GLOBAL EDITION

3E MACROECONOMICS

Daron Acemoglu
David Laibson
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Dedication

With love for Annika, Aras, Arda, Eli,
Greta, Mason, Max, and Noah,
who inspire us every day.

About the Authors

Daron Acemoglu is an Institute Professor in the Department of Economics at the Massachusetts Institute of Technology. He has received a B.A. in economics from the University of York, 1989; an M.Sc. in mathematical economics and econometrics from the London School of Economics, 1990; and a Ph.D. in economics from the London School of Economics in 1992.

He is an elected fellow of the National Academy of Sciences, the American Academy of Arts and Sciences, the Econometric Society, the European Economic Association, and the Society of Labor Economists. He has received numerous awards and fellowships, including the inaugural T. W. Schultz Prize from the University of Chicago in 2004, the inaugural Sherwin Rosen Award for outstanding contribution to labor economics in 2004, the Distinguished Science Award from the Turkish Sciences Association in 2006, the John von Neumann Award, Rajk College, Budapest, in 2007, the Carnegie Fellowship in 2017, the Jean-Jacques Laffont Prize in 2018, and the Global Economy Prize in 2019.

He was also the recipient of the John Bates Clark Medal in 2005, awarded every two years to the best economist in the United States under the age of 40 by the American Economic Association, the Erwin Plein Nemmers Prize, awarded every two years for work of lasting significance in economics, and the BBVA Frontiers of Knowledge Award in Economics, Finance and Management. He holds honorary doctorates from the University of Utrecht, Bosporus University, University of Athens, Bilkent University, University of Bath, Ecole Normale Superieure, Saclay Paris, and the London Business School.

His research interests include political economy, economic development and growth, human capital theory, growth theory, innovation, inequality, search theory, network economics, and learning.

His books include *Economic Origins of Dictatorship and Democracy* (jointly with James A. Robinson), which was awarded the Woodrow Wilson and the William Riker prizes, *Introduction to Modern Economic Growth,* and *Why Nations Fail: The Origins of Power, Prosperity, and Poverty* (jointly with James A. Robinson), which has become a *New York Times* bestseller, and *The Narrow Corridor: States, Societies, and the Fate of Liberty* (jointly written with James A. Robinson).

David Laibson is the Robert I. Goldman Professor of Economics at Harvard University and the Faculty Dean of Lowell House. He is also a member of the National Bureau of Economic Research, where he is Research Associate in the Asset Pricing, Economic Fluctuations, and Aging Working Groups and where he co-directs the National Institute of Aging Roybal Center for Behavior Change in Health. His research focuses on the topics of behavioral economics, intertemporal choice, macroeconomics, and household finance, and he leads Harvard University's Foundations of Human Behavior Initiative. He serves on the Pension Research Council (Wharton), Harvard's Pension Investment Committee, and the Board of the Russell Sage Foundation. He has previously served on the boards of the Health and Retirement Study (National Institutes of Health) and the Academic Research Council of the Consumer Financial Protection Bureau. He has also previously served as the Chair of the Department of Economics at Harvard University. He is a recipient of a Marshall Scholarship, a Fellow of the Econometric Society, and an elected member of the American Academy of Arts and Sciences and the National Academy of Sciences. He is also a recipient of the T. W. Schultz Prize from the University of Chicago and the TIAA-CREF Paul A. Samuelson Award for Outstanding Scholarly Writing on Lifelong Financial Security. Laibson holds degrees from Harvard University (A.B. in economics), the London School of Economics (M.Sc. in econometrics and mathematical economics), and the Massachusetts Institute of Technology (Ph.D. in economics). He received his Ph.D. in 1994 and has taught at Harvard since then. In recognition of his teaching excellence, he has been awarded Harvard's Phi Beta Kappa Prize and a Harvard College Professorship.

John A. List is the Kenneth C. Griffin Distinguished Service Professor in Economics at the University of Chicago. He received his B.S. in economics at the University of Wisconsin-Stevens Point, and Ph.D. in economics at the University of Wyoming. List joined the UChicago faculty in 2005, and served as Chairman of the Department of Economics from 2012–2018. Prior to joining the University of Chicago, he was a professor at the University of Central Florida, University of Arizona, and University of Maryland.

