
2. Housing (renter’s cost of housing, homeowner’s cost of housing, fuel oil, bedroom furniture)
3. Apparel (men’s shirts and sweaters, women’s dresses, jewelry)
4. Transportation (new vehicles, airline fares, gasoline, motor vehicle insurance)
5. Medical care (prescription drugs and medical supplies, physicians’ services, eyeglasses and eye care, hospital services)
6. Recreation (televisions, cable television, pets and pet products, sports equipment, admissions)
7. Education and communication (college tuition, postage, telephone services, computer software and accessories)
8. Other goods and services (tobacco and smoking products, haircuts and other personal services, funeral expenses)

The Weighting of CPI Components

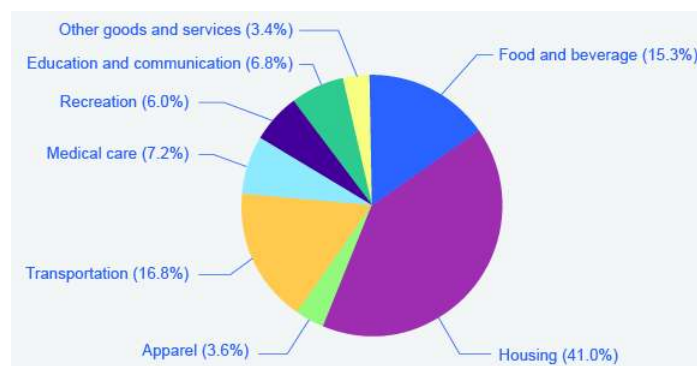


Figure 1: Of the eight categories used to generate the Consumer Price Index, housing is the highest at 41%. The next highest category, transportation at 16.8%, is less than half the size of housing. Other goods and services, and apparel, are the lowest at 3.4% and 3.6%, respectively. (Source: www.bls.gov/cpi)

The CPI and Core Inflation Index

Imagine if you were driving a company truck across the country- you probably would care about things like the prices of available roadside food and motel rooms as well as the truck's operating condition. However, the manager of the firm might have different priorities. He would care mostly about the truck's on-time performance and much less so about the food you were eating and the places you were staying. In other words, the company manager would be paying attention to the production of the firm, while ignoring transitory elements that impacted you, but did not affect the company's bottom line.

In a sense, a similar situation occurs with regard to measures of inflation. As we've learned, CPI measures prices as they affect everyday household spending. Well, a **core inflation index** is typically calculated by taking the CPI and excluding volatile economic variables. In this way, economists have a better sense of the underlying trends in prices that affect the cost of living.

Examples of excluded variables include energy and food prices, which can jump around from month to month because of the weather. According to an article by Kent Bernhard, during Hurricane Katrina in 2005, a key supply point for the nation's gasoline was nearly knocked out. Gas prices quickly shot up across the nation, in some places up to 40 cents a gallon in one day. This was not the cause of an economic policy but rather a short-lived event until the pumps were restored in the region. In this case, the CPI that month would register the change as a cost of living event to households, but the core inflation index would remain unchanged. As a result, the Federal Reserve's decisions on interest rates would not be influenced. Similarly, droughts can cause world-wide spikes in food prices that, if temporary, do not affect the nation's economic capability.

As former Chairman of the Federal Reserve Ben Bernanke noted in 1999 about the core inflation index, "It provide(s) a better guide to monetary policy than the other indices, since it measures the more persistent underlying inflation rather than transitory influences on the price level." Bernanke also noted that it helps communicate that every inflationary shock need not be responded to by the Federal Reserve since some price changes are transitory and not part of a structural change in the economy.

In sum, both the CPI and the core inflation index are important, but serve different audiences. The CPI helps households understand their overall cost of living from month to month, while the core inflation index is a preferred gauge from which to make important government policy changes.

Practical Solutions for the Substitution and the Quality/New Goods Biases

By the early 2000s, the Bureau of Labor Statistics was using alternative mathematical methods for calculating the Consumer Price Index, more complicated than just adding up the cost of a fixed basket of goods, to allow for some substitution between goods. It was also updating the basket of goods behind the CPI more frequently, so that new and improved goods could be included more rapidly. For certain products, the BLS was carrying out studies to try to measure the quality improvement. For example, with computers, an economic study can try to adjust for changes in speed, memory, screen size, and other characteristics of the product, and then calculate the change in price after these product changes are taken into account. But these adjustments are inevitably imperfect, and exactly how to make these adjustments is often a source of controversy among professional economists.

By the early 2000s, the substitution bias and quality/new goods bias had been somewhat reduced, so that since then the rise in the CPI probably overstates the true rise in inflation by only about 0.5% per year. Over one or a few years, this is not much; over a period of a decade or two, even half of a percent per year compounds to a more significant amount. In addition, the CPI tracks prices from physical locations, and not at online sites like Amazon, where prices can be lower.

When measuring inflation (and other economic statistics, too), a tradeoff arises between simplicity and interpretation. If the inflation rate is calculated with a basket of goods that is fixed and unchanging, then the calculation of an inflation rate is straightforward, but the problems of substitution bias and quality/new goods bias will arise. However, when the basket of goods is allowed to shift and evolve to reflect substitution toward lower relative prices, quality improvements, and new goods, the technical details of calculating the inflation rate grow more complex.

Additional Price Indices: PPI, GDP Deflator, and More

The basket of goods behind the Consumer Price Index represents an average hypothetical U.S. household, which is to say that it does not exactly capture anyone's personal experience. When the task is to calculate an average level of inflation, this approach works fine. What if, however, you are concerned about inflation experienced by a certain group, like the elderly, or the poor, or

single-parent families with children, or Hispanic-Americans? In specific situations, a price index based on the buying power of the average consumer may not feel quite right.

This problem has a straightforward solution. If the Consumer Price Index does not serve the desired purpose, then invent another index, based on a basket of goods appropriate for the group of interest. Indeed, the Bureau of Labor Statistics publishes a number of experimental price indices: some for particular groups like the elderly or the poor, some for different geographic areas, and some for certain broad categories of goods like food or housing.

The BLS also calculates several price indices that are not based on baskets of consumer goods. For example, the **Producer Price Index (PPI)** is based on prices paid for supplies and inputs by producers of goods and services. It can be broken down into price indices for different industries, commodities, and stages of processing (like finished goods, intermediate goods, crude materials for further processing, and so on). There is an **International Price Index** based on the prices of merchandise that is exported or imported. An **Employment Cost Index** measures wage inflation in the labor market. The **GDP deflator**, measured by the Bureau of Economic Analysis, is a price index that includes all the components of GDP (that is, consumption plus investment plus government plus exports minus imports). Unlike the CPI, its baskets are not fixed but re-calculate what that year's GDP would have been worth using the base-year's prices. MIT's Billion Prices Project is a more recent alternative attempt to measure prices: data are collected online from retailers and then composed into an index that is compared to the CPI (Source: <http://bpp.mit.edu/usa/>).

What's the best measure of inflation? If concerned with the most accurate measure of inflation, use the GDP deflator as it picks up the prices of goods and services produced. However, it is not a good measure of cost of living as it includes prices of many products not purchased by households (for example, aircraft, fire engines, factory buildings, office complexes, and bulldozers). If one wants the most accurate measure of inflation as it impacts households, use the CPI, as it only picks up prices of products purchased by households. That is why the CPI is sometimes referred to as the cost-of-living index. As the Bureau of Labor Statistics states on its website: "The 'best' measure of inflation for a given application depends on the intended use of the data."

Key Concepts and Summary

Measuring price levels with a fixed basket of goods will always have two problems: the substitution bias, by which a fixed basket of goods does not allow for buying more of what is relatively less expensive and less of what is relatively more expensive; and the quality/new goods bias, by which a fixed basket cannot take into account improvements in quality and the advent of new goods. These problems can be reduced in degree—for example, by allowing the basket of goods to evolve over time—but they cannot be totally eliminated. The most commonly cited measure of inflation is the Consumer Price Index (CPI), which is based on a basket of goods representing what the typical consumer buys. The Core Inflation Index further breaks down the CPI by excluding volatile economic variables. Several price indices are not based on baskets of consumer goods. The GDP deflator is based on all the components of GDP. The Producer Price Index is based on prices of supplies and inputs bought by producers of goods and services. An Employment Cost Index measures wage inflation in the labor market. An International Price Index is based on the prices of merchandise that is exported or imported.

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Glossary

Consumer Price Index (CPI)

a measure of inflation calculated by U.S. government statisticians based on the price level from a fixed basket of goods and services that represents the purchases of the average consumer

core inflation index

a measure of inflation typically calculated by taking the CPI and excluding volatile economic variables such as food and energy prices to better measure the underlying and persistent trend in long-term prices

Employment Cost Index

a measure of inflation based on wages paid in the labor market

GDP deflator

a measure of inflation based on the prices of all the components of GDP

International Price Index

a measure of inflation based on the prices of merchandise that is exported or imported

Producer Price Index (PPI)

a measure of inflation based on prices paid for supplies and inputs by producers of goods and services

quality/new goods bias

inflation calculated using a fixed basket of goods over time tends to overstate the true rise in cost of living, because it does not take into account improvements in the quality of existing goods or the invention of new goods

substitution bias

an inflation rate calculated using a fixed basket of goods over time tends to overstate the true rise in the cost of living, because it does not take into account that the person can substitute away from goods whose prices rise by a lot

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5.2.4: How the U.S. and Other Countries Experience Inflation

In the last three decades, inflation has been relatively low in the U.S. economy, with the Consumer Price Index typically rising 2% to 4% per year. Looking back over the twentieth century, there have been several periods where inflation caused the price level to rise at double-digit rates, but nothing has come close to hyperinflation.

Historical Inflation in the U.S. Economy

Figure 1 (a) shows the level of prices in the Consumer Price Index stretching back to 1916. In this case, the base years (when the CPI is defined as 100) are set for the average level of prices that existed from 1982 to 1984. Figure 1 (b) shows the annual percentage changes in the CPI over time, which is the inflation rate.

U.S. Price Level and Inflation Rates since 1913

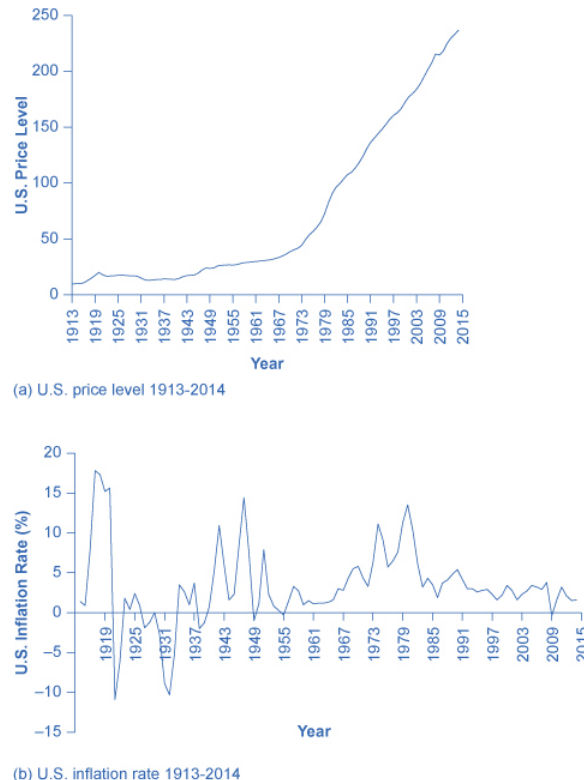


Figure 1: Graph a shows the trends in the U.S. price level from the year 1916 to 2014. In 1916, the graph starts out close to \$10, rises to around \$20 in 1920, stays around \$16 or \$17 until 1931, when it jumps to around \$15. It gradually increases, with periodic dips, until 2014, when it is around \$236. Graph b shows the trends in U.S. inflation rates from the year 1916 to 2014. In 1916, the graph starts out at 7.7%, jumps to close to 18% in 1917, drops drastically to close to -11% in 1921, goes up and down periodically, until settling to around 1.5% in 2014.

The first two waves of inflation are easy to characterize in historical terms: they are right after World War I and World War II. However, there are also two periods of severe negative inflation—called **deflation**—in the early decades of the twentieth century: one following the deep recession of 1920–21 and the other during the Great Depression of the 1930s. (Since inflation is a time when the buying power of money in terms of goods and services is reduced, deflation will be a time when the buying power of money in terms of goods and services increases.) For the period from 1900 to about 1960, the major inflations and deflations nearly balanced each other out, so the average annual rate of inflation over these years was only about 1% per year. A third wave of more severe inflation arrived in the 1970s and departed in the early 1980s.

Note

Visit this website to use an inflation calculator and discover how prices have changed in the last 100 years.

Times of recession or depression often seem to be times when the inflation rate is lower, as in the recession of 1920–1921, the Great Depression, the recession of 1980–1982, and the **Great Recession** in 2008–2009. There were a few months in 2009 that were deflationary, but not at an annual rate. Recessions are typically accompanied by higher levels of unemployment, and the total demand for goods falls, pulling the price level down. Conversely, the rate of inflation often, but not always, seems to start moving up when the economy is growing very strongly, like right after wartime or during the 1960s. The frameworks for macroeconomic analysis, developed in other chapters, will explain why recession often accompanies higher unemployment and lower inflation, while rapid economic growth often brings lower unemployment but higher inflation.

Inflation around the World

Around the rest of the world, the pattern of inflation has been very mixed, as can be seen in Figure 2 which shows inflation rates over the last several decades. Many industrialized countries, not just the United States, had relatively high inflation rates in the 1970s. For example, in 1975, Japan's inflation rate was over 8% and the inflation rate for the United Kingdom was almost 25%. In the 1980s, inflation rates came down in the United States and in Europe and have largely stayed down.

Countries with Relatively Low Inflation Rates, 1960–2014

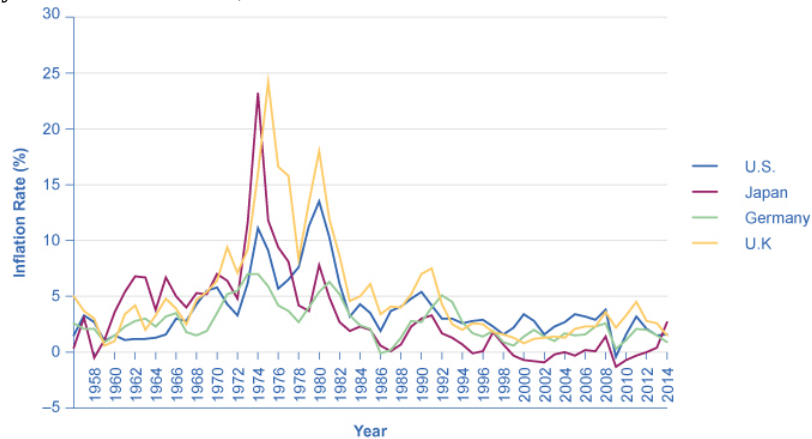


Figure 2: This chart shows the annual percentage change in consumer prices compared with the previous year's consumer prices in the United States, the United Kingdom, Japan, and Germany.

Countries with controlled economies in the 1970s, like the Soviet Union and China, historically had very low rates of measured inflation—because prices were forbidden to rise by law, except for the cases where the government deemed a price increase to be due to quality improvements. However, these countries also had perpetual shortages of goods, since forbidding prices to rise acts like a price ceiling and creates a situation where quantity demanded often exceeds quantity supplied. As Russia and China made a transition toward more market-oriented economies, they also experienced outbursts of inflation, although the statistics for these economies should be regarded as somewhat shakier. Inflation in China averaged about 10% per year for much of the 1980s and early 1990s, although it has dropped off since then. Russia experienced **hyperinflation**—an outburst of high inflation—of 2,500% per year in the early 1990s, although by 2006 Russia's consumer price inflation had dipped below 10% per year, as shown in Figure. The closest the United States has ever gotten to hyperinflation was during the Civil War, 1860–1865, in the Confederate states.

Countries with Relatively High Inflation Rates, 1980–2013

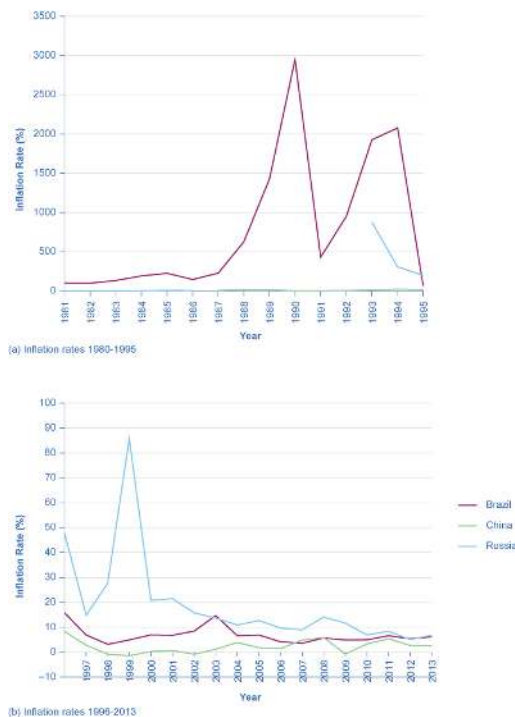


Figure 3: These charts show the percentage change in consumer prices compared with the previous year's consumer prices in Brazil, China, and Russia. (a) Of these, Brazil and Russia experienced hyperinflation at some point between the mid-1980s and mid-1990s. (b) Though not as high, China and Nigeria also had high inflation rates in the mid-1990s. Even though their inflation rates have come down over the last two decades, several of these countries continue to see significant inflation rates. (Sources: research.stlouisfed.org/fred2...FPCPITOTLZGBRA; research.stlouisfed.org/fred2...HNCPIALLMINMEI; research.stlouisfed.org/fred2...FPCPITOTLZGRUS)

Many countries in Latin America experienced raging hyperinflation during the 1980s and early 1990s, with inflation rates often well above 100% per year. In 1990, for example, both Brazil and Argentina saw inflation climb above 2000%. Certain countries in Africa experienced extremely high rates of inflation, sometimes bordering on hyperinflation, in the 1990s. Nigeria, the most populous country in Africa, had an inflation rate of 75% in 1995.

In the early 2000s, the problem of inflation appears to have diminished for most countries, at least in comparison to the worst times of recent decades. As we noted in this earlier Bring it Home feature, in recent years, the world's worst example of hyperinflation was in Zimbabwe, where at one point the government was issuing bills with a face value of \$100 trillion (in Zimbabwean dollars)—that is, the bills had \$100,000,000,000,000 written on the front, but were almost worthless. In many countries, the memory of double-digit, triple-digit, and even quadruple-digit inflation is not very far in the past.

Key Concepts and Summary

In the U.S. economy, the annual inflation rate in the last two decades has typically been around 2% to 4%. The periods of highest inflation in the United States in the twentieth century occurred during the years after World Wars I and II, and in the 1970s. The period of lowest inflation—actually, with deflation—was the Great Depression of the 1930s.

Glossary

deflation

negative inflation; most prices in the economy are falling

hyperinflation

an outburst of high inflation that is often seen (although not exclusively) when economies shift from a controlled economy to a market-oriented economy

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5.2.5: The Confusion Over Inflation

Economists usually oppose high inflation, but they oppose it in a milder way than many non-economists. **Robert Shiller**, one of 2013's Nobel Prize winners in economics, carried out several surveys during the 1990s about attitudes toward inflation. One of his questions asked, "Do you agree that preventing high inflation is an important national priority, as important as preventing drug abuse or preventing deterioration in the quality of our schools?" Answers were on a scale of 1–5, where 1 meant "Fully agree" and 5 meant "Completely disagree." For the U.S. population as a whole, 52% answered "Fully agree" that preventing high inflation was a highly important national priority and just 4% said "Completely disagree." However, among professional economists, only 18% answered "Fully agree," while the same percentage of 18% answered "Completely disagree."

The Land of Funny Money

What are the economic problems caused by inflation, and why do economists often regard them with less concern than the general public? Consider a very short story: "**The Land of Funny Money.**"

One morning, everyone in the Land of Funny Money awakened to find that everything denominated in money had increased by 20%. The change was completely unexpected. Every price in every store was 20% higher. Paychecks were 20% higher. Interest rates were 20 % higher. The amount of money, everywhere from wallets to savings accounts, was 20% larger. This overnight inflation of prices made newspaper headlines everywhere in the Land of Funny Money. But the headlines quickly disappeared, as people realized that in terms of what they could actually buy with their incomes, this inflation had no economic impact. Everyone's pay could still buy exactly the same set of goods as it did before. Everyone's savings were still sufficient to buy exactly the same car, vacation, or retirement that they could have bought before. Equal levels of inflation in all wages and prices ended up not mattering much at all.

When the people in Robert Shiller's surveys explained their concern about inflation, one typical reason was that they feared that as prices rose, they would not be able to afford to buy as much. In other words, people were worried because they did not live in a place like the Land of Funny Money, where all prices and wages rose simultaneously. Instead, people live here on Planet Earth, where prices might rise while wages do not rise at all, or where wages rise more slowly than prices.

Economists note that over most periods, the inflation level in prices is roughly similar to the inflation level in **wages**, and so they reason that, on average, over time, people's economic status is not greatly changed by inflation. If all prices, wages, and interest rates adjusted automatically and immediately with inflation, as in the Land of Funny Money, then no one's purchasing power, profits, or real loan payments would change. However, if other economic variables do not move exactly in sync with inflation, or if they adjust for inflation only after a time lag, then inflation can cause three types of problems: unintended **redistributions** of purchasing power, blurred price signals, and difficulties in long-term planning.

Unintended Redistributions of Purchasing Power

Inflation can cause redistributions of purchasing power that hurt some and help others. People who are hurt by inflation include those who are holding a lot of cash, whether it is in a safe deposit box or in a cardboard box under the bed. When inflation happens, the buying power of cash is diminished. But cash is only an example of a more general problem: anyone who has financial assets invested in a way that the nominal return does not keep up with inflation will tend to suffer from inflation. For example, if a person has money in a bank account that pays 4% interest, but inflation rises to 5%, then the real rate of return for the money invested in that bank account is negative 1%.

The problem of a good-looking **nominal interest rate** being transformed into an ugly-looking real interest rate can be worsened by taxes. The U.S. income tax is charged on the nominal interest received in dollar terms, without an adjustment for inflation. So, a person who invests \$10,000 and receives a 5% nominal rate of interest is taxed on the \$500 received—no matter whether the inflation rate is 0%, 5%, or 10%. If inflation is 0%, then the real interest rate is 5% and all \$500 is a gain in buying power. But if inflation is 5%, then the real interest rate is zero and the person had no real gain—but owes income tax on the nominal gain anyway. If inflation is 10%, then the real interest rate is *negative* 5% and the person is actually falling behind in buying power, but would still owe taxes on the \$500 in nominal gains.

Inflation can cause unintended redistributions for wage earners, too. Wages do typically creep up with inflation over time eventually. The last row of Table 9.1.1 at the start of this chapter showed that average hourly wage in the U.S. economy increased

from \$3.23 in 1970 to \$19.55 in 2014, which is an increase by a factor of almost six. Over that time period, the Consumer Price Index increased by an almost identical amount. However, increases in wages may lag behind inflation for a year or two, since wage adjustments are often somewhat sticky and occur only once or twice a year. Moreover, the extent to which wages keep up with inflation creates insecurity for workers and may involve painful, prolonged conflicts between employers and employees. If the minimum wage is adjusted for inflation only infrequently, minimum wage workers are losing purchasing power from their nominal wages, as shown in Figure 1.

U.S. Minimum Wage and Inflation

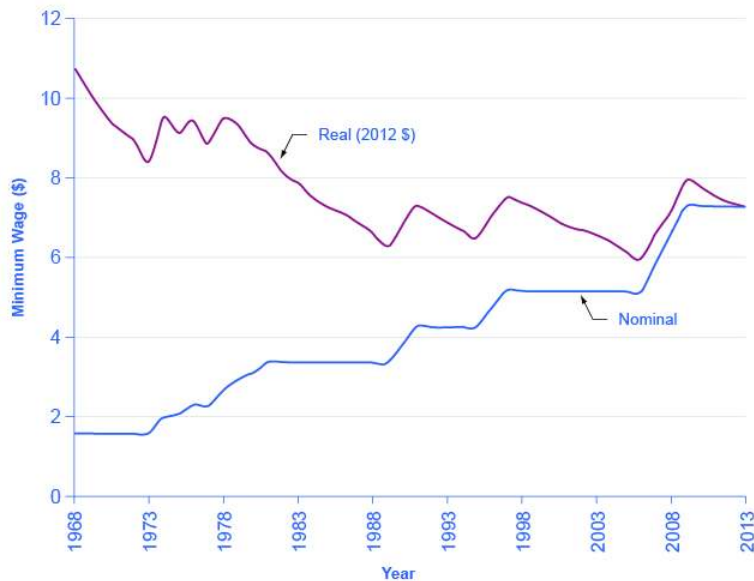


Figure 2: After adjusting for inflation, the federal minimum wage dropped more than 30 percent from 1967 to 2010, even though the nominal figure climbed from \$1.40 to \$7.25 per hour. Increases in the minimum wage in between 2008 and 2010 kept the decline from being worse—as it would have been if the wage had remained the same as it did from 1997 through 2007. (Sources: <http://www.dol.gov/whd/minwage/chart.htm>; <http://data.bls.gov/cgi-bin/surveymost?cu>)

One sizable group of people has often received a large share of their income in a form that does not increase over time: retirees who receive a private company pension. Most **pensions** have traditionally been set as a fixed nominal dollar amount per year at retirement. For this reason, pensions are called “defined benefits” plans. Even if inflation is low, the combination of inflation and a fixed income can create a substantial problem over time. A person who retires on a fixed income at age 65 will find that losing just 1% to 2% of buying power per year to inflation compounds to a considerable loss of buying power after a decade or two.

Fortunately, pensions and other defined benefits retirement plans are increasingly rare, replaced instead by “defined contribution” plans, such as 401(k)s and 403(b)s. In these plans, the employer contributes a fixed amount to the worker’s retirement account on a regular basis (usually every pay check). The employee often contributes as well. The worker invests these funds in a wide range of investment vehicles. These plans are tax deferred, and they are portable so that if the individual takes a job with a different employer, their **401(k)** comes with them. To the extent that the investments made generate real rates of return, retirees do not suffer from the inflation costs of traditional pensioners.

However, ordinary people can sometimes benefit from the unintended redistributions of inflation. Consider someone who borrows \$10,000 to buy a car at a fixed interest rate of 9%. If inflation is 3% at the time the loan is made, then the loan must be repaid at a real interest rate of 6%. But if inflation rises to 9%, then the real interest rate on the loan is zero. In this case, the borrower’s benefit from inflation is the lender’s loss. A borrower paying a fixed interest rate, who benefits from inflation, is just the flip side of an investor receiving a fixed interest rate, who suffers from inflation. The lesson is that when interest rates are fixed, rises in the rate of inflation tend to penalize suppliers of financial capital, who end up being repaid in dollars that are worth less because of inflation, while demanders of financial capital end up better off, because they can repay their loans in dollars that are worth less than originally expected.

The unintended redistributions of buying power caused by inflation may have a broader effect on society. America’s widespread acceptance of market forces rests on a perception that people’s actions have a reasonable connection to market outcomes. When

inflation causes a retiree who built up a pension or invested at a fixed interest rate to suffer, however, while someone who borrowed at a fixed interest rate benefits from inflation, it is hard to believe that this outcome was deserved in any way. Similarly, when homeowners benefit from inflation because the price of their homes rises, while renters suffer because they are paying higher rent, it is hard to see any useful incentive effects. One of the reasons that inflation is so disliked by the general public is a sense that it makes economic rewards and penalties more arbitrary—and therefore likely to be perceived as unfair – even dangerous, as the next Clear It Up feature shows.

Note: Is There a Connection Between German Hyperinflation and Hitler's Rise to Power?

Germany suffered an intense hyperinflation of its currency, the Mark, in the years after World War I, when the Weimar Republic in Germany resorted to printing money to pay its bills and the onset of the Great Depression created the social turmoil that Adolf Hitler could take advantage of in his rise to power. Shiller described the connection this way in a National Bureau of Economic Research 1996 Working Paper:

A fact that is probably little known to young people today, even in Germany, is that the final collapse of the Mark in 1923, the time when the Mark's inflation reached astronomical levels (inflation of 35,974.9% in November 1923 alone, for an annual rate that month of $4.69 \times 1028\%$), came in the same month as did Hitler's Beer Hall Putsch, his Nazi Party's armed attempt to overthrow the German government. This failed putsch resulted in Hitler's imprisonment, at which time he wrote his book *Mein Kampf*, setting forth an inspirational plan for Germany's future, suggesting plans for world domination. . .

Most people in Germany today probably do not clearly remember these events; this lack of attention to it may be because its memory is blurred by the more dramatic events that succeeded it (the Nazi seizure of power and World War II). However, to someone living through these historical events in sequence . . . [the putsch] may have been remembered as vivid evidence of the potential effects of inflation.

Blurred Price Signals

Prices are the messengers in a **market economy**, conveying information about conditions of demand and supply. Inflation blurs those price messages. Inflation means that price signals are perceived more vaguely, like a radio program received with a lot of static. If the static becomes severe, it is hard to tell what is happening.

In Israel, when inflation accelerated to an annual rate of 500% in 1985, some stores stopped posting prices directly on items, since they would have had to put new labels on the items or shelves every few days to reflect inflation. Instead, a shopper just took items from a shelf and went up to the checkout register to find out the price for that day. Obviously, this situation makes comparing prices and shopping for the best deal rather difficult. When the levels and changes of prices become uncertain, businesses and individuals find it harder to react to economic signals. In a world where inflation is at a high rate, but bouncing up and down to some extent, does a higher price of a good mean that inflation has risen, or that supply of that good has decreased, or that demand for that good has increased? Should a buyer of the good take the higher prices as an economic hint to start substituting other products—or have the prices of the substitutes risen by an equal amount? Should a seller of the good take a higher price as a reason to increase production—or is the higher price only a sign of a general inflation in which the prices of all inputs to production are rising as well? The true story will presumably become clear over time, but at a given moment, who can say?

High and variable inflation means that the incentives in the economy to adjust in response to changes in prices are weaker. Markets will adjust toward their equilibrium prices and quantities more erratically and slowly, and many individual markets will experience a greater chance of **surpluses** and **shortages**.

Problems of Long-Term Planning

Inflation can make long-term planning difficult. In discussing unintended **redistributions**, we considered the case of someone trying to plan for retirement with a pension that is fixed in nominal terms and a high rate of inflation. Similar problems arise for all people trying to save for retirement, because they must consider what their money will really buy several decades in the future when the rate of future inflation cannot be known with certainty.

Inflation, especially at moderate or high levels, will pose substantial planning problems for businesses, too. A firm can make money from inflation—for example, by paying bills and wages as late as possible so that it can pay in inflated dollars, while collecting revenues as soon as possible. A firm can also suffer losses from inflation, as in the case of a retail business that gets stuck holding too much cash, only to see the value of that cash eroded by inflation. But when a business spends its time focusing on how to profit by inflation, or at least how to avoid suffering from it, an inevitable tradeoff strikes: less time is spent on improving products and services or on figuring out how to make existing products and services more cheaply. An economy with high inflation rewards businesses that have found clever ways of profiting from inflation, which are not necessarily the businesses that excel at productivity, innovation, or quality of service.

In the short term, low or moderate levels of inflation may not pose an overwhelming difficulty for business planning, because costs of doing business and sales revenues may rise at similar rates. If, however, inflation varies substantially over the short or medium term, then it may make sense for businesses to stick to shorter-term strategies. The evidence as to whether relatively low rates of inflation reduce productivity is controversial among economists. There is some evidence that if inflation can be held to moderate levels of less than 3% per year, it need not prevent a nation's real economy from growing at a healthy pace. For some countries that have experienced hyperinflation of several thousand percent per year, an annual inflation rate of 20–30% may feel basically the same as zero. However, several economists have pointed to the suggestive fact that when U.S. inflation heated up in the early 1970s—to 10%—U.S. growth in productivity slowed down, and when inflation slowed down in the 1980s, productivity edged up again not long thereafter, as shown in Figure 2.

U.S. Inflation Rate and U.S. Labor Productivity, 1961–2014



Figure 2: Over the last several decades in the United States, there have been times when rising inflation rates have been closely followed by lower productivity rates and lower inflation rates have corresponded to increasing productivity rates. As the graph shows, however, this correlation does not always exist.

Any Benefits of Inflation?

Although the economic effects of inflation are primarily negative, two countervailing points are worth noting. First, the impact of inflation will differ considerably according to whether it is creeping up slowly at 0% to 2% per year, galloping along at 10% to 20% per year, or racing to the point of hyperinflation at, say, 40% per month. Hyperinflation can rip an economy and a society apart. An annual inflation rate of 2%, 3%, or 4%, however, is a long way from a national crisis. Low inflation is also better than deflation which occurs with severe recessions.

Second, an argument is sometimes made that moderate inflation may help the economy by making wages in **labor markets** more flexible. The discussion in Unemployment pointed out that wages tend to be sticky in their downward movements and that unemployment can result. A little inflation could nibble away at real wages, and thus help real wages to decline if necessary. In this way, even if a moderate or high rate of inflation may act as sand in the gears of the economy, perhaps a low rate of inflation serves as oil for the gears of the labor market. This argument is controversial. A full analysis would have to take all the effects of inflation into account. It does, however, offer another reason to believe that, all things considered, very low rates of inflation may not be especially harmful.

Key Concepts and Summary

Unexpected inflation will tend to hurt those whose money received, in terms of wages and interest payments, does not rise with inflation. In contrast, inflation can help those who owe money that can be paid in less valuable, inflated dollars. Low rates of inflation have relatively little economic impact over the short term. Over the medium and the long term, even low rates of inflation can complicate future planning. High rates of inflation can muddle price signals in the short term and prevent market forces from operating efficiently, and can vastly complicate long-term savings and investment decisions.

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5.2.6: Indexing and Its Limitations

When a price, wage, or interest rate is adjusted automatically with inflation, it is said to be indexed. An **indexed** payment increases according to the index number that measures inflation. A wide array of indexing arrangements is observed in **private markets** and government programs. Since the negative effects of inflation depend in large part on having inflation unexpectedly affect one part of the economy but not another—say, increasing the prices that people pay but not the wages that workers receive—indexing will take some of the sting out of inflation.

Indexing in Private Markets

In the 1970s and 1980s, labor unions commonly negotiated wage contracts that had **cost-of-living adjustments (COLAs)** which guaranteed that their wages would keep up with inflation. These contracts were sometimes written as, for example, COLA plus 3%. Thus, if inflation was 5%, the wage increase would automatically be 8%, but if inflation rose to 9%, the wage increase would automatically be 12%. COLAs are a form of indexing applied to wages.

Loans often have built-in inflation adjustments, too, so that if the inflation rate rises by two percentage points, then the interest rate charged on the loan rises by two percentage points as well. An **adjustable-rate mortgage (ARM)** is a kind of loan used to purchase a home in which the interest rate varies with the rate of inflation. Often, a borrower will be able to receive a lower interest rate if borrowing with an ARM, compared to a fixed-rate loan. The reason is that with an ARM, the lender is protected against the risk that higher inflation will reduce the real loan payments, and so the risk premium part of the interest rate can be correspondingly lower.

A number of ongoing or long-term business contracts also have provisions that prices will be adjusted automatically according to inflation. Sellers like such contracts because they are not locked into a low nominal selling price if inflation turns out higher than expected; buyers like such contracts because they are not locked into a high buying price if inflation turns out to be lower than expected. A contract with automatic adjustments for inflation in effect agrees on a real price to be paid, rather than a nominal price.

Indexing in Government Programs

Many government programs are indexed to inflation. The U.S. income tax code is designed so that as a person's income rises above certain levels, the tax rate on the marginal income earned rises as well; this is what is meant by the expression "move into a higher tax bracket." For example, according to the basic tax tables from the Internal Revenue Service, in 2014 a single person owed 10% of all taxable income from \$0 to \$9,075; 15% of all income from \$9,076 to \$36,900; 25% of all taxable income from \$36,901 to \$89,350; 28% of all taxable income from \$89,351 to \$186,350; 33% of all taxable income from \$186,351 to \$405,100; 35% of all taxable income from \$405,101 to \$406,750; and 39.6% of all income from \$406,751 and above.

Because of the many complex provisions in the rest of the tax code, the taxes owed by any individual cannot be exactly determined based on these numbers, but the numbers illustrate the basic theme that tax rates rise as the marginal dollar of income rises. Until the late 1970s, if nominal wages increased along with inflation, people were moved into higher tax brackets and owed a higher proportion of their income in taxes, even though their real income had not risen. This "bracket creep," as it was called, was eliminated by law in 1981. Now, the income levels where higher tax rates kick in are indexed to rise automatically with inflation.

The Social Security program offers two examples of indexing. Since the passage of the **Social Security Indexing Act of 1972**, the level of Social Security benefits increases each year along with the Consumer Price Index. Also, Social Security is funded by payroll taxes, which are imposed on the income earned up to a certain amount—\$117,000 in 2014. This level of income is adjusted upward each year according to the rate of inflation, so that the indexed rise in the benefit level is accompanied by an indexed increase in the Social Security tax base.

As yet another example of a government program affected by indexing, in 1996 the U.S. government began offering indexed **bonds**. Bonds are means by which the U.S. government (and many private-sector companies as well) borrows money; that is, investors buy the bonds, and then the government repays the money with interest. Traditionally, government bonds have paid a fixed rate of interest. This policy gave a government that had borrowed an incentive to encourage inflation, because it could then repay its past borrowing in inflated dollars at a lower real interest rate. But indexed bonds promise to pay a certain real rate of interest above whatever inflation rate occurs. In the case of a retiree trying to plan for the long term and worried about the risk of

inflation, for example, indexed bonds that guarantee a rate of return higher than inflation—no matter the level of inflation—can be a very comforting investment.

Might Indexing Reduce Concern over Inflation?

Indexing may seem like an obviously useful step. After all, when individuals, firms, and government programs are indexed against inflation, then people can worry less about arbitrary redistributions and other effects of inflation.

However, some of the fiercest opponents of inflation express grave concern about indexing. They point out that indexing is always partial. Not every employer will provide COLAs for workers. Not all companies can assume that costs and revenues will rise in lockstep with the general rates of inflation. Not all interest rates for borrowers and savers will change to match inflation exactly. But as partial inflation indexing spreads, the political opposition to inflation may diminish. After all, older people whose Social Security benefits are protected against inflation, or banks that have loaned their money with adjustable-rate loans, no longer have as much reason to care whether inflation heats up. In a world where some people are indexed against inflation and some are not, financially savvy businesses and investors may seek out ways to be protected against inflation, while the financially unsophisticated and small businesses may suffer from it most.

A Preview of Policy Discussions of Inflation

This chapter has focused on how inflation is measured, historical experience with inflation, how to adjust nominal variables into real ones, how inflation affects the economy, and how indexing works. The causes of inflation have barely been hinted at, and government policies to deal with inflation have not been addressed at all. These issues will be taken up in depth in other chapters. However, it is useful to offer a preview here.

The cause of inflation can be summed up in one sentence: Too many dollars chasing too few goods. The great surges of inflation early in the twentieth century came after wars, which are a time when government spending is very high, but consumers have little to buy, because production is going to the war effort. Governments also commonly impose price controls during wartime. After the war, the price controls end and pent-up buying power surges forth, driving up inflation. On the other hand, if too few dollars are chasing too many goods, then inflation will decline or even turn into deflation. Therefore, slowdowns in economic activity, as in major recessions and the Great Depression, are typically associated with a reduction in inflation or even outright deflation.

The policy implications are clear. If inflation is to be avoided, the amount of purchasing power in the economy must grow at roughly the same rate as the production of goods. Macroeconomic policies that the government can use to affect the amount of purchasing power—through taxes, spending, and regulation of interest rates and credit—can thus cause inflation to rise or reduce inflation to lower levels.

Note: A \$550 Million Loaf of Bread?

As we will learn in Money and Banking, the existence of money provides enormous benefits to an economy. In a real sense, money is the lubrication that enhances the workings of markets. Money makes transactions easier. It allows people to find employment producing one product, then use the money earned to purchase the other products they need to live on. However, too much money in circulation can lead to inflation. Extreme cases of governments recklessly printing money lead to hyperinflation. Inflation reduces the value of money. Hyperinflation, because money loses value so quickly, ultimately results in people no longer using money. The economy reverts to barter, or it adopts another country's more stable currency, like U.S. dollars. In the meantime, the economy literally falls apart as people leave jobs and fend for themselves because it is not worth the time to work for money that will be worthless in a few days.

Only national governments have the power to cause hyperinflation. Hyperinflation typically happens when government faces extraordinary demands for spending, which it cannot finance by taxes or borrowing. The only option is to print money—more and more of it. With more money in circulation chasing the same amount (or even less) goods and services, the only result is higher and higher prices until the economy and/or the government collapses. This is why economists are generally wary of letting inflation get out of control.

Key Concepts and Summary

A payment is said to be indexed if it is automatically adjusted for inflation. Examples of indexing in the private sector include wage contracts with cost-of-living adjustments (COLAs) and loan agreements like adjustable-rate mortgages (ARMs). Examples of indexing in the public sector include tax brackets and Social Security payments.

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Glossary

adjustable-rate mortgage (ARM)

a loan used to purchase a home in which the interest rate varies with market interest rates

cost-of-living adjustments (COLAs)

a contractual provision that wage increases will keep up with inflation

indexed

a price, wage, or interest rate is adjusted automatically for inflation

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CHAPTER OVERVIEW

6: Economic Growth

- 6.1: The Significance of Economic Growth
- 6.2: Growth and the Long-Run Aggregate Supply Curve
- 6.3: Determinants of Economic Growth
- 6.4: Review and Practice

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6.1: The Significance of Economic Growth

Learning Objective

1. Define economic growth and explain it using the production possibilities model and the concept of potential output.
2. State the rule of 72 and use it to show how even small differences in growth rates can have major effects on a country's potential output over time.
3. Calculate the percentage rate of growth of output per capita.

To demonstrate the impact of economic growth on living standards of a nation, we must start with a clear definition of economic growth and then study its impact over time. We will also see how population growth affects the relationship between economic growth and the standard of living an economy is able to achieve.

Defining Economic Growth

Economic growth is a long-run process that occurs as an economy's potential output increases. Changes in real GDP from quarter to quarter or even from year to year are short-run fluctuations that occur as aggregate demand and short-run aggregate supply change. Regardless of media reports stating that the economy grew at a certain rate in the last quarter or that it is expected to grow at a particular rate during the next year, short-run changes in real GDP say little about economic growth. In the long run, economic activity moves toward its level of potential output. Increases in potential constitute economic growth.

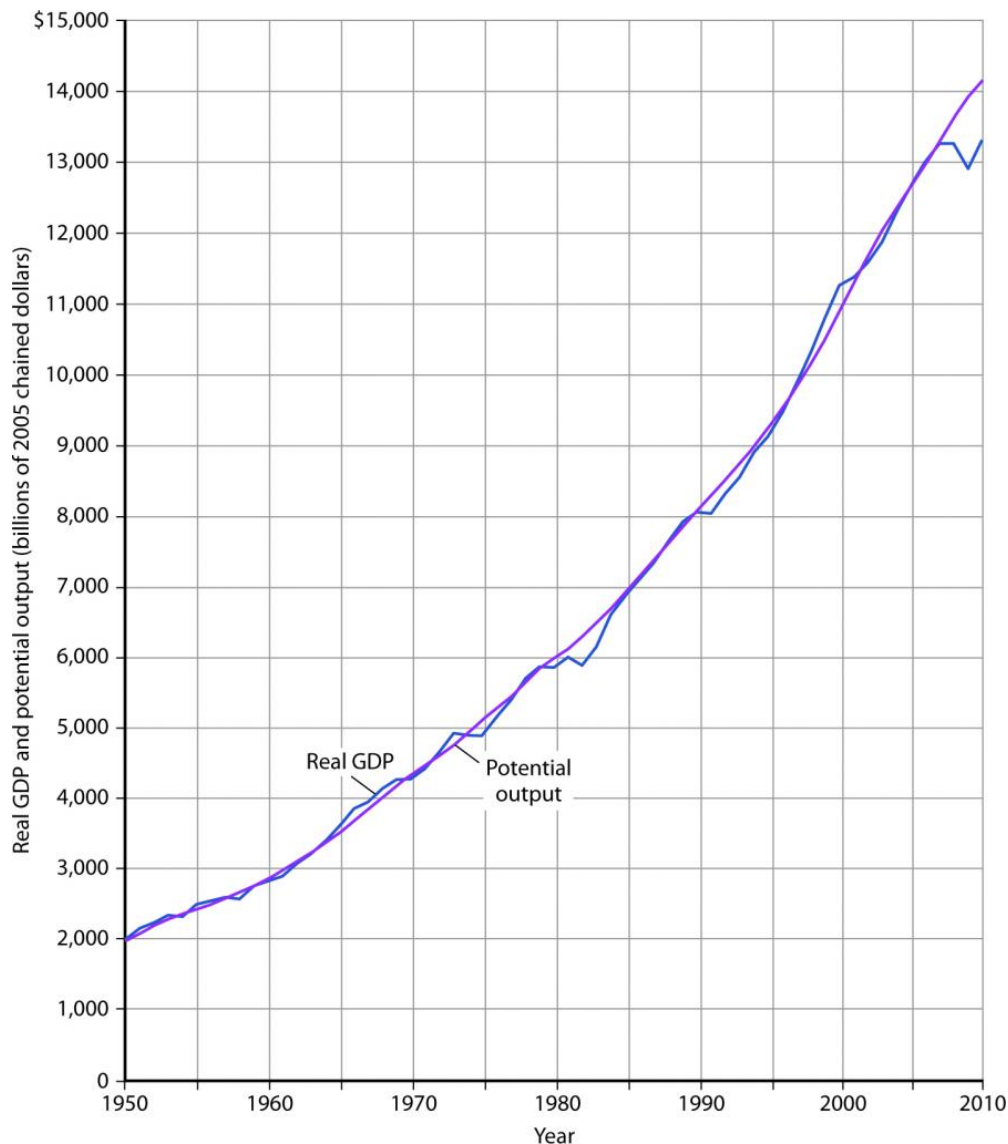
Earlier we defined economic growth as the process through which an economy achieves an outward shift in its production possibilities curve. How does a shift in the production possibilities curve relate to a change in potential output? To produce its potential level of output, an economy must operate on its production possibilities curve. An increase in potential output thus implies an outward shift in the production possibilities curve. In the framework of the macroeconomic model of aggregate demand and aggregate supply, we show economic growth as a shift to the right in the long-run aggregate supply curve.

There are three key points about economic growth to keep in mind:

1. Growth is a process. It is not a single event; rather, it is an unfolding series of events.
2. We define growth in terms of the economy's ability to produce goods and services, as indicated by its level of potential output.
3. Growth suggests that the economy's ability to produce goods and services is rising. A discussion of economic growth is thus a discussion of the series of events that increase the economy's ability to produce goods and services.

Figure 23.1 shows the record of economic growth for the U.S. economy over the past century. The graph shows annual levels of actual real GDP and of potential output. We see that the economy has experienced dramatic growth over the past century; potential output has soared more than 30-fold. The figure also reminds us of a central theme of our analysis of macroeconomics: real GDP fluctuates about potential output. Real GDP sagged well below its potential during the Great Depression of the 1930s and rose well above its potential as the nation mobilized its resources to fight World War II. With the exception of these two periods, real GDP has remained close to the economy's potential output. Since 1950, the actual level of real GDP has deviated from potential output by an average of less than 2%.

Figure 23.1 A Century of Economic Growth



st century, the level of potential output reached a level nearly 30 times its level a century earlier. Over the years, actual real GDP fluctuated about a rising level of potential output." width="497"/>

At the start of the 21st century, the level of potential output reached a level nearly 30 times its level a century earlier. Over the years, actual real GDP fluctuated about a rising level of potential output.

Source: 1900–1949 data from Robert Gordon, *Macroeconomics*, 6th ed. (New York: HarperCollins, 1993), Table A-1, pp. A1–A3; data for 1950–2010 from Congressional Budget Office, *The Budget and Economic Outlook*, August 2010.

We urge you to take some time with Figure 23.1. Over the course of the last century, it is economic growth that has taken center stage. Certainly, the fluctuations about potential output have been important. The recessionary gaps—periods when real GDP slipped below its potential—were often wrenching experiences in which millions of people endured great hardship. The inflationary gaps—periods when real GDP rose above its potential level—often produced dramatic increases in price levels. Those fluctuations mattered. It was the unemployment and/or the inflation that came with them that made headlines. But it was the quiet process of economic growth that pushed living standards ever higher. We must understand growth if we are to understand how we got where we are, and where we are likely to be going during the 21st century.

Figure 23.2 tells us why we use changes in potential output, rather than actual real GDP, as our measure of economic growth. Actual values of real GDP are affected not just by changes in the potential level of output, but also by the cyclical fluctuations about that level of output.