List was elected a Member of the American Academy of Arts and Sciences in 2011, and a Fellow of the Econometric Society in 2015. He also received the Arrow Prize for Senior Economists in 2008, the Kenneth Galbraith Award in 2010, the Yrjo Jahnsson Lecture Prize in 2012, and the Klein Lecture Prize in 2016. He received an honorary doctorate from Tilburg University in 2014, and from the University of Ottawa in 2017. John was also named a Top 50 Innovator in the Non-Profit Times for 2015 and 2016 for his work on charitable giving. He also served in the White House on the Council of Economic Advisers from 2002–2003, and is a Research Associate at the NBER.

His research focuses on questions in microeconomics, with a particular emphasis on using field experiments to address both positive and normative issues. For decades his field experimental research has focused on issues related to the inner-workings of markets, the effects of various incentives schemes on market equilibria and allocations, how behavioral economics can augment the standard economic model, on early childhood education and interventions, and most recently on the gender earnings gap in the gig economy (using evidence from rideshare drivers).

His research includes over 200 peer-reviewed journal articles and several published books, including the 2013 international best-seller, *The Why Axis: Hidden Motives and the Undiscovered Economics of Everyday Life* (with Uri Gneezy).

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WEB Chapter 1 Financial Decision Making
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Preface

What's New in the Third Edition?

In our new edition of *Macroeconomics*, in addition to updating the existing data and empirical features, we have added Evidence-Based Economics Problems at the end of each chapter. These exercises provide students meaningful practice in analyzing and interpreting real-world economic questions. Here are some examples of other changes in the edition. Throughout this revision, we updated the data and charts to the most recent releases and made the text current for the recent global recession, the COVID-19 pandemic, and the 2020 election. We also undertook a number of more specific changes and added various new materials as we detail next.

- In Chapter 1, we've added new coverage on how to examine the economic impacts of COVID-19 through positive and normative lenses. We also discuss the trade-offs between health and economic output during the COVID-19 crisis. New Evidence-Based Economics Problems focus on the opportunity cost of social media, higher education, and going to a movie.
- In Chapter 4, we tell the story of how stay-at-home orders in 2020 impacted the demand for gasoline. A new Letting the Data Speak section profiles how the price of crude oil temporarily fell below $0 per barrel.
- In Chapter 5, we explore the macroeconomic indicators related to the COVID-19 recession. A new Evidence-Based Economics Problem highlights the national income accounting identity.
- Chapter 6 includes new Evidence-Based Economics Problems on efficiency and determinants of cross-country differences in GDP per capita.
- Chapter 7 features new Evidence-Based Economics Problems on GDP growth and investment into human capital, physical capital, and technology.
- In Chapter 8, a new Evidence-Based Economics Problem examines whether economic development is tied to climate.
- In Chapter 9, we added a new Evidence-Based Economics section about wages and employment during the COVID-19 pandemic. A new Letting the Data Speak feature profiles racial discrimination in the labor market. An updated "Luddites and Robots" Choice and Consequence feature explores future implications of AI on employment. New Evidence-Based Economics Problems assess downward rage rigidity and labor market contractions.
- In Chapter 10, we examine savings rate and bank failures during the COVID-19 recession and include a new Evidence-Based Economics Problem on bank failures.
- In Chapter 11, we explore the Fed's reaction to the COVID-19 recession. Our new treatment of monetary policy emphasizes interest on reserves (IOR), which is now the key mechanism that the Fed uses to pin down the federal funds rate. A new Letting the Data Speak section includes research on inflation expectations. The Evidence-Based Economics Problem examines the quantity theory of money.
- In Chapter 12, we offer an updated and expanded discussion on the causes of recessions and a new Evidence-Based Economics section tracking the recession of 2020 and the global economic impact of the COVID-19 pandemic. New Evidence-Based-Economic Problems cover the 2007–2009 and 2020 recessions, as well as an application of Okun's Law.
- In Chapter 13, we've added a new discussion of the government expenditure multiplier during the 2007–2009 and 2020 recessions. We examine shifting the federal funds rate by shifting the demand for reserves and analyze recent changes in the

Fed's balance sheet and the federal funds rate. Chapter 13 also includes this new material:

- We discuss quantitative easing, the Fed's role as lender of last resort, and monetary policy at the zero lower bound.
- A new Evidence-Based Economic Problem examines the spending multipliers of the CARES act, which builds from in-chapter explorations of the CARES act and the impact of fiscal policy on government deficits.

- Chapter 14 contains an updated Choice and Consequence feature on trade policy and politics, including recent changes in U.S. trade policy and Brexit. New Evidence-Based Economics Problems examine economic growth, different sectors of the economy, and child labor.
- Using updated data from 2020, Chapter 15 investigates the foreign exchange market and how it relates to the real economy. Updated Evidence-Based Economics Problems on managed exchange rates explore how George Soros's hedge funds made considerable profits by betting on the devaluation of the British pound, Thai baht, and U.S. dollar.

Solving Learning and Teaching Challenges

Many students who take introductory economics courses have difficulty seeing the relevance of the key concepts of opportunity cost, trade-offs, scarcity, and demand and supply to their lives and their careers. This reduces the willingness of many students to prepare for class and to be engaged during class. With this textbook, we show them how to apply economic thinking creatively to improve their work, their choices, and their daily lives. One of our main objectives in writing this textbook was to show that the fundamentals of economics are not just exciting but also alive with myriad personal applications.

We love economics. We marvel at the way economic systems work. When we buy a smartphone, we think about the complex supply chain and the hundreds of thousands of people who played a role in producing an awe-inspiring piece of technology that was assembled from components manufactured across the globe.

The market's ability to do the world's work without anyone being in charge strikes us as a phenomenon no less profound than the existence of consciousness or life itself. We believe that the creation of the market system (and the regulations that keep it well-functioning, for example, by addressing externalities) is one of the greatest achievements of humankind.

We wrote this book to highlight the simplicity of economic ideas and their extraordinary power to explain, predict, and improve what happens in the world. We want students to master the *essential* principles of economic analysis. With that goal in mind, we identify the three key ideas that lie at the heart of the economic approach to understanding human behavior: optimization, equilibrium, and empiricism.

The breakneck speed of modern technological change has, more than ever, injected economics into the lives—and hands—of our students. The technologies that they use daily illustrate powerful economic forces in action: Uber users observe real-time congestion in the transportation market when they confront surge pricing, and Airbnb travelers explore the relationships among location, convenience, and price by comparing listings near different subway stops in the same city.

As educators, it's our job to transform economic concepts into language, visual representations, and empirical examples that our students understand. Today, markets are much more interactive than they were only a decade ago, and they exemplify that it is not just competitive markets with perfect information that are relevant to our economic lives. Our students routinely take part in auctions, purchase goods and services via organized platforms such as Uber, have to struggle with pervasive informational asymmetries as they participate in online exchanges, and have to guard themselves against a bewildering array of mistakes and traps that are inherent to these new transactions.

In this ever-changing world, students must understand not just well-known economic concepts such as opportunity cost, supply, and demand but also modern ones such as game theory, auctions, socio-economic inequality, and behavioral mistakes. It is these modern

concepts, which are bit parts in most Principles textbooks, that occupy center stage in ours. Today economic analysis has expanded its conceptual and empirical boundaries and, in doing so, has become even more relevant and useful.

This new world provides opportunities for the teaching of economics as well, provided that we adjust our Principles canon to include modern and empirically based notions of economics. This has been our aim from day one and continues to be our aim in this third edition.

At a time when competing empirical claims abound and news sources across the political spectrum are denounced as "fake," our students need the skills to systematically question and evaluate what they read. That is why, in our Evidence-Based Economics segments and end-of-chapter assignments, we examine both the implications and the limitations of academic studies. We hope that our textbook will help form a new generation of careful thinkers, smart decision makers, engaged citizens, and even a few future economists!

Our Vision: Three Unifying Themes

Optimization

The first key principle is that people try to choose the best available option: *optimization*. We don't assume that people always successfully optimize, but we do believe that people try to optimize and often do a relatively good job of it. Because most decision makers try to choose the alternative that offers the greatest net benefit, optimization is a useful tool for predicting human behavior. Optimization is also a useful prescriptive tool. By teaching people how to optimize, we improve their decisions and the quality of their lives. By the end of this course, every student should be a skilled optimizer—without using complicated mathematics, simply by using economic intuition.