Given our definition of economic growth, we would say that the hypothetical economy depicted in Figure 23.2 grew at a 2.5% annual rate throughout the period. If we used actual values of real GDP, however, we would obtain quite different interpretations. Consider, for example, the first decade of this period: it began with a real GDP of \$900 billion and a recessionary gap, and it ended in year 10 with a real GDP of \$1,408 billion and an inflationary gap. If we record growth as the annual rate of change between these levels, we find an annual rate of growth of 4.6%—a rather impressive performance.

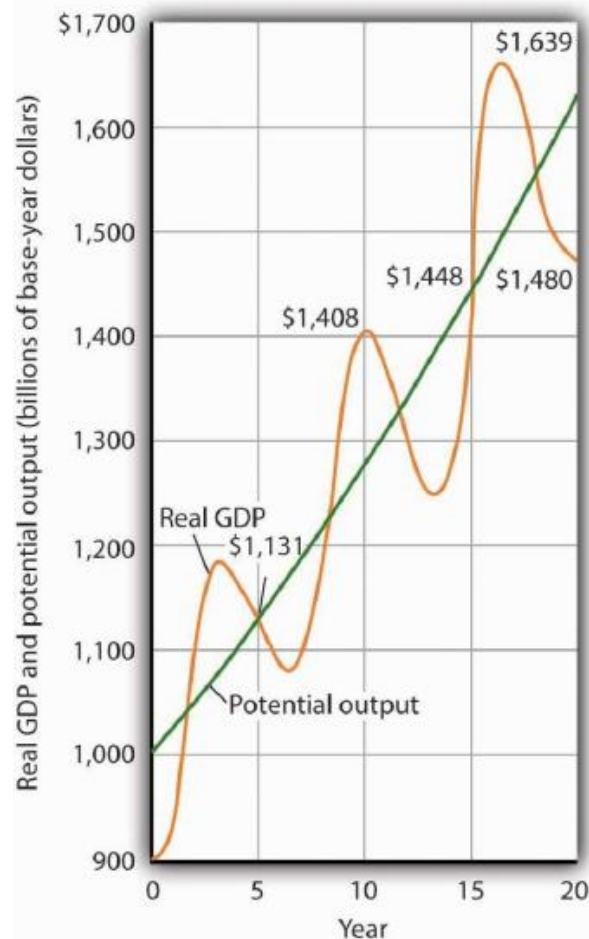


Figure 23.2 Cyclical Change Versus Growth The use of actual values of real GDP to measure growth can give misleading results. Here, an economy's potential output (shown in green) grows at a steady rate of 2.5% per year, with actual values of real GDP fluctuating about that trend. If we measure growth in the first 10 years as the annual rate of change between beginning and ending values of real GDP, we get a growth rate of 4.6%. The rate for the second decade is 0.5%. Growth estimates based on changes in real GDP are affected by cyclical changes that do not represent economic growth.

Now consider the second decade shown in Figure 23.2. It began in year 10, and it ended in year 20 with a recessionary gap. If we measure the growth rate over that period by looking at beginning and ending values of actual real GDP, we compute an annual growth rate of 0.5%. Viewed in this way, performance in the first decade is spectacular while performance in the second is rather lackluster. But these figures depend on the starting and ending points we select; the growth rate of potential output was 2.5% throughout the period.

By measuring economic growth as the rate of increase in potential output, we avoid such problems. One way to do this is to select years in which the economy was operating at the natural level of employment and then to compute the annual rate of change between those years. The result is an estimate of the rate at which potential output increased over the period in question. For the economy shown in Figure 23.2, for example, we see that real GDP equaled its potential in years 5 and 15. Real GDP in year 5 was \$1,131, and real GDP in year 15 was \$1,448. The annual rate of change between these two years was 2.5%. If we have estimates of potential output, of course, we can simply compute annual rates of change between any two years.

The Rule of 72 and Differences in Growth Rates

The Case in Point on presidents and growth at the end of this section suggests a startling fact: the U.S. growth rate began slowing in the 1970s, did not recover until the mid-1990s, only to slow down again in the 2000s. The question we address here is: does it matter? Does a percentage point drop in the growth rate make much difference? It does. To see why, let us investigate what happens when a variable grows at a particular percentage rate.

Suppose two economies with equal populations start out at the same level of real GDP but grow at different rates. Economy A grows at a rate of 3.5%, and Economy B grows at a rate of 2.4%. After a year, the difference in real GDP will hardly be noticeable. After a decade, however, real GDP in Economy A will be 11% greater than in Economy B. Over longer periods, the difference will be more dramatic. After 100 years, for example, income in Economy A will be nearly three times as great as in Economy B. If population growth in the two countries has been the same, the people of Economy A will have a far higher standard of living than those in Economy B. The difference in real GDP per person will be roughly equivalent to the difference that exists today between Great Britain and Mexico.

Over time, small differences in growth rates create large differences in incomes. An economy growing at a 3.5% rate increases by 3.5% of its initial value in the first year. In the second year, the economy increases by 3.5% of that new, higher value. In the third year, it increases by 3.5% of a still higher value. When a quantity grows at a given percentage rate, it experiences **exponential growth**. When a quantity grows at a given percentage rate, it experiences exponential growth. A variable that grows exponentially follows a path such as those shown for potential output in Figure 23.1 and Figure 23.2. These curves become steeper over time because the growth rate is applied to an ever-larger base.

A variable growing at some exponential rate doubles over fixed intervals of time. The doubling time is given by the **rule of 72**. A variable's approximate doubling time equals 72 divided by the growth rate, stated as a whole number., which states that a variable's approximate doubling time equals 72 divided by the growth rate, stated as a whole number. If the level of income were increasing at a 9% rate, for example, its doubling time would be roughly $72/9$, or 8 years¹.

Let us apply this concept of a doubling time to the reduction in the U.S. growth rate. Had the U.S. economy continued to grow at a 3.5% rate after 1970, then its potential output would have doubled roughly every 20 years ($72/3.5 = 20$). That means potential output would have doubled by 1990, would double again by 2010, and would double again by 2030. Real GDP in 2030 would thus be eight times as great as its 1970 level. Growing at a 2.4% rate, however, potential output doubles only every 30 years ($72/2.4 = 30$). It would take until 2000 to double once from its 1970 level, and it would double once more by 2030. Potential output in 2030 would thus be four times its 1970 level if the economy grew at a 2.4% rate (versus eight times its 1970 level if it grew at a 3.5% rate). The 1.1% difference in growth rates produces a 100% difference in potential output by 2030. The different growth paths implied by these growth rates are illustrated in Figure 23.3.

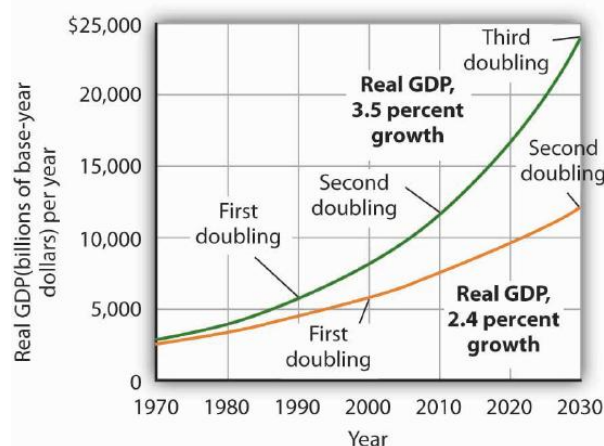


Figure 23.3 Differences in Growth Rates The chart suggests the significance in the long run of a small difference in the growth rate of real GDP. We begin in 1970, when real GDP equaled \$2,873.9 billion. If real GDP grew at an annual rate of 3.5% from that year, it would double roughly every 20 years: in 1990, 2010, and 2030. Growth at a 2.4% rate, however, implies doubling every 30 years: in 2000 and 2030. By 2030, the 3.5% growth rate leaves real GDP at twice the level that would be achieved by 2.4% growth.

Growth in Output per Capita

Of course, it is not just how fast potential output grows that determines how fast the average person's material standard of living rises. For that purpose, we examine economic growth on a per capita basis. An economy's **output per capita** Real GDP per person. equals real GDP per person. If we let N equal population, then

Equation 23.1

$$\text{Output per capita} = \frac{\text{real GDP}}{N}$$

In the United States in the third quarter of 2010, for example, real GDP was \$13,277.4 billion (annual rate). The U.S. population was 311.0 million. Real U.S. output per capita thus equaled \$42,693.

We use output per capita as a gauge of an economy's material standard of living. If the economy's population is growing, then output must rise as rapidly as the population if output per capita is to remain unchanged. If, for example, population increases by 2%, then real GDP would have to rise by 2% to maintain the current level of output per capita. If real GDP rises by less than 2%, output per capita will fall. If real GDP rises by more than 2%, output per capita will rise. More generally, we can write:

Equation 23.2

$$\% \text{ rate of growth of output per capita} \cong \% \text{ rate of growth of output} - \% \text{ rate of population}$$

For economic growth to translate into a higher standard of living on average, economic growth must exceed population growth. From 1970 to 2004, for example, Sierra Leone's population grew at an annual rate of 2.1% per year, while its real GDP grew at an annual rate of 1.4%; its output per capita thus fell at a rate of 0.7% per year. Over the same period, Singapore's population grew at an annual rate of 2.1% per year, while its real GDP grew 7.4% per year. The resultant 5.3% annual growth in output per capita transformed Singapore from a relatively poor country to a country with the one of the highest per capita incomes in the world.

Key Takeaways

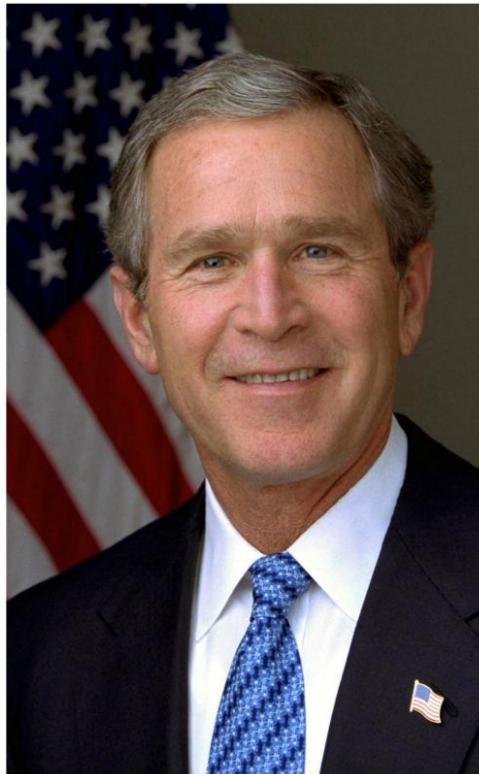
- Economic growth is the process through which an economy's production possibilities curve shifts outward. We measure it as the rate at which the economy's potential level of output increases.
- Measuring economic growth as the rate of increase of the actual level of real GDP can lead to misleading results due to the business cycle.
- Growth of a quantity at a particular percentage rate implies exponential growth. When something grows exponentially, it doubles over fixed intervals of time; these intervals may be computed using the rule of 72.
- Small differences in rates of economic growth can lead to large differences in levels of potential output over long periods of time.
- To assess changes in average standards of living, we subtract the percentage rate of growth of population from the percentage rate of growth of output to get the percentage rate of growth of output per capita.

Try It!

Suppose an economy's potential output and real GDP is \$5 million in 2000 and its rate of economic growth is 3% per year. Also suppose that its population is 5,000 in 2000, and that its population grows at a rate of 1% per year. Compute GDP per capita in 2000. Now estimate GDP and GDP per capita in 2072, using the rule of 72. At what rate does GDP per capita grow? What is its doubling time? Is this result consistent with your findings for GDP per capita in 2000 and in 2072?

Case in Point: Presidents and Economic Growth

Figure 23.4



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President	Annual Increase in Real GDP (%)	Growth Rate (%)
Truman 1949–1952	5.4	4.4
Eisenhower 1953–1960	2.4	3.4
Kennedy-Johnson 1961–1968	5.1	4.3
Nixon-Ford 1969–1976	2.7	3.4
Carter 1977–1980	3.2	3.1
Reagan 1981–1988	3.5	3.1
G. H. W. Bush 1989–1992	2.4	2.7
Clinton 1992–2000	3.6	3.2
G. W. Bush 2001–2008 (Q3)	2.1	2.7

Presidents are often judged by the rate at which the economy grew while they were in office. This test is unfair on two counts. First, a president has little to do with the forces that determine growth. And second, such tests simply compute the annual rate of growth in real GDP over the course of a presidential term, which we know can be affected by cyclical factors. A president who takes office when the economy is down and goes out with the economy up will look like an economic star; a president with the bad luck to have reverse circumstances will seem like a dud. Here are annual rates of change in real GDP for each of the postwar presidents, together with rates of economic growth, measured as the annual rate of change in potential output.

The presidents' economic records are clearly affected by luck. Presidents Truman, Kennedy, Reagan, and Clinton, for example, began their terms when the economy had a recessionary gap and ended them with an inflationary gap or at about potential output. Real GDP thus rose faster than potential output during their presidencies. The Eisenhower, Nixon-Ford, H. W. Bush, and G. W.

Bush administrations each started with an inflationary gap or at about potential and ended with a recessionary gap, thus recording rates of real GDP increase below the rate of gain in potential. Only Jimmy Carter, who came to office and left it with recessionary gaps, presided over a relatively equivalent rate of increase in actual GDP versus potential output.

Answer to Try It! Problem

GDP per capita in 2000 equals \$1,000 ($\$5,000,000/5,000$). If GDP rises 3% per year, it doubles every 24 years ($= 72/3$). Thus, GDP will be \$10,000,000 in 2024, \$20,000,000 in 2048, and \$40,000,000 in 2072. Growing at a rate of 1% per year, population will have doubled once by 2072 to 10,000. GDP per capita will thus be \$4,000 ($= \$40,000,000/10,000$). Notice that GDP rises by eight times its original level, while the increase in GDP per capita is fourfold. The latter value represents a growth rate in output per capita of 2% per year, which implies a doubling time of 36 years. That gives two doublings in GDP per capita between 2000 and 2072 and confirms a fourfold increase.

¹Notice the use of the words *roughly* and *approximately*. The actual value of an income of \$1,000 growing at rate r for a period of n years is $\$1,000 \times (1 + r)^n$. After 8 years of growth at a 9% rate, income would thus be $\$1,000 (1 + 0.09)^8 = \$1,992.56$. The rule of 72 predicts that its value will be \$2,000. The rule of 72 gives an approximation, not an exact measure, of the impact of exponential growth.

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6.2: Growth and the Long-Run Aggregate Supply Curve

Learning Objective

1. Explain and illustrate graphically the concept of the aggregate production function. Explain how its shape relates to the concept of diminishing marginal returns.
2. Derive the long-run aggregate supply curve from the model of the labor market and the aggregate production function.
3. Explain how the long-run aggregate supply curve shifts in responses to shifts in the aggregate production function or to shifts in the demand for or supply of labor.

Economic growth means the economy's potential output is rising. Because the long-run aggregate supply curve is a vertical line at the economy's potential, we can depict the process of economic growth as one in which the long-run aggregate supply curve shifts to the right.

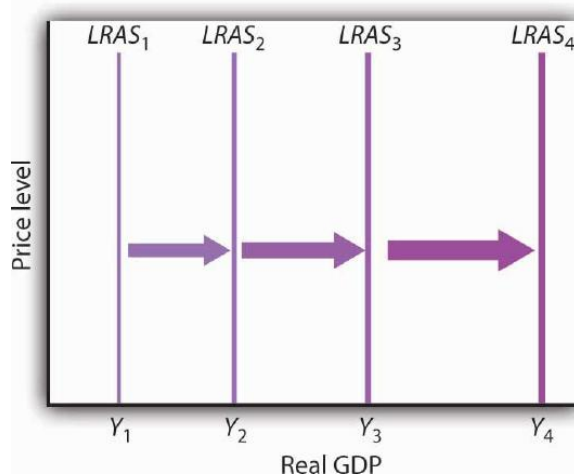


Figure 23.5 Economic Growth and the Long-Run Aggregate Supply Curve Because economic growth is the process through which the economy's potential output is increased, we can depict it as a series of rightward shifts in the long-run aggregate supply curve. Notice that with exponential growth, each successive shift in $LRAS$ is larger and larger.

Figure 23.5 illustrates the process of economic growth. If the economy begins at potential output of Y_1 , growth increases this potential. The figure shows a succession of increases in potential to Y_2 , then Y_3 , and Y_4 . If the economy is growing at a particular percentage rate, and if the levels shown represent successive years, then the size of the increases will become larger and larger, as indicated in the figure.

Because economic growth can be considered as a process in which the long-run aggregate supply curve shifts to the right, and because output tends to remain close to this curve, it is important to gain a deeper understanding of what determines long-run aggregate supply ($LRAS$). We shall examine the derivation of $LRAS$ and then see what factors shift the curve. We shall begin our work by defining an aggregate production function.

The Aggregate Production Function

An **aggregate production function** is a function that relates the total output of an economy to the total amount of labor employed in the economy, all other determinants of production (capital, natural resources, and technology) being unchanged. It relates the total output of an economy to the total amount of labor employed in the economy, all other determinants of production (that is, capital, natural resources, and technology) being unchanged. An economy operating on its aggregate production function is producing its potential level of output.

Figure 23.6 shows an aggregate production function (PF). It shows output levels for a range of employment between 120 million and 140 million workers. When the level of employment is 120 million, the economy produces a real GDP of \$11,500 billion (point A). A level of employment of 130 million produces a real GDP of \$12,000 billion (point B), and when 140 million workers are employed, a real GDP of \$12,300 billion is produced (point C). In drawing the aggregate production function, the amount of labor

varies, but everything else that could affect output, specifically the quantities of other factors of production and technology, is fixed.

The shape of the aggregate production function shows that as employment increases, output increases, but at a decreasing rate. Increasing employment from 120 million to 130 million, for example, increases output by \$500 billion to \$12,000 billion at point B. The next 10 million workers increase production by \$300 billion to \$12,300 billion at point C. This example illustrates diminishing marginal returns. **Diminishing marginal returns** Situation that occurs when additional units of a variable factor add less and less to total output, given constant quantities of other factors. occur when additional units of a variable factor add less and less to total output, given constant quantities of other factors.

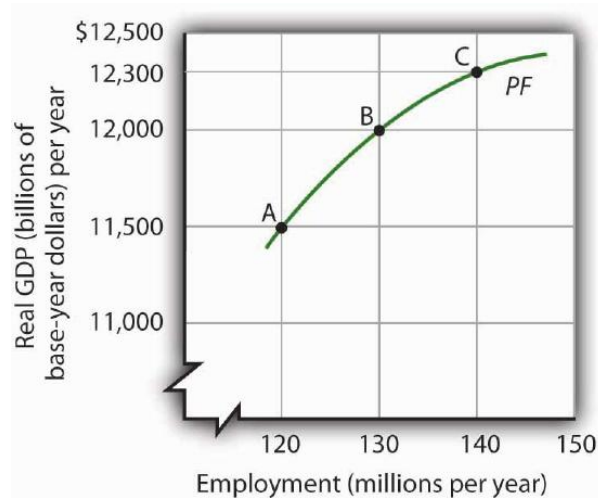


Figure 23.6 The Aggregate Production Function An aggregate production function (PF) relates total output to total employment, assuming all other factors of production and technology are fixed. It shows that increases in employment lead to increases in output but at a decreasing rate.

It is easy to picture the problem of diminishing marginal returns in the context of a single firm. The firm is able to increase output by adding workers. But because the firm's plant size and stock of equipment are fixed, the firm's capital per worker falls as it takes on more workers. Each additional worker adds less to output than the worker before. The firm, like the economy, experiences diminishing marginal returns.

The Aggregate Production Function, the Market for Labor, and Long-Run Aggregate Supply

To derive the long-run aggregate supply curve, we bring together the model of the labor market, introduced in the first macro chapter and the aggregate production function.

As we learned, the labor market is in equilibrium at the natural level of employment. The demand and supply curves for labor intersect at the real wage at which the economy achieves its natural level of employment. We see in Panel (a) of Figure 23.7 that the equilibrium real wage is ω_1 and the natural level of employment is L_1 . Panel (b) shows that with employment of L_1 , the economy can produce a real GDP of Y_p . That output equals the economy's potential output. It is that level of potential output that determines the position of the long-run aggregate supply curve in Panel (c).

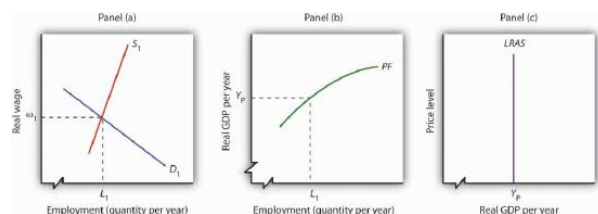


Figure 23.7 Deriving the Long-Run Aggregate Supply Curve Panel (a) shows that the equilibrium real wage is ω_1 , and the natural level of employment is L_1 . Panel (b) shows that with employment of L_1 , the economy can produce a real GDP of Y_p . That output equals the economy's potential output. It is at that level of potential output that we draw the long-run aggregate supply curve in Panel (c).

Changes in Long-Run Aggregate Supply

The position of the long-run aggregate supply curve is determined by the aggregate production function and the demand and supply curves for labor. A change in any of these will shift the long-run aggregate supply curve.

Figure 23.8 shows one possible shifter of long-run aggregate supply: a change in the production function. Suppose, for example, that an improvement in technology shifts the aggregate production function in Panel (b) from PF_1 to PF_2 . Other developments that could produce an upward shift in the curve include an increase in the capital stock or in the availability of natural resources.

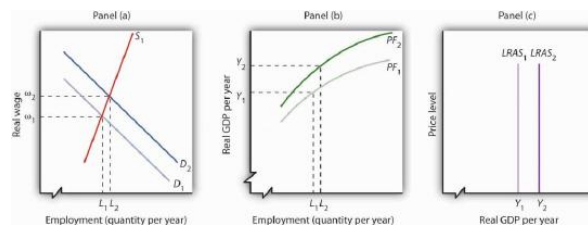


Figure 23.8 Shift in the Aggregate Production Function and the Long-Run Aggregate Supply Curve An improvement in technology shifts the aggregate production function upward in Panel (b). Because labor is more productive, the demand for labor shifts to the right in Panel (a), and the natural level of employment increases to L_2 . In Panel (c) the long-run aggregate supply curve shifts to the right to Y_2 .

The shift in the production function to PF_2 means that labor is now more productive than before. This will affect the demand for labor in Panel (a). Before the technological change, firms employed L_1 workers at a real wage ω_1 . If workers are more productive, firms will find it profitable to hire more of them at ω_1 . The demand curve for labor thus shifts to D_2 in Panel (a). The real wage rises to ω_2 , and the natural level of employment rises to L_2 . The increase in the real wage reflects labor's enhanced productivity. The amount of output per worker., the amount of output per worker. To see how potential output changes, we see in Panel (b) how much output can be produced given the new natural level of employment and the new aggregate production function. The real GDP that the economy is capable of producing rises from Y_1 to Y_2 . The higher output is a reflection of a higher natural level of employment, along with the fact that labor has become more productive as a result of the technological advance. In Panel (c) the long-run aggregate supply curve shifts to the right to the vertical line at Y_2 .

This analysis dispels a common misconception about the impact of improvements in technology or increases in the capital stock on employment. Some people believe that technological gains or increases in the stock of capital reduce the demand for labor, reduce employment, and reduce real wages. Certainly the experience of the United States and most other countries belies that notion. Between 1990 and 2007, for example, the U.S. capital stock and the level of technology increased dramatically. During the same period, employment and real wages rose, suggesting that the demand for labor increased by more than the supply of labor. As some firms add capital or incorporate new technologies, some workers at those firms may lose their jobs. But for the economy as a whole, new jobs become available *and* they generally offer higher wages. The demand for labor rises.

Another event that can shift the long-run aggregate supply curve is an increase in the supply of labor, as shown in Figure 23.9. An increased supply of labor could result from immigration, an increase in the population, or increased participation in the labor force by the adult population. Increased participation by women in the labor force, for example, has tended to increase the supply curve for labor during the past several decades.

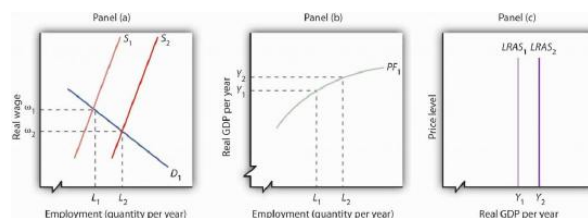


Figure 23.9 Increase in the Supply of Labor and the Long-Run Aggregate Supply Curve An increase in the supply of labor shifts the supply curve in Panel (a) to S_2 , and the natural level of employment rises to L_2 . The real wage falls to ω_2 . With increased labor, the aggregate production function in Panel (b) shows that the economy is now capable of producing real GDP at Y_2 . The long-run aggregate supply curve in Panel (c) shifts to $LRAS_2$.

In Panel (a), an increase in the labor supply shifts the supply curve to S_2 . The increase in the supply of labor does not change the stock of capital or natural resources, nor does it change technology—it therefore does not shift the aggregate production function.

Because there is no change in the production function, there is no shift in the demand for labor. The real wage falls from ω_1 to ω_2 in Panel (a), and the natural level of employment rises from L_1 to L_2 . To see the impact on potential output, Panel (b) shows that employment of L_2 can produce real GDP of Y_2 . The long-run aggregate supply curve in Panel (c) thus shifts to $LRAS_2$. Notice, however, that this shift in the long-run aggregate supply curve to the right is associated with a reduction in the real wage to ω_2 .

Of course, the aggregate production function and the supply curve of labor can shift together, producing higher real wages at the same time population rises. That has been the experience of most industrialized nations. The increase in real wages in the United States between 1990 and 2007, for example, came during a period in which an increasing population increased the supply of labor. The demand for labor increased by more than the supply, pushing the real wage up. The accompanying Case in Point looks at gains in real wages in the face of technological change, an increase in the stock of capital, and rapid population growth in the United States during the 19th century.

Our model of long-run aggregate supply tells us that in the long run, real GDP, the natural level of employment, and the real wage are determined by the economy's production function and by the demand and supply curves for labor. Unless an event shifts the aggregate production function, the demand curve for labor, or the supply curve for labor, it affects neither the natural level of employment nor potential output. Economic growth occurs only if an event shifts the economy's production function or if there is an increase in the demand for or the supply of labor.

Key Takeaways

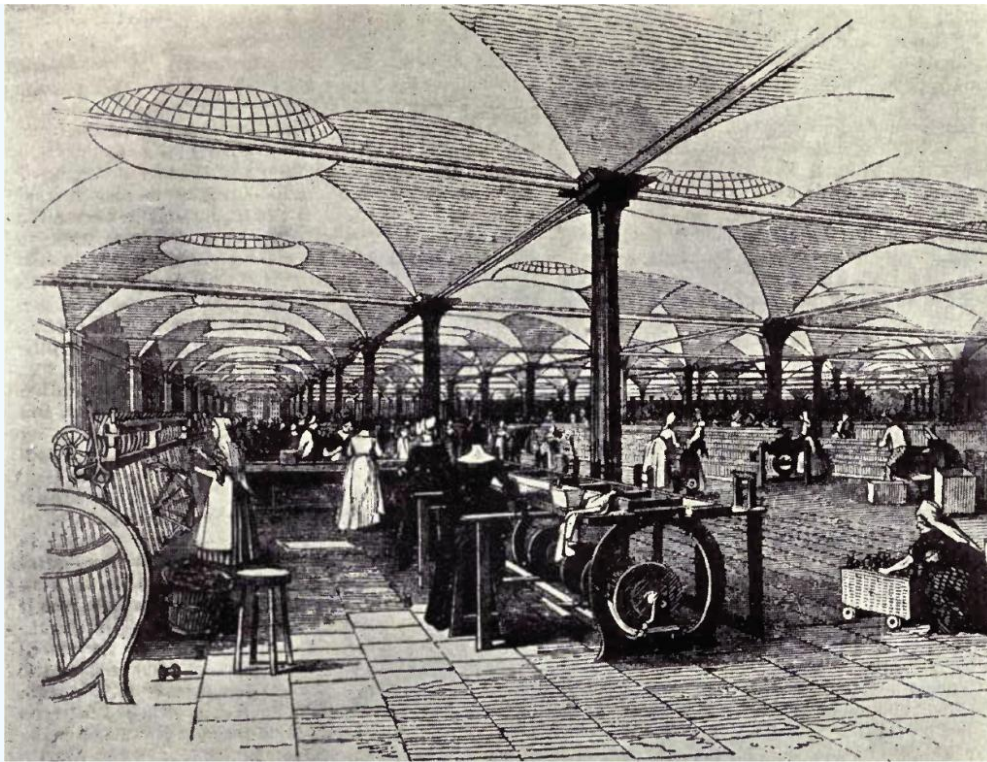
- The aggregate production function relates the level of employment to the level of real GDP produced per period.
- The real wage and the natural level of employment are determined by the intersection of the demand and supply curves for labor. Potential output is given by the point on the aggregate production function corresponding to the natural level of employment. This output level is the same as that shown by the long-run aggregate supply curve.
- Economic growth can be shown as a series of shifts to the right in $LRAS$. Such shifts require either upward shifts in the production function or increases in demand for or supply of labor.

Try It!

Suppose that the quantity of labor supplied is 50 million workers when the real wage is \$20,000 per year and that potential output is \$2,000 billion per year. Draw a three-panel graph similar to the one presented in Figure 23.9 to show the economy's long-run equilibrium. Panel (a) of your graph should show the demand and supply curves for labor, Panel (b) should show the aggregate production function, and Panel (c) should show the long-run aggregate supply curve. Now suppose a technological change increases the economy's output with the same quantity of labor as before to \$2,200 billion, and the real wage rises to \$21,500. In response, the quantity of labor supplied increases to 51 million workers. In the same three panels you have already drawn, sketch the new curves that result from this change. Explain what happens to the level of employment, the level of potential output, and the long-run aggregate supply curve. (Hint: you have information for only one point on each of the curves you draw—two for the supply of labor; simply draw curves of the appropriate shape. Do not worry about getting the scale correct.)

Case in Point: Technological Change, Employment, and Real Wages During the Industrial Revolution

Figure 23.10



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Technological change and the capital investment that typically comes with it are often criticized because they replace labor with machines, reducing employment. Such changes, critics argue, hurt workers. Using the model of aggregate demand and aggregate supply, however, we arrive at a quite different conclusion. The model predicts that improved technology will increase the demand for labor and boost real wages.

The period of industrialization, generally taken to be the time between the Civil War and World War I, was a good test of these competing ideas. Technological changes were dramatic as firms shifted toward mass production and automation. Capital investment soared. Immigration increased the supply of labor. What happened to workers?

Employment more than doubled during this period, consistent with the prediction of our model. It is harder to predict, from a theoretical point of view, the consequences for real wages. The latter third of the 19th century was a period of massive immigration to the United States. Between 1865 and 1880, more than 5 million people came to the United States from abroad; most were of working age. The pace accelerated between 1880 and 1923, when more than 23 million people moved to the United States from other countries. Immigration increased the supply of labor, which should reduce the real wage. There were thus two competing forces at work: Technological change and capital investment tended to increase real wages, while immigration tended to reduce them by increasing the supply of labor.

The evidence suggests that the forces of technological change and capital investment proved far more powerful than increases in labor supply. Real wages soared 60% between 1860 and 1890. They continued to increase after that. Real wages in manufacturing, for example, rose 37% from 1890 to 1914.

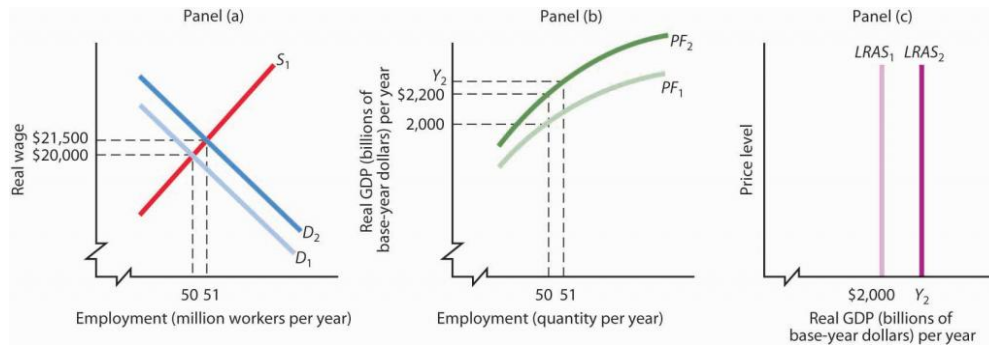
Technological change and capital investment displace workers in some industries. But for the economy as a whole, they increase worker productivity, increase the demand for labor, and increase real wages.

Sources: Wage data taken from Clarence D. Long, *Wages and Earnings in the United States, 1860–1990* (Princeton, NJ: Princeton University Press, 1960), p. 109, and from Albert Rees, *Wages in Manufacturing, 1890–1914* (Princeton, NJ: Princeton University Press, 1961), pp. 3–5. Immigration figures taken from Gary M. Walton and Hugh Rockoff, *History of the American Economy*, 6th ed. (New York: Harcourt Brace Jovanovich, 1990), p. 371.

Answer to Try It! Problem

The production function in Panel (b) shifts up to PF_2 . Because it reflects greater productivity of labor, firms will increase their demand for labor, and the demand curve for labor shifts to D_2 in Panel (a). $LRAS_1$ shifts to $LRAS_2$ in Panel (c). Employment and potential output rise. Potential output will be greater than \$2,200 billion.

Figure 23.11



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6.3: Determinants of Economic Growth

Learning Objective

1. Discuss the sources of economic growth.
2. Discuss possible reasons why countries grow at different rates.

In this section, we review the main determinants of economic growth. We also examine the reasons for the widening disparities in economic growth rates among countries in recent years.

The Sources of Economic Growth

As we have learned, there are two ways to model economic growth: (1) as an outward shift in an economy's production possibilities curve, and (2) as a shift to the right in its long-run aggregate supply curve. In drawing either one at a point in time, we assume that the economy's factors of production and its technology are unchanged. Changing these will shift both curves. Therefore, anything that increases the quantity or quality of factors of production or that improves the technology available to the economy contributes to economic growth.

The sources of growth for the U.S. economy in the 20th century were presented in the chapter on sources of production. There we learned that the main sources of growth for the United States from 1948 to 2002 were divided between increases in the quantities of labor and of physical capital (about 60%) and in improvements in the qualities of the factors of production and technology (about 40%). Since 1995, however, improvements in factor quality and technology have been the main drivers of economic growth in the United States.

In order to devote resources to increasing physical and human capital and to improving technology—activities that will enhance future production—society must forgo using them now to produce consumer goods. Even though the people in the economy would enjoy a higher standard of living today without this sacrifice, they are willing to reduce present consumption in order to have more goods and services available for the future.

As a college student, you personally made such a choice. You decided to devote time to study that you could have spent earning income. With the higher income, you could enjoy greater consumption today. You made this choice because you expect to earn higher income in the future and thus to enjoy greater consumption in the future. Because many other people in the society also choose to acquire more education, society allocates resources to produce education. The education produced today will enhance the society's human capital and thus its economic growth.

All other things equal, higher saving allows more resources to be devoted to increases in physical and human capital and technological improvement. In other words, saving, which is income not spent on consumption, promotes economic growth by making available resources that can be channeled into growth-enhancing uses.

Explaining Recent Disparities in Growth Rates

Toward the end of the 20th century, it appeared that some of the world's more affluent countries were growing robustly while others were growing more slowly or even stagnating. This observation was confirmed in a major study by the Organization for Economic Co-operation and Development (OECD)¹, whose members are listed in Table 23.1 "Growing Disparities in Rates of Economic Growth". The table shows that for the OECD countries as a whole, economic growth per capita fell from an average of 2.2% per year in the 1980s to an average of 1.9% per year in the 1990s. The higher standard deviation in the latter period confirms an increased disparity of growth rates in the more recent period. Moreover, the data on individual countries show that per capita growth in some countries (specifically, the United States, Canada, Ireland, Netherlands, Norway, and Spain) picked up, especially in the latter half of the 1990s, while it decelerated in most of the countries of continental Europe and Japan.

Table 23.1 Growing Disparities in Rates of Economic Growth

Trend Growth of GDP per Capita			
Country	1980–1990		1990–2000
United States	2.1	2.3	2.8
Japan	3.3	1.4	0.9
Germany	1.9	1.2	1.7
France	1.6	1.5	1.9
Italy	2.3	1.5	1.7
United Kingdom	2.2	2.1	2.3
Canada	1.4	1.7	2.6
Austria	2.1	1.9	2.3
Belgium	2.0	1.9	2.3
Denmark	1.9	1.9	2.3
Finland	2.2	2.1	3.9
Greece	0.5	1.8	2.7
Iceland	1.7	1.5	2.6
Ireland	3.0	6.4	7.9
Luxembourg	4.0	4.5	4.6
Netherlands	1.6	2.4	2.7
Portugal	3.1	2.8	2.7
Spain	2.3	2.7	3.2
Sweden	1.7	1.5	2.6
Switzerland	1.4	0.4	1.1
Turkey	2.1	2.1	1.9
Australia	1.6	2.4	2.8
New Zealand	1.4	1.2	1.8
Mexico	0.0	1.6	2.7
Korea	7.2	5.1	4.2
Hungary	—	2.3	3.5
Poland	—	4.2	4.8
Czech Republic	—	1.7	1.4
OECD24 ²	2.2	1.9	2.2
Standard Deviation of OECD24	0.74	1.17	1.37

Variation in the growth in real GDP per capita has widened among the world's leading industrialized economies.

Source: Excerpted from Table 1.1 Organization for Economic Co-operation and Development, *Sources of Economic Growth in OECD Countries*, 2003: p. 32–33.

The study goes on to try to explain the reasons for the divergent growth trends. The main findings were:

- In general, countries with accelerating per capita growth rates also experienced significant increases in employment, while those with stagnant or declining employment generally experienced reductions in per capita growth rates.
- Enhancements in human capital contributed to labor productivity and economic growth, but in slower growing countries such improvements were not enough to offset the impact of reduced or stagnant labor utilization.
- Information and communication technology has contributed to economic growth both through rapid technological progress within the information and communication technology industry itself as well as, more recently, through the use of information and communication technology equipment in other industries. This has made an important contribution to growth in several of the faster growing countries.
- Other factors associated with more growth include: investments in physical and human capital, sound macroeconomic policies (especially low inflation), private sector research and development, trade exposure, and better developed financial markets. Results concerning the impact of the size of the government and of public sector research and development on growth were more difficult to interpret.
- With qualifications, the study found that strict regulation of product markets (for example, regulations that reduce competition) and strict employment protection legislation (for example, laws that make hiring and firing of workers more difficult) had negative effects on growth.
- All countries show a large number of firms entering and exiting markets. But, a key difference between the United States and Europe is that new firms in the United States start out smaller and less productive than those of Europe but grow faster when they are successful. The report hypothesizes that lower start-up costs and less strict labor market regulations may encourage U.S. entrepreneurs to enter a market and then to expand, if warranted. European entrepreneurs may be less willing to experiment in a market in the first place.

The general concern in the second half of the 1970s and the 1980s was that economic growth was slowing down and that it might not be possible to reverse this pattern. The 1990s and early 2000s, in which growth picked up in some countries but not in others, suggested that the problem was not universal and led to a search for the reasons for the disparities in growth rates that emerged. The OECD study described above gives some possible explanations. The findings of that study practically beg countries to examine closely their economic policies at a variety of levels and to consider changes that may add flexibility to their economies.

In closing, it is worth reiterating that economic freedom and higher incomes tend to go together. Countries could not have attained high levels of income if they had not maintained the economic freedom that contributed to high incomes in the first place. Thus, it is also likely that rates of economic growth in the future will be related to the amount of economic freedom countries choose. We shall see in later chapters that monetary and fiscal policies that are used to stabilize the economy in the short run can also have an impact on long-run economic growth.

Key Takeaways

- The main sources of growth for the United States from 1948 to 2002 were divided between increases in the quantities of labor and of physical capital (about 60%) and in improvements in the qualities of the factors of production and technology (about 40%). Since 1995, however, improvements in factor quality and technology have been the main drivers of economic growth in the United States.
- There has been a growing disparity in the rates of economic growth in industrialized countries in the last decade, which may reflect various differences in economic structures and policies.

Try It!

All other things unchanged, compare the position of a country's expected production possibility curve and the expected position of its long-run aggregate supply curve if:

1. Its labor force increases in size by 3% per year compared to 2% per year.
2. Its saving rate falls from 15% to 10%.
3. It passes a law making it more difficult to fire workers.

4. Its level of education rises more quickly than it has in the past.

 Case in Point: Economic Growth in Poor Countries ... or Lack Thereof

Figure 23.12



Alan – [A Home in Sullivan's Gulch \(A Portland Hooverville\)](#) – CC BY-NC-ND 2.0.

Economist William Easterly in his aptly named book *The Elusive Quest for Growth: Economists' Adventures and Misadventures in the Tropics* admits that after 50 years of searching for the magic formula for turning poor countries into rich ones, the quest remains elusive.

Poor countries just need more physical capital, you say? Easterly points out that between 1960 and 1985, the capital stock per work in both Gambia and Japan rose by over 500%. The result? In Gambia, output per worker over the 25-year period rose 2%; in Japan, output per worker rose 260%.

So, it must be that poor countries need more human capital? Again, he finds startling comparisons. For example, human capital expanded faster in Zambia than in Korea, but Zambia's annual growth rate is 7 percentage points below Korea's.

Too much population growth? Too little? More foreign aid? Too much? As Easterly proceeds, writing a prescription for growth seems ever more difficult: "None has delivered as promised," he concludes (p. xi).

While Easterly does not offer his own new panacea for how to move countries to a higher level of per capita GDP, where the model presented in this chapter does seem to provide some explanations of why a country's growth rate may vary over time or differ from another country's, he does argue that creating incentives for growth in poor countries is crucial. Acknowledging a role for plain luck, Easterly argues that good government policies—ones that keep low such negatives as inflation, corruption, and red tape—and quality institutions and laws—ones that, for example, honor contracts and reward merit—will help.

How to actually improve such incentives might constitute the next great quest:

"We have learned once and for all that there are no magical elixirs to bring a happy ending to our quest for growth. Prosperity happens when all the players in the development game have the right incentives. It happens when government incentives induce technological adaptation, high-quality investment in machines, and high-quality schooling. It happens when donors face incentives that induce them to give aid to countries with good policies where aid will have high payoffs, not to countries with poor policies where aid is wasted. It happens when the poor get good opportunities and incentives, which requires government welfare programs that reward rather than penalize earning income. It happens when politics is not polarized between antagonistic interest groups. . . . The solutions are a lot more difficult to describe than the problems. The way forward must be to create incentives for growth for the trinity of governments, donors, and individuals." (p. 289–90)

Source: William Easterly, *The Elusive Quest for Growth: Economists' Adventures and Misadventures in the Tropics* (Cambridge: MIT Press, 2002).

Answer to Try It! Problem

Situations 1 and 4 should lead to a shift further outward in the country's production possibility curve and further to the right in its long-run aggregate supply curve. Situations 2 and 3 should lead to smaller outward shifts in the country's production possibility curve and smaller rightward shifts in its long-run aggregate supply curve.

¹The material in this section is based on Organization for Economic Co-operation and Development, *The Sources of Economic Growth in OECD Countries*, 2003.

²Excludes Czech Republic, Hungary, Korean, Mexico, Poland, and Slovak Republic

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6.4: Review and Practice

Summary

We saw that economic growth can be measured by the rate of increase in potential output. Measuring the rate of increase in actual real GDP can confuse growth statistics by introducing elements of cyclical variation.

Growth is an exponential process. A variable increasing at a fixed percentage rate doubles over fixed intervals. The doubling time is approximated by the rule of 72. The exponential nature of growth means that small differences in growth rates have large effects over long periods of time. Per capita rates of increase in real GDP are found by subtracting the growth rate of the population from the growth rate of GDP.

Growth can be shown in the model of aggregate demand and aggregate supply as a series of rightward shifts in the long-run aggregate supply curve. The position of the *LRAS* is determined by the aggregate production function and by the demand and supply curves for labor. A rightward shift in *LRAS* results either from an upward shift in the production function, due to increases in factors of production other than labor or to improvements in technology, or from an increase in the demand for or the supply of labor.

Saving plays an important role in economic growth, because it allows for more capital to be available for future production, so the rate of economic growth can rise. Saving thus promotes growth.

In recent years, rates of growth among the world's industrialized countries have grown more disparate. Recent research suggests this may be related to differing labor and product market conditions, differences in the diffusion of information and communications technologies, as well as differences in macroeconomic and trade policies. Evidence on the role that government plays in economic growth was less conclusive.

Concept Problems

1. Suppose the people in a certain economy decide to stop saving and instead use all their income for consumption. They do nothing to add to their stock of human or physical capital. Discuss the prospects for growth of such an economy.
2. Singapore has a saving rate that is roughly three times greater than that of the United States. Its greater saving rate has been one reason why the Singapore economy has grown faster than the U.S. economy. Suppose that if the United States increased its saving rate to, say, twice the Singapore level, U.S. growth would surpass the Singapore rate. Would that be a good idea?
3. Suppose an increase in air pollution causes capital to wear out more rapidly, doubling the rate of depreciation. How would this affect economic growth?
4. Some people worry that increases in the capital stock will bring about an economy in which everything is done by machines, with no jobs left for people. What does the model of economic growth presented in this chapter predict?
5. China's annual rate of population growth was 1.2% from 1975 to 2003 and is expected to be 0.6% from 2003 through 2015. How do you think this will affect the rate of increase in real GDP? How will this affect the rate of increase in per capita real GDP?
6. Suppose technology stops changing. Explain the impact on economic growth.
7. Suppose a series of terrorist attacks destroys half the capital in the United States but does not affect the population. What will happen to potential output and to the real wage?
8. "Given the rate at which scientists are making new discoveries, we will soon reach the point that no further discoveries can be made. Economic growth will come to a stop." Discuss.
9. Suppose real GDP increases during President Obama's term in office at a 5% rate. Would that imply that his policies were successful in "growing the economy"?
10. Suppose that for some country it was found that its economic growth was based almost entirely on increases in quantities of factors of production. Why might such growth be difficult to sustain?

Numerical Problems

1. The population of the world in 2003 was 6.314 billion. It grew between 1975 and 2003 at an annual rate of 1.6%. Assume that it continues to grow at this rate.
 1. Compute the doubling time.

1. Compute the doubling time.
 2. Estimate the world population in 2048 and 2093 (assuming all other things remain unchanged).
 2. With a world population in 2003 of 6.314 billion and a projected population growth rate of 1.1% instead (which is the United Nations' projection for the period 2003 to 2015).
 1. Compute the doubling time.
 2. State the year in which the world's population would be 12.628 billion.
 3. Suppose a country's population grows at the rate of 2% per year and its output grows at the rate of 3% per year.
 1. Calculate its rate of growth of per capita output.
 2. If instead its population grows at 3% per year and its output grows at 2% per year, calculate its rate of growth of per capita output.
 4. The rate of economic growth per capita in France from 1996 to 2000 was 1.9% per year, while in Korea over the same period it was 4.2%. Per capita real GDP was \$28,900 in France in 2003, and \$12,700 in Korea. Assume the growth rates for each country remain the same.
 1. Compute the doubling time for France's per capita real GDP.
 2. Compute the doubling time for Korea's per capita real GDP.
 3. What will France's per capita real GDP be in 2045?
 4. What will Korea's per capita real GDP be in 2045?
 5. Suppose real GDPs in country A and country B are identical at \$10 trillion dollars in 2005. Suppose country A's economic growth rate is 2% and country B's is 4% and both growth rates remain constant over time.
 1. On a graph, show country A's potential output until 2025.
 2. On the same graph, show country B's potential output.
 3. Calculate the percentage difference in their levels of potential output in 2025.
- Suppose country A's population grows 1% per year and country B's population grows 3% per year.
1. On a graph, show country A's potential output per capita in 2025.
 2. On the same graph, show country B's potential output per capita in 2025.
 3. Calculate the percentage difference in their levels of potential output per capita in 2025.
6. Two countries, A and B, have identical levels of real GDP per capita. In Country A, an increase in the capital stock increases the potential output by 10%. Country B also experiences a 10% increase in its potential output, but this increase is the result of an increase in its labor force. Using aggregate production functions and labor-market analyses for the two countries, illustrate and explain how these events are likely to affect living standards in the two economies.
7. Suppose the information below characterizes an economy:

Employment (in millions)	Real GDP (in billions)
1	200
2	700
3	1,100
4	1,400
5	1,650
6	1,850
7	2,000
8	2,100
9	2,170
10	2,200

1. Construct the aggregate production function for this economy.
2. What kind of returns does this economy experience? How do you know?
3. Assuming that total available employment is 7 million, draw the economy's long-run aggregate supply curve.

Suppose that improvement in technology means that real GDP at each level of employment rises by \$200 billion.

1. Construct the new aggregate production function for this economy.
 2. Construct the new long-run aggregate supply curve for the economy.
8. In Table 23.1 "Growing Disparities in Rates of Economic Growth", we can see that Japan's growth rate of per capita real GDP fell from 3.3% per year in the 1980s to 1.4% per year in the 1990s.
1. Compare the percent increase in its per capita real GDP over the 20-year period to what it would have been if it had maintained the 3.3% per capita growth rate of the 1980s.
 2. Japan's per capita GDP in 1980 was about \$24,000 (in U.S. 2000 dollars) in 1980. Calculate what it would have been if the growth rate of the 1980s had been maintained. Calculate about how much it is, given the actual growth rates over the two decades.
 3. In Table 23.1 "Growing Disparities in Rates of Economic Growth", we can see that Ireland's growth rate of per capita real GDP grew from 3.0% per year in the 1980s to 6.4% per year in the 1990s.
 4. Compare the percent increase in its per capita real GDP over the 20-year period to what it would have been if it had maintained the 3.0% per capita growth rate of the 1980s.
 5. Ireland's per capita GDP in 1980 was about \$10,000 (in U.S. 2000 dollars). Calculate what it would have been if the growth rate of the 1980s had been maintained. Calculate about how much it is, given the actual growth rates over the two decades.

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CHAPTER OVERVIEW

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7.1: Determining the Level of Consumption

Learning Objective

1. Explain and graph the consumption function and the saving function, explain what the slopes of these curves represent, and explain how the two are related to each other.
2. Compare the current income hypothesis with the permanent income hypothesis, and use each to predict the effect that temporary versus permanent changes in income will have on consumption.
3. Discuss two factors that can cause the consumption function to shift upward or downward.

J. R. McCulloch, an economist of the early nineteenth century, wrote, “Consumption ... is, in fact, the object of industry” (McCulloch, 1824). Goods and services are produced so that people can use them. The factors that determine consumption thus determine how successful an economy is in fulfilling its ultimate purpose: providing goods and services for people. So, consumption is not just important because it is such a large component of economic activity. It is important because, as McCulloch said, consumption is at the heart of the economy’s fundamental purpose.

Consumption and Disposable Personal Income

It seems reasonable to expect that consumption spending by households will be closely related to their disposable personal income, which equals the income households receive less the taxes they pay. Note that disposable personal income and GDP are not the same thing. GDP is a measure of total income; disposable personal income is the income households have available to spend during a specified period.

Real values of disposable personal income and consumption per year from 1960 through 2010 are plotted in Figure 28.1. The data suggest that consumption generally changes in the same direction as does disposable personal income.

The relationship between consumption and disposable personal income is called the **consumption function**. It can be represented algebraically as an equation, as a schedule in a table, or as a curve on a graph.

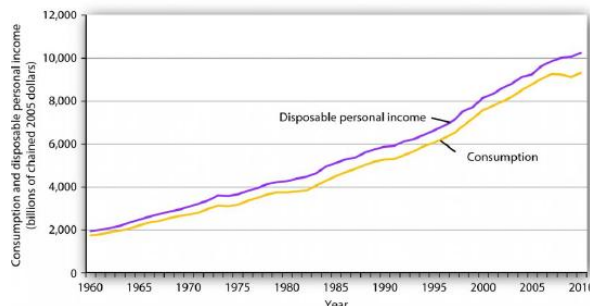


Figure 28.1 The Relationship Between Consumption and Disposable Personal Income, 1960–2010 Plots of consumption and disposable personal income over time suggest that consumption increases as disposable personal income increases.

Source: U. S. Department of Commerce, Bureau of Economic Analysis, NIPA Tables 1.16 and 2.1 (November 23, 2010 revision; Data are through 3rd quarter 2010).

Figure 28.2 illustrates the consumption function. The relationship between consumption and disposable personal income that we encountered in Figure 28.1 is evident in the table and in the curve: consumption in any period increases as disposable personal income increases in that period. The slope of the consumption function tells us by how much. Consider points C and D. When disposable personal income (Y_d) rises by \$500 billion, consumption rises by \$400 billion. More generally, the slope equals the change in consumption divided by the change in disposable personal income. The ratio of the change in consumption (ΔC) to the change in disposable personal income (ΔY_d) is the **marginal propensity to consume (MPC)**. The Greek letter delta (Δ) is used to denote “change in.”

Equation 28.1

$$MPC = \frac{\Delta C}{\Delta Y_d}$$

In this case, the marginal propensity to consume equals $\$400/\$500 = 0.8$. It can be interpreted as the fraction of an extra \$1 of disposable personal income that people spend on consumption. Thus, if a person with an *MPC* of 0.8 received an extra \$1,000 of disposable personal income, that person's consumption would rise by \$0.80 for each extra \$1 of disposable personal income, or \$800.

We can also express the consumption function as an equation

Equation 28.2

$$C = \$300 \text{ billion} + 0.8Y_d$$

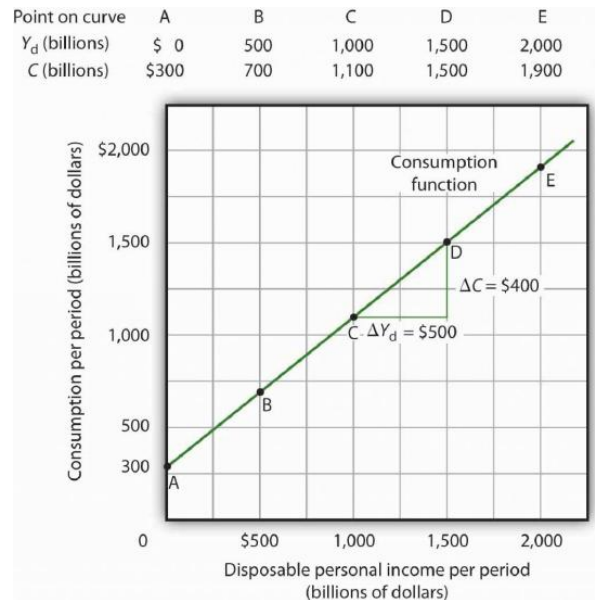


Figure 28.2 Plotting a Consumption Function The consumption function relates consumption C to disposable personal income Y_d . The equation for the consumption function shown here in tabular and graphical form is $C = \$300 \text{ billion} + 0.8Y_d$.

Heads Up!

It is important to note carefully the definition of the marginal propensity to consume. It is the change in consumption divided by the change in disposable personal income. It is not the level of consumption divided by the level of disposable personal income. Using Equation 28.2, at a level of disposable personal income of \$500 billion, for example, the level of consumption will be \$700 billion so that the ratio of consumption to disposable personal income will be 1.4, while the marginal propensity to consume remains 0.8. The marginal propensity to consume is, as its name implies, a marginal concept. It tells us what will happen to an additional dollar of personal disposable income.

Notice from the curve in Figure 28.2 that when disposable personal income equals 0, consumption is \$300 billion. The vertical intercept of the consumption function is thus \$300 billion. Then, for every \$500 billion increase in disposable personal income, consumption rises by \$400 billion. Because the consumption function in our example is linear, its slope is the same between any two points. In this case, the slope of the consumption function, which is the same as the marginal propensity to consume, is 0.8 all along its length.

We can use the consumption function to show the relationship between personal saving and disposable personal income. **Personal saving** is disposable personal income not spent on consumption during a particular period; the value of personal saving for any period is found by subtracting consumption from disposable personal income for that period:

Equation 28.3

$$\text{Personal saving} = \text{disposable personal income} - \text{consumption}$$

The [saving function](#) relates personal saving in any period to disposable personal income in that period. Personal saving is not the only form of saving—firms and government agencies may save as well. In this chapter, however, our focus is on the choice households make between using disposable personal income for consumption or for personal saving.

Figure 28.3 shows how the consumption function and the saving function are related. Personal saving is calculated by subtracting values for consumption from values for disposable personal income, as shown in the table. The values for personal saving are then plotted in the graph. Notice that a 45-degree line has been added to the graph. At every point on the 45-degree line, the value on the vertical axis equals that on the horizontal axis. The consumption function intersects the 45-degree line at an income of \$1,500 billion (point D). At this point, consumption equals disposable personal income and personal saving equals 0 (point D' on the graph of personal saving). Using the graph to find personal saving at other levels of disposable personal income, we subtract the value of consumption, given by the consumption function, from disposable personal income, given by the 45-degree line.

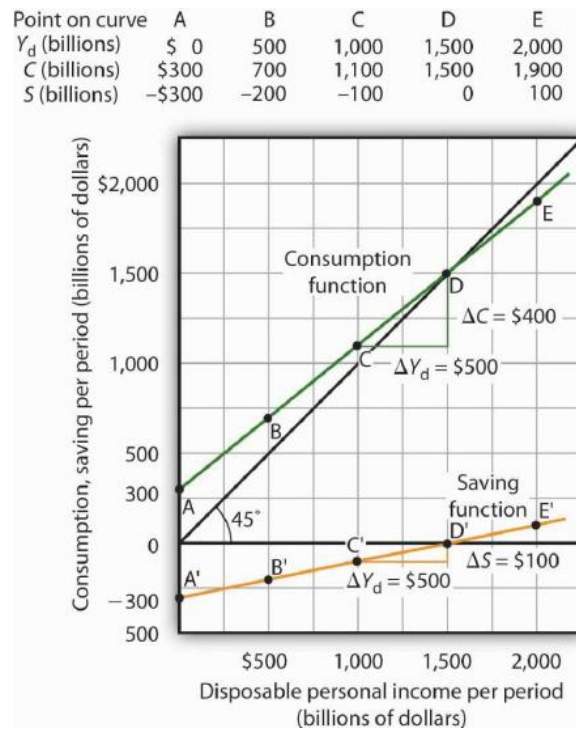


Figure 28.3 Consumption and Personal Saving Personal saving equals disposable personal income minus consumption. The table gives hypothetical values for these variables. The consumption function is plotted in the upper part of the graph. At points along the 45-degree line, the values on the two axes are equal; we can measure personal saving as the distance between the 45-degree line and consumption. The curve of the saving function is in the lower portion of the graph.

At a disposable personal income of \$2,000 billion, for example, consumption is \$1,900 billion (point E). Personal saving equals \$100 billion (point E')—the vertical distance between the 45-degree line and the consumption function. At an income of \$500 billion, consumption totals \$700 billion (point B). The consumption function lies above the 45-degree line at this point; personal saving is -\$200 billion (point B'). A negative value for saving means that consumption exceeds disposable personal income; it must have come from saving accumulated in the past, from selling assets, or from borrowing.

Notice that for every \$500 billion increase in disposable personal income, personal saving rises by \$100 billion. Consider points C' and D' in Figure 28.3. When disposable personal income rises by \$500 billion, personal saving rises by \$100 billion. More generally, the slope of the saving function equals the change in personal saving divided by the change in disposable personal income. The ratio of the change in personal saving (ΔS) to the change in disposable personal income (ΔY_d) is the [marginal propensity to save \(MPS\)](#).

Equation 28.4

$$MPS = \frac{\Delta S}{\Delta Y_d}$$

In this case, the marginal propensity to save equals $\$100/\$500 = 0.2$. It can be interpreted as the fraction of an extra \$1 of disposable personal income that people save. Thus, if a person with an *MPS* of 0.2 received an extra \$1,000 of disposable personal income, that person's saving would rise by \$0.20 for each extra \$1 of disposable personal income, or \$200. Since people have only two choices of what to do with additional disposable personal income—that is, they can use it either for consumption or for personal saving—the fraction of disposable personal income that people consume (*MPC*) plus the fraction of disposable personal income that people save (*MPS*) must add to 1:

Equation 28.5

$$MPC + MPS = 1$$

Current versus Permanent Income

The discussion so far has related consumption in a particular period to income in that same period. The [current income hypothesis](#) holds that consumption in any one period depends on income during that period, or current income.

Although it seems obvious that consumption should be related to disposable personal income, it is not so obvious that consumers base their consumption in any one period on the income they receive during that period. In buying a new car, for example, consumers might base their decision not only on their current income but on the income they expect to receive during the three or four years they expect to be making payments on the car. Parents who purchase a college education for their children might base their decision on their own expected lifetime income.

Indeed, it seems likely that virtually all consumption choices could be affected by expectations of income over a very long period. One reason people save is to provide funds to live on during their retirement years. Another is to build an estate they can leave to their heirs through bequests. The amount people save for their retirement or for bequests depends on the income they expect to receive for the rest of their lives. For these and other reasons, then, personal saving (and thus consumption) in any one year is influenced by permanent income. [Permanent income](#) is the average annual income people expect to receive for the rest of their lives.

People who have the same current income but different permanent incomes might reach very different saving decisions. Someone with a relatively low current income but a high permanent income (a college student planning to go to medical school, for example) might save little or nothing now, expecting to save for retirement and for bequests later. A person with the same low income but no expectation of higher income later might try to save some money now to provide for retirement or bequests later. Because a decision to save a certain amount determines how much will be available for consumption, consumption decisions can also be affected by expected lifetime income. Thus, an alternative approach to explaining consumption behavior is the [permanent income hypothesis](#), which assumes that consumption in any period depends on permanent income. An important implication of the permanent income hypothesis is that a change in income regarded as temporary will not affect consumption much, since it will have little effect on average lifetime income; a change regarded as permanent will have an effect. The current income hypothesis, though, predicts that it does not matter whether consumers view a change in disposable personal income as permanent or temporary; they will move along the consumption function and change consumption accordingly.

The question of whether permanent or current income is a determinant of consumption arose in 1992 when President George H. W. Bush ordered a change in the withholding rate for personal income taxes. Workers have a fraction of their paychecks withheld for taxes each pay period; Mr. Bush directed that this fraction be reduced in 1992. The change in the withholding rate did not change income tax rates; by withholding less in 1992, taxpayers would either receive smaller refund checks in 1993 or owe more taxes. The change thus left taxpayers' permanent income unaffected.

President Bush's measure was designed to increase aggregate demand and close the recessionary gap created by the 1990–1991 recession. Economists who subscribed to the permanent income hypothesis predicted that the change would not have any effect on consumption. Those who subscribed to the current income hypothesis predicted that the measure would boost consumption substantially in 1992. A survey of households taken during this period suggested that households planned to spend about 43% of the temporary increase in disposable personal income produced by the withholding experiment (Shapiro & Slemrod, 1995). That is considerably less than would be predicted by the current income hypothesis, but more than the zero change predicted by the permanent income hypothesis. This result, together with related evidence, suggests that temporary changes in income can affect consumption, but that changes regarded as permanent will have a much stronger impact.

Many of the tax cuts passed during the administration of President George W. Bush are set to expire in 2010. The proposal to make these tax cuts permanent is aimed toward having a stronger impact on consumption, since tax cuts regarded as permanent have larger effects than do changes regarded as temporary.

Other Determinants of Consumption

The consumption function graphed in Figure 28.2 and Figure 28.3 relates consumption spending to the level of disposable personal income. Changes in disposable personal income cause movements *along* this curve; they do not shift the curve. The curve shifts when other determinants of consumption change. Examples of changes that could shift the consumption function are changes in real wealth and changes in expectations. Figure 28.4 illustrates how these changes can cause shifts in the curve.

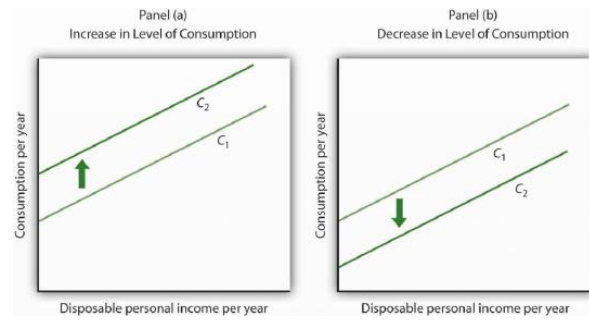


Figure 28.4 Shifts in the Consumption Function An increase in the level of consumption at each level of disposable personal income shifts the consumption function upward in Panel (a). Among the events that would shift the curve upward are an increase in real wealth and an increase in consumer confidence. A reduction in the level of consumption at each level of disposable personal income shifts the curve downward in Panel (b). The events that could shift the curve downward include a reduction in real wealth and a decline in consumer confidence.

Changes in Real Wealth

An increase in stock and bond prices, for example, would make holders of these assets wealthier, and they would be likely to increase their consumption. An increase in real wealth shifts the consumption function upward, as illustrated in Panel (a) of Figure 28.4. A reduction in real wealth shifts it downward, as shown in Panel (b).

A change in the price level changes real wealth. We learned in an earlier chapter that the relationship among the price level, real wealth, and consumption is called the *wealth effect*. A reduction in the price level increases real wealth and shifts the consumption function upward, as shown in Panel (a). An increase in the price level shifts the curve downward, as shown in Panel (b).

Changes in Expectations

Consumers are likely to be more willing to spend money when they are optimistic about the future. Surveyors attempt to gauge this optimism using “consumer confidence” surveys that ask respondents to report whether they are optimistic or pessimistic about their own economic situation and about the prospects for the economy as a whole. An increase in consumer optimism tends to shift the consumption function upward as in Panel (a) of Figure 28.4; an increase in pessimism tends to shift it downward as in Panel (b). The sharp reduction in consumer confidence in 2008 and early in 2009 contributed to a downward shift in the consumption function and thus to the severity of the recession.

The relationship between consumption and consumer expectations concerning future economic conditions tends to be a form of self-fulfilling prophecy. If consumers expect economic conditions to worsen, they will cut their consumption—and economic conditions will worsen! Political leaders often try to persuade people that economic prospects are good. In part, such efforts are an attempt to increase economic activity by boosting consumption.

Key Takeaways

- Consumption is closely related to disposable personal income and is represented by the consumption function, which can be presented in a table, in a graph, or in an equation.
- Personal saving is disposable personal income not spent on consumption.
- The marginal propensity to consume is $MPC = \Delta C / \Delta Y_d$ and the marginal propensity to save is $MPS = \Delta S / \Delta Y_d$. The sum of the MPC and MPS is 1.

- The current income hypothesis holds that consumption is a function of current disposable personal income, whereas the permanent income hypothesis holds that consumption is a function of permanent income, which is the income households expect to receive annually during their lifetime. The permanent income hypothesis predicts that a temporary change in income will have a smaller effect on consumption than is predicted by the current income hypothesis.
- Other factors that affect consumption include real wealth and expectations.

Try It!

For each of the following events, draw a curve representing the consumption function and show how the event would affect the curve.

1. A sharp increase in stock prices increases the real wealth of most households.
2. Consumers decide that a recession is ahead and that their incomes are likely to fall.
3. The price level falls.

Case in Point: Consumption and the Tax Rebate of 2001

Figure 28.5



Max Wei – [Cashier](#) – CC BY-ND 2.0.

The first round of the Bush tax cuts was passed in 2001. Democrats in Congress insisted on a rebate aimed at stimulating consumption. In the summer of 2001, rebates of \$300 per single taxpayer and of \$600 for married couples were distributed. The Department of Treasury reported that 92 million people received the rebates. While the rebates were intended to stimulate consumption, the extent to which the tax rebates stimulated consumption, especially during the recession, is an empirical question.

It is difficult to analyze the impact of a tax rebate that is a single event experienced by all households at the same time. If spending does change at that moment, is it because of the tax rebate or because of some other event that occurred at that time?

Fortunately for researchers Sumit Agarwal, Chunlin Liu, and Nicholas Souleles, using data from credit card accounts, the 2001 tax rebate checks were distributed over 10 successive weeks from July to September of 2001. The timing of receipt was random, since it was based on the next-to-last digit of one's Social Security number, and taxpayers were informed well in advance that the checks were coming. The researchers found that consumers initially saved much of their rebates, by paying down their credit card debts, but over a nine-month period, spending increased to about 40% of the rebate. They also found that consumers who were most liquidity constrained (for example, close to their credit card debt limits) spent more than consumers who were less constrained.

The researchers thus conclude that their findings do not support the permanent income hypothesis, since consumers responded to spending based on when they received their checks and because the results indicate that consumers do respond to what they call “lumpy” changes in income, such as those generated by a tax rebate. In other words, current income does seem to matter.

Two other studies of the 2001 tax rebate reached somewhat different conclusions. Using survey data, researchers Matthew D. Shapiro and Joel Slemrod estimated an *MPC* of about one-third. They note that this low increased spending is particularly surprising, since the rebate was part of a general tax cut that was expected to last a long time. At the other end, David S. Johnson, Jonathan A. Parker, and Nicholas S. Souleles, using yet another data set, found that looking over a six-month period, the *MPC* was about two-thirds. So, while there is disagreement on the size of the *MPC*, all conclude that the impact was non-negligible.

Sources: Sumit Agarwal, Chunlin Liu, and Nicholas S. Souleles, “The Reaction of Consumer Spending and Debt to Tax Rebates—Evidence from Consumer Credit Data,” NBER Working Paper No. 13694, December 2007; David S. Johnson, Jonathan A. Parker, and Nicholas S. Souleles, “Household Expenditure and the Income Tax Rebates of 2001,” *American Economic Review* 96, no. 5 (December 2006): 1589–1610; Matthew D. Shapiro and Joel Slemrod, “Consumer Response to Tax Rebates,” *American Economic Review* 93, no. 1 (March 2003): 381–96; and Matthew D. Shapiro and Joel Slemrod, “Did the 2001 Rebate Stimulate Spending? Evidence from Taxpayer Surveys,” *NBER Tax Policy & the Economy* 17, no. 1 (2003): 83–109.

Answers to Try It! Problems

1. A sharp increase in stock prices makes people wealthier and shifts the consumption function upward, as in Panel (a) of Figure 28.4.
2. This would be reported as a reduction in consumer confidence. Consumers are likely to respond by reducing their purchases, particularly of durable items such as cars and washing machines. The consumption function will shift downward, as in Panel (b) of Figure 28.4.
3. A reduction in the price level increases real wealth and thus boosts consumption. The consumption function will shift upward, as in Panel (a) of Figure 28.4.

References

Mc Culloch, J. R., *A Discourse on the Rise, Progress, Peculiar Objects, and Importance, of Political Economy: Containing the Outline of a Course of Lectures on the Principles and Doctrines of That Science* (Edinburgh: Archibald Constable, 1824), 103.

Shapiro, M. D., and Joel Slemrod, “Consumer Response to the Timing of Income: Evidence from a Change in Tax Withholding,” *American Economic Review* 85 (March 1995): 274–83.

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7.2: The Aggregate Expenditures Model

Learning Objective

1. Explain and illustrate the aggregate expenditures model and the concept of equilibrium real GDP.
2. Distinguish between autonomous and induced aggregate expenditures and explain why a change in autonomous expenditures leads to a multiplied change in equilibrium real GDP.
3. Discuss how adding taxes, government purchases, and net exports to a simplified aggregate expenditures model affects the multiplier and hence the impact on real GDP that arises from an initial change in autonomous expenditures.

The consumption function relates the level of consumption in a period to the level of disposable personal income in that period. In this section, we incorporate other components of aggregate demand: investment, government purchases, and net exports. In doing so, we shall develop a new model of the determination of equilibrium real GDP, the [aggregate expenditures model](#). This model relates [aggregate expenditures](#), which equal the sum of planned levels of consumption, investment, government purchases, and net exports at a given price level, to the level of real GDP. We shall see that people, firms, and government agencies may not always spend what they had planned to spend. If so, then actual real GDP will not be the same as aggregate expenditures, and the economy will not be at the equilibrium level of real GDP.

One purpose of examining the aggregate expenditures model is to gain a deeper understanding of the “ripple effects” from a change in one or more components of aggregate demand. As we saw in the chapter that introduced the aggregate demand and aggregate supply model, a change in investment, government purchases, or net exports leads to greater production; this creates additional income for households, which induces additional consumption, leading to more production, more income, more consumption, and so on. The aggregate expenditures model provides a context within which this series of ripple effects can be better understood. A second reason for introducing the model is that we can use it to derive the aggregate demand curve for the model of aggregate demand and aggregate supply.

To see how the aggregate expenditures model works, we begin with a very simplified model in which there is neither a government sector nor a foreign sector. Then we use the findings based on this simplified model to build a more realistic model. The equations for the simplified economy are easier to work with, and we can readily apply the conclusions reached from analyzing a simplified economy to draw conclusions about a more realistic one.

The Aggregate Expenditures Model: A Simplified View

To develop a simple model, we assume that there are only two components of aggregate expenditures: consumption and investment. In the chapter on measuring total output and income, we learned that real gross domestic product and real gross domestic income are the same thing. With no government or foreign sector, gross domestic income in this economy and disposable personal income would be nearly the same. To simplify further, we will assume that depreciation and undistributed corporate profits (retained earnings) are zero. Thus, for this example, we assume that disposable personal income and real GDP are identical.

Finally, we shall also assume that the only component of aggregate expenditures that may not be at the planned level is investment. Firms determine a level of investment they intend to make in each period. The level of investment firms intend to make in a period is called [planned investment](#). Some investment is unplanned. Suppose, for example, that firms produce and expect to sell more goods during a period than they actually sell. The unsold goods will be added to the firms’ inventories, and they will thus be counted as part of investment. [Unplanned investment](#) is investment during a period that firms did not intend to make. It is also possible that firms may sell more than they had expected. In this case, inventories will fall below what firms expected, in which case, unplanned investment would be negative. Investment during a period equals the sum of planned investment (I_P) and unplanned investment (I_U).

Equation 28.6

$$I = I_P + I_U$$

We shall find that planned and unplanned investment play key roles in the aggregate expenditures model.

Autonomous and Induced Aggregate Expenditures

Economists distinguish two types of expenditures. Expenditures that do not vary with the level of real GDP are called **autonomous aggregate expenditures**. In our example, we assume that planned investment expenditures are autonomous. Expenditures that vary with real GDP are called **induced aggregate expenditures**. Consumption spending that rises with real GDP is an example of an induced aggregate expenditure. Figure 28.6 illustrates the difference between autonomous and induced aggregate expenditures. With real GDP on the horizontal axis and aggregate expenditures on the vertical axis, autonomous aggregate expenditures are shown as a horizontal line in Panel (a). A curve showing induced aggregate expenditures has a slope greater than zero; the value of an induced aggregate expenditure changes with changes in real GDP. Panel (b) shows induced aggregate expenditures that are positively related to real GDP.

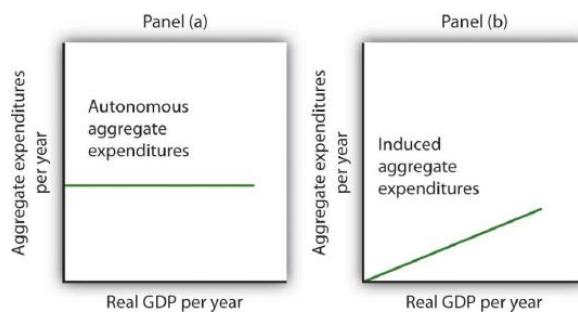


Figure 28.6 Autonomous and Induced Aggregate Expenditures Autonomous aggregate expenditures do not vary with the level of real GDP; induced aggregate expenditures do. Autonomous aggregate expenditures are shown by the horizontal line in Panel (a). Induced aggregate expenditures vary with real GDP, as in Panel (b).

Autonomous and Induced Consumption

The concept of the marginal propensity to consume suggests that consumption contains induced aggregate expenditures; an increase in real GDP raises consumption. But consumption contains an autonomous component as well. The level of consumption at the intersection of the consumption function and the vertical axis is regarded as autonomous consumption; this level of spending would occur regardless of the level of real GDP.

Consider the consumption function we used in deriving the schedule and curve illustrated in Figure 28.2:

$$C = \$300 \text{ billion} + 0.8Y$$

We can omit the subscript on disposable personal income because of the simplifications we have made in this section, and the symbol Y can be thought of as representing both disposable personal income and GDP. Because we assume that the price level in the aggregate expenditures model is constant, GDP equals real GDP. At every level of real GDP, consumption includes \$300 billion in autonomous aggregate expenditures. It will also contain expenditures “induced” by the level of real GDP. At a level of real GDP of \$2,000 billion, for example, consumption equals \$1,900 billion: \$300 billion in autonomous aggregate expenditures and \$1,600 billion in consumption induced by the \$2,000 billion level of real GDP.

Figure 28.7 illustrates these two components of consumption. Autonomous consumption, C_a , which is always \$300 billion, is shown in Panel (a); its equation is

Equation 28.7

$$C_a = \$300 \text{ billion}$$

Induced consumption C_i is shown in Panel (b); its equation is

Equation 28.8

$$C_i = 0.8Y$$

The consumption function is given by the sum of Figure 28.7. It is the same as the equation $C = \$300 \text{ billion} + 0.8Y_d$, since in this simple example, Y and Y_d are the same.

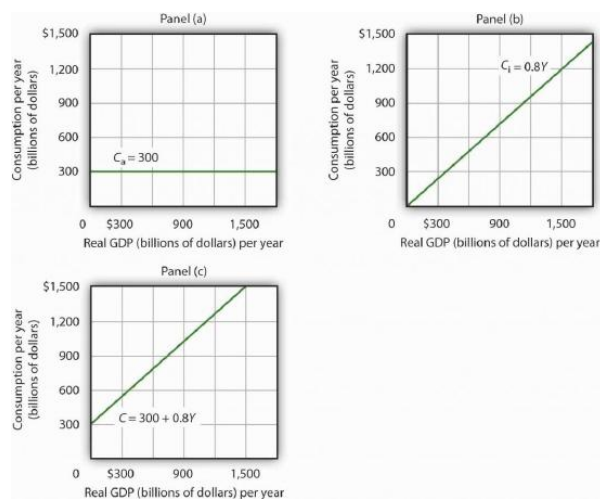


Figure 28.7 Autonomous and Induced Consumption Consumption has an autonomous component and an induced component. In Panel (a), autonomous consumption C_a equals \$300 billion at every level of real GDP. Panel (b) shows induced consumption C_i . Total consumption C is shown in Panel (c).

Plotting the Aggregate Expenditures Curve

In this simplified economy, investment is the only other component of aggregate expenditures. We shall assume that investment is autonomous and that firms plan to invest \$1,100 billion per year.

Equation 28.9

$$I_P = \$1,100 \text{ billion}$$

The level of planned investment is unaffected by the level of real GDP.

Aggregate expenditures equal the sum of consumption C and planned investment I_P . The [aggregate expenditures function](#) is the relationship of aggregate expenditures to the value of real GDP. It can be represented with an equation, as a table, or as a curve.

We begin with the definition of aggregate expenditures AE when there is no government or foreign sector:

Equation 28.10

$$AE = C + I_P$$

Substituting the information from above on consumption and planned investment yields (throughout this discussion all values are in billions of base-year dollars)

$$AE = \$300 + 0.8Y + \$1,100$$

or

Equation 28.11

$$AE = \$1,400 + 0.8Y$$

Equation 28.11 is the algebraic representation of the aggregate expenditures function. We shall use this equation to determine the equilibrium level of real GDP in the aggregate expenditures model. It is important to keep in mind that aggregate expenditures measure total planned spending at each level of real GDP (for any given price level). Real GDP is total production. Aggregate expenditures and real GDP need not be equal, and indeed will not be equal except when the economy is operating at its equilibrium level, as we will see in the next section.

In Equation 28.11, the autonomous component of aggregate expenditures is \$1,400 billion, and the induced component is $0.8Y$. We shall plot this aggregate expenditures function. To do so, we arbitrarily select various levels of real GDP and then use Equation 28.10 to compute aggregate expenditures at each level. At a level of real GDP of \$6,000 billion, for example, aggregate expenditures equal \$6,200 billion:

$$AE = \$1,400 + 0.8(\$6,000) = \$6,200$$

The table in Figure 28.8 shows the values of aggregate expenditures at various levels of real GDP. Based on these values, we plot the aggregate expenditures curve. To obtain each value for aggregate expenditures, we simply insert the corresponding value for real GDP into Equation 28.11. The value at which the aggregate expenditures curve intersects the vertical axis corresponds to the level of autonomous aggregate expenditures. In our example, autonomous aggregate expenditures equal \$1,400 billion. That figure includes \$1,100 billion in planned investment, which is assumed to be autonomous, and \$300 billion in autonomous consumption expenditure.

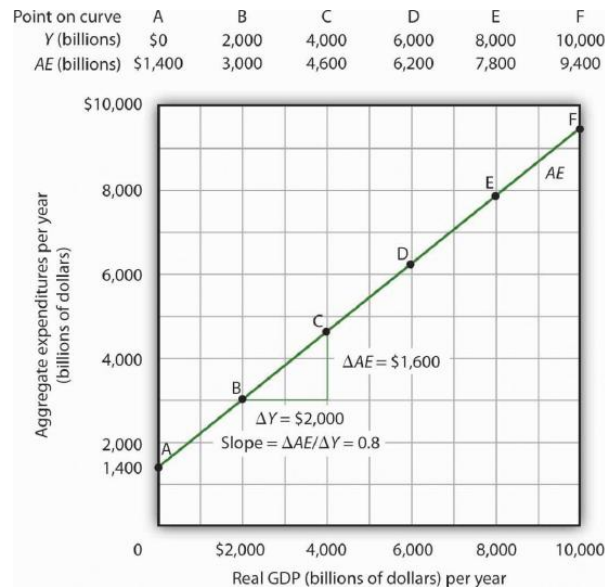


Figure 28.8 Plotting the Aggregate Expenditures Curve Values for aggregate expenditures AE are computed by inserting values for real GDP into Equation 28.10; these are given in the aggregate expenditures schedule. The point at which the aggregate expenditures curve intersects the vertical axis is the value of autonomous aggregate expenditures, here \$1,400 billion. The slope of this aggregate expenditures curve is 0.8.

The Slope of the Aggregate Expenditures Curve

The slope of the aggregate expenditures curve, given by the change in aggregate expenditures divided by the change in real GDP between any two points, measures the additional expenditures induced by increases in real GDP. The slope for the aggregate expenditures curve in Figure 28.8 is shown for points B and C: it is 0.8.

In Figure 28.8, the slope of the aggregate expenditures curve equals the marginal propensity to consume. This is because we have assumed that the only other expenditure, planned investment, is autonomous and that real GDP and disposable personal income are identical. Changes in real GDP thus affect only consumption in this simplified economy.

Equilibrium in the Aggregate Expenditures Model

Real GDP is a measure of the total output of firms. Aggregate expenditures equal total planned spending on that output. Equilibrium in the model occurs where aggregate expenditures in some period equal real GDP in that period. One way to think about equilibrium is to recognize that firms, except for some inventory that they plan to hold, produce goods and services with the intention of selling them. Aggregate expenditures consist of what people, firms, and government agencies plan to spend. If the economy is at its equilibrium real GDP, then firms are selling what they plan to sell (that is, there are no unplanned changes in inventories).

Figure 28.9 illustrates the concept of equilibrium in the aggregate expenditures model. A 45-degree line connects all the points at which the values on the two axes, representing aggregate expenditures and real GDP, are equal. Equilibrium must occur at some point along this 45-degree line. The point at which the aggregate expenditures curve crosses the 45-degree line is the equilibrium real GDP, here achieved at a real GDP of \$7,000 billion.

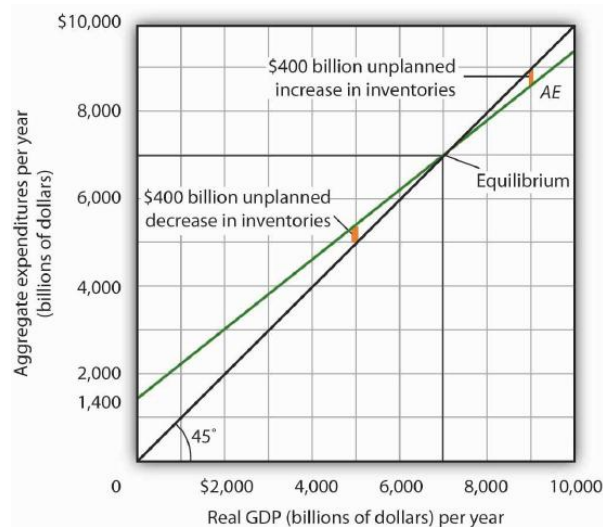


Figure 28.9 Determining Equilibrium in the Aggregate Expenditures Model The 45-degree line shows all the points at which aggregate expenditures AE equal real GDP, as required for equilibrium. The equilibrium solution occurs where the AE curve crosses the 45-degree line, at a real GDP of \$7,000 billion.

Equation 28.11 tells us that at a real GDP of \$7,000 billion, the sum of consumption and planned investment is \$7,000 billion—precisely the level of output firms produced. At that level of output, firms sell what they planned to sell and keep inventories that they planned to keep. A real GDP of \$7,000 billion represents equilibrium in the sense that it generates an equal level of aggregate expenditures.

If firms were to produce a real GDP greater than \$7,000 billion per year, aggregate expenditures would fall short of real GDP. At a level of real GDP of \$9,000 billion per year, for example, aggregate expenditures equal \$8,600 billion. Firms would be left with \$400 billion worth of goods they intended to sell but did not. Their actual level of investment would be \$400 billion greater than their planned level of investment. With those unsold goods on hand (that is, with an unplanned increase in inventories), firms would be likely to cut their output, moving the economy toward its equilibrium GDP of \$7,000 billion. If firms were to produce \$5,000 billion, aggregate expenditures would be \$5,400 billion. Consumers and firms would demand more than was produced; firms would respond by reducing their inventories below the planned level (that is, there would be an unplanned decrease in inventories) and increasing their output in subsequent periods, again moving the economy toward its equilibrium real GDP of \$7,000 billion. Figure 28.10 shows possible levels of real GDP in the economy for the aggregate expenditures function illustrated in Figure 28.9. It shows the level of aggregate expenditures at various levels of real GDP and the direction in which real GDP will change whenever AE does not equal real GDP. At any level of real GDP other than the equilibrium level, there is unplanned investment.

If real GDP is	Consumption expenditures will be	Planned investment will be	Aggregate expenditures will equal	Unplanned investment will be	Real GDP will
\$9,000	\$7,500	\$1,100	\$8,600	\$400	Fall ↓
8,000	6,700	1,100	7,800	200	Fall ↓
7,000	5,900	1,100	7,000	0	Remain unchanged
6,000	5,100	1,100	6,200	−200	Rise ↑
5,000	4,300	1,100	5,400	−400	Rise ↑

Figure 28.10 Adjusting to Equilibrium Real GDP Each level of real GDP will result in a particular amount of aggregate expenditures. If aggregate expenditures are less than the level of real GDP, firms will reduce their output and real GDP will fall. If aggregate expenditures exceed real GDP, then firms will increase their output and real GDP will rise. If aggregate expenditures equal real GDP, then firms will leave their output unchanged; we have achieved equilibrium in the aggregate expenditures model. At equilibrium, there is no unplanned investment. Here, that occurs at a real GDP of \$7,000 billion.

Changes in Aggregate Expenditures: The Multiplier

In the aggregate expenditures model, equilibrium is found at the level of real GDP at which the aggregate expenditures curve crosses the 45-degree line. It follows that a shift in the curve will change equilibrium real GDP. Here we will examine the magnitude of such changes.

Figure 28.11 begins with the aggregate expenditures curve shown in Figure 28.9. Now suppose that planned investment increases from the original value of \$1,100 billion to a new value of \$1,400 billion—an increase of \$300 billion. This increase in planned investment shifts the aggregate expenditures curve upward by \$300 billion, all other things unchanged. Notice, however, that the new aggregate expenditures curve intersects the 45-degree line at a real GDP of \$8,500 billion. The \$300 billion increase in planned investment has produced an increase in equilibrium real GDP of \$1,500 billion.

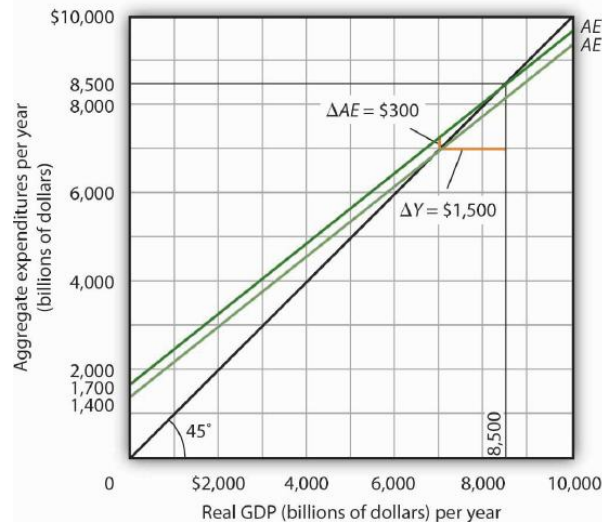


Figure 28.11 A Change in Autonomous Aggregate Expenditures Changes Equilibrium Real GDP An increase of \$300 billion in planned investment raises the aggregate expenditures curve by \$300 billion. The \$300 billion increase in planned investment results in an increase in equilibrium real GDP of \$1,500 billion.

How could an increase in aggregate expenditures of \$300 billion produce an increase in equilibrium real GDP of \$1,500 billion? The answer lies in the operation of the multiplier. Because firms have increased their demand for investment goods (that is, for capital) by \$300 billion, the firms that produce those goods will have \$300 billion in additional orders. They will produce \$300 billion in additional real GDP and, given our simplifying assumption, \$300 billion in additional disposable personal income. But in this economy, each \$1 of additional real GDP induces \$0.80 in additional consumption. The \$300 billion increase in autonomous aggregate expenditures initially induces \$240 billion ($= 0.8 \times \$300$ billion) in additional consumption.

The \$240 billion in additional consumption boosts production, creating another \$240 billion in real GDP. But that second round of increase in real GDP induces \$192 billion ($= 0.8 \times \$240$) in additional consumption, creating still more production, still more income, and still more consumption. Eventually (after many additional rounds of increases in induced consumption), the \$300 billion increase in aggregate expenditures will result in a \$1,500 billion increase in equilibrium real GDP. Table 28.1 “The Multiplied Effect of an Increase in Autonomous Aggregate Expenditures” shows the multiplied effect of a \$300 billion increase in autonomous aggregate expenditures, assuming each \$1 of additional real GDP induces \$0.80 in additional consumption.

Table 28.1 The Multiplied Effect of an Increase in Autonomous Aggregate Expenditures

Round of spending	Increase in real GDP (billions of dollars)
1	\$300
2	240
3	192
4	154
5	123
6	98
7	79
8	63
9	50
10	40
11	32
12	26
Subsequent rounds	+103
Total increase in real GDP	\$1,500

The size of the additional rounds of expenditure is based on the slope of the aggregate expenditures function, which in this example is simply the marginal propensity to consume. Had the slope been flatter (if the marginal propensity to consume were smaller), the additional rounds of spending would have been smaller. A steeper slope would mean that the additional rounds of spending would have been larger.

This process could also work in reverse. That is, a decrease in planned investment would lead to a multiplied decrease in real GDP. A reduction in planned investment would reduce the incomes of some households. They would reduce their consumption by the *MPC* times the reduction in their income. That, in turn, would reduce incomes for households that would have received the spending by the first group of households. The process continues, thus multiplying the impact of the reduction in aggregate expenditures resulting from the reduction in planned investment.

Computation of the Multiplier

The **multiplier** is the number by which we multiply an initial change in aggregate demand to get the full amount of the shift in the aggregate demand curve. Because the multiplier shows the amount by which the aggregate demand curve shifts at a given price level, and the aggregate expenditures model assumes a given price level, we can use the aggregate expenditures model to derive the multiplier explicitly.

Let Y_{eq} be the equilibrium level of real GDP in the aggregate expenditures model, and let A be autonomous aggregate expenditures. Then the multiplier is

Equation 28.12

$$Multiplier = \frac{\Delta Y_{eq}}{\Delta A}$$

In the example we have just discussed, a change in autonomous aggregate expenditures of \$300 billion produced a change in equilibrium real GDP of \$1,500 billion. The value of the multiplier is therefore $\$1,500/\$300 = 5$.

The multiplier effect works because a change in autonomous aggregate expenditures causes a change in real GDP and disposable personal income, inducing a further change in the level of aggregate expenditures, which creates still more GDP and thus an even higher level of aggregate expenditures. The degree to which a given change in real GDP induces a change in aggregate

expenditures is given in this simplified economy by the marginal propensity to consume, which, in this case, is the slope of the aggregate expenditures curve. The slope of the aggregate expenditures curve is thus linked to the size of the multiplier. We turn now to an investigation of the relationship between the marginal propensity to consume and the multiplier.

The Marginal Propensity to Consume and the Multiplier

We can compute the multiplier for this simplified economy from the marginal propensity to consume. We know that the amount by which equilibrium real GDP will change as a result of a change in aggregate expenditures consists of two parts: the change in autonomous aggregate expenditures itself, $\Delta \bar{A}$, and the induced change in spending. This induced change equals the marginal propensity to consume times the change in equilibrium real GDP, ΔY_{eq} . Thus

Equation 28.13

$$\Delta Y_{eq} = \Delta \bar{A} + MPC \Delta Y_{eq}$$

Subtract the $MPC \Delta Y_{eq}$ term from both sides of the equation:

$$\Delta Y_{eq} - MPC \Delta Y_{eq} = \Delta \bar{A}$$

Factor out the ΔY_{eq} term on the left:

$$\Delta Y_{eq}(1 - MPC) = \Delta \bar{A}$$

Finally, solve for the multiplier $\Delta Y_{eq}/\Delta \bar{A}$ by dividing both sides of the equation above by $\Delta \bar{A}$ and by dividing both sides by $(1 - MPC)$. We get the following:

Equation 28.14

$$\frac{\Delta Y_{eq}}{\Delta \bar{A}} = \frac{1}{1 - MPC}$$

We thus compute the multiplier by taking 1 minus the marginal propensity to consume, then dividing the result into 1. In our example, the marginal propensity to consume is 0.8; the multiplier is 5, as we have already seen [multiplier = $1/(1 - MPC) = 1/(1 - 0.8) = 1/0.2 = 5$]. Since the sum of the marginal propensity to consume and the marginal propensity to save is 1, the denominator on the right-hand side of Equation 28.13 is equivalent to the *MPS*, and the multiplier could also be expressed as $1/MPS$.

Equation 28.15

$$Multiplier = \frac{1}{MPS}$$

We can rearrange terms in Equation 28.14 to use the multiplier to compute the impact of a change in autonomous aggregate expenditures. We simply multiply both sides of the equation by $\bar{A}$ to obtain the following:

Equation 28.16

$$\Delta Y_{eq} = \frac{\Delta \bar{A}}{1 - MPC}$$

The change in the equilibrium level of income in the aggregate expenditures model (remember that the model assumes a constant price level) equals the change in autonomous aggregate expenditures times the multiplier. Thus, the greater the multiplier, the greater will be the impact on income of a change in autonomous aggregate expenditures.

The Aggregate Expenditures Model in a More Realistic Economy

Four conclusions emerge from our application of the aggregate expenditures model to the simplified economy presented so far. These conclusions can be applied to a more realistic view of the economy.

1. The aggregate expenditures function relates aggregate expenditures to real GDP. The intercept of the aggregate expenditures curve shows the level of autonomous aggregate expenditures. The slope of the aggregate expenditures curve shows how much increases in real GDP induce additional aggregate expenditures.
2. Equilibrium real GDP occurs where aggregate expenditures equal real GDP.

3. A change in autonomous aggregate expenditures changes equilibrium real GDP by a multiple of the change in autonomous aggregate expenditures.
4. The size of the multiplier depends on the slope of the aggregate expenditures curve. The steeper the aggregate expenditures curve, the larger the multiplier; the flatter the aggregate expenditures curve, the smaller the multiplier.

These four points still hold as we add the two other components of aggregate expenditures—government purchases and net exports—and recognize that government not only spends but also collects taxes. We look first at the effect of adding taxes to the aggregate expenditures model and then at the effect of adding government purchases and net exports.

Taxes and the Aggregate Expenditure Function

Suppose that the only difference between real GDP and disposable personal income is personal income taxes. Let us see what happens to the slope of the aggregate expenditures function.

As before, we assume that the marginal propensity to consume is 0.8, but we now add the assumption that income taxes take $\frac{1}{4}$ of real GDP. This means that for every additional \$1 of real GDP, disposable personal income rises by \$0.75 and, in turn, consumption rises by \$0.60 ($= 0.8 \times \$0.75$). In the simplified model in which disposable personal income and real GDP were the same, an additional \$1 of real GDP raised consumption by \$0.80. The slope of the aggregate expenditures curve was 0.8, the marginal propensity to consume. Now, as a result of taxes, the aggregate expenditures curve will be flatter than the one shown in Figure 28.8 and Figure 28.10. In this example, the slope will be 0.6; an additional \$1 of real GDP will increase consumption by \$0.60.

Other things the same, the multiplier will be smaller than it was in the simplified economy in which disposable personal income and real GDP were identical. The wedge between disposable personal income and real GDP created by taxes means that the additional rounds of spending induced by a change in autonomous aggregate expenditures will be smaller than if there were no taxes. Hence, the multiplied effect of any change in autonomous aggregate expenditures is smaller.

The Addition of Government Purchases and Net Exports

Suppose that government purchases and net exports are autonomous. If so, they enter the aggregate expenditures function in the same way that investment did. Compared to the simplified aggregate expenditures model, the aggregate expenditures curve shifts up by the amount of government purchases and net exports¹.