Equilibrium

The second key principle extends the first: economic systems operate in *equilibrium*, a state in which everybody is simultaneously trying to optimize. We want students to see that they're not the only ones maximizing their well-being. An economic system is in equilibrium when each person feels that he or she cannot do any better by picking another course of action. The principle of equilibrium highlights the connections among economic actors. For example, Apple stores stock millions of iPhones because millions of consumers are going to turn up to buy them. In turn, millions of consumers go to Apple stores because those stores are ready to sell those iPhones. In equilibrium, consumers and producers are simultaneously optimizing, and their behaviors are intertwined.

Empiricism

Our first two principles—optimization and equilibrium—are conceptual. The third is methodological: *empiricism*. Economists use *data* to test economic theories, learn about the world, and speak to policymakers. Accordingly, data play a starring role in our book, though we keep the empirical analysis extremely simple. It is this emphasis on matching theories with real data that we think most distinguishes our book from others. We show students how economists use data to answer specific questions, which makes our chapters concrete, interesting, and fun. Modern students demand the evidence behind the theory, and our book supplies it.

For example, we begin every chapter with an empirical question and then answer that question using data. One chapter begins by asking:

Why are you so much more prosperous than your great-great-grandparents were? Later in that chapter, we demonstrate the central role played by technology in explaining U.S. economic growth and why we are much better off than our relatives a few generations ago.

In our experience, students taking their first economics class often have the impression that economics is a series of theoretical assertions with little empirical basis. By using data, we explain how economists evaluate and improve our scientific insights. Data also make concepts more memorable. Using evidence helps students build intuition because data move the conversation from abstract principles to concrete facts. Every chapter

sheds light on how economists use data to answer questions that directly interest students. Every chapter demonstrates the key role that evidence plays in advancing the science of economics.

Features

All of our features showcase intuitive empirical questions.

- In **Evidence-Based Economics (EBE)**, we show how economists use data to answer the question we pose in the opening paragraph of the chapter. The EBE uses actual data from field experiments, lab experiments, or naturally occurring data, while highlighting some of the major concepts discussed within the chapter. This tie-in with the data gives students a substantive look at economics as it plays out in the world around them.

  The questions explored aren't just dry intellectual ideas; they spring to life the minute the student sets foot outside the classroom—*Is Facebook free? Is college worth it? Are tropical and semitropical areas condemned to poverty by their geographies? What caused the recession of 2007–2009? Are companies like Nike harming workers in Vietnam?*

EVIDENCE-BASED ECONOMICS

Q: What caused the recession of 2020?

The recession of 2020 was caused by the COVID-19 pandemic, which reduced the productivity of economic exchange. Because of the risk of infection, households became less willing to demand goods and services that involved in-person contact, and many industries could not profitably *and* safely supply goods and services.

The first documented U.S. infection occurred on January 15, 2020. The severity of the public health threat was not widely recognized at this time, although the COVID-19 virus was already rapidly spreading in Wuhan, China. For example, on February 24, President Donald Trump tweeted, "The Coronavirus is very much under control in the USA. We are in contact with everyone and all relevant countries. CDC & World Health have been working hard and very smart. Stock Market starting to look very good to me!" The first deaths in the United States occurred two days later—February 26—and by late April over 2,000 people were dying each day from COVID-19 infections.

- **Letting the Data Speak** is another feature that analyzes an economic question by using real data as the foundation of the discussion. Among the many issues we explore are such topics as life expectancy and innovation, living in an interconnected world, and why Chinese authorities historically kept the yuan undervalued (but no longer do so).

LETTING THE **DATA SPEAK**

The Day Oil Became Garbage

Something extraordinary happened in the oil market on April 20, 2020. On this day, the demand curve for oil shifted sharply to the left because of the global COVID-19 pandemic.[5] The market price of crude oil deliverable in Cushing, Oklahoma, (a huge pipeline crossroads in the United States where oil deliveries are made) temporarily fell below $0 per barrel. At the end of the trading day, the price closed at –$37.63/barrel (yes, that is a minus sign). In a nutshell, the storage facilities in this major oil hub were so full that traders were worried about where they were going to stick all of the oil that was coming through the pipelines (and not getting used to make jet fuel and gasoline, products with drastically reduced demand because of lockdowns and stay-at-home orders).