Figure 28.12 shows the difference between the aggregate expenditures model of the simplified economy in Figure 28.9 and a more realistic view of the economy. Panel (a) shows an AE curve for an economy with only consumption and investment expenditures. In Panel (b), the AE curve includes all four components of aggregate expenditures.

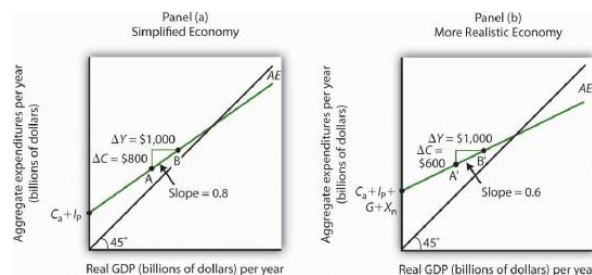


Figure 28.12 The Aggregate Expenditures Function: Comparison of a Simplified Economy and a More Realistic Economy Panel (a) shows an aggregate expenditures curve for a simplified view of the economy; Panel (b) shows an aggregate expenditures curve for a more realistic model. The AE curve in Panel (b) has a higher intercept than the AE curve in Panel (a) because of the additional components of autonomous aggregate expenditures in a more realistic view of the economy. The slope of the AE curve in Panel (b) is flatter than the slope of the AE curve in Panel (a). In a simplified economy, the slope of the AE curve is the marginal propensity to consume (MPC). In a more realistic view of the economy, it is less than the MPC because of the difference between real GDP and disposable personal income.

There are two major differences between the aggregate expenditures curves shown in the two panels. Notice first that the intercept of the AE curve in Panel (b) is higher than that of the AE curve in Panel (a). The reason is that, in addition to the autonomous part of consumption and planned investment, there are two other components of aggregate expenditures—government purchases and net exports—that we have also assumed are autonomous. Thus, the intercept of the aggregate expenditures curve in Panel (b) is the

sum of the four autonomous aggregate expenditures components: consumption (C_a), planned investment (I_p), government purchases (G), and net exports (X_n). In Panel (a), the intercept includes only the first two components.

Second, notice that the slope of the aggregate expenditures curve is flatter for the more realistic economy in Panel (b) than it is for the simplified economy in Panel (a). This can be seen by comparing the slope of the aggregate expenditures curve between points A and B in Panel (a) to the slope of the aggregate expenditures curve between points A' and B' in Panel (b). Between both sets of points, real GDP changes by the same amount, \$1,000 billion. In Panel (a), consumption rises by \$800 billion, whereas in Panel (b) consumption rises by only \$600 billion. This difference occurs because, in the more realistic view of the economy, households have only a fraction of real GDP available as disposable personal income. Thus, for a given change in real GDP, consumption rises by a smaller amount.

Let us examine what happens to equilibrium real GDP in each case if there is a shift in autonomous aggregate expenditures, such as an increase in planned investment, as shown in Figure 28.13. In both panels, the initial level of equilibrium real GDP is the same, Y_1 . Equilibrium real GDP occurs where the given aggregate expenditures curve intersects the 45-degree line. The aggregate expenditures curve shifts up by the same amount— ΔA is the same in both panels. The new level of equilibrium real GDP occurs where the new AE curve intersects the 45-degree line. In Panel (a), we see that the new level of equilibrium real GDP rises to Y_2 , but in Panel (b) it rises only to Y_3 . Since the same change in autonomous aggregate expenditures led to a greater increase in equilibrium real GDP in Panel (a) than in Panel (b), the multiplier for the more realistic model of the economy must be smaller. The multiplier is smaller, of course, because the slope of the aggregate expenditures curve is flatter.

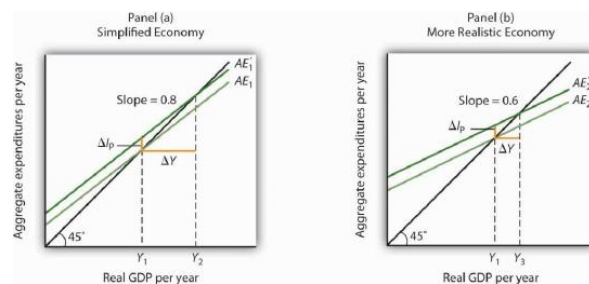


Figure 28.13 A Change in Autonomous Aggregate Expenditures: Comparison of a Simplified Economy and a More Realistic Economy In Panels (a) and (b), equilibrium real GDP is initially Y_1 . Then autonomous aggregate expenditures rise by the same amount, ΔI_p . In Panel (a), the upward shift in the AE curve leads to a new level of equilibrium real GDP of Y_2 ; in Panel (b) equilibrium real GDP rises to Y_3 . Because equilibrium real GDP rises by more in Panel (a) than in Panel (b), the multiplier in the simplified economy is greater than in the more realistic one.

Key Takeaways

- The aggregate expenditures model relates aggregate expenditures to real GDP. Equilibrium in the model occurs where aggregate expenditures equal real GDP and is found graphically at the intersection of the aggregate expenditures curve and the 45-degree line.
- Economists distinguish between autonomous and induced aggregate expenditures. The former do not vary with GDP; the latter do.
- Equilibrium in the aggregate expenditures model implies that unintended investment equals zero.
- A change in autonomous aggregate expenditures leads to a change in equilibrium real GDP, which is a multiple of the change in autonomous aggregate expenditures.
- The size of the multiplier depends on the slope of the aggregate expenditures curve. In general, the steeper the aggregate expenditures curve, the greater the multiplier. The flatter the aggregate expenditures curve, the smaller the multiplier.
- Income taxes tend to flatten the aggregate expenditures curve.

Try It!

Suppose you are given the following data for an economy. All data are in billions of dollars. Y is actual real GDP, and C , I_p , G , and X_n are the consumption, planned investment, government purchases, and net exports components of aggregate expenditures, respectively.

Y	C	I _p	G	X _n
\$0	\$800	\$1,000	\$1,400	-\$200
2,500	2,300	1,000	1,400	-200
5,000	3,800	1,000	1,400	-200
7,500	5,300	1,000	1,400	-200
10,000	6,800	1,000	1,400	-200

1. Plot the corresponding aggregate expenditures curve and draw in the 45-degree line.
2. What is the intercept of the AE curve? What is its slope?
3. Determine the equilibrium level of real GDP.
4. Now suppose that net exports fall by \$1,000 billion and that this is the only change in autonomous aggregate expenditures. Plot the new aggregate expenditures curve. What is the new equilibrium level of real GDP?
5. What is the value of the multiplier?

Case in Point: Fiscal Policy in the Kennedy Administration

Figure 28.14



U.S. Embassy New Delhi – [President John F. Kennedy](#) – CC BY-ND 2.0.

It was the first time expansionary fiscal policy had ever been proposed. The economy had slipped into a recession in 1960. Presidential candidate John Kennedy received proposals from several economists that year for a tax cut aimed at stimulating the economy. As a candidate, he was unconvinced. But, as president he proposed the tax cut in 1962. His chief economic adviser, Walter Heller, defended the tax cut idea before Congress and introduced what was politically a novel concept: the multiplier.

In testimony to the Senate Subcommittee on Employment and Manpower, Mr. Heller predicted that a \$10 billion cut in personal income taxes would boost consumption “by over \$9 billion.”

To assess the ultimate impact of the tax cut, Mr. Heller applied the aggregate expenditures model. He rounded the increased consumption off to \$9 billion and explained,

“This is far from the end of the matter. The higher production of consumer goods to meet this extra spending would mean extra employment, higher payrolls, higher profits, and higher farm and professional and service incomes. This added purchasing power

would generate still further increases in spending and incomes. ... The initial rise of \$9 billion, plus this extra consumption spending and extra output of consumer goods, would add over \$18 billion to our annual GDP.”

We can summarize this continuing process by saying that a “multiplier” of approximately 2 has been applied to the direct increment of consumption spending.

Mr. Heller also predicted that proposed cuts in corporate income tax rates would increase investment by about \$6 billion. The total change in autonomous aggregate expenditures would thus be \$15 billion: \$9 billion in consumption and \$6 billion in investment. He predicted that the total increase in equilibrium GDP would be \$30 billion, the amount the Council of Economic Advisers had estimated would be necessary to reach full employment.

In the end, the tax cut was not passed until 1964, after President Kennedy’s assassination in 1963. While the Council of Economic Advisers concluded that the tax cut had worked as advertised, it came long after the economy had recovered and tended to push the economy into an inflationary gap. As we will see in later chapters, the tax cut helped push the economy into a period of rising inflation.

Source: *Economic Report of the President 1964* (Washington, DC: U.S. Government Printing Office, 1964), 172–73.

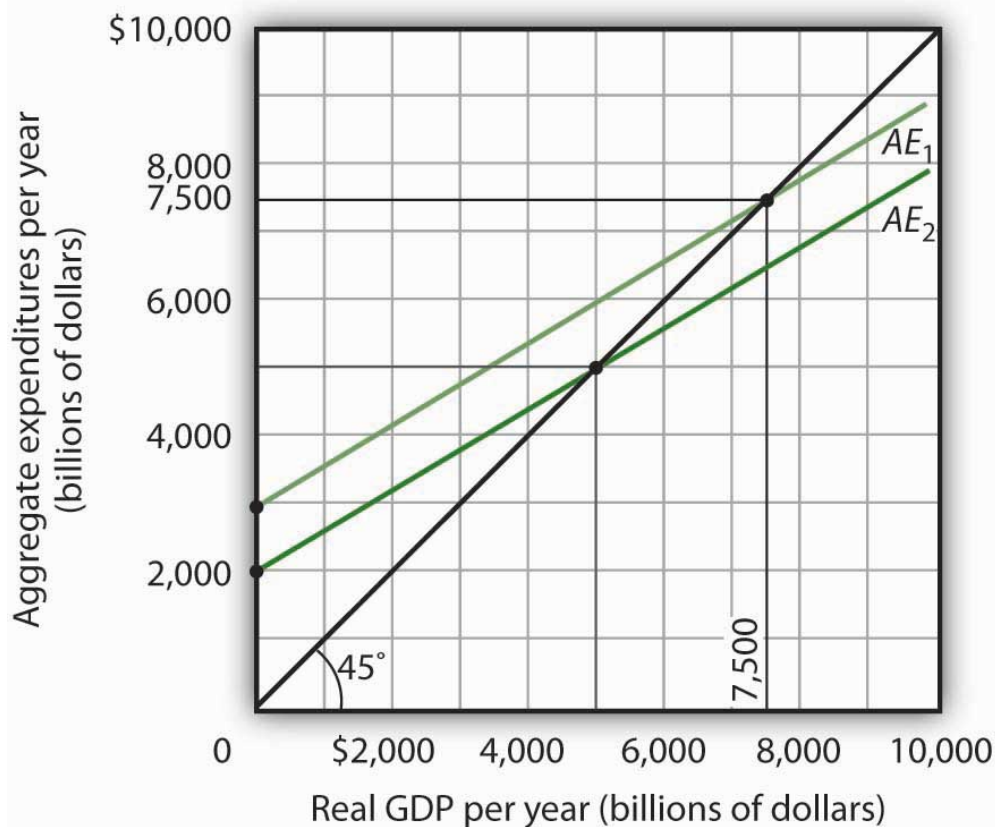
Answers to Try It! Problems

1. The aggregate expenditures curve is plotted in the accompanying chart as AE_1 .
2. The intercept of the AE_1 curve is \$3,000. It is the amount of aggregate expenditures ($C + I_p + G + X_n$) when real GDP is zero. The slope of the AE_1 curve is 0.6. It can be found by determining the amount of aggregate expenditures for any two levels of real GDP and then by dividing the change in aggregate expenditures by the change in real GDP over the interval. For example, between real GDP of \$2,500 and \$5,000, aggregate expenditures go from \$4,500 to \$6,000. Thus,

$$\frac{\Delta E_1}{\Delta Y} = \frac{\$6,000 - \$4,500}{\$5,000 - \$2,500} = \frac{\$1,500}{\$2,500} = 0.6$$

3. The equilibrium level of real GDP is \$7,500. It can be found by determining the intersection of AE_1 and the 45-degree line. At $Y = \$7,500$, $AE_1 = \$5,300 + 1,000 + 1,400 - 200 = \$7,500$.
4. A reduction of net exports of \$1,000 shifts the aggregate expenditures curve down by \$1,000 to AE_2 . The equilibrium real GDP falls from \$7,500 to \$5,000. The new aggregate expenditures curve, AE_2 , intersects the 45-degree line at real GDP of \$5,000.
5. The multiplier is 2.5 [$= (-\$2,500)/(-\$1,000)$].

Figure 28.15



¹An even more realistic view of the economy might assume that imports are induced, since as a country's real GDP rises it will buy more goods and services, some of which will be imports. In that case, the slope of the aggregate expenditures curve would change.

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7.3: Aggregate Expenditures and Aggregate Demand

Learning Objective

1. Explain and illustrate how a change in the price level affects the aggregate expenditures curve.
2. Explain and illustrate how to derive an aggregate demand curve from the aggregate expenditures curve for different price levels.
3. Explain and illustrate how an increase or decrease in autonomous aggregate expenditures affects the aggregate demand curve.

We can use the aggregate expenditures model to gain greater insight into the aggregate demand curve. In this section we shall see how to derive the aggregate demand curve from the aggregate expenditures model. We shall also see how to apply the analysis of multiplier effects in the aggregate expenditures model to the aggregate demand–aggregate supply model.

Aggregate Expenditures Curves and Price Levels

An aggregate expenditures curve assumes a fixed price level. If the price level were to change, the levels of consumption, investment, and net exports would all change, producing a new aggregate expenditures curve and a new equilibrium solution in the aggregate expenditures model.

A change in the price level changes people's real wealth. Suppose, for example, that your wealth includes \$10,000 in a bond account. An increase in the price level would reduce the real value of this money, reduce your real wealth, and thus reduce your consumption. Similarly, a reduction in the price level would increase the real value of money holdings and thus increase real wealth and consumption. The tendency for price level changes to change real wealth and consumption is called the [wealth effect](#).

Because changes in the price level also affect the real quantity of money, we can expect a change in the price level to change the interest rate. A reduction in the price level will increase the real quantity of money and thus lower the interest rate. A lower interest rate, all other things unchanged, will increase the level of investment. Similarly, a higher price level reduces the real quantity of money, raises interest rates, and reduces investment. This is called the [interest rate effect](#).

Finally, a change in the domestic price level will affect exports and imports. A higher price level makes a country's exports fall and imports rise, reducing net exports. A lower price level will increase exports and reduce imports, increasing net exports. This impact of different price levels on the level of net exports is called the [international trade effect](#).

Panel (a) of Figure 28.16 shows three possible aggregate expenditures curves for three different price levels. For example, the aggregate expenditures curve labeled $AE_{P=1.0}$ is the aggregate expenditures curve for an economy with a price level of 1.0. Since that aggregate expenditures curve crosses the 45-degree line at \$6,000 billion, equilibrium real GDP is \$6,000 billion at that price level. At a lower price level, aggregate expenditures would rise because of the wealth effect, the interest rate effect, and the international trade effect. Assume that at every level of real GDP, a reduction in the price level to 0.5 would boost aggregate expenditures by \$2,000 billion to $AE_{P=0.5}$, and an increase in the price level from 1.0 to 1.5 would reduce aggregate expenditures by \$2,000 billion. The aggregate expenditures curve for a price level of 1.5 is shown as $AE_{P=1.5}$. There is a different aggregate expenditures curve, and a different level of equilibrium real GDP, for each of these three price levels. A price level of 1.5 produces equilibrium at point A, a price level of 1.0 does so at point B, and a price level of 0.5 does so at point C. More generally, there will be a different level of equilibrium real GDP for every price level; the higher the price level, the lower the equilibrium value of real GDP.

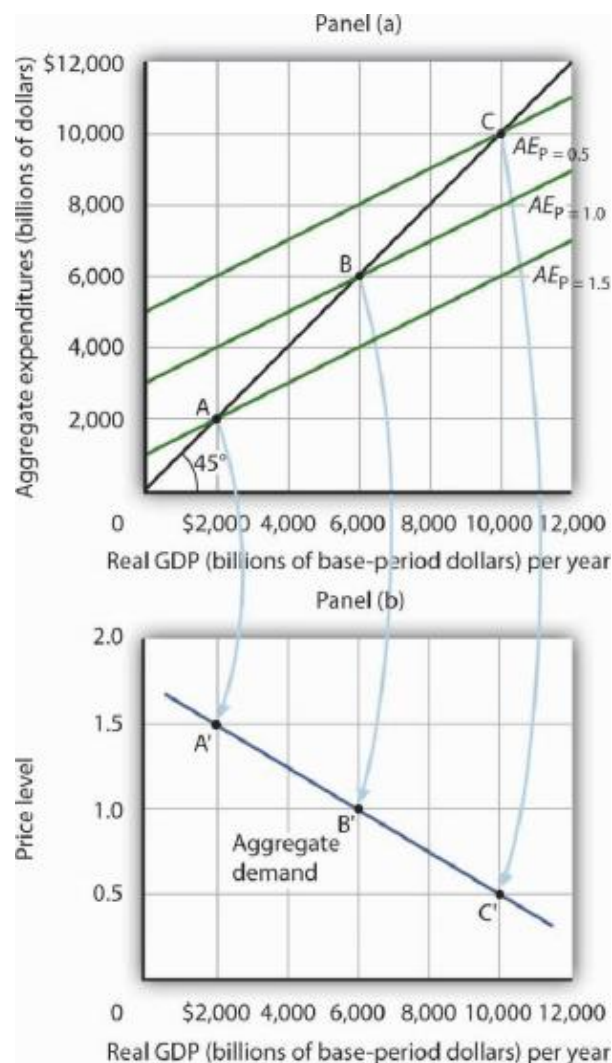


Figure 28.16 From Aggregate Expenditures to Aggregate Demand Because there is a different aggregate expenditures curve for each price level, there is a different equilibrium real GDP for each price level. Panel (a) shows aggregate expenditures curves for three different price levels. Panel (b) shows that the aggregate demand curve, which shows the quantity of goods and services demanded at each price level, can thus be derived from the aggregate expenditures model. The aggregate expenditures curve for a price level of 1.0, for example, intersects the 45-degree line in Panel (a) at point B, producing an equilibrium real GDP of \$6,000 billion. We can thus plot point B' on the aggregate demand curve in Panel (b), which shows that at a price level of 1.0, a real GDP of \$6,000 billion is demanded.

Panel (b) of Figure 28.16 shows how an aggregate demand curve can be derived from the aggregate expenditures curves for different price levels. The equilibrium real GDP associated with each price level in the aggregate expenditures model is plotted as a point showing the price level and the quantity of goods and services demanded (measured as real GDP). At a price level of 1.0, for example, the equilibrium level of real GDP in the aggregate expenditures model in Panel (a) is \$6,000 billion at point B. That means \$6,000 billion worth of goods and services is demanded; point B' on the aggregate demand curve in Panel (b) corresponds to a real GDP demanded of \$6,000 billion and a price level of 1.0. At a price level of 0.5 the equilibrium GDP demanded is \$10,000 billion at point C', and at a price level of 1.5 the equilibrium real GDP demanded is \$2,000 billion at point A'. The aggregate demand curve thus shows the equilibrium real GDP from the aggregate expenditures model at each price level.

The Multiplier and Changes in Aggregate Demand

In the aggregate expenditures model, a change in autonomous aggregate expenditures changes equilibrium real GDP by the multiplier times the change in autonomous aggregate expenditures. That model, however, assumes a constant price level. How can we incorporate the concept of the multiplier into the model of aggregate demand and aggregate supply?

Consider the aggregate expenditures curves given in Panel (a) of Figure 28.17, each of which corresponds to a particular price level. Suppose net exports rise by \$1,000 billion. Such a change increases aggregate expenditures at each price level by \$1,000 billion.

A \$1,000-billion increase in net exports shifts each of the aggregate expenditures curves up by \$1,000 billion, to $AE'_{P=1.0}$ and $AE'_{P=1.5}$. That changes the equilibrium real GDP associated with each price level; it thus shifts the aggregate demand curve to AD_2 in Panel (b). In the aggregate expenditures model, equilibrium real GDP changes by an amount equal to the initial change in autonomous aggregate expenditures times the multiplier, so the aggregate demand curve shifts by the same amount. In this example, we assume the multiplier is 2. The aggregate demand curve thus shifts to the right by \$2,000 billion, two times the \$1,000-billion change in autonomous aggregate expenditures.

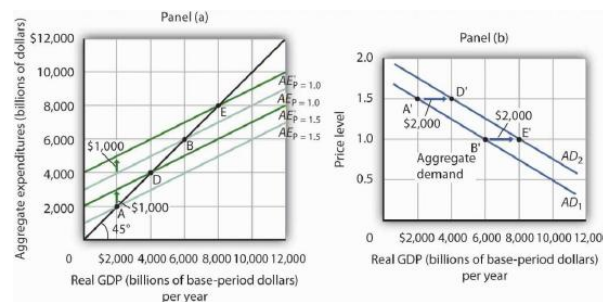


Figure 28.17 Changes in Aggregate Demand The aggregate expenditures curves for price levels of 1.0 and 1.5 are the same as in Figure 28.16, as is the aggregate demand curve. Now suppose a \$1,000-billion increase in net exports shifts each of the aggregate expenditures curves up; $AE_{P=1.0}$, for example, rises to $AE'_{P=1.0}$. The aggregate demand curve thus shifts to the right by \$2,000 billion, the change in aggregate expenditures times the multiplier, assumed to be 2 in this example.

In general, any change in autonomous aggregate expenditures shifts the aggregate demand curve. The amount of the shift is always equal to the change in autonomous aggregate expenditures times the multiplier. An increase in autonomous aggregate expenditures shifts the aggregate demand curve to the right; a reduction shifts it to the left.

Key Takeaways

- There will be a different aggregate expenditures curve for each price level.
- Aggregate expenditures will vary with the price level because of the wealth effect, the interest rate effect, and the international trade effect. The higher the price level, the lower the aggregate expenditures curve and the lower the equilibrium level of real GDP. The lower the price level, the higher the aggregate expenditures curve and the higher the equilibrium level of real GDP.
- A change in autonomous aggregate expenditures shifts the aggregate expenditures curve for each price level. That shifts the aggregate demand curve by an amount equal to the change in autonomous aggregate expenditures times the multiplier.

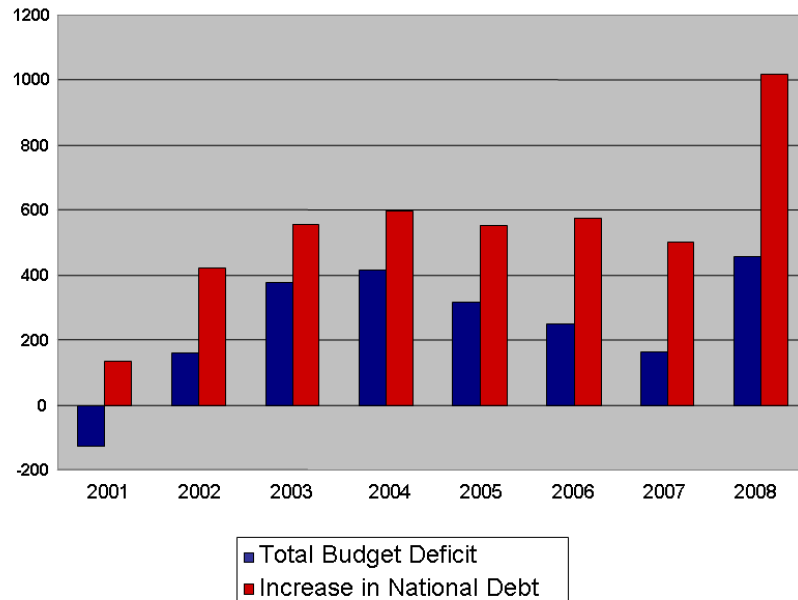
Try It!

Sketch three aggregate expenditures curves for price levels of P_1 , P_2 , and P_3 , where P_1 is the lowest price level and P_3 the highest (you do not have numbers for this exercise; simply sketch curves of the appropriate shape). Label the equilibrium levels of real GDP Y_1 , Y_2 , and Y_3 . Now draw the aggregate demand curve implied by your analysis, labeling points that correspond to P_1 , P_2 , and P_3 and Y_1 , Y_2 , and Y_3 . You can use Figure 28.16 as a model for your work.

Case in Point: Predicting the Impact of Alternative Fiscal Policies in 2008

Figure 28.18

Total Deficits vs. National Debt Increases (\$ Billions)



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Economists are often asked to simulate the effects of policy changes on the economy. In 2008, as the economy weakened and Congress and the president debated a stimulus package, Mark M. Zandi, an economist at Moody's Economy.com, produced a paper assessing the impact of various possible stimulus packages. His research produced the following table.

Table 28.2 Fiscal Economic Bang for the Buck

Tax cuts	
Nonrefundable lump-sum tax rebate	1.02
Refundable lump-sum tax rebate	1.26
Temporary tax cuts	
Payroll tax holiday	1.29
Across-the-board tax cut	1.03
Accelerated depreciation	0.27
Permanent tax cuts	
Extend alternative minimum tax patch	0.48
Make Bush income tax cuts permanent	0.29
Make dividend and capital gains tax cuts permanent	0.37
Spending increases	
Extending UI benefits	1.64
Temporary increase in food stamps	1.73
General aid to state governments	1.36
Increased infrastructure spending	1.59

The \$100-billion tax rebate for households that was actually passed was of the nonrefundable lump-sum type. “Nonrefundable” refers to the fact those not earning enough to pay income taxes would not receive a rebate, meaning that many households received zero or partial refunds. As shown, he estimated that a \$100-billion tax rebate would shift the aggregate demand curve by \$102 billion, assuming a constant price level. As part of the analysis, in the article he mentioned that he assumed an *MPC* of about two-thirds, since many households at the time were living paycheck-to-paycheck. So, consumption would increase by about \$67 billion. The implied multiplier is thus 1.54 (= 102/67).

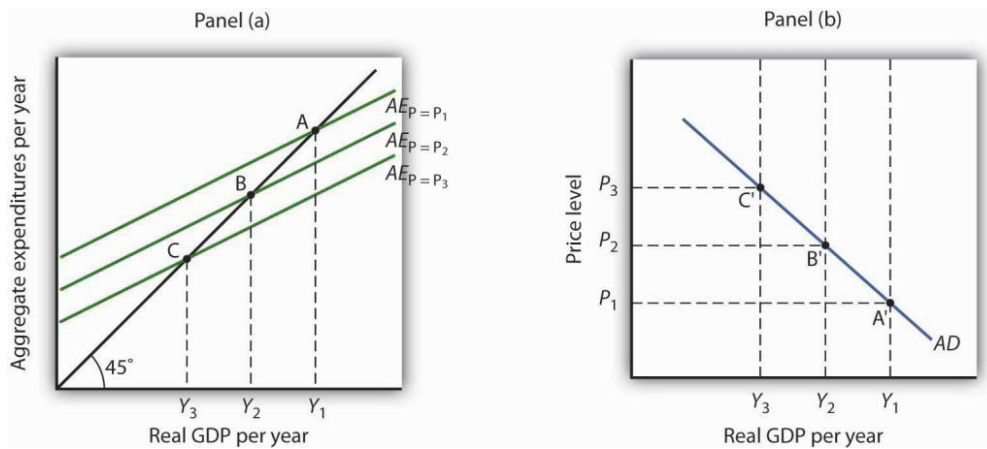
The table shows that other stimuli would have smaller or larger effects. He reasoned that making various tax cuts permanent would have little impact on consumption now, since households in 2008 were cash-strapped. The table shows an estimated bigger bang for the buck from various kinds of government spending increases. That follows, since the change in aggregate expenditure is the full amount of the spending increase instead of the portion of a tax rebate of the same magnitude that consumers decide to spend.

Source: Mark M. Zandi, “Assessing the Macro Economic Impact of Fiscal Stimulus 2008,” Moody’s Economy.com, January 2008.

Answer to Try It! Problem

The lowest price level, P_1 , corresponds to the highest *AE* curve, $AE_{P=P_1}$, as shown. This suggests a downward-sloping aggregate demand curve. Points A, B, and C on the *AE* curve correspond to points A', B', and C' on the *AD* curve, respectively.

Figure 28.19



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7.4: Review and Practice

Summary

This chapter presented the aggregate expenditures model. Aggregate expenditures are the sum of planned levels of consumption, investment, government purchases, and net exports at a given price level. The aggregate expenditures model relates aggregate expenditures to the level of real GDP.

We began by observing the close relationship between consumption and disposable personal income. A consumption function shows this relationship. The saving function can be derived from the consumption function.

The time period over which income is considered to be a determinant of consumption is important. The current income hypothesis holds that consumption in one period is a function of income in that same period. The permanent income hypothesis holds that consumption in a period is a function of permanent income. An important implication of the permanent income hypothesis is that the marginal propensity to consume will be smaller for temporary than for permanent changes in disposable personal income.

Changes in real wealth and consumer expectations can affect the consumption function. Such changes shift the curve relating consumption to disposable personal income, the graphical representation of the consumption function; changes in disposable personal income do not shift the curve but cause movements along it.

An aggregate expenditures curve shows total planned expenditures at each level of real GDP. This curve is used in the aggregate expenditures model to determine the equilibrium real GDP (at a given price level). A change in autonomous aggregate expenditures produces a multiplier effect that leads to a larger change in equilibrium real GDP. In a simplified economy, with only consumption and investment expenditures, in which the slope of the aggregate expenditures curve is the marginal propensity to consume (MPC), the multiplier is equal to $1/(1 - MPC)$. Because the sum of the marginal propensity to consume and the marginal propensity to save (MPS) is 1, the multiplier in this simplified model is also equal to $1/MPS$.

Finally, we derived the aggregate demand curve from the aggregate expenditures model. Each point on the aggregate demand curve corresponds to the equilibrium level of real GDP as derived in the aggregate expenditures model for each price level. The downward slope of the aggregate demand curve (and the shifting of the aggregate expenditures curve at each price level) reflects the wealth effect, the interest rate effect, and the international trade effect. A change in autonomous aggregate expenditures shifts the aggregate demand curve by an amount equal to the change in autonomous aggregate expenditures times the multiplier.

In a more realistic aggregate expenditures model that includes all four components of aggregate expenditures (consumption, investment, government purchases, and net exports), the slope of the aggregate expenditures curve shows the additional aggregate expenditures induced by increases in real GDP, and the size of the multiplier depends on the slope of the aggregate expenditures curve. The steeper the aggregate expenditures curve, the larger the multiplier; the flatter the aggregate expenditures curve, the smaller the multiplier.

Concept Problems

1. Explain the difference between autonomous and induced expenditures. Give examples of each.
2. The consumption function we studied in the chapter predicted that consumption would sometimes exceed disposable personal income. How could this be?
3. The consumption function can be represented as a table, as an equation, or as a curve. Distinguish among these three representations.
4. The introduction to this chapter described the behavior of consumer spending at the end of 2008. Explain this phenomenon in terms of the analysis presented in this chapter.
5. Explain the role played by the 45-degree line in the aggregate expenditures model.
6. Your college or university, if it does what many others do, occasionally releases a news story claiming that its impact on the total employment in the local economy is understated by its own employment statistics. If the institution keeps accurate statistics, is that possible?

7. Suppose the level of investment in a certain economy changes when the level of real GDP changes; an increase in real GDP induces an increase in investment, while a reduction in real GDP causes investment to fall. How do you think such behavior would affect the slope of the aggregate expenditures curve? The multiplier?
8. Give an intuitive explanation for how the multiplier works on a reduction in autonomous aggregate expenditures. Why does equilibrium real GDP fall by more than the change in autonomous aggregate expenditures?
9. Explain why the marginal propensity to consume out of a temporary tax rebate would be lower than that for a permanent rebate.
10. Pretend you are a member of the Council of Economic Advisers and are trying to persuade the members of the House Appropriations Committee to purchase \$100 billion worth of new materials, in part to stimulate the economy. Explain to the members how the multiplier process will work.

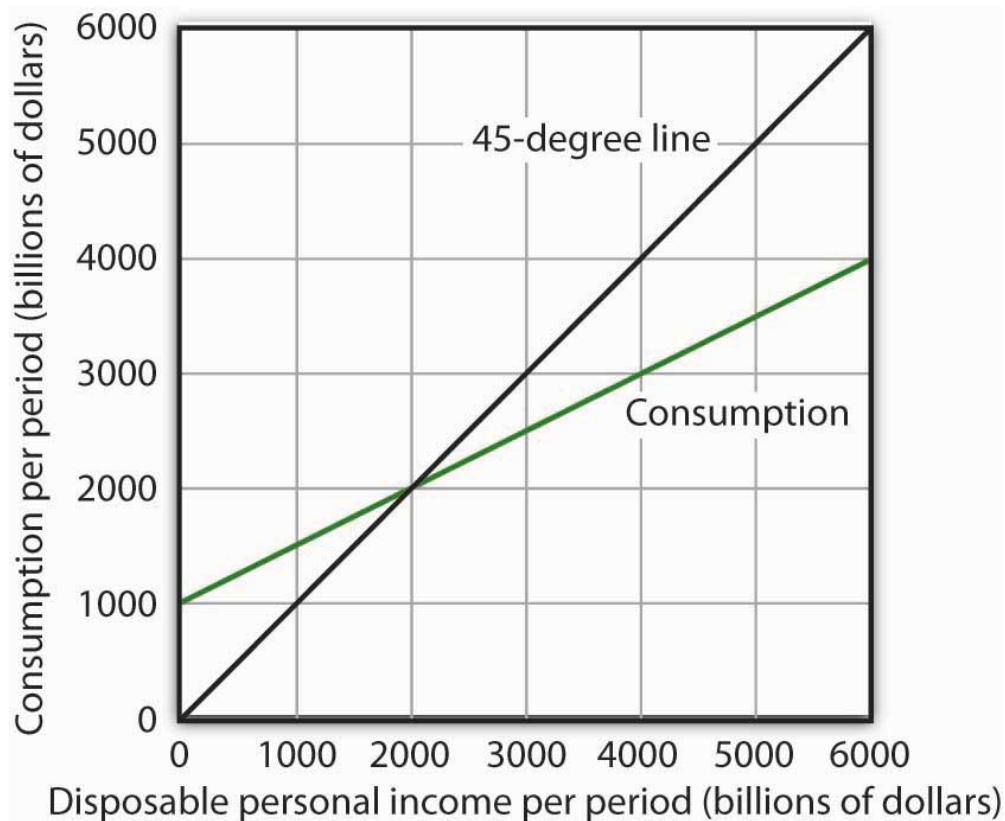
Numerical Problems

1. Suppose the following information describes a simple economy. Figures are in billion of dollars.

Disposable personal income	Consumption
0	100
100	120
200	140
300	160

1. What is the marginal propensity to consume?
 2. What is the marginal propensity to save?
 3. Write an equation that describes consumption.
 4. Write an equation that describes saving.
2. The graph below shows a consumption function.

Figure 28.20



1. When disposable personal income is equal to zero, how much is consumption?
2. When disposable personal income is equal to \$4,000 billion, how much is consumption?
3. At what level of personal disposable income are consumption and disposable personal income equal?
4. How much is personal saving when consumption is \$2,500 billion?
5. How much is personal saving when consumption is \$5,000 billion?
6. What is the marginal propensity to consume?
7. What is the marginal propensity to save?
8. Draw the saving function implied by the consumption function above.

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CHAPTER OVERVIEW

8: Aggregate Demand and Aggregate Supply

8.1: Aggregate Demand

8.2: Aggregate Demand and Aggregate Supply- The Long Run and the Short Run

8.3: Recessionary and Inflationary Gaps and Long-Run Macroeconomic Equilibrium

8.4: Review and Practice

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8.1: Aggregate Demand

Learning Objective

1. Define potential output, also called the natural level of GDP.
2. Define aggregate demand, represent it using a hypothetical aggregate demand curve, and identify and explain the three effects that cause this curve to slope downward.
3. Distinguish between a change in the aggregate quantity of goods and services demanded and a change in aggregate demand.
4. Use examples to explain how each component of aggregate demand can be a possible aggregate demand shifter.
5. Explain what a multiplier is and tell how to calculate it.

Firms face four sources of demand: households (personal consumption), other firms (investment), government agencies (government purchases), and foreign markets (net exports). **Aggregate demand** is the relationship between the total quantity of goods and services demanded (from all the four sources of demand) and the price level, all other determinants of spending unchanged. The **aggregate demand curve** is a graphical representation of aggregate demand.

The Slope of the Aggregate Demand Curve

We will use the implicit price deflator as our measure of the price level; the aggregate quantity of goods and services demanded is measured as real GDP. The table in Figure 22.1 gives values for each component of aggregate demand at each price level for a hypothetical economy. Various points on the aggregate demand curve are found by adding the values of these components at different price levels. The aggregate demand curve for the data given in the table is plotted on the graph in Figure 22.1. At point A, at a price level of 1.18, \$11,800 billion worth of goods and services will be demanded; at point C, a reduction in the price level to 1.14 increases the quantity of goods and services demanded to \$12,000 billion; and at point E, at a price level of 1.10, \$12,200 billion will be demanded.

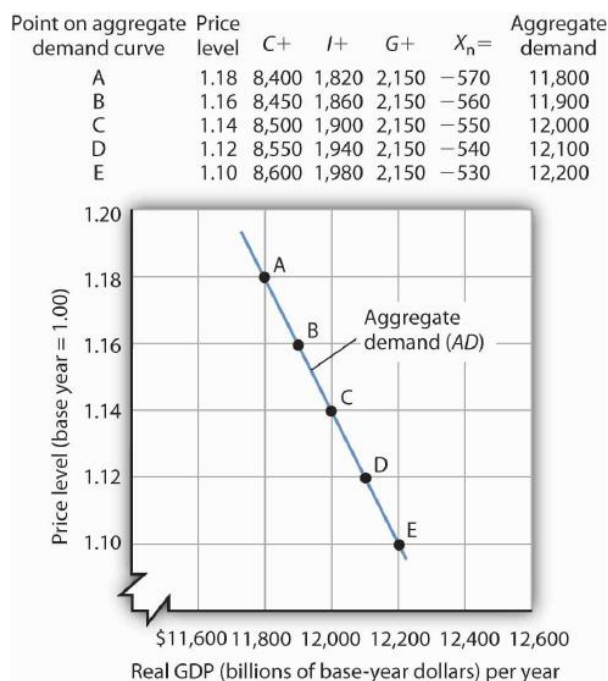


Figure 22.1 Aggregate Demand An aggregate demand curve (AD) shows the relationship between the total quantity of output demanded (measured as real GDP) and the price level (measured as the implicit price deflator). At each price level, the total quantity of goods and services demanded is the sum of the components of real GDP, as shown in the table. There is a negative relationship between the price level and the total quantity of goods and services demanded, all other things unchanged.

The negative slope of the aggregate demand curve suggests that it behaves in the same manner as an ordinary demand curve. But we *cannot* apply the reasoning we use to explain downward-sloping demand curves in individual markets to explain the downward-

sloping aggregate demand curve. There are two reasons for a negative relationship between price and quantity demanded in individual markets. First, a lower price induces people to substitute more of the good whose price has fallen for other goods, increasing the quantity demanded. Second, the lower price creates a higher real income. This normally increases quantity demanded further.

Neither of these effects is relevant to a change in prices in the aggregate. When we are dealing with the average of all prices—the price level—we can no longer say that a fall in prices will induce a change in relative prices that will lead consumers to buy more of the goods and services whose prices have fallen and less of the goods and services whose prices have not fallen. The price of corn may have fallen, but the prices of wheat, sugar, tractors, steel, and most other goods or services produced in the economy are likely to have fallen as well.

Furthermore, a reduction in the price level means that it is not just the prices consumers pay that are falling. It means the prices people receive—their wages, the rents they may charge as landlords, the interest rates they earn—are likely to be falling as well. A falling price level means that goods and services are cheaper, but incomes are lower, too. There is no reason to expect that a change in real income will boost the quantity of goods and services demanded—indeed, no change in real income would occur. If nominal incomes and prices all fall by 10%, for example, real incomes do not change.

Why, then, does the aggregate demand curve slope downward? One reason for the downward slope of the aggregate demand curve lies in the relationship between real wealth (the stocks, bonds, and other assets that people have accumulated) and consumption (one of the four components of aggregate demand). When the price level falls, the real value of wealth increases—it packs more purchasing power. For example, if the price level falls by 25%, then \$10,000 of wealth could purchase more goods and services than it would have if the price level had not fallen. An increase in wealth will induce people to increase their consumption. The consumption component of aggregate demand will thus be greater at lower price levels than at higher price levels. The tendency for a change in the price level to affect real wealth and thus alter consumption is called the [wealth effect](#); it suggests a negative relationship between the price level and the real value of consumption spending.

A second reason the aggregate demand curve slopes downward lies in the relationship between interest rates and investment. A lower price level lowers the demand for money, because less money is required to buy a given quantity of goods. What economists mean by money demand will be explained in more detail in a later chapter. But, as we learned in studying demand and supply, a reduction in the demand for something, all other things unchanged, lowers its price. In this case, the “something” is money and its price is the interest rate. A lower price level thus reduces interest rates. Lower interest rates make borrowing by firms to build factories or buy equipment and other capital more attractive. A lower interest rate means lower mortgage payments, which tends to increase investment in residential houses. Investment thus rises when the price level falls. The tendency for a change in the price level to affect the interest rate and thus to affect the quantity of investment demanded is called the [interest rate effect](#). John Maynard Keynes, a British economist whose analysis of the Great Depression and what to do about it led to the birth of modern macroeconomics, emphasized this effect. For this reason, the interest rate effect is sometimes called the Keynes effect.

A third reason for the rise in the total quantity of goods and services demanded as the price level falls can be found in changes in the net export component of aggregate demand. All other things unchanged, a lower price level in an economy reduces the prices of its goods and services relative to foreign-produced goods and services. A lower price level makes that economy’s goods more attractive to foreign buyers, increasing exports. It will also make foreign-produced goods and services less attractive to the economy’s buyers, reducing imports. The result is an increase in net exports. The [international trade effect](#) is the tendency for a change in the price level to affect net exports.

Taken together, then, a fall in the price level means that the quantities of consumption, investment, and net export components of aggregate demand may all rise. Since government purchases are determined through a political process, we assume there is no causal link between the price level and the real volume of government purchases. Therefore, this component of GDP does not contribute to the downward slope of the curve.

In general, a change in the price level, with all other determinants of aggregate demand unchanged, causes a movement along the aggregate demand curve. A movement along an aggregate demand curve is a [change in the aggregate quantity of goods and services demanded](#). A movement from point A to point B on the aggregate demand curve in Figure 22.1 is an example. Such a change is a response to a change in the price level.

Notice that the axes of the aggregate demand curve graph are drawn with a break near the origin to remind us that the plotted values reflect a relatively narrow range of changes in real GDP and the price level. We do not know what might happen if the price level or output for an entire economy approached zero. Such a phenomenon has never been observed.

Changes in Aggregate Demand

Aggregate demand changes in response to a change in any of its components. An increase in the total quantity of consumer goods and services demanded at every price level, for example, would shift the aggregate demand curve to the right. A change in the aggregate quantity of goods and services demanded at every price level is a **change in aggregate demand**, which shifts the aggregate demand curve. Increases and decreases in aggregate demand are shown in Figure 22.2.

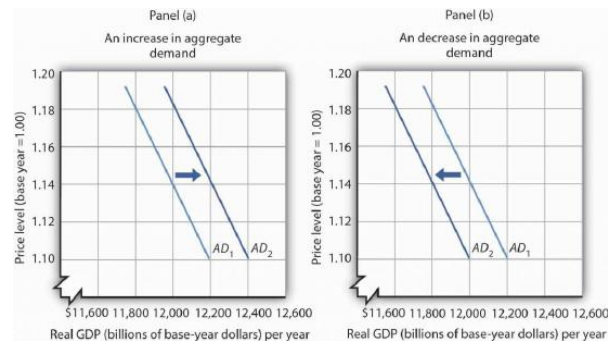


Figure 22.2 Changes in Aggregate Demand An increase in consumption, investment, government purchases, or net exports shifts the aggregate demand curve AD_1 to the right as shown in Panel (a). A reduction in one of the components of aggregate demand shifts the curve to the left, as shown in Panel (b).

What factors might cause the aggregate demand curve to shift? Each of the components of aggregate demand is a possible aggregate demand shifter. We shall look at some of the events that can trigger changes in the components of aggregate demand and thus shift the aggregate demand curve.

Changes in Consumption

Several events could change the quantity of consumption at each price level and thus shift aggregate demand. One determinant of consumption is consumer confidence. If consumers expect good economic conditions and are optimistic about their economic prospects, they are more likely to buy major items such as cars or furniture. The result would be an increase in the real value of consumption at each price level and an increase in aggregate demand. In the second half of the 1990s, sustained economic growth and low unemployment fueled high expectations and consumer optimism. Surveys revealed consumer confidence to be very high. That consumer confidence translated into increased consumption and increased aggregate demand. In contrast, a decrease in consumption would accompany diminished consumer expectations and a decrease in consumer confidence, as happened after the stock market crash of 1929. The same problem has plagued the economies of most Western nations in 2008 as declining consumer confidence has tended to reduce consumption. A survey by the Conference Board in September of 2008 showed that just 13.5% of consumers surveyed expected economic conditions in the United States to improve in the next six months. Similarly pessimistic views prevailed in the previous two months. That contributed to the decline in consumption that occurred in the third quarter of the year.

Another factor that can change consumption and shift aggregate demand is tax policy. A cut in personal income taxes leaves people with more after-tax income, which may induce them to increase their consumption. The federal government in the United States cut taxes in 1964, 1981, 1986, 1997, and 2003; each of those tax cuts tended to increase consumption and aggregate demand at each price level.

In the United States, another government policy aimed at increasing consumption and thus aggregate demand has been the use of rebates in which taxpayers are simply sent checks in hopes that those checks will be used for consumption. Rebates have been used in 1975, 2001, and 2008. In each case the rebate was a one-time payment. Careful studies by economists of the 1975 and 2001 rebates showed little impact on consumption. Final evidence on the impact of the 2008 rebates is not yet in, but early results suggest a similar outcome. In a subsequent chapter, we will investigate arguments about whether temporary increases in income produced by rebates are likely to have a significant impact on consumption.

Transfer payments such as welfare and Social Security also affect the income people have available to spend. At any given price level, an increase in transfer payments raises consumption and aggregate demand, and a reduction lowers consumption and aggregate demand.

Changes in Investment

Investment is the production of new capital that will be used for future production of goods and services. Firms make investment choices based on what they think they will be producing in the future. The expectations of firms thus play a critical role in determining investment. If firms expect their sales to go up, they are likely to increase their investment so that they can increase production and meet consumer demand. Such an increase in investment raises the aggregate quantity of goods and services demanded at each price level; it increases aggregate demand.

Changes in interest rates also affect investment and thus affect aggregate demand. We must be careful to distinguish such changes from the interest rate effect, which causes a movement along the aggregate demand curve. A change in interest rates that results from a change in the price level affects investment in a way that is already captured in the downward slope of the aggregate demand curve; it causes a movement along the curve. A change in interest rates for some other reason shifts the curve. We examine reasons interest rates might change in another chapter.

Investment can also be affected by tax policy. One provision of the Job and Growth Tax Relief Reconciliation Act of 2003 was a reduction in the tax rate on certain capital gains. Capital gains result when the owner of an asset, such as a house or a factory, sells the asset for more than its purchase price (less any depreciation claimed in earlier years). The lower capital gains tax could stimulate investment, because the owners of such assets know that they will lose less to taxes when they sell those assets, thus making assets subject to the tax more attractive.

Changes in Government Purchases

Any change in government purchases, all other things unchanged, will affect aggregate demand. An increase in government purchases increases aggregate demand; a decrease in government purchases decreases aggregate demand.

Many economists argued that reductions in defense spending in the wake of the collapse of the Soviet Union in 1991 tended to reduce aggregate demand. Similarly, increased defense spending for the wars in Afghanistan and Iraq increased aggregate demand. Dramatic increases in defense spending to fight World War II accounted in large part for the rapid recovery from the Great Depression.

Changes in Net Exports

A change in the value of net exports at each price level shifts the aggregate demand curve. A major determinant of net exports is foreign demand for a country's goods and services; that demand will vary with foreign incomes. An increase in foreign incomes increases a country's net exports and aggregate demand; a slump in foreign incomes reduces net exports and aggregate demand. For example, several major U.S. trading partners in Asia suffered recessions in 1997 and 1998. Lower real incomes in those countries reduced U.S. exports and tended to reduce aggregate demand.

Exchange rates also influence net exports, all other things unchanged. A country's **exchange rate** is the price of its currency in terms of another currency or currencies. A rise in the U.S. exchange rate means that it takes more Japanese yen, for example, to purchase one dollar. That also means that U.S. traders get more yen per dollar. Since prices of goods produced in Japan are given in yen and prices of goods produced in the United States are given in dollars, a rise in the U.S. exchange rate increases the price to foreigners for goods and services produced in the United States, thus reducing U.S. exports; it reduces the price of foreign-produced goods and services for U.S. consumers, thus increasing imports to the United States. A higher exchange rate tends to reduce net exports, reducing aggregate demand. A lower exchange rate tends to increase net exports, increasing aggregate demand.

Foreign price levels can affect aggregate demand in the same way as exchange rates. For example, when foreign price levels fall relative to the price level in the United States, U.S. goods and services become relatively more expensive, reducing exports and boosting imports in the United States. Such a reduction in net exports reduces aggregate demand. An increase in foreign prices relative to U.S. prices has the opposite effect.

The trade policies of various countries can also affect net exports. A policy by Japan to increase its imports of goods and services from India, for example, would increase net exports in India.

The Multiplier

A change in any component of aggregate demand shifts the aggregate demand curve. Generally, the aggregate demand curve shifts by more than the amount by which the component initially causing it to shift changes.

Suppose that net exports increase due to an increase in foreign incomes. As foreign demand for domestically made products rises, a country's firms will hire additional workers or perhaps increase the average number of hours that their employees work. In either case, incomes will rise, and higher incomes will lead to an increase in consumption. Taking into account these other increases in the components of aggregate demand, the aggregate demand curve will shift by more than the initial shift caused by the initial increase in net exports.

The **multiplier** is the ratio of the change in the quantity of real GDP demanded at each price level to the initial change in one or more components of aggregate demand that produced it. In other words, we can use Equation 22.1 to solve for the change in real GDP demanded at each price level to the initial change in one or more components of aggregate demand that produced it:

Equation 22.1

$$\text{Multiplier} = \frac{\Delta(\text{real GDP demanded at each price level})}{\text{initial } \Delta(\text{component of AD})}$$

We use the capital Greek letter delta (Δ) to mean "change in." In the aggregate demand–aggregate supply model presented in this chapter, it is the number by which we multiply an initial change in aggregate demand to obtain the amount by which the aggregate demand curve shifts as a result of the initial change. In other words, we can use Equation 22.1 to solve for the change in real GDP demanded at each price level:

Equation 22.2

$$\Delta(\text{real GDP demanded at each price level}) = \text{multiplier} \times \text{initial } \Delta(\text{component of AD})$$

Suppose that the initial increase in net exports is \$100 billion and that the initial \$100-billion increase generates additional consumption of \$100 billion at each price level. In Panel (a) of Figure 22.3, the aggregate demand curve shifts to the right by \$200 billion—the amount of the initial increase in net exports times the multiplier of 2. We obtained the value for the multiplier in this example by plugging \$200 billion (the initial \$100-billion increase in net exports plus the \$100-billion increase that it generated in consumption) into the numerator of Equation 22.1 and \$100 billion into the denominator. Similarly, a decrease in net exports of \$100 billion leads to a decrease in aggregate demand of \$200 billion at each price level, as shown in Panel (b).

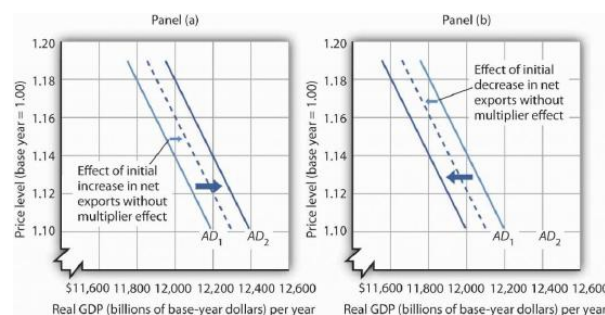


Figure 22.3 The Multiplier A change in one component of aggregate demand shifts the aggregate demand curve by more than the initial change. In Panel (a), an initial increase of \$100 billion of net exports shifts the aggregate demand curve to the right by \$200 billion at each price level. In Panel (b), a decrease of net exports of \$100 billion shifts the aggregate demand curve to the left by \$200 billion. In this example, the multiplier is 2.

Key Takeaways

- Potential output is the level of output an economy can achieve when labor is employed at its natural level. When an economy fails to produce at its potential, the government or the central bank may try to push the economy toward its potential.

- The aggregate demand curve represents the total of consumption, investment, government purchases, and net exports at each price level in any period. It slopes downward because of the wealth effect on consumption, the interest rate effect on investment, and the international trade effect on net exports.
- The aggregate demand curve shifts when the quantity of real GDP demanded at each price level changes.
- The multiplier is the number by which we multiply an initial change in aggregate demand to obtain the amount by which the aggregate demand curve shifts at each price level as a result of the initial change.

Try It!

Explain the effect of each of the following on the aggregate demand curve for the United States:

1. A decrease in consumer optimism
2. An increase in real GDP in the countries that buy U.S. exports
3. An increase in the price level
4. An increase in government spending on highways

Case in Point: The Multiplied Economic Impact of SARS on China's Economy

Figure 22.4



Zervas – [wrong face mask](#) – CC BY-NC-ND 2.0.

Severe Acute Respiratory Syndrome (SARS), an atypical pneumonia-like disease, broke onto the world scene in late 2002. In March 2003, the World Health Organization (WHO) issued its first worldwide alert and a month later its first travel advisory, which recommended that travelers avoid Hong Kong and the southern province of China, Guangdong. Over the next few months, additional travel advisories were issued for other parts of China, Taiwan, and briefly for Toronto, Canada. By the end of June, all WHO travel advisories had been removed.

To estimate the overall impact of SARS on the Chinese economy in 2003, economists Wen Hai, Zhong Zhao, and Jian Want of Peking University's China Center for Economic Research conducted a survey of Beijing's tourism industry in April 2003. Based on findings from the Beijing area, they projected the tourism sector of China as a whole would lose \$16.8 billion—of which \$10.8 billion came from an approximate 50% reduction in foreign tourist revenue and \$6 billion from curtailed domestic tourism, as holiday celebrations were cancelled and domestic travel restrictions imposed.

To figure out the total impact of SARS on China's economy, they argued that the multiplier for tourism revenue in China is between 2 and 3. Since the SARS outbreak only began to have a major economic impact after March, they assumed a smaller multiplier of 1.5 for all of 2003. They thus predicted that the Chinese economy would be \$25.3 billion smaller in 2003 as a result of SARS:

Source: Wen Hai, Zhong Zhao, and Jian Wan, “The Short-Term Impact of SARS on the Chinese Economy,” *Asian Economic Papers* 3, no. 1 (Winter 2004): 57–61.

Answer to Try It! Problem

1. A decline in consumer optimism would cause the aggregate demand curve to shift to the left. If consumers are more pessimistic about the future, they are likely to cut purchases, especially of major items.
2. An increase in the real GDP of other countries would increase the demand for U.S. exports and cause the aggregate demand curve to shift to the right. Higher incomes in other countries will make consumers in those countries more willing and able to buy U.S. goods.
3. An increase in the price level corresponds to a movement up along the unchanged aggregate demand curve. At the higher price level, the consumption, investment, and net export components of aggregate demand will all fall; that is, there will be a reduction in the total quantity of goods and services demanded, but not a shift of the aggregate demand curve itself.
4. An increase in government spending on highways means an increase in government purchases. The aggregate demand curve would shift to the right.

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8.2: Aggregate Demand and Aggregate Supply- The Long Run and the Short Run

Learning Objective

1. Distinguish between the short run and the long run, as these terms are used in macroeconomics.
2. Draw a hypothetical long-run aggregate supply curve and explain what it shows about the natural levels of employment and output at various price levels, given changes in aggregate demand.
3. Draw a hypothetical short-run aggregate supply curve, explain why it slopes upward, and explain why it may shift; that is, distinguish between a change in the aggregate quantity of goods and services supplied and a change in short-run aggregate supply.
4. Discuss various explanations for wage and price stickiness.
5. Explain and illustrate what is meant by equilibrium in the short run and relate the equilibrium to potential output.

In macroeconomics, we seek to understand two types of equilibria, one corresponding to the short run and the other corresponding to the long run. The **short run** in macroeconomic analysis is a period in which wages and some other prices do not respond to changes in economic conditions. In certain markets, as economic conditions change, prices (including wages) may not adjust quickly enough to maintain equilibrium in these markets. A **sticky price** is a price that is slow to adjust to its equilibrium level, creating sustained periods of shortage or surplus. Wage and price stickiness prevent the economy from achieving its natural level of employment and its potential output. In contrast, the **long run** in macroeconomic analysis is a period in which wages and prices are flexible. In the long run, employment will move to its natural level and real GDP to potential.

We begin with a discussion of long-run macroeconomic equilibrium, because this type of equilibrium allows us to see the macroeconomy after full market adjustment has been achieved. In contrast, in the short run, price or wage stickiness is an obstacle to full adjustment. Why these deviations from the potential level of output occur and what the implications are for the macroeconomy will be discussed in the section on short-run macroeconomic equilibrium.

The Long Run

As explained in a previous chapter, the natural level of employment occurs where the real wage adjusts so that the quantity of labor demanded equals the quantity of labor supplied. When the economy achieves its natural level of employment, it achieves its potential level of output. We will see that real GDP eventually moves to potential, because all wages and prices are assumed to be flexible in the long run.

Long-Run Aggregate Supply

The **long-run aggregate supply (LRAS) curve** relates the level of output produced by firms to the price level in the long run. In Panel (b) of Figure 22.5, the long-run aggregate supply curve is a vertical line at the economy's potential level of output. There is a single real wage at which employment reaches its natural level. In Panel (a) of Figure 22.5, only a real wage of ω_e generates natural employment L_e . The economy could, however, achieve this real wage with any of an infinitely large set of nominal wage and price-level combinations. Suppose, for example, that the equilibrium real wage (the ratio of wages to the price level) is 1.5. We could have that with a nominal wage level of 1.5 and a price level of 1.0, a nominal wage level of 1.65 and a price level of 1.1, a nominal wage level of 3.0 and a price level of 2.0, and so on.

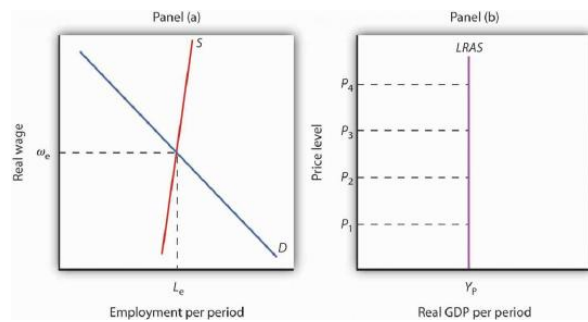


Figure 22.5 Natural Employment and Long-Run Aggregate Supply When the economy achieves its natural level of employment, as shown in Panel (a) at the intersection of the demand and supply curves for labor, it achieves its potential output, as shown in Panel (b) by the vertical long-run aggregate supply curve $LRAS$ at Y_p .

In Panel (b) we see price levels ranging from P_1 to P_4 . Higher price levels would require higher nominal wages to create a real wage of w_e , and flexible nominal wages would achieve that in the long run.

In the long run, then, the economy can achieve its natural level of employment and potential output at any price level. This conclusion gives us our long-run aggregate supply curve. With only one level of output at any price level, the long-run aggregate supply curve is a vertical line at the economy's potential level of output of Y_p .

Equilibrium Levels of Price and Output in the Long Run

The intersection of the economy's aggregate demand curve and the long-run aggregate supply curve determines its equilibrium real GDP and price level in the long run. Figure 22.6 depicts an economy in long-run equilibrium. With aggregate demand at AD_1 and the long-run aggregate supply curve as shown, real GDP is \$12,000 billion per year and the price level is 1.14. If aggregate demand increases to AD_2 , long-run equilibrium will be reestablished at real GDP of \$12,000 billion per year, but at a higher price level of 1.18. If aggregate demand decreases to AD_3 , long-run equilibrium will still be at real GDP of \$12,000 billion per year, but with the now lower price level of 1.10.

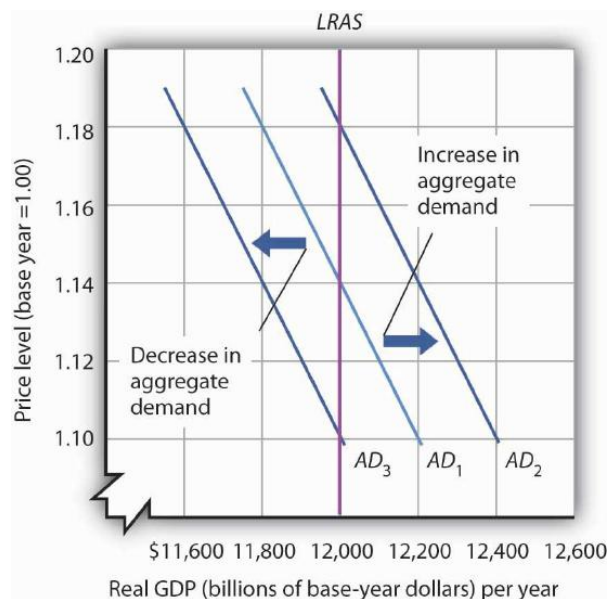


Figure 22.6 Long-Run Equilibrium Long-run equilibrium occurs at the intersection of the aggregate demand curve and the long-run aggregate supply curve. For the three aggregate demand curves shown, long-run equilibrium occurs at three different price levels, but always at an output level of \$12,000 billion per year, which corresponds to potential output.

The Short Run

Analysis of the macroeconomy in the short run—a period in which stickiness of wages and prices may prevent the economy from operating at potential output—helps explain how deviations of real GDP from potential output can and do occur. We will explore the effects of changes in aggregate demand and in short-run aggregate supply in this section.

Short-Run Aggregate Supply

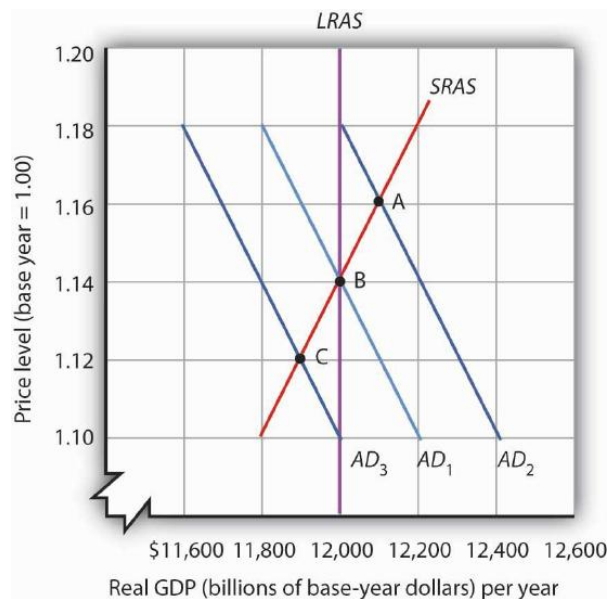


Figure 22.7 Deriving the Short-Run Aggregate Supply Curve The economy shown here is in long-run equilibrium at the intersection of AD_1 with the long-run aggregate supply curve. If aggregate demand increases to AD_2 , in the short run, both real GDP and the price level rise. If aggregate demand decreases to AD_3 , in the short run, both real GDP and the price level fall. A line drawn through points A, B, and C traces out the short-run aggregate supply curve $SRAS$.

The model of aggregate demand and long-run aggregate supply predicts that the economy will eventually move toward its potential output. To see how nominal wage and price stickiness can cause real GDP to be either above or below potential in the short run, consider the response of the economy to a change in aggregate demand. Figure 22.7 shows an economy that has been operating at potential output of \$12,000 billion and a price level of 1.14. This occurs at the intersection of AD_1 with the long-run aggregate supply curve at point B. Now suppose that the aggregate demand curve shifts to the right (to AD_2). This could occur as a result of an increase in exports. (The shift from AD_1 to AD_2 includes the multiplied effect of the increase in exports.) At the price level of 1.14, there is now excess demand and pressure on prices to rise. If all prices in the economy adjusted quickly, the economy would quickly settle at potential output of \$12,000 billion, but at a higher price level (1.18 in this case).

Is it possible to expand output above potential? Yes. It may be the case, for example, that some people who were in the labor force but were frictionally or structurally unemployed find work because of the ease of getting jobs at the going nominal wage in such an environment. The result is an economy operating at point A in Figure 22.7 at a higher price level and with output temporarily above potential.

Consider next the effect of a reduction in aggregate demand (to AD_3), possibly due to a reduction in investment. As the price level starts to fall, output also falls. The economy finds itself at a price level–output combination at which real GDP is below potential, at point C. Again, price stickiness is to blame. The prices firms receive are falling with the reduction in demand. Without corresponding reductions in nominal wages, there will be an increase in the real wage. Firms will employ less labor and produce less output.

By examining what happens as aggregate demand shifts over a period when price adjustment is incomplete, we can trace out the short-run aggregate supply curve by drawing a line through points A, B, and C. The **short-run aggregate supply (SRAS) curve** is a graphical representation of the relationship between production and the price level in the short run. Among the factors held constant in drawing a short-run aggregate supply curve are the capital stock, the stock of natural resources, the level of technology, and the prices of factors of production.

A change in the price level produces a **change in the aggregate quantity of goods and services supplied** and is illustrated by the movement along the short-run aggregate supply curve. This occurs between points A, B, and C in Figure 22.7.

A change in the quantity of goods and services supplied at every price level in the short run is a **change in short-run aggregate supply**. Changes in the factors held constant in drawing the short-run aggregate supply curve shift the curve. (These factors may

also shift the long-run aggregate supply curve; we will discuss them along with other determinants of long-run aggregate supply in the next chapter.)

One type of event that would shift the short-run aggregate supply curve is an increase in the price of a natural resource such as oil. An increase in the price of natural resources or any other factor of production, all other things unchanged, raises the cost of production and leads to a reduction in short-run aggregate supply. In Panel (a) of Figure 22.8, $SRAS_1$ shifts leftward to $SRAS_2$. A decrease in the price of a natural resource would lower the cost of production and, other things unchanged, would allow greater production from the economy's stock of resources and would shift the short-run aggregate supply curve to the right; such a shift is shown in Panel (b) by a shift from $SRAS_1$ to $SRAS_3$.

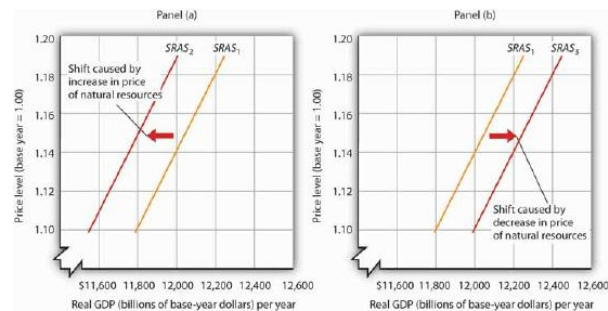


Figure 22.8 Changes in Short-Run Aggregate Supply A reduction in short-run aggregate supply shifts the curve from $SRAS_1$ to $SRAS_2$ in Panel (a). An increase shifts it to the right to $SRAS_3$, as shown in Panel (b).

Reasons for Wage and Price Stickiness

Wage or price stickiness means that the economy may not always be operating at potential. Rather, the economy may operate either above or below potential output in the short run. Correspondingly, the overall unemployment rate will be below or above the natural level.

Many prices observed throughout the economy do adjust quickly to changes in market conditions so that equilibrium, once lost, is quickly regained. Prices for fresh food and shares of common stock are two such examples.

Other prices, though, adjust more slowly. Nominal wages, the price of labor, adjust very slowly. We will first look at why nominal wages are sticky, due to their association with the unemployment rate, a variable of great interest in macroeconomics, and then at other prices that may be sticky.

Wage Stickiness

Wage contracts fix nominal wages for the life of the contract. The length of wage contracts varies from one week or one month for temporary employees, to one year (teachers and professors often have such contracts), to three years (for most union workers employed under major collective bargaining agreements). The existence of such explicit contracts means that both workers and firms accept some wage at the time of negotiating, even though economic conditions could change while the agreement is still in force.

Think about your own job or a job you once had. Chances are you go to work each day knowing what your wage will be. Your wage does not fluctuate from one day to the next with changes in demand or supply. You may have a formal contract with your employer that specifies what your wage will be over some period. Or you may have an informal understanding that sets your wage. Whatever the nature of your agreement, your wage is “stuck” over the period of the agreement. Your wage is an example of a sticky price.

One reason workers and firms may be willing to accept long-term nominal wage contracts is that negotiating a contract is a costly process. Both parties must keep themselves adequately informed about market conditions. Where unions are involved, wage negotiations raise the possibility of a labor strike, an eventuality that firms may prepare for by accumulating additional inventories, also a costly process. Even when unions are not involved, time and energy spent discussing wages takes away from time and energy spent producing goods and services. In addition, workers may simply prefer knowing that their nominal wage will be fixed for some period of time.

Some contracts do attempt to take into account changing economic conditions, such as inflation, through cost-of-living adjustments, but even these relatively simple contingencies are not as widespread as one might think. One reason might be that a firm is concerned that while the aggregate price level is rising, the prices for the goods and services it sells might not be moving at the same rate. Also, cost-of-living or other contingencies add complexity to contracts that both sides may want to avoid.

Even markets where workers are not employed under explicit contracts seem to behave as if such contracts existed. In these cases, wage stickiness may stem from a desire to avoid the same uncertainty and adjustment costs that explicit contracts avert.

Finally, minimum wage laws prevent wages from falling below a legal minimum, even if unemployment is rising. Unskilled workers are particularly vulnerable to shifts in aggregate demand.

Price Stickiness

Rigidity of other prices becomes easier to explain in light of the arguments about nominal wage stickiness. Since wages are a major component of the overall cost of doing business, wage stickiness may lead to output price stickiness. With nominal wages stable, at least some firms can adopt a “wait and see” attitude before adjusting their prices. During this time, they can evaluate information about why sales are rising or falling (Is the change in demand temporary or permanent?) and try to assess likely reactions by consumers or competing firms in the industry to any price changes they might make (Will consumers be angered by a price increase, for example? Will competing firms match price changes?).

In the meantime, firms may prefer to adjust output and employment in response to changing market conditions, leaving product price alone. Quantity adjustments have costs, but firms may assume that the associated risks are smaller than those associated with price adjustments.

Another possible explanation for price stickiness is the notion that there are adjustment costs associated with changing prices. In some cases, firms must print new price lists and catalogs, and notify customers of price changes. Doing this too often could jeopardize customer relations.

Yet another explanation of price stickiness is that firms may have explicit long-term contracts to sell their products to other firms at specified prices. For example, electric utilities often buy their inputs of coal or oil under long-term contracts.

Taken together, these reasons for wage and price stickiness explain why aggregate price adjustment may be incomplete in the sense that the change in the price level is insufficient to maintain real GDP at its potential level. These reasons do not lead to the conclusion that no price adjustments occur. But the adjustments require some time. During this time, the economy may remain above or below its potential level of output.

Equilibrium Levels of Price and Output in the Short Run

To illustrate how we will use the model of aggregate demand and aggregate supply, let us examine the impact of two events: an increase in the cost of health care and an increase in government purchases. The first reduces short-run aggregate supply; the second increases aggregate demand. Both events change equilibrium real GDP and the price level in the short run.

A Change in the Cost of Health Care

In the United States, most people receive health insurance for themselves and their families through their employers. In fact, it is quite common for employers to pay a large percentage of employees’ health insurance premiums, and this benefit is often written into labor contracts. As the cost of health care has gone up over time, firms have had to pay higher and higher health insurance premiums. With nominal wages fixed in the short run, an increase in health insurance premiums paid by firms raises the cost of employing each worker. It affects the cost of production in the same way that higher wages would. The result of higher health insurance premiums is that firms will choose to employ fewer workers.

Suppose the economy is operating initially at the short-run equilibrium at the intersection of AD_1 and $SRAS_1$, with a real GDP of Y_1 and a price level of P_1 , as shown in Figure 22.9. This is the initial equilibrium price and output in the short run. The increase in labor cost shifts the short-run aggregate supply curve to $SRAS_2$. The price level rises to P_2 and real GDP falls to Y_2 .

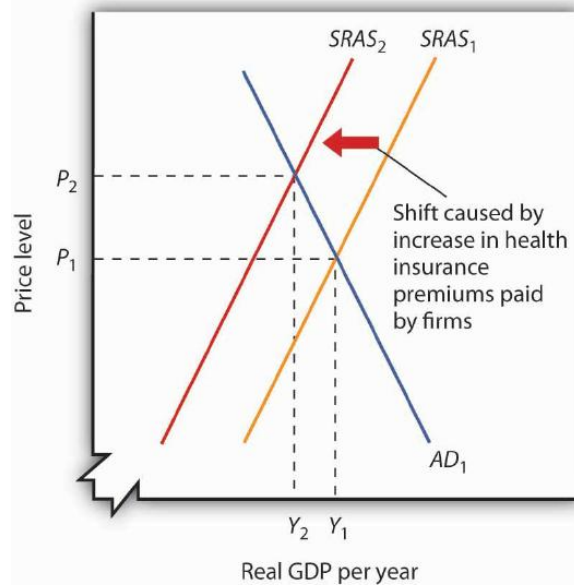


Figure 22.9 An Increase in Health Insurance Premiums Paid by Firms An increase in health insurance premiums paid by firms increases labor costs, reducing short-run aggregate supply from $SRAS_1$ to $SRAS_2$. The price level rises from P_1 to P_2 and output falls from Y_1 to Y_2 .

A reduction in health insurance premiums would have the opposite effect. There would be a shift to the right in the short-run aggregate supply curve with pressure on the price level to fall and real GDP to rise.

A Change in Government Purchases

Suppose the federal government increases its spending for highway construction. This circumstance leads to an increase in U.S. government purchases and an increase in aggregate demand.

Assuming no other changes affect aggregate demand, the increase in government purchases shifts the aggregate demand curve by a multiplied amount of the initial increase in government purchases to AD_2 in Figure 22.10. Real GDP rises from Y_1 to Y_2 , while the price level rises from P_1 to P_2 . Notice that the increase in real GDP is less than it would have been if the price level had not risen.

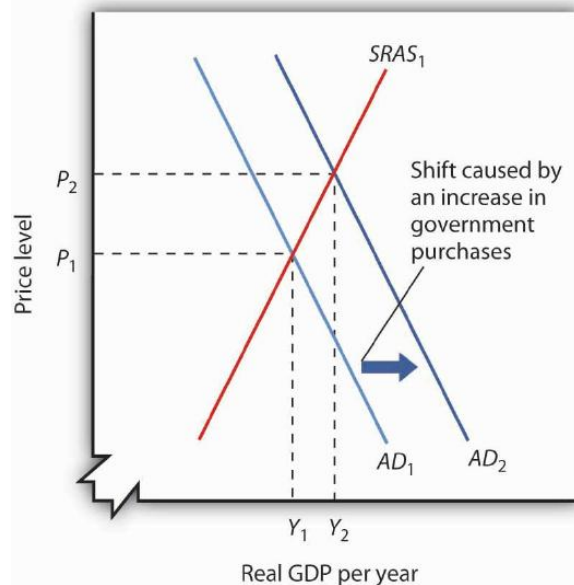


Figure 22.10 An Increase in Government Purchases An increase in government purchases boosts aggregate demand from AD_1 to AD_2 . Short-run equilibrium is at the intersection of AD_2 and the short-run aggregate supply curve $SRAS_1$. The price level rises to P_2 and real GDP rises to Y_2 .

In contrast, a reduction in government purchases would reduce aggregate demand. The aggregate demand curve shifts to the left, putting pressure on both the price level and real GDP to fall.

In the short run, real GDP and the price level are determined by the intersection of the aggregate demand and short-run aggregate supply curves. Recall, however, that the short run is a period in which sticky prices may prevent the economy from reaching its natural level of employment and potential output. In the next section, we will see how the model adjusts to move the economy to long-run equilibrium and what, if anything, can be done to steer the economy toward the natural level of employment and potential output.

Key Takeaways

- The short run in macroeconomics is a period in which wages and some other prices are sticky. The long run is a period in which full wage and price flexibility, and market adjustment, has been achieved, so that the economy is at the natural level of employment and potential output.
- The long-run aggregate supply curve is a vertical line at the potential level of output. The intersection of the economy's aggregate demand and long-run aggregate supply curves determines its equilibrium real GDP and price level in the long run.
- The short-run aggregate supply curve is an upward-sloping curve that shows the quantity of total output that will be produced at each price level in the short run. Wage and price stickiness account for the short-run aggregate supply curve's upward slope.
- Changes in prices of factors of production shift the short-run aggregate supply curve. In addition, changes in the capital stock, the stock of natural resources, and the level of technology can also cause the short-run aggregate supply curve to shift.
- In the short run, the equilibrium price level and the equilibrium level of total output are determined by the intersection of the aggregate demand and the short-run aggregate supply curves. In the short run, output can be either below or above potential output.

Try It!

The tools we have covered in this section can be used to understand the Great Depression of the 1930s. We know that investment and consumption began falling in late 1929. The reductions were reinforced by plunges in net exports and government purchases over the next four years. In addition, nominal wages plunged 26% between 1929 and 1933. We also know that real GDP in 1933 was 30% below real GDP in 1929. Use the tools of aggregate demand and short-run aggregate supply to graph and explain what happened to the economy between 1929 and 1933.

Case in Point: The U.S. Recession of 2001

Figure 22.11



Simon Cunningham – Recession – CC BY 2.0.

What were the causes of the U.S. recession of 2001? Economist Kevin Kliesen of the Federal Reserve Bank of St. Louis points to four factors that, taken together, shifted the aggregate demand curve to the left and kept it there for a long enough period to keep real GDP falling for about nine months. They were the fall in stock market prices, the decrease in business investment both for computers and software and in structures, the decline in the real value of exports, and the aftermath of 9/11. Notable exceptions to this list of culprits were the behavior of consumer spending during the period and new residential housing, which falls into the investment category.

During the expansion in the late 1990s, a surging stock market probably made it easier for firms to raise funding for investment in both structures and information technology. Even though the stock market bubble burst well before the actual recession, the continuation of projects already underway delayed the decline in the investment component of GDP. Also, spending for information technology was probably prolonged as firms dealt with Y2K computing issues, that is, computer problems associated with the change in the date from 1999 to 2000. Most computers used only two digits to indicate the year, and when the year changed from '99 to '00, computers did not know how to interpret the change, and extensive reprogramming of computers was required.

Real exports fell during the recession because (1) the dollar was strong during the period and (2) real GDP growth in the rest of the world fell almost 5% from 2000 to 2001.

Then, the terrorist attacks of 9/11, which literally shut down transportation and financial markets for several days, may have prolonged these negative tendencies just long enough to turn what might otherwise have been a mild decline into enough of a downturn to qualify the period as a recession.

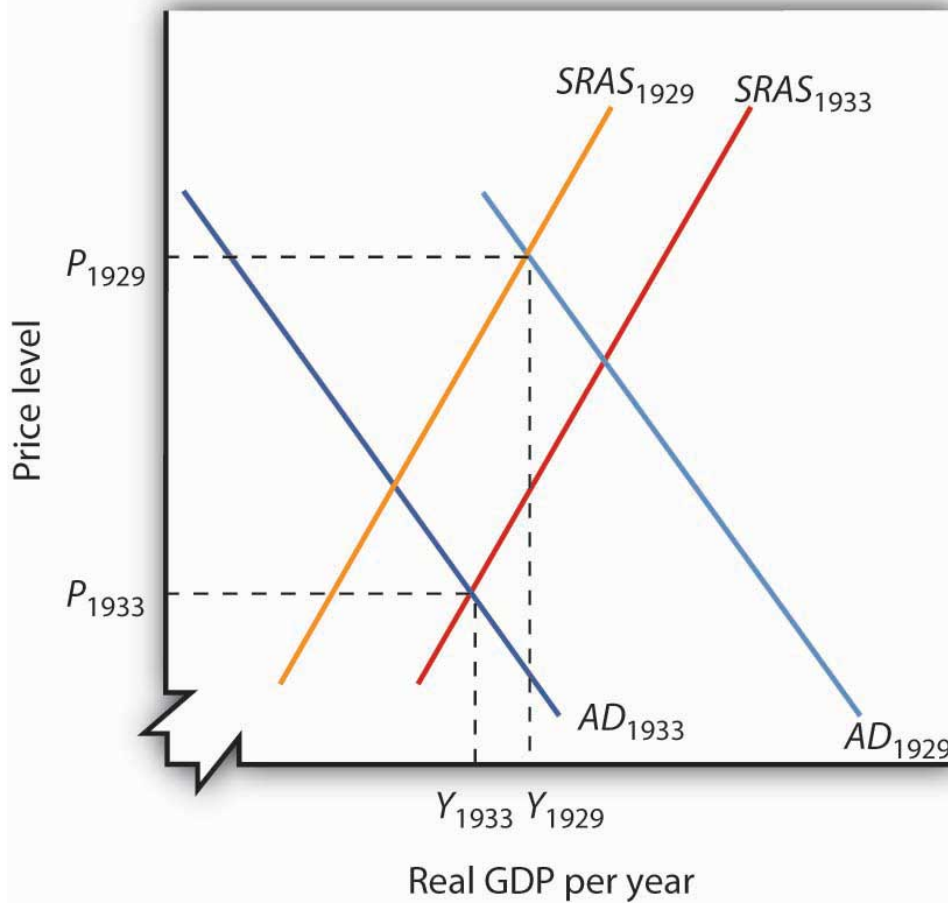
During this period the measured price level was essentially stable—with the implicit price deflator rising by less than 1%. Thus, while the aggregate demand curve shifted left as a result of all the reasons given above, there was also a leftward shift in the short-run aggregate supply curve.

Source: Kevin L. Kliesen, “The 2001 Recession: How Was It Different and What Developments May Have Caused It?” *The Federal Reserve Bank of St. Louis Review*, September/October 2003: 23–37.

Answer to Try It! Problem

All components of aggregate demand (consumption, investment, government purchases, and net exports) declined between 1929 and 1933. Thus the aggregate demand curve shifted markedly to the left, moving from AD_{1929} to AD_{1933} . The reduction in nominal wages corresponds to an increase in short-run aggregate supply from $SRAS_{1929}$ to $SRAS_{1933}$. Since real GDP in 1933 was less than real GDP in 1929, we know that the movement in the aggregate demand curve was greater than that of the short-run aggregate supply curve.

Figure 22.12



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8.3: Recessionary and Inflationary Gaps and Long-Run Macroeconomic Equilibrium

Learning Objective

1. Explain and illustrate graphically recessionary and inflationary gaps and relate these gaps to what is happening in the labor market.
2. Identify the various policy choices available when an economy experiences an inflationary or recessionary gap and discuss some of the pros and cons that make these choices controversial.

The intersection of the economy's aggregate demand and short-run aggregate supply curves determines equilibrium real GDP and price level in the short run. The intersection of aggregate demand and long-run aggregate supply determines its long-run equilibrium. In this section we will examine the process through which an economy moves from equilibrium in the short run to equilibrium in the long run.

The long run puts a nation's macroeconomic house in order: only frictional and structural unemployment remain, and the price level is stabilized. In the short run, stickiness of nominal wages and other prices can prevent the economy from achieving its potential output. Actual output may exceed or fall short of potential output. In such a situation the economy operates with a gap. When output is above potential, employment is above the natural level of employment. When output is below potential, employment is below the natural level.

Recessionary and Inflationary Gaps

At any time, real GDP and the price level are determined by the intersection of the aggregate demand and short-run aggregate supply curves. If employment is below the natural level of employment, real GDP will be below potential. The aggregate demand and short-run aggregate supply curves will intersect to the left of the long-run aggregate supply curve.

Suppose an economy's natural level of employment is L_e , shown in Panel (a) of Figure 22.13. This level of employment is achieved at a real wage of ω_e . Suppose, however, that the initial real wage ω_1 exceeds this equilibrium value. Employment at L_1 falls short of the natural level. A lower level of employment produces a lower level of output; the aggregate demand and short-run aggregate supply curves, AD and $SRAS$, intersect to the left of the long-run aggregate supply curve $LRAS$ in Panel (b). The gap between the level of real GDP and potential output, when real GDP is less than potential, is called a **recessionary gap**. The gap between the level of real GDP and potential output, when real GDP is less than potential.

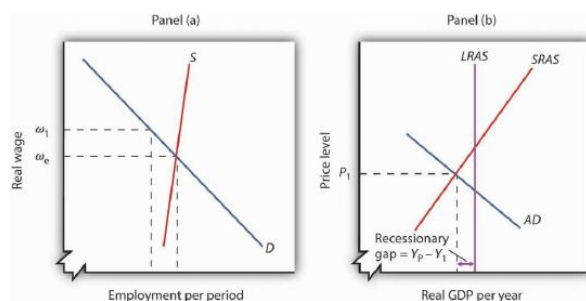


Figure 22.13 A Recessionary Gap If employment is below the natural level, as shown in Panel (a), then output must be below potential. Panel (b) shows the recessionary gap $Y_p - Y_1$, which occurs when the aggregate demand curve AD and the short-run aggregate supply curve $SRAS$ intersect to the left of the long-run aggregate supply curve $LRAS$.

Just as employment can fall short of its natural level, it can also exceed it. If employment is greater than its natural level, real GDP will also be greater than its potential level. Figure 22.14 shows an economy with a natural level of employment of L_e in Panel (a) and potential output of Y_p in Panel (b). If the real wage ω_1 is less than the equilibrium real wage ω_e , then employment L_1 will exceed the natural level. As a result, real GDP, Y_1 , exceeds potential. The gap between the level of real GDP and potential output, when real GDP is greater than potential, is called an **inflationary gap**. The gap between the level of real GDP and potential output, when real GDP is greater than potential.. In Panel (b), the inflationary gap equals $Y_1 - Y_p$.

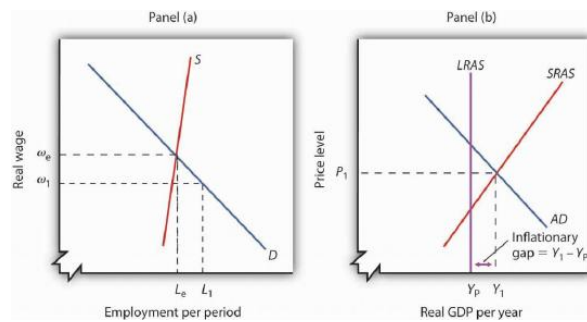


Figure 22.14 An Inflationary Gap Panel (a) shows that if employment is above the natural level, then output must be above potential. The inflationary gap, shown in Panel (b), equals $Y_1 - Y_p$. The aggregate demand curve AD and the short-run aggregate supply curve $SRAS$ intersect to the right of the long-run aggregate supply curve $LRAS$.

Restoring Long-Run Macroeconomic Equilibrium

We have already seen that the aggregate demand curve shifts in response to a change in consumption, investment, government purchases, or net exports. The short-run aggregate supply curve shifts in response to changes in the prices of factors of production, the quantities of factors of production available, or technology. Now we will see how the economy responds to a shift in aggregate demand or short-run aggregate supply using two examples presented earlier: a change in government purchases and a change in health-care costs. By returning to these examples, we will be able to distinguish the long-run response from the short-run response.

A Shift in Aggregate Demand: An Increase in Government Purchases

Suppose an economy is initially in equilibrium at potential output Y_p as in Figure 22.15. Because the economy is operating at its potential, the labor market must be in equilibrium; the quantities of labor demanded and supplied are equal.

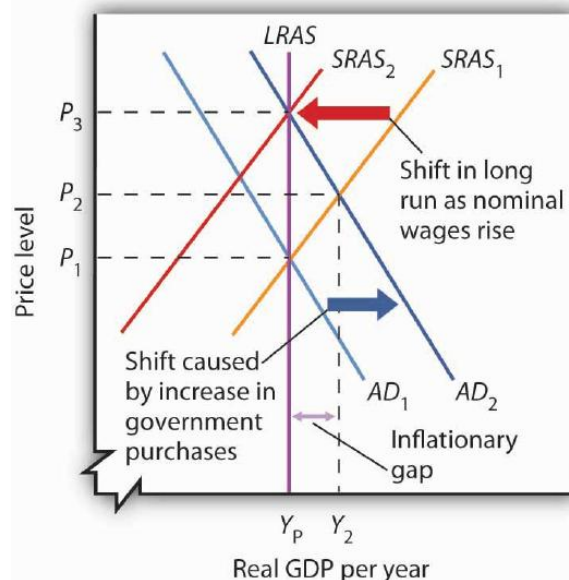


Figure 22.15 Long-Run Adjustment to an Inflationary Gap An increase in aggregate demand to AD_2 boosts real GDP to Y_2 and the price level to P_2 , creating an inflationary gap of $Y_2 - Y_p$. In the long run, as price and nominal wages increase, the short-run aggregate supply curve moves to $SRAS_2$. Real GDP returns to potential.

Now suppose aggregate demand increases because one or more of its components (consumption, investment, government purchases, and net exports) has increased at each price level. For example, suppose government purchases increase. The aggregate demand curve shifts from AD_1 to AD_2 in Figure 22.15. That will increase real GDP to Y_2 and force the price level up to P_2 in the short run. The higher price level, combined with a fixed nominal wage, results in a lower real wage. Firms employ more workers to supply the increased output.

The economy's new production level Y_2 exceeds potential output. Employment exceeds its natural level. The economy with output of Y_2 and price level of P_2 is only in short-run equilibrium; there is an inflationary gap equal to the difference between Y_2 and Y_p .

Because real GDP is above potential, there will be pressure on prices to rise further.

Ultimately, the nominal wage will rise as workers seek to restore their lost purchasing power. As the nominal wage rises, the short-run aggregate supply curve will begin shifting to the left. It will continue to shift as long as the nominal wage rises, and the nominal wage will rise as long as there is an inflationary gap. These shifts in short-run aggregate supply, however, will reduce real GDP and thus begin to close this gap. When the short-run aggregate supply curve reaches $SRAS_2$, the economy will have returned to its potential output, and employment will have returned to its natural level. These adjustments will close the inflationary gap.

A Shift in Short-Run Aggregate Supply: An Increase in the Cost of Health Care

Again suppose, with an aggregate demand curve at AD_1 and a short-run aggregate supply at $SRAS_1$, an economy is initially in equilibrium at its potential output Y_p , at a price level of P_1 , as shown in Figure 22.16. Now suppose that the short-run aggregate supply curve shifts owing to a rise in the cost of health care. As we explained earlier, because health insurance premiums are paid primarily by firms for their workers, an increase in premiums raises the cost of production and causes a reduction in the short-run aggregate supply curve from $SRAS_1$ to $SRAS_2$.

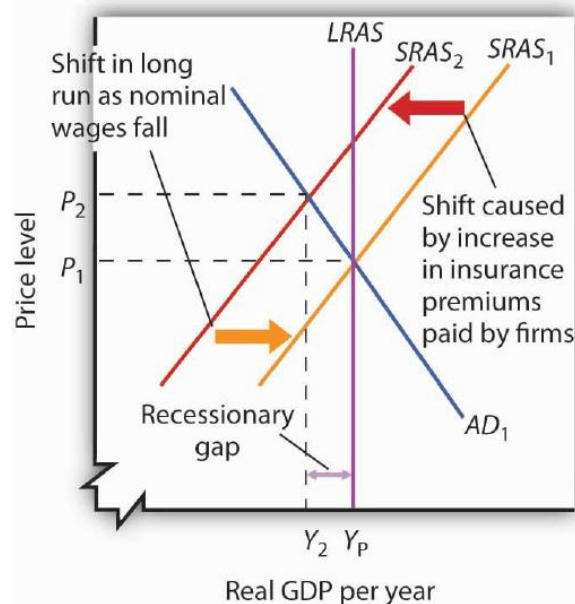


Figure 22.16 Long-Run Adjustment to a Recessionary Gap A decrease in aggregate supply from $SRAS_1$ to $SRAS_2$ reduces real GDP to Y_2 and raises the price level to P_2 , creating a recessionary gap of $Y_p - Y_2$. In the long run, as prices and nominal wages decrease, the short-run aggregate supply curve moves back to $SRAS_1$ and real GDP returns to potential.

As a result, the price level rises to P_2 and real GDP falls to Y_2 . The economy now has a recessionary gap equal to the difference between Y_p and Y_2 . Notice that this situation is particularly disagreeable, because both unemployment and the price level rose.

With real GDP below potential, though, there will eventually be pressure on the price level to fall. Increased unemployment also puts pressure on nominal wages to fall. In the long run, the short-run aggregate supply curve shifts back to $SRAS_1$. In this case, real GDP returns to potential at Y_p , the price level falls back to P_1 , and employment returns to its natural level. These adjustments will close the recessionary gap.

How sticky prices and nominal wages are will determine the time it takes for the economy to return to potential. People often expect the government or the central bank to respond in some way to try to close gaps. This issue is addressed next.

Gaps and Public Policy

If the economy faces a gap, how do we get from that situation to potential output?

Gaps present us with two alternatives. First, we can do nothing. In the long run, real wages will adjust to the equilibrium level, employment will move to its natural level, and real GDP will move to its potential. Second, we can do something. Faced with a recessionary or an inflationary gap, policy makers can undertake policies aimed at shifting the aggregate demand or short-run aggregate supply curves in a way that moves the economy to its potential. A policy choice to take no action to try to close a

recessionary or an inflationary gap, but to allow the economy to adjust on its own to its potential output, is a [nonintervention policy](#). A policy choice to take no action to try to close a recessionary or an inflationary gap, but to allow the economy to adjust on its own to its potential output. A policy in which the government or central bank acts to move the economy to its potential output is called a [stabilization policy](#). A policy in which the government or central bank acts to move the economy to its potential output.

Nonintervention or Expansionary Policy?

Figure 22.17 illustrates the alternatives for closing a recessionary gap. In both panels, the economy starts with a real GDP of Y_1 and a price level of P_1 . There is a recessionary gap equal to $Y_P - Y_1$. In Panel (a), the economy closes the gap through a process of self-correction. Real and nominal wages will fall as long as employment remains below the natural level. Lower nominal wages shift the short-run aggregate supply curve. The process is a gradual one, however, given the stickiness of nominal wages, but after a series of shifts in the short-run aggregate supply curve, the economy moves toward equilibrium at a price level of P_2 and its potential output of Y_P .

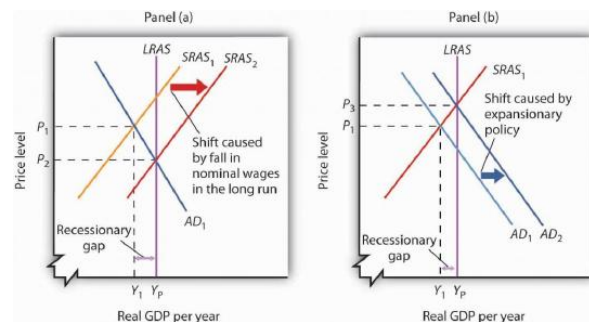


Figure 22.17 Alternatives in Closing a Recessionary Gap Panel (a) illustrates a gradual closing of a recessionary gap. Under a nonintervention policy, short-run aggregate supply shifts from $SRAS_1$ to $SRAS_2$. Panel (b) shows the effects of expansionary policy acting on aggregate demand to close the gap.

Panel (b) illustrates the stabilization alternative. Faced with an economy operating below its potential, public officials act to stimulate aggregate demand. For example, the government can increase government purchases of goods and services or cut taxes. Tax cuts leave people with more after-tax income to spend, boost their consumption, and increase aggregate demand. As AD_1 shifts to AD_2 in Panel (b) of Figure 22.17, the economy achieves output of Y_P , but at a higher price level, P_3 . A stabilization policy designed to increase real GDP is known as an [expansionary policy](#). A stabilization policy designed to increase real GDP.

Nonintervention or Contractionary Policy?

Figure 22.18 illustrates the alternatives for closing an inflationary gap. Employment in an economy with an inflationary gap exceeds its natural level—the quantity of labor demanded exceeds the long-run supply of labor. A nonintervention policy would rely on nominal wages to rise in response to the shortage of labor. As nominal wages rise, the short-run aggregate supply curve begins to shift, as shown in Panel (a), bringing the economy to its potential output when it reaches $SRAS_2$ and P_2 .

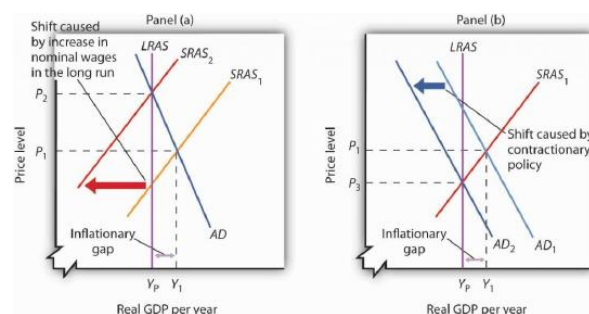


Figure 22.18 Alternatives in Closing an Inflationary Gap Panel (a) illustrates a gradual closing of an inflationary gap. Under a nonintervention policy, short-run aggregate supply shifts from $SRAS_1$ to $SRAS_2$. Panel (b) shows the effects of contractionary policy to reduce aggregate demand from AD_1 to AD_2 in order to close the gap.

A stabilization policy that reduces the level of GDP is a [contractionary policy](#). A stabilization policy designed to reduce real GDP. Such a policy would aim at shifting the aggregate demand curve from AD_1 to AD_2 to close the gap, as shown in Panel (b). A policy to shift the aggregate demand curve to the left would return real GDP to its potential at a price level of P_3 .

For both kinds of gaps, a combination of letting market forces in the economy close part of the gap and of using stabilization policy to close the rest of the gap is also an option. Later chapters will explain stabilization policies in more detail, but there are essentially two types of stabilization policy: fiscal policy and monetary policy. **Fiscal policy** The use of government purchases, transfer payments, and taxes to influence the level of economic activity. **Monetary policy** The use of central bank policies to influence the level of economic activity. is the use of central bank policies to influence the level of economic activity.

To Intervene or Not to Intervene: An Introduction to the Controversy

How large are inflationary and recessionary gaps? Panel (a) of Figure 22.19 shows potential output versus the actual level of real GDP in the United States since 1960. Real GDP appears to follow potential output quite closely, although you see some periods where there have been inflationary or recessionary gaps. Panel (b) shows the sizes of these gaps expressed as percentages of potential output. The percentage gap is positive during periods of inflationary gaps and negative during periods of recessionary gaps. The economy seldom departs by more than 5% from its potential output.

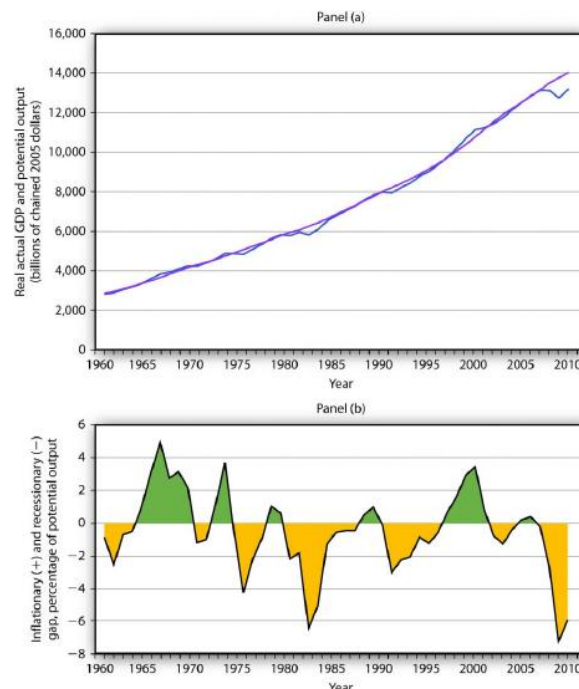


Figure 22.19 Real GDP and Potential Output Panel (a) shows potential output (the blue line) and actual real GDP (the purple line) since 1960. Panel (b) shows the gap between potential and actual real GDP expressed as a percentage of potential output. Inflationary gaps are shown in green and recessionary gaps are shown in yellow.

Source: Bureau of Economic Analysis, NIPA Table 1.1.6. Real Gross Domestic Product, Chained Dollars [Billions of chained (2005) dollars]. Seasonally adjusted at annual rates 2010 is through 3rd quarter; Congressional Budget Office, The Budget and Economic Outlook, August 2010.

Panel (a) gives a long-run perspective on the economy. It suggests that the economy generally operates at about potential output. In Panel (a), the gaps seem minor. Panel (b) gives a short-run perspective; the view it gives emphasizes the gaps. Both of these perspectives are important. While it is reassuring to see that the economy is often close to potential, the years in which there are substantial gaps have real effects: Inflation or unemployment can harm people.

Some economists argue that stabilization policy can and should be used when recessionary or inflationary gaps exist. Others urge reliance on the economy's own ability to correct itself. They sometimes argue that the tools available to the public sector to influence aggregate demand are not likely to shift the curve, or they argue that the tools would shift the curve in a way that could do more harm than good.

Economists who advocate stabilization policies argue that prices are sufficiently sticky that the economy's own adjustment to its potential will be a slow process—and a painful one. For an economy with a recessionary gap, unacceptably high levels of

unemployment will persist for too long a time. For an economy with an inflationary gap, the increased prices that occur as the short-run aggregate supply curve shifts upward impose too high an inflation rate in the short run. These economists believe it is far preferable to use stabilization policy to shift the aggregate demand curve in an effort to shorten the time the economy is subject to a gap.

Economists who favor a nonintervention approach accept the notion that stabilization policy can shift the aggregate demand curve. They argue, however, that such efforts are not nearly as simple in the real world as they may appear on paper. For example, policies to change real GDP may not affect the economy for months or even years. By the time the impact of the stabilization policy occurs, the state of the economy might have changed. Policy makers might choose an expansionary policy when a contractionary one is needed or vice versa. Other economists who favor nonintervention also question how sticky prices really are and if gaps even exist.

The debate over how policy makers should respond to recessionary and inflationary gaps is an ongoing one. These issues of nonintervention versus stabilization policies lie at the heart of the macroeconomic policy debate. We will return to them as we continue our analysis of the determination of output and the price level.

Key Takeaways

- When the aggregate demand and short-run aggregate supply curves intersect below potential output, the economy has a recessionary gap. When they intersect above potential output, the economy has an inflationary gap.
- Inflationary and recessionary gaps are closed as the real wage returns to equilibrium, where the quantity of labor demanded equals the quantity supplied. Because of nominal wage and price stickiness, however, such an adjustment takes time.
- When the economy has a gap, policy makers can choose to do nothing and let the economy return to potential output and the natural level of employment on its own. A policy to take no action to try to close a gap is a nonintervention policy.
- Alternatively, policy makers can choose to try to close a gap by using stabilization policy. Stabilization policy designed to increase real GDP is called expansionary policy. Stabilization policy designed to decrease real GDP is called contractionary policy.

Try It!

Using the scenario of the Great Depression of the 1930s, as analyzed in the previous Try It!, tell what kind of gap the U.S. economy faced in 1933, assuming the economy had been at potential output in 1929. Do you think the unemployment rate was above or below the natural rate of unemployment? How could the economy have been brought back to its potential output?

Case in Point: Survey of Economists Reveals Little Consensus on Macroeconomic Policy Issues

Figure 22.20



[Wikimedia Commons](#) – CC BY-SA 3.0.

“An economy in short-run equilibrium at a real GDP below potential GDP has a self-correcting mechanism that will eventually return it to potential real GDP.”

Of economists surveyed, 36% disagreed, 33% agreed with provisos, 25% agreed, and 5% did not respond. So, only about 60% of economists responding to the survey agreed that the economy would adjust on its own.

“Changes in aggregate demand affect real GDP in the short run but not in the long run.”

On this statement, 36% disagreed, 31% agreed with provisos, 29% agreed, and 4% did not respond. Once again, about 60% of economists accepted the conclusion of the aggregate demand–aggregate supply model.

This level of disagreement on macroeconomic policy issues among economists, based on a fall 2000 survey of members of the American Economic Association, stands in sharp contrast to their more harmonious responses to questions on international economics and microeconomics. For example,

“Tariffs and import quotas usually reduce the general welfare of society.”

Seventy-two percent of those surveyed agreed with this statement outright and another 21% agreed with provisos. So, 93% of economists generally agreed with the statement.

“Minimum wages increase unemployment among young and unskilled workers.”

On this, 45% agreed and 29% agreed with provisos.

“Pollution taxes or marketable pollution permits are a more economically efficient approach to pollution control than emission standards.”

On this environmental question, only 6% disagreed and 63% wholeheartedly agreed.

The relatively low degree of consensus on macroeconomic policy issues and the higher degrees of consensus on other economic issues found in this survey concur with results of other periodic surveys since 1976.

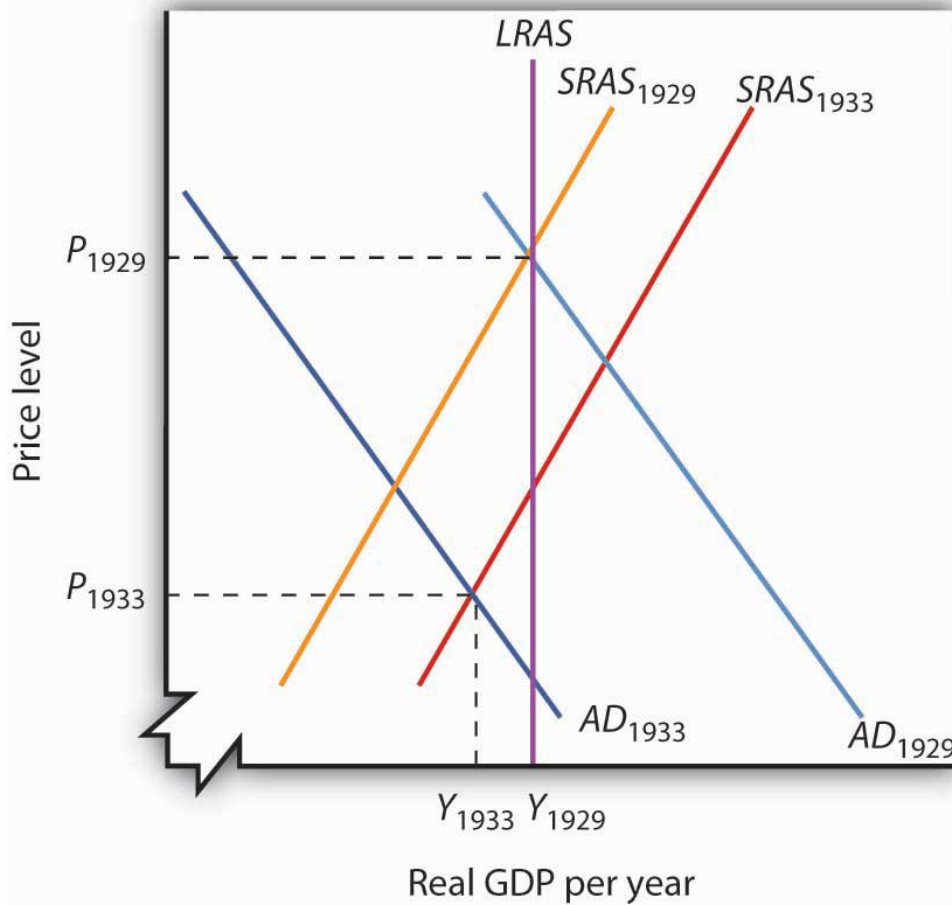
So, as textbook authors, we will not hide the dirty laundry from you. Fortunately, though, the model of aggregate demand–aggregate supply we present throughout the macroeconomic chapters can handle most of these disagreements. For example, economists who agree with the first proposition quoted above, that an economy operating below potential has self-correcting mechanisms to bring it back to potential, are probably assuming that wages and prices are not very sticky and hence that the short-run aggregate supply curve will shift rather easily to the right, as shown in Panel (a) of Figure 22.17. In contrast, economists who disagree with the statement are saying that the movement of the short-run aggregate supply curve is likely to be slow. This latter group of economists probably advocates expansionary policy as shown in Panel (b) of Figure 22.17. Both groups of economists can use the same model and its constructs to analyze the macroeconomy, but they may disagree on such things as the slopes of the various curves, on how fast these various curves shift, and on the size of the underlying multiplier. The model allows economists to speak the same language of analysis even though they disagree on some specifics.

Source: Dan Fuller and Doris Geide-Stevenson, “Consensus on Economic Issues: A Survey of Republicans, Democrats and Economists,” *Eastern Economic Journal* 33, no. 1 (Winter 2007): 81–94.

Answer to Try It! Problem

To the graph in the previous Try It! problem we add the long-run aggregate supply curve to show that, with output below potential, the U.S. economy in 1933 was in a recessionary gap. The unemployment rate was above the natural rate of unemployment. Indeed, real GDP in 1933 was about 30% below what it had been in 1929, and the unemployment rate had increased from 3% to 25%. Note that during the period of the Great Depression, wages did fall. The notion of nominal wage and other price stickiness discussed in this section should not be construed to mean complete wage and price inflexibility. Rather, during this period, nominal wages and other prices were not flexible enough to restore the economy to the potential level of output. There are two basic choices on how to close recessionary gaps. Nonintervention would mean waiting for wages to fall further. As wages fall, the short-run aggregate supply curve would continue to shift to the right. The alternative would be to use some type of expansionary policy. This would shift the aggregate demand curve to the right. These two options were illustrated in Figure 22.18.

Figure 22.21



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8.4: Review and Practice

Summary

In this chapter, we outlined the model of aggregate demand and aggregate supply. We saw that the aggregate demand curve slopes downward, reflecting the tendency for the aggregate quantity of goods and services demanded to rise as the price level falls and to fall as the price level rises. The negative relationship between the price level and the quantity of goods and services demanded results from the wealth effect for consumption, the interest rate effect for investment, and the international trade effect for net exports. We examined the factors that can shift the aggregate demand curve as well. Generally, the aggregate demand curve shifts by a multiple of the initial amount by which the component causing it to shift changes.

We distinguished between two types of equilibria in macroeconomics—one corresponding to the short run, a period of analysis in which nominal wages and some prices are sticky, and the other corresponding to the long run, a period in which full wage and price flexibility, and hence market adjustment, have been achieved. Long-run equilibrium occurs at the intersection of the aggregate demand curve with the long-run aggregate supply curve. The long-run aggregate supply curve is a vertical line at the economy's potential level of output. Short-run equilibrium occurs at the intersection of the aggregate demand curve with the short-run aggregate supply curve. The short-run aggregate supply curve relates the quantity of total output produced to the price level in the short run. It is upward sloping because of wage and price stickiness. In short-run equilibrium, output can be below or above potential.

If an economy is initially operating at its potential output, then a change in aggregate demand or short-run aggregate supply will induce a recessionary or inflationary gap. Such a gap will be closed in the long run by changes in the nominal wage, which will shift the short-run aggregate supply curve to the left (to close an inflationary gap) or to the right (to close a recessionary gap). Policy makers might respond to a recessionary or inflationary gap with a nonintervention policy, or they could use stabilization policy.

Concept Problems

1. Explain how the following changes in aggregate demand or short-run aggregate supply, other things held unchanged, are likely to affect the level of total output and the price level in the short run.
 1. An increase in aggregate demand
 2. A decrease in aggregate demand
 3. An increase in short-run aggregate supply
 4. A reduction in short-run aggregate supply
2. Explain why a change in one component of aggregate demand will cause the aggregate demand curve to shift by a multiple of the initial change.
3. Use the model of aggregate demand and short-run aggregate supply to explain how each of the following would affect real GDP and the price level in the short run.
 1. An increase in government purchases
 2. A reduction in nominal wages
 3. A major improvement in technology
 4. A reduction in net exports
4. How would an increase in the supply of labor affect the natural level of employment and potential output? How would it affect the real wage, the level of real GDP, and the price level in the short run? How would it affect long-run aggregate supply? What kind of gaps would be created?
5. Give three reasons for the downward slope of the aggregate demand curve.
6. "When the price level falls, people's wealth increases. When wealth increases, the real volume of consumption increases. Therefore, a decrease in the price level will cause the aggregate demand curve to shift to the right." Do you agree? Explain.
7. Suppose the economy has a recessionary gap. We know that if we do nothing, the economy will close the gap on its own. Alternatively, we could arrange for an increase in aggregate demand (say, by increasing government spending) to close the gap.

How would your views about the degree of price stickiness in the economy influence your views on whether such a policy would be desirable?

8. The cost of hiring workers includes not only payments made directly to workers, that is, wages, but payments made on behalf of workers as well, such as contributions by employers to pension plans and to health-care insurance for employees. How would a decrease in the cost of employer-provided health insurance affect the economy? Using Figure 22.9 as a guide, draw a graph to illustrate your answer.
9. Suppose nominal wages never changed. What would be the significance of such a characteristic?
10. Suppose the minimum wage were increased sharply. How would this affect the equilibrium price level and output level in the model of aggregate demand and aggregate supply in the short run? In the long run?
11. Explain the short-run impact of each of the following.
 1. A discovery that makes cold fusion a reality, greatly reducing the cost of producing energy
 2. An increase in the payroll tax

Numerical Problems

1. Suppose the aggregate demand and short-run aggregate supply schedules for an economy whose potential output equals \$2,700 are given by the table.

Price Level	Aggregate Quantity of Goods and Services	
	Demanded	Supplied
0.50	\$3,500	\$1,000
0.75	3,000	2,000
1.00	2,500	2,500
1.25	2,000	2,700
1.50	1,500	2,800

1. Draw the aggregate demand, short-run aggregate supply, and long-run aggregate supply curves.
2. State the short-run equilibrium level of real GDP and the price level.
3. Characterize the current economic situation. Is there an inflationary or a recessionary gap? If so, how large is it?
4. Now suppose aggregate demand increases by \$700 at each price level; for example, the aggregate quantity of goods and services demanded at a price level of 0.50 now equals \$4,200. Show the new aggregate demand curve, state the new short-run equilibrium price level and real GDP, and state whether there is an inflationary or a recessionary gap and give its size.
2. An economy is characterized by the values in the table for aggregate demand and short-run aggregate supply. Its potential output is \$1,500.

Price Level	Aggregate Quantity of Goods and Services	
	Demanded	Supplied
0.50	\$2,500	\$1,500
0.75	2,000	2,000
1.00	1,500	2,300
1.25	1,000	2,500
1.50	500	2,600

1. Draw the aggregate demand, short-run aggregate supply, and long-run aggregate supply curves.
2. State the equilibrium level of real GDP and the price level.

3. Characterize the current economic situation. Is there an inflationary or a recessionary gap? If so, how large is it?
4. Now suppose that nominal wages rise and that the price level required to induce a particular level of total output rises by 0.50. For example, a price level of 1.00 is now required to induce producers to produce a real GDP of \$1,500. Show the new short-run aggregate supply curve, state the new equilibrium price level and real GDP, and state whether there is an inflationary or a recessionary gap and give its size. Why might such a change occur?
3. Suppose the price level in a particular economy equals 1.3 and that the quantity of real GDP demanded at that price level is \$1,200. An increase of 0.1 point in the price level reduces the quantity of real GDP demanded by \$220, and a reduction of 0.1 point would produce an increase in the quantity of real GDP demanded of \$220. Draw the aggregate demand curve and show the price level and quantity of real GDP demanded at three points.
4. Suppose an economy is described by the following aggregate demand and short-run aggregate supply curves. The potential level of output is \$10 trillion.

Aggregate Quantity of Goods and Services		
Price Level	Demanded	Supplied
3.0	\$11.0 trillion	\$9.0 trillion
3.4	\$10.8 trillion	\$9.2 trillion
3.8	\$10.6 trillion	\$9.4 trillion
4.2	\$10.4 trillion	\$9.6 trillion
4.6	\$10.2 trillion	\$9.8 trillion
5.0	\$10.0 trillion	\$10.0 trillion
5.4	\$9.8 trillion	\$10.2 trillion
5.8	\$9.6 trillion	\$10.4 trillion
6.2	\$9.4 trillion	\$10.6 trillion
6.6	\$9.2 trillion	\$10.8 trillion
7.0	\$9.0 trillion	\$11.0 trillion

1. Draw the aggregate demand and short-run aggregate supply curves.
2. What is the initial real GDP?
3. What is the initial price level?
4. What kind of gap, if any, exists?
5. After the increase in health-care costs, each level of real GDP requires an increase in the price level of 0.8. For example, producing \$9.0 trillion worth of goods and services now requires a price level of 3.8. What is the short-run equilibrium level of real GDP?
6. After the health-care cost increase, what is the new equilibrium price level in the short run?
7. What sort of gap, if any, now exists?
5. According to Alaskan state economist Mark Edwards, the multiplier effect of Alaska's trade with Japan is such that for every \$1 billion exported from Alaska to Japan another \$600 million is added to the state's economy (Volz, M., 2004). Calculate the size of the export multiplier.
6. The Nottinghamshire Research Observatory in England calculated that students who attend Nottingham Technical University spend about £2,760 each in the local economy for a total of £50.45 million. In total, the impact of their spending on the local economy is £63 million (Nottingham Evening Post, 2004). Calculate the size of the student spending multiplier.
7. In Goa, India, the multiplier effect of iron ore exports is calculated to be 1.62 (Ta, V. K., 2003). Calculate the impact of an additional 1,000 rupees of iron ore exports on the economy of Goa.

References

Nottingham Evening Post, “University Brings in £250m to Economy,” November 4, 2004, p. 37.

Ta, V. K., “Iron Ore Mining Gives Impetus to Goa’s Economy,” *Times of India*, April 30, 2003.

Volz, M., “Trade Officials Hopeful for Japanese Recovery,” *Associated Press and Local Wire*, June 22, 2004, BC cycle.

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CHAPTER OVERVIEW

9: Government and Fiscal Policy

9.1: Government and the Economy

9.2: The Use of Fiscal Policy to Stabilize the Economy

9.3: Issues in Fiscal Policy

9.4: Review and Practice

Thumbnail: <https://www.pexels.com/photo/american-flag-with-rolled-dollar-bills-4386346/>

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9.1: Government and the Economy

Learning Objective

1. Understand the major components of U.S. government spending and sources of government revenues.
2. Define the terms *budget surplus*, *budget deficit*, *balanced budget*, and *national debt*, and discuss their trends over time in the United States.

We begin our analysis of fiscal policy with an examination of government purchases, transfer payments, and taxes in the U.S. economy.

Government Purchases

The government-purchases component of aggregate demand includes all purchases by government agencies of goods and services produced by firms, as well as direct production by government agencies themselves. When the federal government buys staples and staplers, the transaction is part of government purchases. The production of educational and research services by public colleges and universities is also counted in the government-purchases component of GDP.

While government spending has grown over time, government purchases as a share of GDP generally declined from over 20% until the early 1990s to under 18% in 2001. Since then, though, the percentage of government purchases in GDP began to increase back toward 20%, first as military spending picked up and then more recently to over 20% during the 2007-2009 recession.

Figure 27.1 shows federal as well as state and local government purchases as a percentage of GDP from 1960 to 2009. Notice the changes that have occurred over this period. In 1960, the federal government accounted for the majority share of total purchases. Since then, however, federal purchases have fallen by almost half relative to GDP, while state and local purchases relative to GDP have risen.

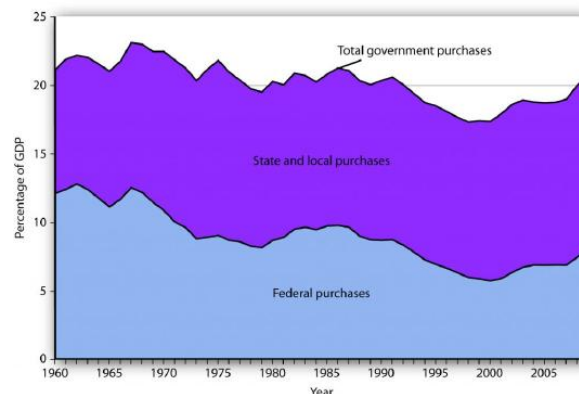


Figure 27.1 Federal, State, and Local Purchases Relative to GDP, 1960–2009 Government purchases were generally above 20% of GDP from 1960 until the early 1990s and then below 20% of GDP until the 2007-2009 recession. The share of government purchases in GDP began rising again in the 21st century.

Source: Bureau of Economic Analysis, NIPA Table 1.1 and 3.1 (November 23, 2010 revision).

Transfer Payments

A **transfer payment** is the provision of aid or money to an individual who is not required to provide anything in exchange. Social Security and welfare benefits are examples of transfer payments. During the 2007-2009 recession, transfers again rose.

A number of changes have influenced transfer payments over the past several decades. First, they increased rapidly during the late 1960s and early 1970s. This was the period in which federal programs such as Medicare (health insurance for the elderly) and Medicaid (health insurance for the poor) were created and other programs were expanded.

Figure 27.2 shows that transfer payment spending by the federal government and by state and local governments has risen as a percentage of GDP. In 1960, such spending totaled about 6% of GDP; by 2009, it had risen to about 18%. The federal government accounts for the bulk of transfer payment spending in the United States.

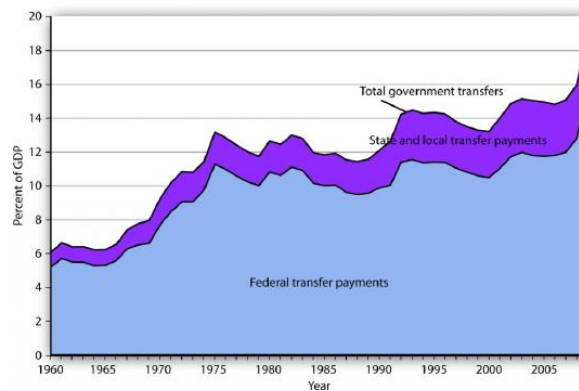


Figure 27.2 Federal, State, and Local Transfer Payments as a Percentage of GDP, 1960–2009 The chart shows transfer payment spending as a percentage of GDP from 1960 through 2009. This spending rose dramatically relative to GDP during the late 1960s and the 1970s as federal programs expanded. More recently, sharp increases in health-care costs have driven upward the spending for transfer payment programs such as Medicare and Medicaid. Transfer payments fluctuate with the business cycle, rising in times of recession and falling during times of expansion. As such, they rose sharply during the deep 2007–2009 recession.

Source: Bureau of Economic Analysis, NIPA Table 1.1, 3.2, and 3.3 (November 23, 2010 revision).

Transfer payment spending relative to GDP tends to fluctuate with the business cycle. Transfer payments fell during the late 1970s, a period of expansion, then rose as the economy slipped into a recessionary gap during the 1979–1982 period. Transfer payments fell during the expansion that began late in 1982, then began rising in 1989 as the expansion began to slow. Transfer payments continued to rise relative to GDP during the recessions of 1990–1991 and 2001–2002 and then fell as the economy entered expansionary phases after each of those recessions. During the 2007–2009 recession, transfers again rose.

When economic activity falls, incomes fall, people lose jobs, and more people qualify for aid. People qualify to receive welfare benefits, such as cash, food stamps, or Medicaid, only if their income falls below a certain level. They qualify for unemployment compensation by losing their jobs. More people qualify for transfer payments during recessions. When the economy expands, incomes and employment rise, and fewer people qualify for welfare or unemployment benefits. Spending for those programs therefore tends to fall during an expansion.

Figure 27.3 summarizes trends in government spending since 1960. It shows three categories of government spending relative to GDP: government purchases, transfer payments, and net interest. Net interest includes payments of interest by governments at all levels on money borrowed, less interest earned on saving.

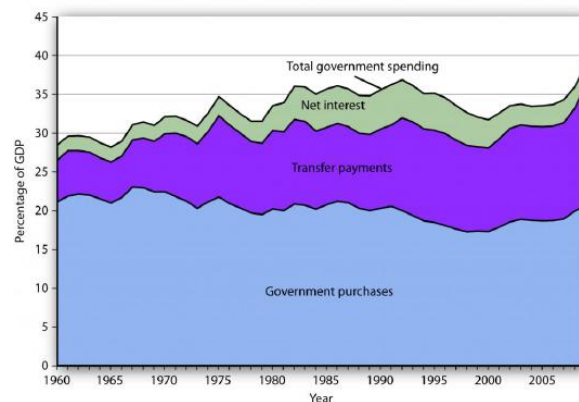


Figure 27.3 Government Spending as a Percentage of GDP, 1960–2009 This chart shows three major categories of government spending as percentages of GDP: government purchases, transfer payments, and net interest.

Source: Bureau of Economic Analysis, NIPA Table 1.1 and 3.1 (November 23, 2010 revision).

Taxes

Taxes affect the relationship between real GDP and personal disposable income; they therefore affect consumption. They also influence investment decisions. Taxes imposed on firms affect the profitability of investment decisions and therefore affect the

levels of investment firms will choose. Payroll taxes imposed on firms affect the costs of hiring workers; they therefore have an impact on employment and on the real wages earned by workers.

The bulk of federal receipts come from the personal income tax and from payroll taxes. State and local tax receipts are dominated by property taxes and sales taxes. The federal government, as well as state and local governments, also collects taxes imposed on business firms, such as taxes on corporate profits. Figure 27.4 shows the composition of federal, state, and local receipts in a recent year.

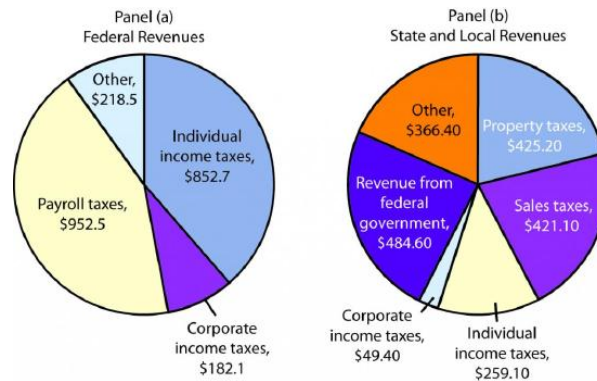


Figure 27.4 The Composition of Federal, State, and Local Revenues Federal receipts come primarily from payroll taxes and from personal taxes such as the personal income tax. State and local tax receipts come from a variety of sources; the most important are property taxes, sales taxes, income taxes, and grants from the federal government. Revenue shares are for 2009.

Source: Bureau of Economic Analysis, NIPA Table 3.2 and 3.3 (November 23, 2010 revision).

The Government Budget Balance

The government's budget balance is the difference between the government's revenues and its expenditures. A **budget surplus** occurs if government revenues exceed expenditures. A **budget deficit** occurs if government expenditures exceed revenues. The minus sign is often omitted when reporting a deficit. If the budget surplus equals zero, we say the government has a **balanced budget**.

Figure 27.5 compares federal, state, and local government revenues to expenditures relative to GDP since 1960. The government's budget was generally in surplus in the 1960s, then mostly in deficit since, except for a brief period between 1998 and 2001. Bear in mind that these data are for all levels of government.

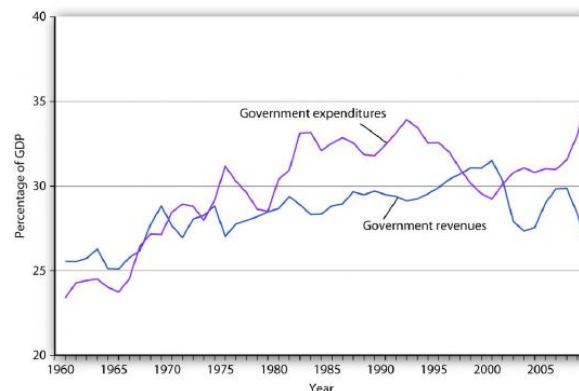


Figure 27.5 Government Revenue and Expenditure as a Percentage of GDP, 1960–2009 The government's budget was generally in surplus in the 1960s, then mostly in deficit since, except for a brief period between 1998 and 2001.

Source: Bureau of Economic Analysis, NIPA Table 1.1 and 3.1 (November 23, 2010 revision).

The administration of George W. Bush saw a large increase in the federal deficit. In part, this is the result of the government's response to the terrorist attacks in 2001. It also results, however, from large increases in federal spending at all levels together with tax cuts in 2001, 2002, and 2003. The federal deficit is projected to be even larger during the administration of Barack Obama.

The National Debt

The **national debt** is the sum of all past federal deficits, minus any surpluses. Figure 27.6 shows the national debt as a percentage of GDP. It suggests that, relative to the level of economic activity, the debt is well below the levels reached during World War II. The ratio of debt to GDP rose from 1981 to 1996 and fell in the last years of the 20th century; it began rising again in 2002.

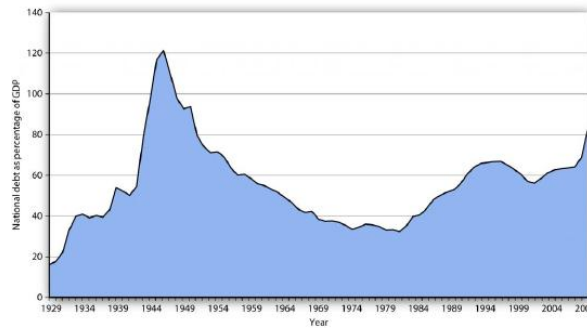


Figure 27.6 The National Debt and the Economy, 1929–2009 The national debt relative to GDP is much smaller today than it was during World War II. The ratio of debt to GDP rose from 1981 to 1996 and fell in the last years of the 20th century; it began rising again in 2002.

Sources: Data for 1929–1938 from *Historical Statistics of the United States, Colonial Times to 1957*—not strictly comparable with later data. Data for remaining years from Office of Management and Budget, *Budget of the United States Government, Fiscal Year 2011, Historical Tables*.

Judged by international standards, the U.S. national debt relative to its GDP is somewhat above average among developed nations. Figure 27.7 shows national debt as a percentage of GDP for 26 countries in 2008. It also shows deficits or surpluses as a percentage of GDP.

Country	National Debt as percentage of GDP	Deficit (–) or surplus as percentage of GDP
Japan	172.1	–2.7
Italy	114.4	–2.7
Greece	102.6	–7.8
Iceland	96.3	–13.6
Belgium	93.5	–1.2
Hungary	77.0	–3.7
France	75.7	–3.4
Portugal	75.2	–2.8
United States	70.0	–6.5
Canada	69.7	0.1
Germany	68.8	–0.2
Austria	66.2	–0.5
Netherlands	65.8	0.7
United Kingdom	56.8	–5.3
Norway	56.0	18.8
Poland	54.0	–3.7
Sweden	47.1	2.5
Spain	47.0	–4.1
Switzerland	44.0	1.6
Finland	40.7	4.4
Denmark	39.8	3.4
Slovak Republic	30.8	–2.3
Korea	26.8	3.3
New Zealand	25.3	3.1
Luxembourg	16.3	2.5
Australia	14.3	1.0
Average	63.3	

Figure 27.7 Debts and Deficits for 26 Nations, 2008 The chart shows national debt as a percentage of GDP and deficits or surpluses as a percentage of GDP in 2008. The national debt of the United States relative to its GDP was somewhat above average among these nations.

Source: Organisation for Economic Co-operation and Development (OECD). *Factbook 2010*. OECD Publishing, May 25, 2010.

Key Takeaways

- Over the last 50 years, government purchases fell from about 20% of U.S. GDP to below 20%, but have been rising over the last decade.

- Transfer payment spending has risen sharply, both in absolute terms and as a percentage of real GDP since 1960.
- The bulk of federal revenues comes from income and payroll taxes. State and local revenues consist primarily of sales and property taxes.
- The government budget balance is the difference between government revenues and government expenditures.
- The national debt is the sum of all past federal deficits minus any surpluses.

Try It!

What happens to the national debt when there is a budget surplus? What happens to it when there is a budget deficit? What happens to the national debt if there is a decrease in a surplus? What happens to it if the deficit falls?

Case in Point: Generational Accounting

Figure 27.8



Kevin Krejci – [Our National Debt](#) – CC BY 2.0.

One method of assessing the degree to which current fiscal policies affect future generations is through a device introduced in the early 1990s called generational accounting. It measures the impact of current fiscal policies on different generations in the economy, including future generations. Generational accounting is now practiced by governments in many countries, including the United States and the European Union.

As populations age, the burden of current fiscal policy is increasingly borne by younger people in the population. In most countries, economists computing generational accounts have found that people age 40 or below will pay more in taxes than they receive in transfer payments, while those age 60 or above will receive more in transfers than they pay in taxes. The differences are huge. According to a recent study by Jagadeesh Gokhale, summarized in the table below, in 2004 in the United States, a male age 30 could expect to pay \$201,300 more than he receives in government transfers during his lifetime, while another male age 75 could expect to receive \$171,100 more in transfers than he paid in taxes during his lifetime. That is a difference of \$372,400! For future generations, those born after the year 2004, the difference is even more staggering. A male born after the year 2005 can expect to pay \$332,200 more in taxes than he will receive in transfer payments. For a woman, the differences are also large but not as great. A woman age 30 in 2004 could expect to pay \$30,200 more in taxes than she will receive in transfers during her lifetime, while a woman age 75 could expect to receive transfers of \$184,100 in excess of her lifetime tax burden.

The table below gives generational accounting estimates for the United States for the year 2004 for males and females. Notice that the net burden on females is much lower than for males. That is because women live longer than men and thus receive Social Security and Medicare benefits over a longer period of time. Women also have lower labor force participation rates and earn less than men, and pay lower taxes as a result.

Table 27.1 Generational Accounts for the United States (thousands of 2004 dollars)

Year of birth	Age in 2004	Male	Female
2005 (future born)	-1	333.2	26.0
2004 (newborn)	0	104.3	8.1
1989	15	185.7	42.0
1974	30	201.3	30.2
1959	45	67.8	-54.1
1944	60	-162.6	-189.4
1929	75	-171.1	-184.1
1914	90	-65.0	-69.2

Generational accounting has its critics—for example, the table above only measures direct taxes and transfers but omits benefits from government spending on public goods and services. In addition, government spending programs can be modified, which would alter the impact on future generations. Nonetheless, it does help to focus attention on the sustainability of current fiscal policies. Can future generations pay for Social Security, Medicare, and other retirement and health care spending as currently configured? Should they be asked to do so?

Sources: Jagadeesh Gokhale, “Generational Accounting,” *The New Palgrave Dictionary of Economics*, 2nd ed. (forthcoming).

Answer to Try It! Problem

A budget surplus leads to a decline in national debt; a budget deficit causes the national debt to grow. If there is a decrease in a budget surplus, national debt still declines but by less than it would have had the surplus not gotten smaller. If there is a decrease in the budget deficit, the national debt still grows, but by less than it would have if the deficit had not gotten smaller.

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9.2: The Use of Fiscal Policy to Stabilize the Economy

Learning Objective

1. Define automatic stabilizers and explain how they work.
2. Explain and illustrate graphically how discretionary fiscal policy works and compare the changes in aggregate demand that result from changes in government purchases, income taxes, and transfer payments.

Fiscal policy—the use of government expenditures and taxes to influence the level of economic activity—is the government counterpart to monetary policy. Like monetary policy, it can be used in an effort to close a recessionary or an inflationary gap.

Some tax and expenditure programs change automatically with the level of economic activity. We will examine these first. Then we will look at how discretionary fiscal policies work. Four examples of discretionary fiscal policy choices were the tax cuts introduced by the Kennedy, Reagan, and George W. Bush administrations and the increase in government purchases proposed by President Clinton in 1993. The 2009 fiscal stimulus bill passed in the first months of the administration of Barack Obama included both tax cuts and spending increases. All were designed to stimulate aggregate demand and close recessionary gaps.

Automatic Stabilizers

Certain government expenditure and taxation policies tend to insulate individuals from the impact of shocks to the economy. Transfer payments have this effect. Because more people become eligible for income supplements when income is falling, transfer payments reduce the effect of a change in real GDP on disposable personal income and thus help to insulate households from the impact of the change. Income taxes also have this effect. As incomes fall, people pay less in income taxes.

Any government program that tends to reduce fluctuations in GDP automatically is called an **automatic stabilizer**. Automatic stabilizers tend to increase GDP when it is falling and reduce GDP when it is rising.

To see how automatic stabilizers work, consider the decline in real GDP that occurred during the recession of 1990–1991. Real GDP fell 1.6% from the peak to the trough of that recession. The reduction in economic activity automatically reduced tax payments, reducing the impact of the downturn on disposable personal income. Furthermore, the reduction in incomes increased transfer payment spending, boosting disposable personal income further. Real disposable personal income thus fell by only 0.9% during the 1990–1991 recession, a much smaller percentage than the reduction in real GDP. Rising transfer payments and falling tax collections helped cushion households from the impact of the recession and kept real GDP from falling as much as it would have otherwise.

Automatic stabilizers have emerged as key elements of fiscal policy. Increases in income tax rates and unemployment benefits have enhanced their importance as automatic stabilizers. The introduction in the 1960s and 1970s of means-tested federal transfer payments, in which individuals qualify depending on their income, added to the nation's arsenal of automatic stabilizers. The advantage of automatic stabilizers is suggested by their name. As soon as income starts to change, they go to work. Because they affect disposable personal income directly, and because changes in disposable personal income are closely linked to changes in consumption, automatic stabilizers act swiftly to reduce the degree of changes in real GDP.

It is important to note that changes in expenditures and taxes that occur through automatic stabilizers do not shift the aggregate demand curve. Because they are automatic, their operation is already incorporated in the curve itself.

Discretionary Fiscal Policy Tools

As we begin to look at deliberate government efforts to stabilize the economy through fiscal policy choices, we note that most of the government's taxing and spending is for purposes other than economic stabilization. For example, the increase in defense spending in the early 1980s under President Ronald Reagan and in the administration of George W. Bush were undertaken primarily to promote national security. That the increased spending affected real GDP and employment was a by-product. The effect of such changes on real GDP and the price level is secondary, but it cannot be ignored. Our focus here, however, is on discretionary fiscal policy that is undertaken with the intention of stabilizing the economy. As we have seen, the tax cuts introduced by the Bush administration were justified as expansionary measures.

Discretionary government spending and tax policies can be used to shift aggregate demand. Expansionary fiscal policy might consist of an increase in government purchases or transfer payments, a reduction in taxes, or a combination of these tools to shift the aggregate demand curve to the right. A contractionary fiscal policy might involve a reduction in government purchases or transfer payments, an increase in taxes, or a mix of all three to shift the aggregate demand curve to the left.

Figure 27.9 illustrates the use of fiscal policy to shift aggregate demand in response to a recessionary gap and an inflationary gap. In Panel (a), the economy produces a real GDP of Y_1 , which is below its potential level of Y_p . An expansionary fiscal policy seeks to shift aggregate demand to AD_2 in order to close the gap. In Panel (b), the economy initially has an inflationary gap at Y_1 . A contractionary fiscal policy seeks to reduce aggregate demand to AD_2 and close the gap. Now we shall look at how specific fiscal policy options work. In our preliminary analysis of the effects of fiscal policy on the economy, we will assume that at a given price level these policies do not affect interest rates or exchange rates. We will relax that assumption later in the chapter.

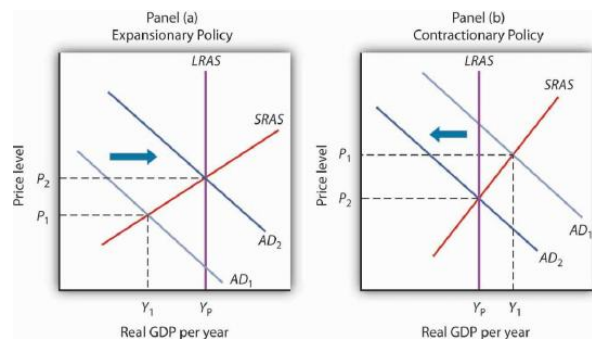


Figure 27.9 Expansionary and Contractionary Fiscal Policies to Shift Aggregate Demand In Panel (a), the economy faces a recessionary gap ($Y_p - Y_1$). An expansionary fiscal policy seeks to shift aggregate demand to AD_2 to close the gap. In Panel (b), the economy faces an inflationary gap ($Y_1 - Y_p$). A contractionary fiscal policy seeks to reduce aggregate demand to AD_2 to close the gap.

Changes in Government Purchases

One policy through which the government could seek to shift the aggregate demand curve is a change in government purchases. We learned that the aggregate demand curve shifts to the right by an amount equal to the initial change in government purchases times the multiplier. This multiplied effect of a change in government purchases occurs because the increase in government purchases increases income, which in turn increases consumption. Then, part of the impact of the increase in aggregate demand is absorbed by higher prices, preventing the full increase in real GDP that would have occurred if the price level did not rise.

Figure 27.10 shows the effect of an increase in government purchases of \$200 billion. The initial price level is P_1 and the initial equilibrium real GDP is \$12,000 billion. Suppose the multiplier is 2. The \$200 billion increase in government purchases increases the total quantity of goods and services demanded, at a price level of P_1 , by \$400 billion (the \$200 billion increase in government purchases times the multiplier) to \$12,400 billion. The aggregate demand thus shifts to the right by that amount to AD_2 . The equilibrium level of real GDP rises to \$12,300 billion, and the price level rises to P_2 .

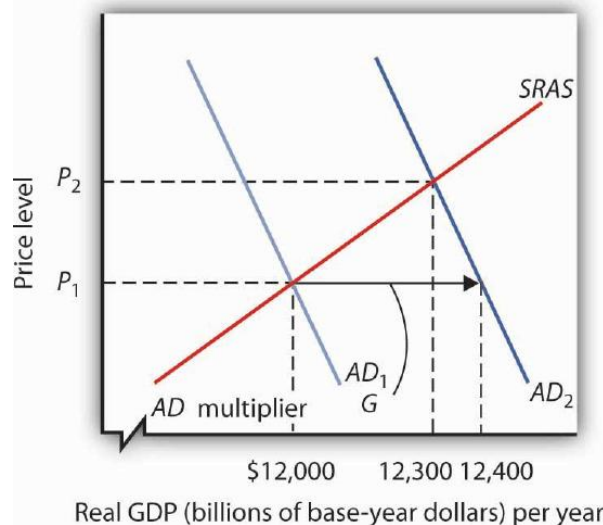


Figure 27.10 An Increase in Government Purchases The economy shown here is initially in equilibrium at a real GDP of \$12,000 billion and a price level of P_1 . An increase of \$200 billion in the level of government purchases (ΔG) shifts the aggregate demand curve to the right by \$400 billion to AD_2 . The equilibrium level of real GDP rises to \$12,300 billion, while the price level rises to P_2 .

A reduction in government purchases would have the opposite effect. The aggregate demand curve would shift to the left by an amount equal to the initial change in government purchases times the multiplier. Real GDP and the price level would fall.

Changes in Business Taxes

One of the first fiscal policy measures undertaken by the Kennedy administration in the 1960s was an investment tax credit. An investment tax credit allows a firm to reduce its tax liability by a percentage of the investment it undertakes during a particular period. With an investment tax credit of 10%, for example, a firm that engaged in \$1 million worth of investment during a year could reduce its tax liability for that year by \$100,000. The investment tax credit introduced by the Kennedy administration was later repealed. It was reintroduced during the Reagan administration in 1981, then abolished by the Tax Reform Act of 1986. President Clinton called for a new investment tax credit in 1993 as part of his job stimulus proposal, but that proposal was rejected by Congress. The Bush administration reinstated the investment tax credit as part of its tax cut package.

An investment tax credit is intended, of course, to stimulate additional private sector investment. A reduction in the tax rate on corporate profits would be likely to have a similar effect. Conversely, an increase in the corporate income tax rate or a reduction in an investment tax credit could be expected to reduce investment.

A change in investment affects the aggregate demand curve in precisely the same manner as a change in government purchases. It shifts the aggregate demand curve by an amount equal to the initial change in investment times the multiplier.

An increase in the investment tax credit, or a reduction in corporate income tax rates, will increase investment and shift the aggregate demand curve to the right. Real GDP and the price level will rise. A reduction in the investment tax credit, or an increase in corporate income tax rates, will reduce investment and shift the aggregate demand curve to the left. Real GDP and the price level will fall¹.

Changes in Income Taxes

Income taxes affect the consumption component of aggregate demand. An increase in income taxes reduces disposable personal income and thus reduces consumption (but by less than the change in disposable personal income). That shifts the aggregate demand curve leftward by an amount equal to the initial change in consumption that the change in income taxes produces times the multiplier². A reduction in income taxes increases disposable personal income, increases consumption (but by less than the change in disposable personal income), and increases aggregate demand.

Suppose, for example, that income taxes are reduced by \$200 billion. Only some of the increase in disposable personal income will be used for consumption and the rest will be saved. Suppose the initial increase in consumption is \$180 billion. Then the shift in the

aggregate demand curve will be a multiple of \$180 billion; if the multiplier is 2, aggregate demand will shift to the right by \$360 billion. Thus, as compared to the \$200-billion increase in government purchases that we saw in Figure 27.10, the shift in the aggregate demand curve due to an income tax cut is somewhat less, as is the effect on real GDP and the price level.

Changes in Transfer Payments

Changes in transfer payments, like changes in income taxes, alter the disposable personal income of households and thus affect their consumption, which is a component of aggregate demand. A change in transfer payments will thus shift the aggregate demand curve because it will affect consumption. Because consumption will change by less than the change in disposable personal income, a change in transfer payments of some amount will result in a smaller change in real GDP than would a change in government purchases of the same amount. As with income taxes, a \$200-billion increase in transfer payments will shift the aggregate demand curve to the right by less than the \$200-billion increase in government purchases that we saw in Figure 27.10.

Table 27.2 “Fiscal Policy in the United States Since 1964” summarizes U.S. fiscal policies undertaken to shift aggregate demand since the 1964 tax cuts. We see that expansionary policies have been chosen in response to recessionary gaps and that contractionary policies have been chosen in response to inflationary gaps. Changes in government purchases and in taxes have been the primary tools of fiscal policy in the United States.

Table 27.2 Fiscal Policy in the United States Since 1964

Year	Situation	Policy response
1968	Inflationary gap	A temporary tax increase, first recommended by President Johnson's Council of Economic Advisers in 1965, goes into effect. This one-time surcharge of 10% is added to individual income tax liabilities.
1969	Inflationary gap	President Nixon, facing a continued inflationary gap, orders cuts in government purchases.
1975	Recessionary gap	President Ford, facing a recession induced by an OPEC oil-price increase, proposes a temporary 10% tax cut. It is passed almost immediately and goes into effect within two months.
1981	Recessionary gap	President Reagan had campaigned on a platform of increased defense spending and a sharp cut in income taxes. The tax cuts are approved in 1981 and are implemented over a period of three years. The increased defense spending begins in 1981. While the Reagan administration rejects the use of fiscal policy as a stabilization tool, its policies tend to increase aggregate demand early in the 1980s.
1992	Recessionary gap	President Bush had rejected the use of expansionary fiscal policy during the recession of 1990–1991. Indeed, he agreed late in 1990 to a cut in government purchases and a tax increase. In a campaign year, however, he orders a cut in withholding rates designed to increase disposable personal income in 1992 and to boost consumption.
1993	Recessionary gap	President Clinton calls for a \$16-billion jobs package consisting of increased government purchases and tax cuts aimed at stimulating investment. The president says the plan will create 500,000 new jobs. The measure is rejected by Congress.
2001	Recessionary gap	President Bush campaigned to reduce taxes in order to reduce the size of government and encourage long-term growth. When he took office in 2001, the economy was weak and the \$1.35-billion tax cut was aimed at both long-term tax relief and at stimulating the economy in the short term. It included, for example, a personal income tax rebate of \$300 to \$600 per household. With

Year	Situation	Policy response
		unemployment still high a couple of years into the expansion, another tax cut was passed in 2003.
2008	Recessionary gap	Fiscal stimulus package of \$150 billion to spur economy. It included \$100 billion in tax rebates and \$50 in tax cuts for businesses.
2009	Recessionary gap	Fiscal stimulus package of \$787 billion included tax cuts and increased government spending passed in early days of President Obama's administration.

Key Takeaways

- Discretionary fiscal policy may be either expansionary or contractionary.
- A change in government purchases shifts the aggregate demand curve at a given price level by an amount equal to the initial change in government purchases times the multiplier. The change in real GDP, however, will be reduced by the fact that the price level will change.
- A change in income taxes or government transfer payments shifts the aggregate demand curve by a multiple of the initial change in consumption (which is less than the change in personal disposable income) that the change in income taxes or transfer payments causes. Then, the change in real GDP will be reduced by the fact that the price level will change.
- A change in government purchases has a larger impact on the aggregate demand curve than does an equal change in income taxes or transfers.
- Changes in business tax rates, including an investment tax credit, can be used to influence the level of investment and thus the level of aggregate demand.

Try It!

Suppose the economy has an inflationary gap. What fiscal policies might be used to close the gap? Using the model of aggregate demand and aggregate supply, illustrate the effect of these policies.

Case in Point: Post–World War II Experiences with Fiscal Policy in the United States

Figure 27.11



Commonwealth Club – [Christina Romer](#) – CC BY 2.0.

Christina Romer, tapped by Barack Obama to head the Council of Economic Advisers, has a long history of writing on economic history. Much of her work focuses on the macroeconomic performance of the United States economy over the past 100-plus years and hence also involves painstaking work to construct historical data series.

One such study titled “Changes in Business Cycles: Evidence and Explanations” draws on a number of her research efforts to compare economic fluctuations before World War I to those after World War II in order to see if the advent of macroeconomic stabilization policy has affected macroeconomic performance. After first showing that macroeconomic performance has not improved as markedly as we might think (excluding the interwar period when “all hell broke loose in the American economy”), she does conclude that monetary and fiscal policies to influence aggregate demand since World War II have “served to dampen many recessions and counteract some shocks entirely.”

She notes that before World War I, changes in macroeconomic policy could not have affected economic performance, because the government was simply too small, with, for example, government spending as a percent of GNP averaging between 1.5% and 2.5% between 1901 and 1916. During that period, the government did operate under specified monetary standards and banking regulations, but the Federal Reserve was not created until 1914, so there was no monetary institution to respond to macroeconomic instability. Thus, macroeconomic policy can truly be seen as a post–World War II phenomenon.

Germaine to the focus on fiscal policy in this chapter, Romer found that discretionary fiscal policy after World War II contributed 0.5 percentage points to the rate of growth of real GDP in years following the troughs of recessions, while automatic stabilizers contributed 0.85 percentage points. Adding in the average contribution of monetary policy of 1.5 percentage points, macroeconomic policy in total contributed 2.85 percentage points to the average actual growth of GDP in the years following troughs of 4.6%. She also concluded that macroeconomic policies likely prevented some recessions or near-recessions. For example, automatic stabilizers muted fluctuations in years of extreme changes in GDP, up or down, by 1 to 2 percentage points in absolute value and fluctuations in years of moderate changes in GDP by about 0.5 percentage points in absolute value.

Especially in light of the active use of both monetary and fiscal policies to counter the recession that began in December 2007, she also found that there has been a rise in policy-induced recessions and that this phenomenon explains both why output and other macroeconomic variables have not been more stable in the past half-century and why post–World War II business cycles have been in the moderate range. In particular, she argues that the Fed has generally been too expansionary when the economy was growing, which has led to inflation. Then the Fed has used contractionary policy to reduce inflation. She concludes, “In essence, we have replaced the prewar boom-bust cycle driven by animal spirits and financial panics with the postwar boom-bust cycle driven by policy.”

Source: Christina Romer, “Changes in Business Cycles: Evidence and Explanations,” *Journal of Economic Perspectives* 13, no. 2 (Spring 1999): 23–44.

Answer to Try It! Problem

Fiscal policies that could be used to close an inflationary gap include reductions in government purchases and transfer payments and increases in taxes. As shown in Panel (b) of Figure 27.9, the goal would be to shift the aggregate demand curve to the left so that it will intersect the short-run aggregate supply curve at Y_p .

¹Investment also affects the long-run aggregate supply curve, since a change in the capital stock changes the potential level of real GDP. We examined this earlier in the chapter on economic growth.

²A change in tax rates will change the value of the multiplier. The reason is explained in another chapter.

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9.3: Issues in Fiscal Policy

Learning Objective

1. Explain how the various kinds of lags influence the effectiveness of discretionary fiscal policy.
2. Explain and illustrate graphically how crowding out (and its reverse) influences the impact of expansionary or contractionary fiscal policy.
3. Discuss the controversy concerning which types of fiscal policies to use, including the arguments from supply-side economics.

The discussion in the previous section about the use of fiscal policy to close gaps suggests that economies can be easily stabilized by government actions to shift the aggregate demand curve. However, as we discovered with monetary policy in the previous chapter, government attempts at stabilization are fraught with difficulties.

Lags

Discretionary fiscal policy is subject to the same lags that we discussed for monetary policy. It takes some time for policy makers to realize that a recessionary or an inflationary gap exists—the *recognition lag*. Recognition lags stem largely from the difficulty of collecting economic data in a timely and accurate fashion. The current recession was not identified until October 2008, when the Business Cycle Dating Committee of the National Bureau of Economic Research announced that it had begun in December 2007. Then, more time elapses before a fiscal policy, such as a change in government purchases or a change in taxes, is agreed to and put into effect—the *implementation lag*. Finally, still more time goes by before the policy has its full effect on aggregate demand—the *impact lag*.

Changes in fiscal policy are likely to involve a particularly long implementation lag. A tax cut was proposed to presidential candidate John F. Kennedy in 1960 as a means of ending the recession that year. He recommended it to Congress in 1962. It was not passed until 1964, three years after the recession had ended. Some economists have concluded that the long implementation lag for discretionary fiscal policy makes this stabilization tool ineffective. Fortunately, automatic stabilizers respond automatically to changes in the economy. They thus avoid not only the implementation lag but also the recognition lag.

The implementation lag results partly from the nature of bureaucracy itself. The CBO estimate that only a portion of the spending for the stimulus plan passed in 2009 will be spent in the next two years is an example of the implementation lag. Government spending requires bureaucratic approval of that spending. For example, a portion of the stimulus plan must go through the Department of Energy. One division of the department focuses on approving loan guarantees for energy-saving industrial projects. It was created early in 2007 as part of another effort to stimulate economic activity. A Minnesota company, Sage Electrochromics, has developed a process for producing windows that can be darkened or lightened on demand to reduce energy use in buildings. Sage applied two years ago for a guarantee on a loan of \$66 million to build a plant that would employ 250 workers. Its application has not been approved. In fact, the loan approval division, which will be crucial for projects in the stimulus plan, has never approved any application made to it in its two years in existence!

Energy Secretary Steven Chu, a Nobel Prize-winning physicist, recognizes the urgency of the problem. In an interview with the *Wall Street Journal*, Dr. Chu said that his agency would have to do better. “Otherwise, it’s just going to be a bust,” he said (Power & King Jr., 2009).

Crowding Out

Because an expansionary fiscal policy either increases government spending or reduces revenues, it increases the government budget deficit or reduces the surplus. A contractionary policy is likely to reduce a deficit or increase a surplus. In either case, fiscal policy thus affects the bond market. Our analysis of monetary policy showed that developments in the bond market can affect investment and net exports. We shall find in this section that the same is true for fiscal policy.

Figure 27.12 shows the impact of an expansionary fiscal policy: an increase in government purchases. The increase in government purchases increases the deficit or reduces the surplus. In either case, the Treasury will sell more bonds than it would have otherwise, shifting the supply curve for bonds to the right in Panel (a). That reduces the price of bonds, raising the interest rate. The

increase in the interest rate reduces the quantity of private investment demanded. The higher interest rate increases the demand for and reduces the supply of dollars in the foreign exchange market, raising the exchange rate in Panel (b). A higher exchange rate reduces net exports. Panel (c) shows the effects of all these changes on the aggregate demand curve. Before the change in government purchases, the economy is in equilibrium at a real GDP of Y_1 , determined by the intersection of AD_1 and the short-run aggregate supply curve. The increase in government expenditures would shift the curve outward to AD_2 if there were no adverse impact on investment and net exports. But the reduction in investment and net exports partially offsets this increase. Taking the reduction in investment and net exports into account means that the aggregate demand curve shifts only to AD_3 . The tendency for an expansionary fiscal policy to reduce other components of aggregate demand is called crowding out. In the short run, this policy leads to an increase in real GDP to Y_2 and a higher price level, P_2 .

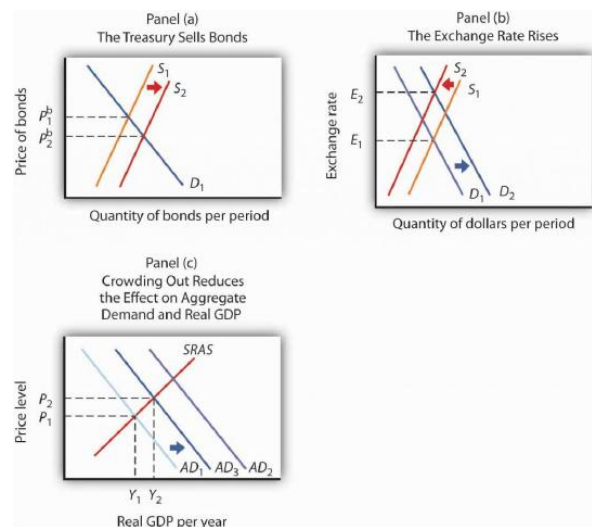


Figure 27.12 An Expansionary Fiscal Policy and Crowding Out In Panel (a), increased government purchases are financed through the sale of bonds, lowering their price to P_2 . In Panel (b), the higher interest rate causes the exchange rate to rise, reducing net exports. Increased government purchases would shift the aggregate demand curve to AD_2 in Panel (c) if there were no crowding out. Crowding out of investment and net exports, however, causes the aggregate demand curve to shift only to AD_3 . Then a higher price level means that GDP rises only to Y_2 .

Crowding out reduces the effectiveness of any expansionary fiscal policy, whether it be an increase in government purchases, an increase in transfer payments, or a reduction in income taxes. Each of these policies increases the deficit and thus increases government borrowing. The supply of bonds increases, interest rates rise, investment falls, the exchange rate rises, and net exports fall.

Note, however, that it is private investment that is crowded out. The expansionary fiscal policy could take the form of an increase in the investment component of government purchases. As we have learned, some government purchases are for goods, such as office supplies, and services. But the government can also purchase investment items, such as roads and schools. In that case, government investment may be crowding out private investment.

The reverse of crowding out occurs with a contractionary fiscal policy—a cut in government purchases or transfer payments, or an increase in taxes. Such policies reduce the deficit (or increase the surplus) and thus reduce government borrowing, shifting the supply curve for bonds to the left. Interest rates drop, inducing a greater quantity of investment. Lower interest rates also reduce the demand for and increase the supply of dollars, lowering the exchange rate and boosting net exports. This phenomenon is known as “crowding in.”

Crowding out and crowding in clearly weaken the impact of fiscal policy. An expansionary fiscal policy has less punch; a contractionary policy puts less of a damper on economic activity. Some economists argue that these forces are so powerful that a change in fiscal policy will have no effect on aggregate demand. Because empirical studies have been inconclusive, the extent of crowding out (and its reverse) remains a very controversial area of study.

Also, the fact that government deficits today may reduce the capital stock that would otherwise be available to future generations does not imply that such deficits are wrong. If, for example, the deficits are used to finance public sector investment, then the reduction in private capital provided to the future is offset by the increased provision of public sector capital. Future generations may have fewer office buildings but more schools.

Choice of Policy

Suppose Congress and the president agree that something needs to be done to close a recessionary gap. We have learned that fiscal policies that increase government purchases, reduce taxes, or increase transfer payments—or do a combination of these—all have the potential, theoretically, to raise real GDP. The government must decide which kind of fiscal policy to employ. Because the decision makers who determine fiscal policy are all elected politicians, the choice among the policy options available is an intensely political matter, often reflecting the ideology of the politicians.

For example, those who believe that government is too big would argue for tax cuts to close recessionary gaps and for spending cuts to close inflationary gaps. Those who believe that the private sector has failed to provide adequately a host of services that would benefit society, such as better education or public transportation systems, tend to advocate increases in government purchases to close recessionary gaps and tax increases to close inflationary gaps.

Another area of contention comes from those who believe that fiscal policy should be constructed primarily so as to promote long-term growth. Supply-side economics is the school of thought that promotes the use of fiscal policy to stimulate long-run aggregate supply. Supply-side economists advocate reducing tax rates in order to encourage people to work more or more individuals to work and providing investment tax credits to stimulate capital formation.

While there is considerable debate over how strong the supply-side effects are in relation to the demand-side effects, such considerations may affect the choice of policies. Supply-siders tend to favor tax cuts over increases in government purchases or increases in transfer payments. President Reagan advocated tax cuts in 1981 on the basis of their supply-side effects. Coupled with increased defense spending in the early 1980s, fiscal policy under Mr. Reagan clearly stimulated aggregate demand by increasing both consumption and investment. Falling inflation and accelerated growth are signs that supply-side factors may also have been at work during that period. President George W. Bush's chief economic adviser, N. Gregory Mankiw, argued that the Bush tax cuts would encourage economic growth, a supply-side argument. Mr. Bush's next chief economic adviser, Ben Bernanke, who became the next chairman of the Federal Reserve Board in 2006, made a similar argument and urged that the Bush tax cuts be made permanent.

Finally, even when there is agreement to stimulate the economy, say through increasing government expenditures on highways, the *how* question remains. How should the expenditures be allocated? Specifically, which states should the highways run through? Each member of Congress has a political stake in the outcome. These types of considerations make the implementation lag particularly long for fiscal policy.

Key Takeaways

- Discretionary fiscal policy involves the same kind of lags as monetary policy. However, the implementation lag in fiscal policy is likely to be more pronounced, while the impact lag is likely to be less pronounced.
- Expansionary fiscal policy may result in the crowding out of private investment and net exports, reducing the impact of the policy. Similarly, contractionary policy may “crowd in” additional investment and net exports, reducing the contractionary impact of the policy.
- Supply-side economics stresses the use of fiscal policy to stimulate economic growth. Advocates of supply-side economics generally favor tax cuts to stimulate economic growth.

Try It!

Do the following hypothetical situations tend to enhance or make more difficult the use of fiscal policy as a stabilization tool?

1. Better and more speedily available data on the state of the economy
2. A finding that private sector investment spending is not much affected by interest rate changes
3. A finding that the supply-side effects of a tax cut are substantial

 Case in Point: Crowding Out in Canada

Figure 27.13



Moni cah – [canadian dollars](#) – CC BY-NC-ND 2.0.

In an intriguing study, economist Baotai Wang examined the degree of crowding out of Canadian private investment as a result of government expenditures from 1961–2000. What made Professor Wang’s analysis unusual was that he divided Canadian government expenditures into five categories: expenditures for health and education, expenditures for capital and infrastructure, expenditures for the protection of persons and property (which included defense spending), expenditures for debt services, and expenditures for government and social services.

Mr. Wang found that only government expenditures for capital and infrastructure crowded out private investment. While these expenditures reduced private investment, they represented increased public sector investment for things such as highways and ports.

Expenditures for health and education actually “crowded in” private sector investment. These expenditures, Mr. Wang argued, represented increases in human capital. Such increases complement returns on private sector investment and therefore increase it.

Mr. Wang found that Canadian government expenditures for debt service, the protection of persons and property, and for government and social services had no effect on private sector investment. He argued that expenditures for protection of persons and property may involve some crowding out, but that they also stimulated private investment by firms winning government contracts for defense purchases. The same explanation could be applied to government expenditures for government and social services. These also include an element of investment in human capital.

His results suggest that crowding out depends on the nature of spending done by the government. Some kinds of spending clearly did not crowd out private sector investment in Canada.

Source: Baotai Wang, “Effects of Government Expenditure on Private Investment: Canadian Empirical Evidence,” *Empirical Economics* 30, no. 2 (September 2005): 493–504.

Answers to Try It! Problems

1. Data on the economy that are more accurate and more speedily available should enhance the use of fiscal policy by reducing the length of the recognition lag.

2. If private sector investment does not respond much to interest rate changes, then there will be less crowding out when expansionary policies are undertaken. That is, the rising interest rates that accompany expansionary fiscal policy will not reduce investment spending much, making the shift in the aggregate demand curve to the right greater than it would be otherwise. Also, the use of contractionary fiscal policy would be more effective, since the fall in interest rates would “invite in” less investment spending, making the shift in the aggregate demand curve to the left greater than it would otherwise be.
3. Large supply-side effects enhance the impact of tax cuts. For a given expansionary policy, without the supply-side effects, GDP would advance only to the point where the aggregate demand curve intersects the short-run aggregate supply curve. With the supply-side effects, both the short-run and long-run aggregate supply curves shift to the right. The intersection of the *AD* curve with the now increased short-run aggregate supply curve will be farther to the right than it would have been in the absence of the supply-side effects. The potential level of real GDP will also increase.

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9.4: Review and Practice

Summary

The government sector plays a major role in the economy. The spending, tax, and transfer policies of local, state, and federal agencies affect aggregate demand and aggregate supply and thus affect the level of real GDP and the price level. An expansionary policy tends to increase real GDP. Such a policy could be used to close a recessionary gap. A contractionary fiscal policy tends to reduce real GDP. A contractionary policy could be used to close an inflationary gap.

Government purchases of goods and services have a direct impact on aggregate demand. An increase in government purchases shifts the aggregate demand curve by the amount of the initial change in government purchases times the multiplier. Changes in personal income taxes or in the level of transfer payments affect disposable personal income. They change consumption, though initially by less than the amount of the change in taxes or transfers. They thus cause somewhat smaller shifts in the aggregate demand curve than do equal changes in government purchases.

There are several issues in the use of fiscal policies for stabilization purposes. They include lags associated with fiscal policy, crowding out, the choice of which fiscal policy tool to use, and the possible burdens of accumulating national debt.

Concept Problems

1. What is the difference between government expenditures and government purchases? How do the two variables differ in terms of their effect on GDP?
2. Federally funded student aid programs generally reduce benefits by \$1 for every \$1 that recipients earn. Do such programs represent government purchases or transfer payments? Are they automatic stabilizers?
3. Crowding out reduces the degree to which a change in government purchases influences the level of economic activity. Is it a form of automatic stabilizer?
4. The Case in Point on fiscal policy before World War I and after World War II mentions the idea of policy-induced recessions. Explain how this notion relates to the difficulties discussed in the text of using discretionary policy to stabilize the economy.
5. Suppose an economy has an inflationary gap. How does the government's actual budget deficit or surplus compare to the deficit or surplus it would have at potential output?
6. Suppose the president were given the authority to increase or decrease federal spending by as much as \$100 billion in order to stabilize economic activity. Do you think this would tend to make the economy more or less stable?
7. Suppose the government increases purchases in an economy with a recessionary gap. How would this policy affect bond prices, interest rates, investment, net exports, real GDP, and the price level? Show your results graphically.
8. Suppose the government cuts transfer payments in an economy with an inflationary gap. How would this policy affect bond prices, interest rates, investment, the exchange rate, net exports, real GDP, and the price level? Show your results graphically.
9. Suppose that at the same time the government undertakes expansionary fiscal policy, such as a cut in taxes, the Fed undertakes contractionary monetary policy. How would this policy affect bond prices, interest rates, investment, net exports, real GDP, and the price level? Show your results graphically.
10. Given the nature of the implementation lag discussed in the text, discuss possible measures that might reduce the lag.

Numerical Problems

1. Look up the table on Federal Receipts and Outlays, by Major Category, in the most recent *Economic Report of the President* available in your library or on the Internet.
 1. Complete the following table:

Category	Total outlays	Percentage of total outlays
National defense		
International affairs		
Health		
Medicare		
Income security		
Social Security		
Net interest		
Other		

2. Construct a pie chart showing the percentages of spending for each category in the total.
2. Look up the table on ownership of U.S. Treasury securities in the most recent *Economic Report of the President* available in your library or on the Internet.
 1. Make a pie chart showing the percentage owned by various groups in the earliest year shown in the table.
 2. Make a pie chart showing the percentage owned by various groups in the most recent year shown in the table.
 3. What are some of the major changes in ownership of U.S. government debt over the period?
3. Suppose a country has a national debt of \$5,000 billion, a GDP of \$10,000 billion, and a budget deficit of \$100 billion.
 1. How much will its new national debt be?
 2. Compute its debt-GDP ratio.
 3. Suppose its GDP grows by 1% in the next year and the budget deficit is again \$100 billion. Compute its new level of national debt and its new debt-GDP ratio.
4. Suppose a country's debt rises by 10% and its GDP rises by 12%.
 1. What happens to the debt-GDP ratio?
 2. Does the relative level of the initial values affect your answer?
5. The data below show a country's national debt and its prime lending rate.

Year	National debt (billions of \$)	Lending rate (%)
1992	4,064	6.0
1993	4,411	6.0
1994	4,692	8.5
1995	4,973	8.7
1996	5,224	8.3
1997	5,413	8.5

1. Plot the relationship between national debt and the lending rate.
2. Based on your graph, does crowding out appear to be a problem?
6. Suppose a country increases government purchases by \$100 billion. Suppose the multiplier is 1.5 and the economy's real GDP is \$5,000 billion.
 1. In which direction will the aggregate demand curve shift and by how much?
 2. Explain using a graph why the change in real GDP is likely to be smaller than the shift in the aggregate demand curve.

7. Suppose a country decreases government purchases by \$100 billion. Suppose the multiplier is 1.5 and the economy's real GDP is \$5,000 billion.
1. In which direction will the aggregate demand curve shift and by how much?
 2. Explain using a graph why the change in real GDP is likely to be smaller than the shift in the aggregate demand curve.
8. Suppose a country decreases income taxes by \$100 billion, and this leads to an increase in consumption spending of \$90 billion. Suppose the multiplier is 1.5 and the economy's real GDP is \$5,000 billion.
1. In which direction will the aggregate demand curve shift and by how much?
 2. Explain using a graph why the change in real GDP is likely to be smaller than the shift in the aggregate demand curve.
9. Suppose a country increases income taxes by \$100 billion, and this leads to a decrease in consumption spending of \$90 billion. Suppose the multiplier is 1.5 and the economy's real GDP is \$5,000 billion.
1. In which direction will the aggregate demand curve shift and by how much?
 2. Explain using a graph why the change in real GDP is likely to be smaller than the shift in the aggregate demand curve.
10. Suppose a country institutes an investment tax credit, and this leads to an increase in investment spending of \$100 billion. Suppose the multiplier is 1.5 and the economy's real GDP is \$5,000 billion.
1. In which direction will the aggregate demand curve shift and by how much?
 2. Explain using a graph why the change in real GDP is likely to be smaller than the shift in the aggregate demand curve.
11. Suppose a country repeals an investment tax credit, and this leads to a decrease in investment spending of \$100 billion. Suppose the multiplier is 1.5 and the economy's real GDP is \$5,000 billion.
1. In which direction will the aggregate demand curve shift and by how much?
 2. Explain using a graph why the change in real GDP is likely to be smaller than the shift in the aggregate demand curve.
12. Explain why the shifts in the aggregate demand curves in questions 7 through 11 above are the same or different in absolute value.

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CHAPTER OVERVIEW

10: Monetary Policy and the Fed

10.1: Monetary Policy in the United States

10.2: Problems and Controversies of Monetary Policy

10.3: Monetary Policy and the Equation of Exchange

10.4: Review and Practice

Thumbnail: <https://www.pexels.com/photo/symbol-of-eagle-with-shield-on-dollar-banknote-4386226/>

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10.1: Monetary Policy in the United States

Learning Objective

1. Discuss the Fed's primary and secondary goals and relate these goals to the legislation that created the Fed as well as to subsequent legislation that affects the Fed.
2. State and show graphically how expansionary and contractionary monetary policy can be used to close gaps.

In many respects, the Fed is the most powerful maker of economic policy in the United States. Congress can pass laws, but the president must execute them; the president can propose laws, but only Congress can pass them. The Fed, however, both sets and carries out monetary policy. Deliberations about fiscal policy can drag on for months, even years, but the Federal Open Market Committee (FOMC) can, behind closed doors, set monetary policy in a day—and see that policy implemented within hours. The Board of Governors can change the discount rate or reserve requirements at any time. The impact of the Fed's policies on the economy can be quite dramatic. The Fed can push interest rates up or down. It can promote a recession or an expansion. It can cause the inflation rate to rise or fall. The Fed wields enormous power.

But to what ends should all this power be directed? With what tools are the Fed's policies carried out? And what problems exist in trying to achieve the Fed's goals? This section reviews the goals of monetary policy, the tools available to the Fed in pursuing those goals, and the way in which monetary policy affects macroeconomic variables.

Goals of Monetary Policy

When we think of the goals of monetary policy, we naturally think of standards of macroeconomic performance that seem desirable—a low unemployment rate, a stable price level, and economic growth. It thus seems reasonable to conclude that the goals of monetary policy should include the maintenance of full employment, the avoidance of inflation or deflation, and the promotion of economic growth.

But these goals, each of which is desirable in itself, may conflict with one another. A monetary policy that helps to close a recessionary gap and thus promotes full employment may accelerate inflation. A monetary policy that seeks to reduce inflation may increase unemployment and weaken economic growth. You might expect that in such cases, monetary authorities would receive guidance from legislation spelling out goals for the Fed to pursue and specifying what to do when achieving one goal means not achieving another. But as we shall see, that kind of guidance does not exist.

The Federal Reserve Act

When Congress established the Federal Reserve System in 1913, it said little about the policy goals the Fed should seek. The closest it came to spelling out the goals of monetary policy was in the first paragraph of the Federal Reserve Act, the legislation that created the Fed:

“An Act to provide for the establishment of Federal reserve banks, to furnish an elastic currency, [to make loans to banks], to establish a more effective supervision of banking in the United States, and for other purposes.”

In short, nothing in the legislation creating the Fed anticipates that the institution will act to close recessionary or inflationary gaps, that it will seek to spur economic growth, or that it will strive to keep the price level steady. There is no guidance as to what the Fed should do when these goals conflict with one another.

The Employment Act of 1946

The first U.S. effort to specify macroeconomic goals came after World War II. The Great Depression of the 1930s had instilled in people a deep desire to prevent similar calamities in the future. That desire, coupled with the 1936 publication of John Maynard Keynes's prescription for avoiding such problems through government policy (*The General Theory of Employment, Interest and Money*), led to the passage of the Employment Act of 1946, which declared that the federal government should “use all practical means . . . to promote maximum employment, production and purchasing power.” The act also created the Council of Economic Advisers (CEA) to advise the president on economic matters.

The Fed might be expected to be influenced by this specification of federal goals, but because it is an independent agency, it is not required to follow any particular path. Furthermore, the legislation does not suggest what should be done if the goals of achieving full employment and maximum purchasing power conflict.

The Full Employment and Balanced Growth Act of 1978

The clearest, and most specific, statement of federal economic goals came in the Full Employment and Balanced Growth Act of 1978. This act, generally known as the Humphrey–Hawkins Act, specified that by 1983 the federal government should achieve an unemployment rate among adults of 3% or less, a civilian unemployment rate of 4% or less, and an inflation rate of 3% or less. Although these goals have the virtue of specificity, they offer little in terms of practical policy guidance. The last time the civilian unemployment rate in the United States fell below 4% was 1969, and the inflation rate that year was 6.2%. In 2000, the unemployment rate touched 4%, and the inflation rate that year was 3.4%, so the goals were close to being met. Except for 2007 when inflation hit 4.1%, inflation has hovered between 1.6% and 3.4% in all the other years between 1991 and 2008, so the inflation goal was met or nearly met, but unemployment fluctuated between 4.0% and 7.5% during those years.

The Humphrey-Hawkins Act requires that the chairman of the Fed's Board of Governors report twice each year to Congress about the Fed's monetary policy. These sessions provide an opportunity for members of the House and Senate to express their views on monetary policy.

Federal Reserve Policy and Goals

Perhaps the clearest way to see the Fed's goals is to observe the policy choices it makes. Since 1979, following a bout of double-digit inflation, its actions have suggested that the Fed's primary goal is to keep inflation under control. Provided that the inflation rate falls within acceptable limits, however, the Fed will also use stimulative measures to close recessionary gaps.

In 1979, the Fed, then led by Paul Volcker, launched a deliberate program of reducing the inflation rate. It stuck to that effort through the early 1980s, even in the face of a major recession. That effort achieved its goal: the annual inflation rate fell from 13.3% in 1979 to 3.8% in 1982. The cost, however, was great. Unemployment soared past 9% during the recession. With the inflation rate below 4%, the Fed shifted to a stimulative policy early in 1983.

In 1990, when the economy slipped into a recession, the Fed, with Alan Greenspan at the helm, engaged in aggressive open-market operations to stimulate the economy, despite the fact that the inflation rate had jumped to 6.1%. Much of that increase in the inflation rate, however, resulted from an oil-price boost that came in the wake of Iraq's invasion of Kuwait that year. A jump in prices that occurs at the same time as real GDP is slumping suggests a leftward shift in short-run aggregate supply, a shift that creates a recessionary gap. Fed officials concluded that the upturn in inflation in 1990 was a temporary phenomenon and that an expansionary policy was an appropriate response to a weak economy. Once the recovery was clearly under way, the Fed shifted to a neutral policy, seeking neither to boost nor to reduce aggregate demand. Early in 1994, the Fed shifted to a contractionary policy, selling bonds to reduce the money supply and raise interest rates. Then Fed Chairman Greenspan indicated that the move was intended to head off any possible increase in inflation from its 1993 rate of 2.7%. Although the economy was still in a recessionary gap when the Fed acted, Greenspan indicated that any acceleration of the inflation rate would be unacceptable.

By March 1997 the inflation rate had fallen to 2.4%. The Fed became concerned that inflationary pressures were increasing and tightened monetary policy, raising the goal for the federal funds interest rate to 5.5%. Inflation remained well below 2.0% throughout the rest of 1997 and 1998. In the fall of 1998, with inflation low, the Fed was concerned that the economic recession in much of Asia and slow growth in Europe would reduce growth in the United States. In quarter-point steps it reduced the goal for the federal funds rate to 4.75%. With real GDP growing briskly in the first half of 1999, the Fed became concerned that inflation would increase, even though the inflation rate at the time was about 2%, and in June 1999, it raised its goal for the federal funds rate to 5% and continued raising the rate until it reached 6.5% in May 2000.

With inflation under control, it then began lowering the federal funds rate to stimulate the economy. It continued lowering through the brief recession of 2001 and beyond. There were 11 rate cuts in 2001, with the rate at the end of that year at 1.75%; in late 2002 the rate was cut to 1.25%, and in mid-2003 it was cut to 1.0%.

Then, with growth picking up and inflation again a concern, the Fed began again in the middle of 2004 to increase rates. By the end of 2006, the rate stood at 5.25% as a result of 17 quarter-point rate increases.

Starting in September 2007, the Fed, since 2006 led by Ben Bernanke, shifted gears and began lowering the federal funds rate, mostly in larger steps or 0.5 to 0.75 percentage points. Though initially somewhat concerned with inflation, it sensed that the economy was beginning to slow down. It moved aggressively to lower rates over the course of the next 15 months, and by the end of 2008, the rate was targeted at between 0% and 0.25%. In late 2008 and for at least the following two years, with inflation running quite low and deflation threatening, the Fed seemed quite willing to use all of its options to try to keep financial markets running smoothly and to moderate the recession.

What can we infer from these episodes in the 1980s, 1990s, and the first years of this century? It seems clear that the Fed is determined not to allow the high inflation rates of the 1970s to occur again. When the inflation rate is within acceptable limits, the Fed will undertake stimulative measures in response to a recessionary gap or even in response to the possibility of a growth slowdown. Those limits seem to have tightened over time. In the late 1990s and early 2000s, it appeared that an inflation rate above 3%—or any indication that inflation might rise above 3%—would lead the Fed to adopt a contractionary policy. While on the Federal Reserve Board in the early 2000s, Ben Bernanke had been an advocate of inflation targeting. Under that system, the central bank announces its inflation target and then adjusts the federal funds rate if the inflation rate moves above or below the central bank's target. Mr. Bernanke indicated his preferred target to be an expected increase in the price level, as measured by the price index for consumer goods and services excluding food and energy, of between 1% and 2%. Thus, the inflation goal appears to have tightened even more—to a rate of 2% or less. If inflation were expected to remain below 2%, however, the Fed would undertake stimulative measures to close a recessionary gap. Whether the Fed will hold to that goal will not really be tested until further macroeconomic experiences unfold.

Monetary Policy and Macroeconomic Variables

We saw in an earlier chapter that the Fed has three tools at its command to try to change aggregate demand and thus to influence the level of economic activity. It can buy or sell federal government bonds through open-market operations, it can change the discount rate, or it can change reserve requirements. It can also use these tools in combination. In the next section of this chapter, where we discuss the notion of a liquidity trap, we will also introduce more extraordinary measures that the Fed has at its disposal.

Most economists agree that these tools of monetary policy affect the economy, but they sometimes disagree on the precise mechanisms through which this occurs, on the strength of those mechanisms, and on the ways in which monetary policy should be used. Before we address some of these issues, we shall review the ways in which monetary policy affects the economy in the context of the model of aggregate demand and aggregate supply. Our focus will be on open-market operations, the purchase or sale by the Fed of federal bonds.

Expansionary Monetary Policy

The Fed might pursue an expansionary monetary policy in response to the initial situation shown in Panel (a) of Figure 26.1. An economy with a potential output of Y_P is operating at Y_1 ; there is a recessionary gap. One possible policy response is to allow the economy to correct this gap on its own, waiting for reductions in nominal wages and other prices to shift the short-run aggregate supply curve $SRAS_1$ to the right until it intersects the aggregate demand curve AD_1 at Y_P . An alternative is a stabilization policy that seeks to increase aggregate demand to AD_2 to close the gap. An expansionary monetary policy is one way to achieve such a shift.

To carry out an expansionary monetary policy, the Fed will buy bonds, thereby increasing the money supply. That shifts the demand curve for bonds to D_2 , as illustrated in Panel (b). Bond prices rise to P^b_2 . The higher price for bonds reduces the interest rate. These changes in the bond market are consistent with the changes in the money market, shown in Panel (c), in which the greater money supply leads to a fall in the interest rate to r_2 . The lower interest rate stimulates investment. In addition, the lower interest rate reduces the demand for and increases the supply of dollars in the currency market, reducing the exchange rate to E_2 in Panel (d). The lower exchange rate will stimulate net exports. The combined impact of greater investment and net exports will shift the aggregate demand curve to the right. The curve shifts by an amount equal to the multiplier times the sum of the initial changes in investment and net exports. In Panel (a), this is shown as a shift to AD_2 , and the recessionary gap is closed.

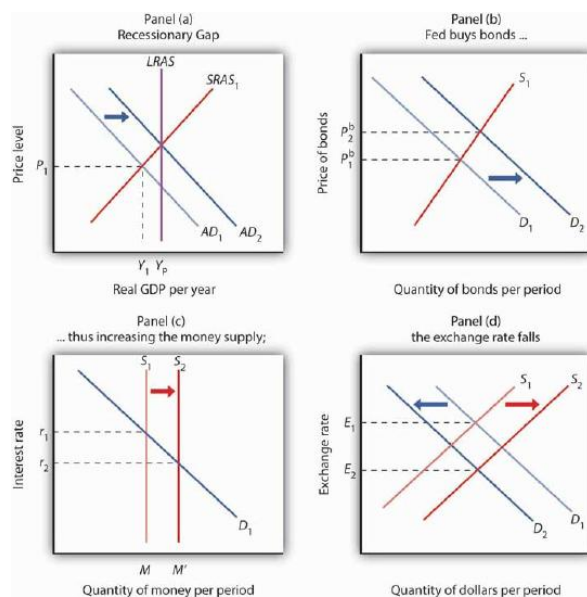


Figure 26.1 Expansionary Monetary Policy to Close a Recessionary Gap In Panel (a), the economy has a recessionary gap $Y_P - Y_1$. An expansionary monetary policy could seek to close this gap by shifting the aggregate demand curve to AD_2 . In Panel (b), the Fed buys bonds, shifting the demand curve for bonds to D_2 and increasing the price of bonds to P_2^b . By buying bonds, the Fed increases the money supply to M' in Panel (c). The Fed's action lowers interest rates to r_2 . The lower interest rate also reduces the demand for and increases the supply of dollars, reducing the exchange rate to E_2 in Panel (d). The resulting increases in investment and net exports shift the aggregate demand curve in Panel (a).

Contractionary Monetary Policy

The Fed will generally pursue a contractionary monetary policy when it considers inflation a threat. Suppose, for example, that the economy faces an inflationary gap; the aggregate demand and short-run aggregate supply curves intersect to the right of the long-run aggregate supply curve, as shown in Panel (a) of Figure 26.2.

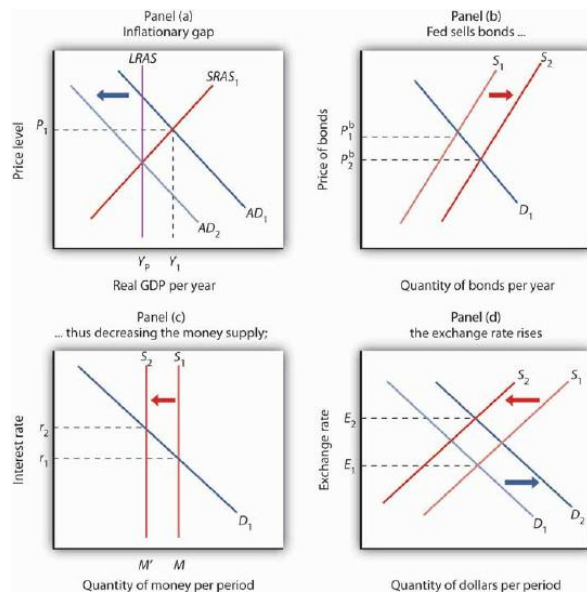


Figure 26.2 A Contractionary Monetary Policy to Close an Inflationary Gap In Panel (a), the economy has an inflationary gap $Y_1 - Y_P$. A contractionary monetary policy could seek to close this gap by shifting the aggregate demand curve to AD_2 . In Panel (b), the Fed sells bonds, shifting the supply curve for bonds to S_2 and lowering the price of bonds to P_2^b . The lower price of bonds means a higher interest rate, r_2 , as shown in Panel (c). The higher interest rate also increases the demand for and decreases the supply of dollars, raising the exchange rate to E_2 in Panel (d), which will increase net exports. The decreases in investment and net exports are responsible for decreasing aggregate demand in Panel (a).

To carry out a contractionary policy, the Fed sells bonds. In the bond market, shown in Panel (b) of Figure 26.2, the supply curve shifts to the right, lowering the price of bonds and increasing the interest rate. In the money market, shown in Panel (c), the Fed's

bond sales reduce the money supply and raise the interest rate. The higher interest rate reduces investment. The higher interest rate also induces a greater demand for dollars as foreigners seek to take advantage of higher interest rates in the United States. The supply of dollars falls; people in the United States are less likely to purchase foreign interest-earning assets now that U.S. assets are paying a higher rate. These changes boost the exchange rate, as shown in Panel (d), which reduces exports and increases imports and thus causes net exports to fall. The contractionary monetary policy thus shifts aggregate demand to the left, by an amount equal to the multiplier times the combined initial changes in investment and net exports, as shown in Panel (a).

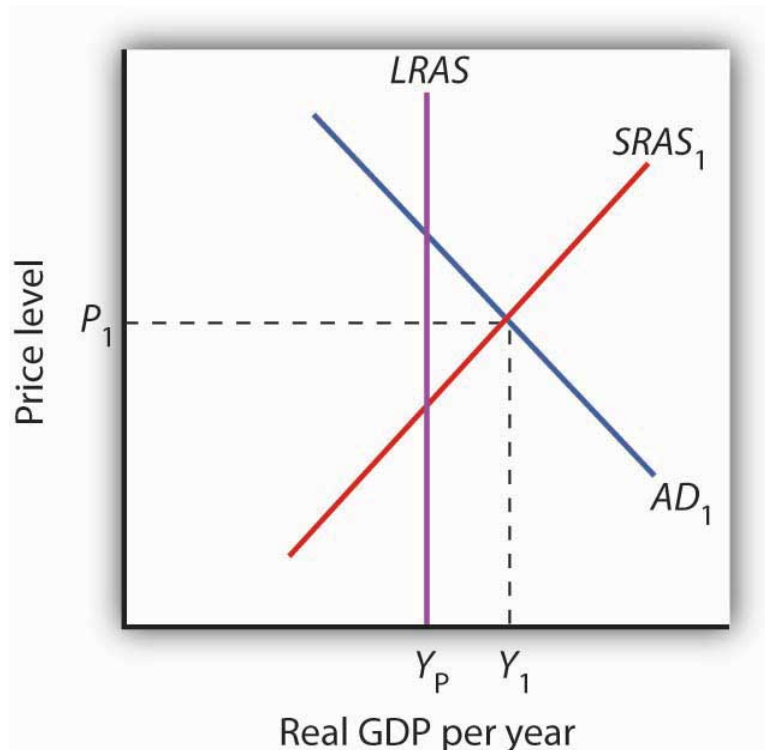
Key Takeaways

- The Federal Reserve Board and the Federal Open Market Committee are among the most powerful institutions in the United States.
- The Fed's primary goal appears to be the control of inflation. Providing that inflation is under control, the Fed will act to close recessionary gaps.
- Expansionary policy, such as a purchase of government securities by the Fed, tends to push bond prices up and interest rates down, increasing investment and aggregate demand. Contractionary policy, such as a sale of government securities by the Fed, pushes bond prices down, interest rates up, investment down, and aggregate demand shifts to the left.

Try It!

The figure shows an economy operating at a real GDP of Y_1 and a price level of P_1 , at the intersection of AD_1 and $SRAS_1$.

Figure 26.3



1. What kind of gap is the economy experiencing?
2. What type of monetary policy (expansionary or contractionary) would be appropriate for closing the gap?
3. If the Fed decided to pursue this policy, what type of open-market operations would it conduct?
4. How would bond prices, interest rates, and the exchange rate change?
5. How would investment and net exports change?
6. How would the aggregate demand curve shift?

Case in Point: A Brief History of the Greenspan Fed

Figure 26.4



Javier – [Alan Greenspan](#) – CC BY-NC-ND 2.0.

With the passage of time and the fact that the fallout on the economy turned out to be relatively minor, it is hard in retrospect to realize how scary a situation Alan Greenspan and the Fed faced just two months after his appointment as Chairman of the Federal Reserve Board. On October 12, 1987, the stock market had its worst day ever. The Dow Jones Industrial Average plunged 508 points, wiping out more than \$500 billion in a few hours of feverish trading on Wall Street. That drop represented a loss in value of over 22%. In comparison, the largest daily drop in 2008 of 778 points on September 29, 2008, represented a loss in value of about 7%.

When the Fed faced another huge plunge in stock prices in 1929—also in October—members of the Board of Governors met and decided that no action was necessary. Determined not to repeat the terrible mistake of 1929, one that helped to usher in the Great Depression, Alan Greenspan immediately reassured the country, saying that the Fed would provide adequate liquidity, by buying federal securities, to assure that economic activity would not fall. As it turned out, the damage to the economy was minor and the stock market quickly regained value.

In the fall of 1990, the economy began to slip into recession. The Fed responded with expansionary monetary policy—cutting reserve requirements, lowering the discount rate, and buying Treasury bonds.

Interest rates fell quite quickly in response to the Fed's actions, but, as is often the case, changes to the components of aggregate demand were slower in coming. Consumption and investment began to rise in 1991, but their growth was weak, and unemployment continued to rise because growth in output was too slow to keep up with growth in the labor force. It was not until the fall of 1992 that the economy started to pick up steam. This episode demonstrates an important difficulty with stabilization policy: attempts to manipulate aggregate demand achieve shifts in the curve, but with a lag.

Throughout the rest of the 1990s, with some tightening when the economy seemed to be moving into an inflationary gap and some loosening when the economy seemed to be possibly moving toward a recessionary gap—especially in 1998 and 1999 when parts of Asia experienced financial turmoil and recession and European growth had slowed down—the Fed helped steer what is now referred to as the Goldilocks (not too hot, not too cold, just right) economy.

The U.S. economy again experienced a mild recession in 2001 under Greenspan. At that time, the Fed systematically conducted expansionary policy. Similar to its response to the 1987 stock market crash, the Fed has been credited with maintaining liquidity following the dot-com stock market crash in early 2001 and the attacks on the World Trade Center and the Pentagon in September 2001.

When Greenspan retired in January 2006, many hailed him as the greatest central banker ever. As the economy faltered in 2008 and as the financial crisis unfolded throughout the year, however, the question of how the policies of Greenspan's Fed played into the current difficulties took center stage. Testifying before Congress in October 2008, he said that the country faces a “once-in-a-century credit tsunami,” and he admitted, “I made a mistake in presuming that the self-interests of organizations, specifically banks and others, were such as that they were best capable of protecting their own shareholders and their equity in their firms.” The criticisms he has faced are twofold: that the very low interest rates used to fight the 2001 recession and maintained for too long

fueled the real estate bubble and that he did not promote appropriate regulations to deal with the new financial instruments that were created in the early 2000s. While supporting some additional regulations when he testified before Congress, he also warned that overreacting could be dangerous: “We have to recognize that this is almost surely a once-in-a-century phenomenon, and, in that regard, to realize the types of regulation that would prevent this from happening in the future are so onerous as to basically suppress the growth rate in the economy and . . . the standards of living of the American people.”

Answers to Try It! Problems

1. Inflationary gap
2. Contractionary
3. Open-market sales of bonds
4. The price of bonds would fall. The interest rate and the exchange rate would rise.
5. Investment and net exports would fall.
6. The aggregate demand curve would shift to the left.

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10.2: Problems and Controversies of Monetary Policy

Learning Objective

1. Explain the three kinds of lags that can influence the effectiveness of monetary policy.
2. Identify the macroeconomic targets at which the Fed can aim in managing the economy, and discuss the difficulties inherent in using each of them as a target.
3. Discuss how each of the following influences a central bank's ability to achieve its desired macroeconomic outcomes: political pressures, the degree of impact on the economy (including the situation of a liquidity trap), and the rational expectations hypothesis.

The Fed has some obvious advantages in its conduct of monetary policy. The two policy-making bodies, the Board of Governors and the Federal Open Market Committee (FOMC), are small and largely independent from other political institutions. These bodies can thus reach decisions quickly and implement them immediately. Their relative independence from the political process, together with the fact that they meet in secret, allows them to operate outside the glare of publicity that might otherwise be focused on bodies that wield such enormous power.

Despite the apparent ease with which the Fed can conduct monetary policy, it still faces difficulties in its efforts to stabilize the economy. We examine some of the problems and uncertainties associated with monetary policy in this section.

Lags

Perhaps the greatest obstacle facing the Fed, or any other central bank, is the problem of lags. It is easy enough to show a recessionary gap on a graph and then to show how monetary policy can shift aggregate demand and close the gap. In the real world, however, it may take several months before anyone even realizes that a particular macroeconomic problem is occurring. When monetary authorities become aware of a problem, they can act quickly to inject reserves into the system or to withdraw reserves from it. Once that is done, however, it may be a year or more before the action affects aggregate demand.

The delay between the time a macroeconomic problem arises and the time at which policy makers become aware of it is called a [recognition lag](#). The 1990–1991 recession, for example, began in July 1990. It was not until late October that members of the FOMC noticed a slowing in economic activity, which prompted a stimulative monetary policy. In contrast, the most recent recession began in December 2007, and Fed easing began in September 2007.

Recognition lags stem largely from problems in collecting economic data. First, data are available only after the conclusion of a particular period. Preliminary estimates of real GDP, for example, are released about a month after the end of a quarter. Thus, a change that occurs early in a quarter will not be reflected in the data until several months later. Second, estimates of economic indicators are subject to revision. The first estimates of real GDP in the third quarter of 1990, for example, showed it increasing. Not until several months had passed did revised estimates show that a recession had begun. And finally, different indicators can lead to different interpretations. Data on employment and retail sales might be pointing in one direction while data on housing starts and industrial production might be pointing in another. It is one thing to look back after a few years have elapsed and determine whether the economy was expanding or contracting. It is quite another to decipher changes in real GDP when one is right in the middle of events. Even in a world brimming with computer-generated data on the economy, recognition lags can be substantial.

Only after policy makers recognize there is a problem can they take action to deal with it. The delay between the time at which a problem is recognized and the time at which a policy to deal with it is enacted is called the [implementation lag](#). For monetary policy changes, the implementation lag is quite short. The FOMC meets eight times per year, and its members may confer between meetings through conference calls. Once the FOMC determines that a policy change is in order, the required open-market operations to buy or sell federal bonds can be put into effect immediately.

Policy makers at the Fed still have to contend with the [impact lag](#), the delay between the time a policy is enacted and the time that policy has its impact on the economy.

The impact lag for monetary policy occurs for several reasons. First, it takes some time for the deposit multiplier process to work itself out. The Fed can inject new reserves into the economy immediately, but the deposit expansion process of bank lending will need time to have its full effect on the money supply. Interest rates are affected immediately, but the money supply grows more slowly. Second, firms need some time to respond to the monetary policy with new investment spending—if they respond at all. Third, a monetary change is likely to affect the exchange rate, but that translates into a change in net exports only after some delay. Thus, the shift in the aggregate demand curve due to initial changes in investment and in net exports occurs after some delay. Finally, the multiplier process of an expenditure change takes time to unfold. It is only as incomes start to rise that consumption spending picks up.

The problem of lags suggests that monetary policy should respond not to statistical reports of economic conditions in the recent past but to conditions *expected* to exist in the future. In justifying the imposition of a contractionary monetary policy early in 1994, when the economy still had a recessionary gap, Greenspan indicated that the Fed expected a one-year impact lag. The policy initiated in 1994 was a response not to the economic conditions thought to exist at the time but to conditions expected to exist in 1995. When the Fed used contractionary policy in the middle of 1999, it argued that it was doing so to forestall a possible increase in inflation. When the Fed began easing in September 2007, it argued that it was doing so to forestall adverse effects to the economy of falling housing prices. In these examples, the Fed appeared to be looking forward. It must do so with information and forecasts that are far from perfect.

Estimates of the length of time required for the impact lag to work itself out range from six months to two years. Worse, the length of the lag can vary—when they take action, policy makers cannot know whether their choices will affect the economy within a few months or within a few years. Because of the uncertain length of the impact lag, efforts to stabilize the economy through monetary policy could be destabilizing. Suppose, for example, that the Fed responds to a recessionary gap with an expansionary policy but that by the time the policy begins to affect aggregate demand, the economy has already returned to potential GDP. The policy designed to correct a recessionary gap could create an inflationary gap. Similarly, a shift to a contractionary policy in response to an inflationary gap might not affect aggregate demand until after a self-correction process had already closed the gap. In that case, the policy could plunge the economy into a recession.

Choosing Targets

In attempting to manage the economy, on what macroeconomic variables should the Fed base its policies? It must have some target, or set of targets, that it wants to achieve. The failure of the economy to achieve one of the Fed's targets would then trigger a shift in monetary policy. The choice of a target, or set of targets, is a crucial one for monetary policy. Possible targets include interest rates, money growth rates, and the price level or expected changes in the price level.

Interest Rates

Interest rates, particularly the federal funds rate, played a key role in recent Fed policy. The FOMC does not decide to increase or decrease the money supply. Rather, it engages in operations to nudge the federal funds rate up or down.

Up until August 1997, it had instructed the trading desk at the New York Federal Reserve Bank to conduct open-market operations in a way that would either maintain, increase, or ease the current “degree of pressure” on the reserve positions of banks. That degree of pressure was reflected by the federal funds rate; if existing reserves were less than the amount banks wanted to hold, then the bidding for the available supply would send the federal funds rate up. If reserves were plentiful, then the federal funds rate would tend to decline. When the Fed increased the degree of pressure on reserves, it sold bonds, thus reducing the supply of reserves and increasing the federal funds rate. The Fed decreased the degree of pressure on reserves by buying bonds, thus injecting new reserves into the system and reducing the federal funds rate.

The current operating procedures of the Fed focus explicitly on interest rates. At each of its eight meetings during the year, the FOMC sets a specific target or target range for the federal funds rate. When the Fed lowers the target for the federal funds rate, it buys bonds. When it raises the target for the federal funds rate, it sells bonds.

Money Growth Rates

Until 2000, the Fed was required to announce to Congress at the beginning of each year its target for money growth that year and each report dutifully did so. At the same time, the Fed report would mention that its money growth targets were benchmarks based

on historical relationships rather than guides for policy. As soon as the legal requirement to report targets for money growth ended, the Fed stopped doing so. Since in recent years the Fed has placed more importance on the federal funds rate, it must adjust the money supply in order to move the federal funds rate to the level it desires. As a result, the money growth targets tended to fall by the wayside, even over the last decade in which they were being reported. Instead, as data on economic conditions unfolded, the Fed made, and continues to make, adjustments in order to affect the federal funds interest rate.

Price Level or Expected Changes in the Price Level

Some economists argue that the Fed's primary goal should be price stability. If so, an obvious possible target is the price level itself. The Fed could target a particular price level or a particular rate of change in the price level and adjust its policies accordingly. If, for example, the Fed sought an inflation rate of 2%, then it could shift to a contractionary policy whenever the rate rose above 2%. One difficulty with such a policy, of course, is that the Fed would be responding to past economic conditions with policies that are not likely to affect the economy for a year or more. Another difficulty is that inflation could be rising when the economy is experiencing a recessionary gap. An example of this, mentioned earlier, occurred in 1990 when inflation increased due to the seemingly temporary increase in oil prices following Iraq's invasion of Kuwait. The Fed was faced with a similar situation in the first half of 2008 when oil prices were again rising. If the Fed undertakes contractionary monetary policy at such times, then its efforts to reduce the inflation rate could worsen the recessionary gap.

The solution proposed by Chairman Bernanke, who is an advocate of inflation rate targeting, is to focus not on the past rate of inflation or even the current rate of inflation, but on the expected rate of inflation, as revealed by various indicators, over the next year. This concept is discussed in the Case in Point essay that follows this section.

Political Pressures

The institutional relationship between the leaders of the Fed and the executive and legislative branches of the federal government is structured to provide for the Fed's independence. Members of the Board of Governors are appointed by the president, with confirmation by the Senate, but the 14-year terms of office provide a considerable degree of insulation from political pressure. A president exercises greater influence in the choice of the chairman of the Board of Governors; that appointment carries a four-year term. Neither the president nor Congress has any direct say over the selection of the presidents of Federal Reserve district banks. They are chosen by their individual boards of directors with the approval of the Board of Governors.

The degree of independence that central banks around the world have varies. A central bank is considered to be more independent if it is insulated from the government by such factors as longer term appointments of its governors and fewer requirements to finance government budget deficits. Studies in the 1980s and early 1990s showed that, in general, greater central bank independence was associated with lower average inflation and that there was no systematic relationship between central bank independence and other indicators of economic performance, such as real GDP growth or unemployment¹. By the rankings used in those studies, the Fed was considered quite independent, second only to Switzerland and the German *Bundesbank* at the time. Perhaps as a result of such findings, a number of countries have granted greater independence to their central banks in the last decade. The charter for the European Central Bank, which began operations in 1998, was modeled on that of the German *Bundesbank*. Its charter states explicitly that its primary objective is to maintain price stability. Also, since 1998, central bank independence has increased in the United Kingdom, Canada, Japan, and New Zealand.

While the Fed is formally insulated from the political process, the men and women who serve on the Board of Governors and the FOMC are human beings. They are not immune to the pressures that can be placed on them by members of Congress and by the president. The chairman of the Board of Governors meets regularly with the president and the executive staff and also reports to and meets with congressional committees that deal with economic matters.

The Fed was created by the Congress; its charter could be altered—or even revoked—by that same body. The Fed is in the somewhat paradoxical situation of having to cooperate with the legislative and executive branches in order to preserve its independence.

The Degree of Impact on the Economy

The problem of lags suggests that the Fed does not know with certainty *when* its policies will work their way through the financial system to have an impact on macroeconomic performance. The Fed also does not know with certainty *towhat extent* its policy

decisions will affect the macroeconomy.

For example, investment can be particularly volatile. An effort by the Fed to reduce aggregate demand in the face of an inflationary gap could be partially offset by rising investment demand. But, generally, contractionary policies do tend to slow down the economy as if the Fed were “pulling on a rope.” That may not be the case with expansionary policies. Since investment depends crucially on expectations about the future, business leaders must be optimistic about economic conditions in order to expand production facilities and buy new equipment. That optimism might not exist in a recession. Instead, the pessimism that might prevail during an economic slump could prevent lower interest rates from stimulating investment. An effort to stimulate the economy through monetary policy could be like “pushing on a string.” The central bank could push with great force by buying bonds and engaging in quantitative easing, but little might happen to the economy at the other end of the string.

What if the Fed cannot bring about a change in interest rates? A **liquidity trap** is said to exist when a change in monetary policy has no effect on interest rates. This would be the case if the money demand curve were horizontal at some interest rate, as shown in Figure 26.5. If a change in the money supply from M to M' cannot change interest rates, then, unless there is some other change in the economy, there is no reason for investment or any other component of aggregate demand to change. Hence, traditional monetary policy is rendered totally ineffective; its degree of impact on the economy is nil. At an interest rate of zero, since bonds cease to be an attractive alternative to money, which is at least useful for transactions purposes, there would be a liquidity trap.

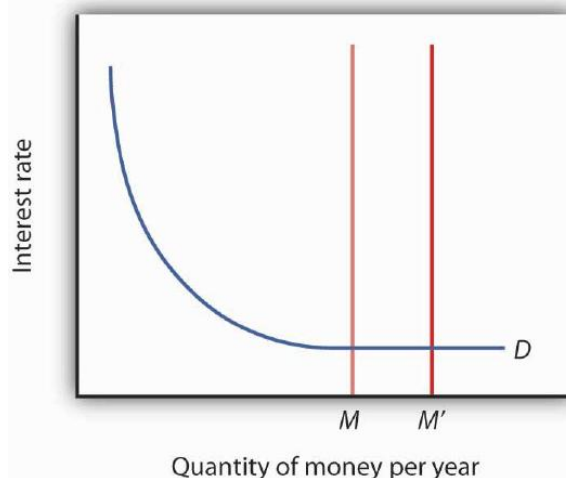


Figure 26.5 A Liquidity Trap When a change in the money supply has no effect on the interest rate, the economy is said to be in a liquidity trap.

With the federal funds rate in the United States close to zero at the end of 2008, the possibility that the country is in or nearly in a liquidity trap cannot be dismissed. As discussed in the introduction to the chapter, at the same time the Fed lowered the federal funds rate to close to zero, it mentioned that it intended to pursue additional, nontraditional measures. What the Fed seeks to do is to make firms and consumers want to spend now by using a tool not aimed at reducing the interest rate, since it cannot reduce the interest rate below zero. It thus shifts its focus to the price level and to avoiding expected deflation. For example, if the public expects the price level to fall by 2% and the interest rate is zero, by holding money, the money is actually earning a positive *real* interest rate of 2%—the difference between the *nominal* interest rate and the expected deflation rate. Since the nominal rate of interest cannot fall below zero (Who would, for example, want to lend at an interest rate below zero when lending is risky whereas cash is not? In short, it does not make sense to lend \$10 and get less than \$10 back.), expected deflation makes holding cash very attractive and discourages spending since people will put off purchases because goods and services are expected to get cheaper.

To combat this “wait-and-see” mentality, the Fed or other central bank, using a strategy referred to as **quantitative easing**, must convince the public that it will keep interest rates very low by providing substantial reserves for as long as is necessary to avoid deflation. In other words, it is aimed at creating expected inflation. For example, at the Fed’s October 2003 meeting, it announced that it would keep the federal funds rate at 1% for “a considerable period.” When the Fed lowered the rate to between 0% and 0.25% in December 2008, it added that “the Committee anticipates that weak economic conditions are likely to warrant exceptionally low levels of the federal funds rate for some time.” After working so hard to convince economic players that it will not tolerate inflation above 2%, the Fed must now convince the public that it will, but of course not too much! If it is successful,

this extraordinary form of expansionary monetary policy will lead to increased purchases of goods and services, compared to what they would have been with expected deflation. Also, by providing banks with lots of liquidity, it is hoping to encourage them to lend.

The Japanese economy provides an interesting modern example of a country that attempted quantitative easing. With a recessionary gap starting in the early 1990s and deflation in most years from 1995 on, Japan's central bank, the Bank of Japan, began to lower the call money rate (equivalent to the federal funds rate in the United States), reaching near zero by the late 1990s. With growth still languishing, Japan appeared to be in a traditional liquidity trap. In late 1999, the Bank of Japan announced that it would maintain a zero interest rate policy for the foreseeable future, and in March 2001 it officially began a policy of quantitative easing. In 2006, with the price level rising modestly, Japan ended quantitative easing and began increasing the call rate again. It should be noted that the government simultaneously engaged in expansionary fiscal policy.

How well did these policies work? The economy began to grow modestly in 2003, though deflation between 1% and 2% remained. Some researchers feel that the Bank of Japan ended quantitative easing too early. Also, delays in implementing the policy, as well as delays in restructuring the banking sector, exacerbated Japan's problems (OECD Economic Surveys, 2008; Spiegel, 2006).

Fed Chairman Bernanke and other Fed officials have argued that the Fed is also engaged in credit easing (Bernanke, 2009; Yellen, 2009). **Credit easing** is a strategy that involves the extension of central bank lending to influence more broadly the proper functioning of credit markets and to improve liquidity. The specific new credit facilities that the Fed has created were discussed in the Case in Point in the chapter on the nature and creation of money. In general, the Fed is hoping that these new credit facilities will improve liquidity in a variety of credit markets, ranging from those used by money market mutual funds to those involved in student and car loans.

Rational Expectations

One hypothesis suggests that monetary policy may affect the price level but not real GDP. The **rational expectations hypothesis** states that people use all available information to make forecasts about future economic activity and the price level, and they adjust their behavior to these forecasts.

Figure 26.6 uses the model of aggregate demand and aggregate supply to show the implications of the rational expectations argument for monetary policy. Suppose the economy is operating at Y_p , as illustrated by point A. An increase in the money supply boosts aggregate demand to AD_2 . In the analysis we have explored thus far, the shift in aggregate demand would move the economy to a higher level of real GDP and create an inflationary gap. That, in turn, would put upward pressure on wages and other prices, shifting the short-run aggregate supply curve to $SRAS_2$ and moving the economy to point B, closing the inflationary gap in the long run. The rational expectations hypothesis, however, suggests a quite different interpretation.

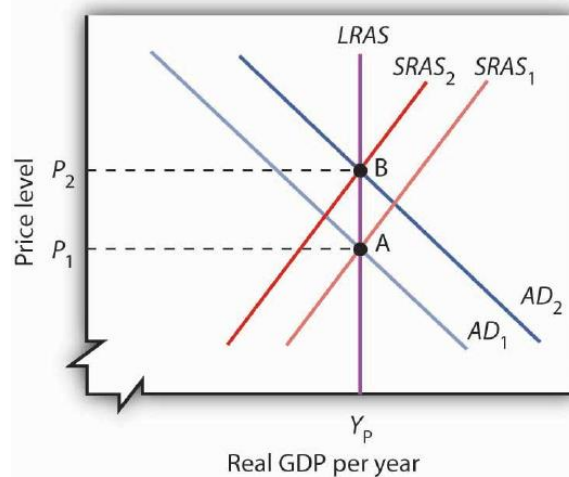


Figure 26.6 Monetary Policy and Rational Expectations Suppose the economy is operating at point A and that individuals have rational expectations. They calculate that an expansionary monetary policy undertaken at price level P_1 will raise prices to P_2 . They adjust their expectations—and wage demands—accordingly, quickly shifting the short-run aggregate supply curve to $SRAS_2$. The result is a movement along the long-run aggregate supply curve $LRAS$ to point B, with no change in real GDP.

Suppose people observe the initial monetary policy change undertaken when the economy is at point A and calculate that the increase in the money supply will ultimately drive the price level up to point B. Anticipating this change in prices, people adjust their behavior. For example, if the increase in the price level from P_1 to P_2 is a 10% change, workers will anticipate that the prices they pay will rise 10%, and they will demand 10% higher wages. Their employers, anticipating that the prices they will receive will also rise, will agree to pay those higher wages. As nominal wages increase, the short-run aggregate supply curve *immediately* shifts to $SRAS_2$. The result is an upward movement along the long-run aggregate supply curve, $LRAS$. There is no change in real GDP. The monetary policy has no effect, other than its impact on the price level. This rational expectations argument relies on wages and prices being sufficiently flexible—not sticky, as described in an earlier chapter—so that the change in expectations will allow the short-run aggregate supply curve to shift quickly to $SRAS_2$.

One important implication of the rational expectations argument is that a contractionary monetary policy could be painless. Suppose the economy is at point B in Figure 26.6, and the Fed reduces the money supply in order to shift the aggregate demand curve back to AD_1 . In the model of aggregate demand and aggregate supply, the result would be a recession. But in a rational expectations world, people's expectations change, the short-run aggregate supply immediately shifts to the right, and the economy moves painlessly down its long-run aggregate supply curve $LRAS$ to point A. Those who support the rational expectations hypothesis, however, also tend to argue that monetary policy should not be used as a tool of stabilization policy.

For some, the events of the early 1980s weakened support for the rational expectations hypothesis; for others, those same events strengthened support for this hypothesis. As we saw in the introduction to an earlier chapter, in 1979 President Jimmy Carter appointed Paul Volcker as Chairman of the Federal Reserve and pledged his full support for whatever the Fed might do to contain inflation. Mr. Volcker made it clear that the Fed was going to slow money growth and boost interest rates. He acknowledged that this policy would have costs but said that the Fed would stick to it as long as necessary to control inflation. Here was a monetary policy that was clearly announced and carried out as advertised. But the policy brought on the most severe recession since the Great Depression—a result that seems inconsistent with the rational expectations argument that changing expectations would prevent such a policy from having a substantial effect on real GDP.

Others, however, argue that people were aware of the Fed's pronouncements but were skeptical about whether the anti-inflation effort would persist, since the Fed had not vigorously fought inflation in the late 1960s and the 1970s. Against this history, people adjusted their estimates of inflation downward slowly. In essence, the recession occurred because people were surprised that the Fed was serious about fighting inflation.

Regardless of where one stands on this debate, one message does seem clear: once the Fed has proved it is serious about maintaining price stability, doing so in the future gets easier. To put this in concrete terms, Volcker's fight made Greenspan's work easier, and Greenspan's legacy of low inflation should make Bernanke's easier.

Key Takeaways

- Macroeconomic policy makers must contend with recognition, implementation, and impact lags.
- Potential targets for macroeconomic policy include interest rates, money growth rates, and the price level or expected rates of change in the price level.
- Even if a central bank is structured to be independent of political pressure, its officers are likely to be affected by such pressure.
- To counteract liquidity traps, central banks have used quantitative-easing and credit-easing strategies.
- No central bank can know in advance how its policies will affect the economy; the rational expectations hypothesis predicts that central bank actions will affect the money supply and the price level but not the real level of economic activity.

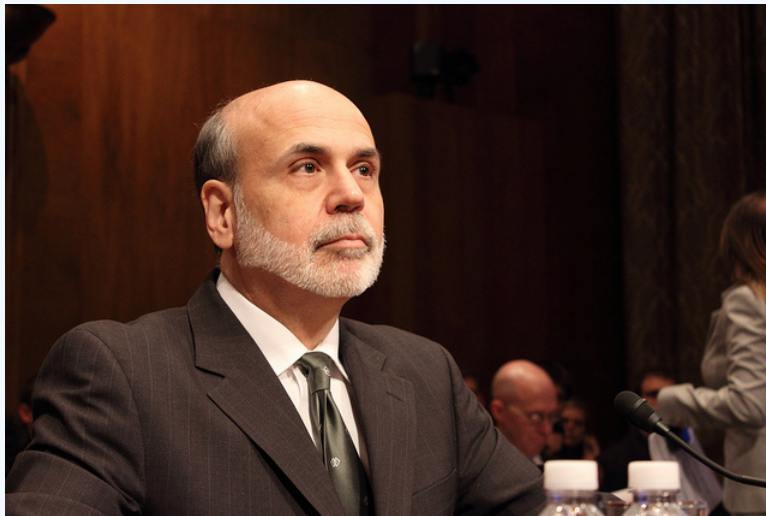
Try It!

The scenarios below describe the U.S. recession and recovery in the early 1990s. Identify the lag that may have contributed to the difficulty in using monetary policy as a tool of economic stabilization.

1. The U.S. economy entered into a recession in July 1990. The Fed countered with expansionary monetary policy in October 1990, ultimately lowering the federal funds rate from 8% to 3% in 1992.
2. Investment began to increase, although slowly, in early 1992, and surged in 1993.

Case in Point: Targeting Monetary Policy

Figure 26.7



Medill DC – [Bernanke](#) – CC BY 2.0.

Ben Bernanke, the chairman of the Federal Reserve Board, is among a growing group of economists who (at least under normal macroeconomic circumstances!) advocate targeting as an approach to monetary policy. The idea, first proposed in 1993 by Stanford University economist John Taylor, calls for the central bank to set an inflation target and, if the actual rate is above or below it, raise or lower the federal funds rate.

The approach would be a change from the policy carried out under Alan Greenspan, who chaired the board from 1987 to 2006. Mr. Greenspan, who opposed targeting, favors a discretionary approach, one that some critics (and admirers) have called a “seat-of-the-pants” approach to monetary policy.

Targeting would not, according to Mr. Bernanke, be entirely formulaic, replacing the judgment of the Open Market Committee with a rigid rule. Mr. Bernanke has noted, for example, that if the inflation were to increase as a result of a supply side shock (such as an increase in oil prices), then an automatic increase in the federal funds rate would not be appropriate.

One danger of using the current inflation rate as a target is that it might be destabilizing. After all, the current rate is actually the rate for the past month or past several months. Adjusting the federal funds rate to past inflation could, given the inherent recognition and impact lags of monetary policy, easily lead to a worsening of the business cycle. Imagine that past inflation has increased as a result of a much earlier increase in the money supply. That inflation might already be correcting itself by the time a tightening effort takes hold in the economy. It thus could cause a contraction.

Bernanke has said that his preferred target is the expected rate of increase for the next year in the price index for consumer goods and services, excluding food and energy prices. That would avoid the danger of relying on previous inflation rates. He has said that his “comfort zone” for expected inflation is between 1% and 2%.

The central banks of Australia, Brazil, Canada, Great Britain, New Zealand, South Korea, and Sweden adopted targeting. Japan and the United States did not. A study by Goldman Sachs, the investment consulting and management firm, examined the performance of countries that did and did not engage in targeting. It found that countries that used targeting had more stable interest rates and sustained steady growth. Japan and the United States had much more volatile stock and bond markets. In short, the results of the study tended to support the practice of targeting inflation.

Sources: Peter Coy, “What’s the Fuss over Inflation Targeting?” *Business Week* 3958 (November 7, 2005): 34; Justin Fox, “Who Will Replace Greenspan? Who Cares?” *Fortune* 152, no. 9 (October 31, 2005): 114.

Answers to Try It! Problems

1. The recognition lag: the Fed did not seem to “recognize” that the economy was in a recession until several months after the recession began.
2. The impact lag: investment did not pick up quickly after interest rates were reduced. Alternatively, it could be attributed to the expansionary monetary policy’s not having its desired effect, at least initially, on investment.

¹See, for example, Alberto Alesina and Lawrence H. Summers, “Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence,” *Journal of Money, Credit, and Banking* 25, no. 2 (May 1993): 151–62.

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10.3: Monetary Policy and the Equation of Exchange

Learning Objective

1. Explain the meaning of the equation of exchange, $MV = PY$, and tell why it must hold true.
2. Discuss the usefulness of the quantity theory of money in explaining the behavior of nominal GDP and inflation in the long run.
3. Discuss why the quantity theory of money is less useful in analyzing the short run.

So far we have focused on how monetary policy affects real GDP and the price level in the short run. That is, we have examined how it can be used—however imprecisely—to close recessionary or inflationary gaps and to stabilize the price level. In this section, we will explore the relationship between money and the economy in the context of an equation that relates the money supply directly to nominal GDP. As we shall see, it also identifies circumstances in which changes in the price level are directly related to changes in the money supply.

The Equation of Exchange

We can relate the money supply to the aggregate economy by using the equation of exchange:

Equation 26.1

$$MV = \text{nominal GDP}$$

The [equation of exchange](#) shows that the money supply M times its velocity V equals nominal GDP. [Velocity](#) is the number of times the money supply is spent to obtain the goods and services that make up GDP during a particular time period.

To see that nominal GDP is the price level multiplied by real GDP, recall from an earlier chapter that the implicit price deflator P equals nominal GDP divided by real GDP:

Equation 26.2

$$P = \frac{\text{Nominal GDP}}{\text{Real GDP}}$$

Multiplying both sides by real GDP, we have

Equation 26.3

$$\text{Nominal GDP} = P \times \text{real GDP}$$

Letting Y equal real GDP, we can rewrite the equation of exchange as

Equation 26.4

$$MV = PY$$

We shall use the equation of exchange to see how it represents spending in a hypothetical economy that consists of 50 people, each of whom has a car. Each person has \$10 in cash and no other money. The money supply of this economy is thus \$500. Now suppose that the sole economic activity in this economy is car washing. Each person in the economy washes one other person's car once a month, and the price of a car wash is \$10. In one month, then, a total of 50 car washes are produced at a price of \$10 each. During that month, the money supply is spent once.

Applying the equation of exchange to this economy, we have a money supply M of \$500 and a velocity V of 1. Because the only good or service produced is car washing, we can measure real GDP as the number of car washes. Thus Y equals 50 car washes. The price level P is the price of a car wash: \$10. The equation of exchange for a period of 1 month is

$$\$500 \times 1 = \$10 \times 50$$

Now suppose that in the second month everyone washes someone else's car again. Over the full two-month period, the money supply has been spent twice—the velocity over a period of two months is 2. The total output in the economy is \$1,000—100 car

washes have been produced over a two-month period at a price of \$10 each. Inserting these values into the equation of exchange, we have

$$\$500 \times 2 = \$10 \times 100$$

Suppose this process continues for one more month. For the three-month period, the money supply of \$500 has been spent three times, for a velocity of 3. We have

$$\$500 \times 3 = \$10 \times 150$$

The essential thing to note about the equation of exchange is that it always holds. That should come as no surprise. The left side, MV , gives the money supply times the number of times that money is spent on goods and services during a period. It thus measures total spending. The right side is nominal GDP. But that is a measure of total spending on goods and services as well. Nominal GDP is the value of all final goods and services produced during a particular period. Those goods and services are either sold or added to inventory. If they are sold, then they must be part of total spending. If they are added to inventory, then some firm must have either purchased them or paid for their production; they thus represent a portion of total spending. In effect, the equation of exchange says simply that total spending on goods and services, measured as MV , equals total spending on goods and services, measured as PY (or nominal GDP). The equation of exchange is thus an identity, a mathematical expression that is true by definition.

To apply the equation of exchange to a real economy, we need measures of each of the variables in it. Three of these variables are readily available. The Department of Commerce reports the price level (that is, the implicit price deflator) and real GDP. The Federal Reserve Board reports M2, a measure of the money supply. For the second quarter of 2008, the values of these variables at an annual rate were

$$M = \$7,635.4 \text{ billion}$$

$$P = 1.22$$

$$Y = 11,727.4 \text{ billion}$$

To solve for the velocity of money, V , we divide both sides of Equation 26.4 by M :

Equation 26.5

$$V = \frac{PY}{M}$$

Using the data for the second quarter of 2008 to compute velocity, we find that V then was equal to 1.87. A velocity of 1.87 means that the money supply was spent 1.87 times in the purchase of goods and services in the second quarter of 2008.

Money, Nominal GDP, and Price-Level Changes

Assume for the moment that velocity is constant, expressed as $\bar{V}$. Our equation of exchange is now written as

Equation 26.6

$$M\bar{V} = PY$$

A constant value for velocity would have two important implications:

1. Nominal GDP could change *only* if there were a change in the money supply. Other kinds of changes, such as a change in government purchases or a change in investment, could have no effect on nominal GDP.
2. A change in the money supply would always change nominal GDP, and by an equal percentage.

In short, if velocity were constant, a course in macroeconomics would be quite simple. The quantity of money would determine nominal GDP; nothing else would matter.

Indeed, when we look at the behavior of economies over long periods of time, the prediction that the quantity of money determines nominal output holds rather well. Figure 26.8 compares long-term averages in the growth rates of M2 and nominal GNP in the United States for more than a century. The lines representing the two variables do seem to move together most of the time, suggesting that velocity is constant when viewed over the long run.

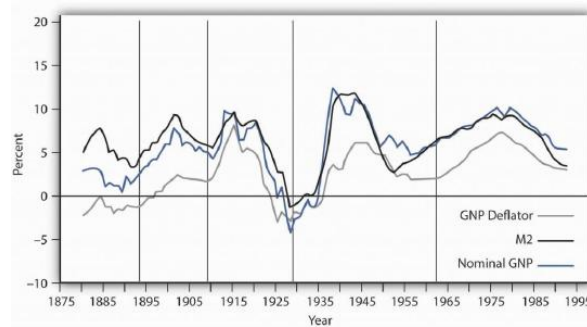


Figure 26.8 Inflation, M2 Growth, and GDP Growth The chart shows the behavior of price-level changes, the growth of M2, and the growth of nominal GDP using 10-year moving averages. Viewed in this light, the relationship between money growth and nominal GDP seems quite strong.

Source: William G. Dewald, “Historical U.S. Money Growth, Inflation, and Inflation Credibility,” Federal Reserve Bank of St. Louis Review 80:6 (November/December 1998): 13-23.

Moreover, price-level changes also follow the same pattern that changes in M2 and nominal GNP do. Why is this?

We can rewrite the equation of exchange, $M\bar{V} = PY$, in terms of percentage rates of change. When two products, such as $M\bar{V}$ and PY , are equal, and the variables themselves are changing, then the sums of the percentage rates of change are approximately equal:

Equation 26.7

$$\% \Delta M + \% \Delta V \cong \% \Delta P + \% \Delta Y$$

The Greek letter Δ (delta) means “change in.” Assume that velocity is constant in the long run, so that $\% \Delta V = 0$. We also assume that real GDP moves to its potential level, Y_p , in the long run. With these assumptions, we can rewrite Equation 26.7 as follows:

Equation 26.8

$$\% \Delta M \cong \% \Delta P + \% \Delta Y_p$$

Subtracting $\% \Delta Y_p$ from both sides of Equation 26.8, we have the following:

Equation 26.9

$$\% \Delta M - \% \Delta Y_p \cong \% \Delta P$$

Equation 26.9 has enormously important implications for monetary policy. It tells us that, in the long run, the rate of inflation, $\% \Delta P$, equals the difference between the rate of money growth and the rate of increase in potential output, $\% \Delta Y_p$, given our assumption of constant velocity. Because potential output is likely to rise by at most a few percentage points per year, the rate of money growth will be close to the rate of inflation in the long run.

Several recent studies that looked at all the countries on which they could get data on inflation and money growth over long periods found a very high correlation between growth rates of the money supply and of the price level for countries with high inflation rates, but the relationship was much weaker for countries with inflation rates of less than 10%¹. These findings support the [quantity theory of money](#), which holds that in the long run the price level moves in proportion with changes in the money supply, at least for high-inflation countries.

Why the Quantity Theory of Money Is Less Useful in Analyzing the Short Run

The stability of velocity in the long run underlies the close relationship we have seen between changes in the money supply and changes in the price level. But velocity is not stable in the short run; it varies significantly from one period to the next. Figure 26.9 shows annual values of the velocity of M2 from 1970 through 2009. Velocity is quite variable, so other factors must affect economic activity. Any change in velocity implies a change in the demand for money. For analyzing the effects of monetary policy from one period to the next, we apply the framework that emphasizes the impact of changes in the money market on aggregate demand.

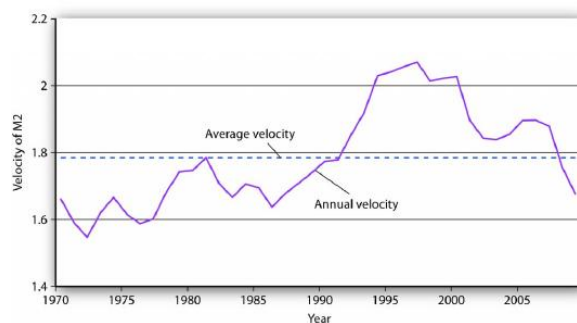


Figure 26.9 The Velocity of M2, 1970–2009 The annual velocity of M2 varied about an average of 1.78 between 1970 and 2009.

Source: Economic Report of the President, 2010, Tables B-1 and B-69.

The factors that cause velocity to fluctuate are those that influence the demand for money, such as the interest rate and expectations about bond prices and future price levels. We can gain some insight about the demand for money and its significance by rearranging terms in the equation of exchange so that we turn the equation of exchange into an equation for the demand for money. If we multiply both sides of Equation 26.1 by the reciprocal of velocity, $1/V$, we have this equation for money demand:

Equation 26.10

$$M = \frac{1}{V}PY$$

The equation of exchange can thus be rewritten as an equation that expresses the demand for money as a percentage, given by $1/V$, of nominal GDP. With a velocity of 1.87, for example, people wish to hold a quantity of money equal to 53.4% ($1/1.87$) of nominal GDP. Other things unchanged, an increase in money demand reduces velocity, and a decrease in money demand increases velocity.

If people wanted to hold a quantity of money equal to a larger percentage of nominal GDP, perhaps because interest rates were low, velocity would be a smaller number. Suppose, for example, that people held a quantity of money equal to 80% of nominal GDP. That would imply a velocity of 1.25. If people held a quantity of money equal to a smaller fraction of nominal GDP, perhaps owing to high interest rates, velocity would be a larger number. If people held a quantity of money equal to 25% of nominal GDP, for example, the velocity would be 4.

As another example, in the chapter on financial markets and the economy, we learned that money demand falls when people expect inflation to increase. In essence, they do not want to hold money that they believe will only lose value, so they turn it over faster, that is, velocity rises. Expectations of deflation lower the velocity of money, as people hold onto money because they expect it will rise in value.

In our first look at the equation of exchange, we noted some remarkable conclusions that would hold if velocity were constant: a given percentage change in the money supply M would produce an equal percentage change in nominal GDP, and no change in nominal GDP could occur without an equal percentage change in M . We have learned, however, that velocity varies in the short run. Thus, the conclusions that would apply if velocity were constant must be changed.

First, we do not expect a given percentage change in the money supply to produce an equal percentage change in nominal GDP. Suppose, for example, that the money supply increases by 10%. Interest rates drop, and the quantity of money demanded goes up. Velocity is likely to decline, though not by as large a percentage as the money supply increases. The result will be a reduction in the degree to which a given percentage increase in the money supply boosts nominal GDP.

Second, nominal GDP could change even when there is no change in the money supply. Suppose government purchases increase. Such an increase shifts the aggregate demand curve to the right, increasing real GDP and the price level. That effect would be impossible if velocity were constant. The fact that velocity varies, and varies positively with the interest rate, suggests that an increase in government purchases could boost aggregate demand and nominal GDP. To finance increased spending, the government borrows money by selling bonds. An increased supply of bonds lowers their price, and that means higher interest rates. The higher interest rates produce the increase in velocity that must occur if increased government purchases are to boost the price level and real GDP.

Just as we cannot assume that velocity is constant when we look at macroeconomic behavior period to period, neither can we assume that output is at potential. With both V and Y in the equation of exchange variable, in the short run, the impact of a change in the money supply on the price level depends on the degree to which velocity and real GDP change.

In the short run, it is not reasonable to assume that velocity and output are constants. Using the model in which interest rates and other factors affect the quantity of money demanded seems more fruitful for understanding the impact of monetary policy on economic activity in that period. However, the empirical evidence on the long-run relationship between changes in money supply and changes in the price level that we presented earlier gives us reason to pause. As Federal Reserve Governor from 1996 to 2002 Laurence H. Meyer put it: “I believe monitoring money growth has value, even for central banks that follow a disciplined strategy of adjusting their policy rate to ongoing economic developments. The value may be particularly important at the extremes: during periods of very high inflation, as in the late 1970s and early 1980s in the United States ... and in deflationary episodes” (Meyer, 2001).

It would be a mistake to allow short-term fluctuations in velocity and output to lead policy makers to completely ignore the relationship between money and price level changes in the long run.

Key Takeaways

- The equation of exchange can be written $MV = PY$.
- When M , V , P , and Y are changing, then $\% \Delta M + \% \Delta V = \% \Delta P + \% \Delta Y$, where Δ means “change in.”
- In the long run, V is constant, so $\% \Delta V = 0$. Furthermore, in the long run Y tends toward Y_p , so $\% \Delta M = \% \Delta P$.
- In the short run, V is not constant, so changes in the money supply can affect the level of income.

Try It!

The Case in Point on velocity in the Confederacy during the Civil War shows that, assuming real GDP in the South was constant, velocity rose. What happened to money demand? Why did it change?

Case in Point: Velocity and the Confederacy

Figure 26.10



Elycefeliz – [Confederate 100 Dollar Bill](#) – CC BY-NC-ND 2.0.

The Union and the Confederacy financed their respective efforts during the Civil War largely through the issue of paper money. The Union roughly doubled its money supply through this process, and the Confederacy printed enough “Confederates” to increase the money supply in the South 20-fold from 1861 to 1865. That huge increase in the money supply boosted the price level in the Confederacy dramatically. It rose from an index of 100 in 1861 to 9,200 in 1865.

Estimates of real GDP in the South during the Civil War are unavailable, but it could hardly have increased very much. Although production undoubtedly rose early in the period, the South lost considerable capital and an appalling number of men killed in battle. Let us suppose that real GDP over the entire period remained constant. For the price level to rise 92-fold with a 20-fold increase in the money supply, there must have been a 4.6-fold increase in velocity. People in the South must have reduced their demand for Confederates.

An account of an exchange for eggs in 1864 from the diary of Mary Chestnut illustrates how eager people in the South were to part with their Confederate money. It also suggests that other commodities had assumed much greater relative value:

“She asked me 20 dollars for five dozen eggs and then said she would take it in “Confederate.” Then I would have given her 100 dollars as easily. But if she had taken my offer of yarn! I haggle in yarn for the millionth part of a thread! ... When they ask for Confederate money, I never stop to chafer [bargain or argue]. I give them 20 or 50 dollars cheerfully for anything.”

Sources: C. Vann Woodward, ed., *Mary Chestnut's Civil War* (New Haven, CT: Yale University Press, 1981), 749. Money and price data from E. M. Lerner, “Money, Prices, and Wages in the Confederacy, 1861–1865,” *Journal of Political Economy* 63 (February 1955): 20–40.

Answer to Try It! Problem

People in the South must have reduced their demand for money. The fall in money demand was probably due to the expectation that the price level would continue to rise. In periods of high inflation, people try to get rid of money quickly because it loses value rapidly.

¹For example, one study examined data on 81 countries using inflation rates averaged for the period 1980 to 1993 (John R. Moroney, “Money Growth, Output Growth, and Inflation: Estimation of a Modern Quantity Theory,” *Southern Economic Journal* 69, no. 2 [2002]: 398–413) while another examined data on 160 countries over the period 1969–1999 (Paul De Grauwe and Magdalena Polan, “Is Inflation Always and Everywhere a Monetary Phenomenon?” *Scandinavian Journal of Economics* 107, no. 2 [2005]: 239–59).

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10.4: Review and Practice

Summary

Part of the Fed's power stems from the fact that it has no legislative mandate to seek particular goals. That leaves the Fed free to set its own goals. In recent years, its primary goal has seemed to be the maintenance of an inflation rate below 2% to 3%. Given success in meeting that goal, the Fed has used its tools to stimulate the economy to close recessionary gaps. Once the Fed has made a choice to undertake an expansionary or contractionary policy, we can trace the impact of that policy on the economy.

There are a number of problems in the use of monetary policy. These include various types of lags, the issue of the choice of targets in conducting monetary policy, political pressures placed on the process of policy setting, and uncertainty as to how great an impact the Fed's policy decisions have on macroeconomic variables. We highlighted the difficulties for monetary policy if the economy is in or near a liquidity trap and discussed the use of quantitative easing and credit easing in such situations. If people have rational expectations and respond to those expectations in their wage and price choices, then changes in monetary policy may have no effect on real GDP.

We saw in this chapter that the money supply is related to the level of nominal GDP by the equation of exchange. A crucial issue in that relationship is the stability of the velocity of money and of real GDP. If the velocity of money were constant, nominal GDP could change only if the money supply changed, and a change in the money supply would produce an equal percentage change in nominal GDP. If velocity were constant and real GDP were at its potential level, then the price level would change by about the same percentage as the money supply. While these predictions seem to hold up in the long run, there is less support for them when we look at macroeconomic behavior in the short run. Nonetheless, policy makers must be mindful of these long-run relationships as they formulate policies for the short run.

Concept Problems

1. Suppose the Fed were required to conduct monetary policy so as to hold the unemployment rate below 4%, the goal specified in the Humphrey–Hawkins Act. What implications would this have for the economy?
2. The statutes of the recently established European Central Bank (ECB) state that its primary objective is to maintain price stability. How does this charter differ from that of the Fed? What significance does it have for monetary policy?
3. Do you think the Fed should be given a clearer legislative mandate concerning macroeconomic goals? If so, what should it be?
4. Referring to the Case in Point on targeting, what difference does it make whether the target is the inflation rate of the past year or the expected inflation rate over the next year?
5. In a speech in January 1995¹, Federal Reserve Chairman Alan Greenspan used a transportation metaphor to describe some of the difficulties of implementing monetary policy. He referred to the criticism levied against the Fed for shifting in 1994 to an anti-inflation, contractionary policy when the inflation rate was still quite low:

“To successfully navigate a bend in the river, the barge must begin the turn well before the bend is reached. Even so, currents are always changing and even an experienced crew cannot foresee all the events that might occur as the river is being navigated. A year ago, the Fed began its turn (a shift toward an expansionary monetary policy), and it was successful.”

Mr. Greenspan was referring, of course, to the problem of lags. What kind of lag do you think he had in mind? What do you suppose the reference to changing currents means?

6. In a speech in August 1999 (Greenspan, 1999), Mr. Greenspan said,

We no longer have the luxury to look primarily to the flow of goods and services, as conventionally estimated, when evaluating the macroeconomic environment in which monetary policy must function. There are important—but extremely difficult—questions surrounding the behavior of asset prices and the implications of this behavior for the decisions of households and businesses.

The asset price that Mr. Greenspan was referring to was the U.S. stock market, which had been rising sharply in the weeks and months preceding this speech. Inflation and unemployment were both low at that time. What issues concerning the conduct of

monetary policy was Mr. Greenspan raising?

7. Suppose we observed an economy in which changes in the money supply produce no changes whatever in nominal GDP. What could we conclude about velocity?
8. Suppose the price level were falling 10% per day. How would this affect the demand for money? How would it affect velocity? What can you conclude about the role of velocity during periods of rapid price change?
9. Suppose investment increases and the money supply does not change. Use the model of aggregate demand and aggregate supply to predict the impact of such an increase on nominal GDP. Now what happens in terms of the variables in the equation of exchange?
10. The text notes that prior to August 1997 (when it began specifying a target value for the federal funds rate), the FOMC adopted directives calling for the trading desk at the New York Federal Reserve Bank to increase, decrease, or maintain the existing degree of pressure on reserve positions. On the meeting dates given in the first column, the FOMC voted to decrease pressure on reserve positions (that is, adopt a more expansionary policy). On the meeting dates given in the second column, it voted to increase reserve pressure:

July 5–6, 1995	February 3–4, 1994
December 19, 1995	January 31–February 1, 1995
January 30–31, 1996	March 25, 1997

Recent minutes of the FOMC can be found at the Federal Reserve Board of Governors website. Pick one of these dates on which a decrease in reserve pressure was ordered and one on which an increase was ordered and find out why that particular policy was chosen.

11. Since August 1997, the Fed has simply set a specific target for the federal funds rate. The four dates below show the first four times after August 1997 that the Fed voted to set a new target for the federal funds rate on the following dates:

September 29, 1998	November 17, 1998
June 29, 1999	August 24, 1999

Pick one of these dates and find out why it chose to change its target for the federal funds rate on that date.

12. Four recent meetings at which the Fed changed the target for the federal funds rate are shown below.

January 30, 2008	March 18, 2008
October 8, 2008	October 29, 2008

Pick one of these dates and find out why it chose to change its target for the federal funds rate on that date.

13. The text notes that a 10% increase in the money supply may not increase the price level by 10% in the short run. Explain why.
14. Trace the impact of an expansionary monetary policy on bond prices, interest rates, investment, the exchange rate, net exports, real GDP, and the price level. Illustrate your analysis graphically.
15. Trace the impact of a contractionary monetary policy on bond prices, interest rates, investment, the exchange rate, net exports, real GDP, and the price level. Illustrate your analysis graphically.

Numerical Problems

1. Here are annual values for M2 and for nominal GDP (all figures are in billions of dollars) for the mid-1990s.

Year	M2	Nominal GDP
1993	3,482.0	\$6,657.4
1994	3,498.1	7,072.2
1995	3,642.1	7,397.7
1996	3,820.5	7,816.9
1997	4,034.1	8,304.3

1. Compute the velocity for each year.
2. Compute the fraction of nominal GDP that was being held as money.
3. What is your conclusion about the stability of velocity in this five-year period?

2. Here are annual values for M2 and for nominal GDP (all figures are in billions of dollars) for the mid-2000s.

Year	M2	Nominal GDP
2003	6,055.5	\$10,960.8
2004	6,400.7	11,685.9
2005	6,659.7	12,421.9
2006	7,012.3	13,178.4
2007	7,404.3	13,807.5

1. Compute the velocity for each year.
2. Compute the fraction of nominal GDP that was being held as money.
3. What is your conclusion about the stability of velocity in this five-year period?

3. The following data show M1 for the years 1993 to 1997, respectively (all figures are in billions of dollars): 1,129.6; 1,150.7; 1,127.4; 1,081.3; 1,072.5.

1. Compute the M1 velocity for these years. (Nominal GDP for these years is shown in problem 1.)
2. If you were going to use a money target, would M1 or M2 have been preferable during the 1990s? Explain your reasoning.

4. The following data show M1 for the years 2003 to 2007, respectively (all figures are in billions of dollars): 1,306.1; 1,376.3; 1,374.5; 1,366.5; 1,366.5

1. Compute the M1 velocity for these years. (Nominal GDP for these years is shown in problem 2.)
2. If you were going to use a money target, would M1 or M2 have been preferable during the 2000s? Explain your reasoning.

5. Assume a hypothetical economy in which the velocity is constant at 2 and real GDP is always at a constant potential of \$4,000. Suppose the money supply is \$1,000 in the first year, \$1,100 in the second year, \$1,200 in the third year, and \$1,300 in the fourth year.

1. Using the equation of exchange, compute the price level in each year.
2. Compute the inflation rate for each year.
3. Explain why inflation varies, even though the money supply rises by \$100 each year.
4. If the central bank wanted to keep inflation at zero, what should it have done to the money supply each year?
5. If the central bank wanted to keep inflation at 10% each year, what money supply should it have targeted in each year?

6. Suppose the velocity of money is constant and potential output grows by 3% per year. By what percentage should the money supply grow in order to achieve the following inflation rate targets?

1. 0%
2. 1%

3. 2%

7. Suppose the velocity of money is constant and potential output grows by 5% per year. For each of the following money supply growth rates, what will the inflation rate be?

1. 4%

2. 5%

3. 6%

8. Suppose that a country whose money supply grew by about 20% a year over the long run had an annual inflation rate of about 20% and that a country whose money supply grew by about 50% a year had an annual inflation rate of about 50%. Explain this finding in terms of the equation of exchange.

¹Speech by Alan Greenspan before the Board of Directors of the National Association of Home Builders, January 28, 1995.

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