Crude oil in Cushing, Oklahoma, temporarily became like garbage: something you have to pay people to take away. The negative price for oil only lasted for one day, but it was a sign of how deep the 2020 economic crisis had become. It's also a lesson in how a market works when the quantity demanded is less than the quantity supplied at a zero price. It's possible for a market price to be negative—like the price of garbage—if you have to pay someone to remove something that you can't freely store.

- In keeping with the optimization theme, in a feature titled **Choice & Consequence** we ask students to make a real economic decision or evaluate the consequences of past real decisions. We then explain how an economist might analyze the same decision. Among the choices investigated are such questions and concepts as the power of exponential growth, foreign aid and corruption, and policies that address the problem of banks that are "too big to fail."

CHOICE & CONSEQUENCE

The Power of Exponential Growth

You have two choices. You can either start a job with a salary of $1,000 per month and a 6 percent increase in your salary every month, or you can start with a salary of $2,000 but never get a raise. Which one of these two options do you prefer?

The answer might naturally vary from person to person. If you have an immediate need for money, you may be attracted by the prospect of a $2,000 paycheck. But before you rush to sign on the dotted line for the $2,000-per-month job, think of the implications of the 6 percent monthly increase. With a 6-percent-per-month increase, your monthly salary will already exceed $2,000 after only a year. After 4 years, it will be approximately $16,400 a month. So if you were thinking of staying in this job for more than a year, starting with a lower salary might be a much better idea.

The first option is attractive, at least for those of you intending to stay with it for a while, precisely because of exponential growth. The 6-percent-per-month increases in salary do not apply to the base salary (if they did, this would have increased your salary by $60 every month). Rather, they compound, meaning that each 6 percent applies to the amount that has accumulated up to that point. Thus after 1 month, your salary will be $1,060. After 2 months, it is $1,060 × 1.06 = $1,123.60. After 3 months, it is $1,123.60 × 1.06 = $1,191.02, and so on. We will next see that exponential growth plays the same role in countries' growth trajectories as in your potential income from these two hypothetical jobs.

An even more dramatic illustration of the power of exponential growth comes from the story of the invention of the game of chess in ancient India. According to legend, the inventor of the game exploited the power of exponential growth when asked for a reward for his invention by the king.[1] He proposed that the king place a single grain of wheat on the first square of the chessboard, two on the second, four on the third, and eight on the fourth. Then continue doubling the number of grains for all sixty-four squares on the board, and he would receive the total amount of wheat on the board. The king, hearing the request, thought it trivial—but when his treasurers calculated the final tally, they returned to him in shock. The total amount, they found, was more than 18,000,000,000,000,000,000 grains of wheat—far more than they could ever produce in their entire kingdom. Indeed, today, this amount of wheat would allow you to distribute a ton of wheat to every person in the world every day for 6 months. A good story to remember both as a reminder of the power of exponential growth and as a pointer for you if you have to make choices between different options with varying growth prospects.

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Macroeconomics: Flexibility Chart

Core Approach	Emphasis on Long-Run Growth	Emphasis on International
Chapter 1: The Principles and Practice of Economics	**Chapter 1:** The Principles and Practice of Economics	**Chapter 1:** The Principles and Practice of Economics
Chapter 2: Economic Science: Using Data and Models to Understand the World (optional)	**Chapter 2:** Economic Science: Using Data and Models to Understand the World (optional)	**Chapter 2:** Economic Science: Using Data and Models to Understand the World (optional)
Chapter 2 Appendix: Constructing and Interpreting Charts and Graphs	**Chapter 2 Appendix:** Constructing and Interpreting Charts and Graphs	**Chapter 2 Appendix:** Constructing and Interpreting Charts and Graphs
Chapter 3: Optimization: Trying to Do the Best You Can (optional)	**Chapter 3:** Optimization: Trying to Do the Best You Can (optional)	**Chapter 3:** Optimization: Trying to Do the Best You Can (optional)
Chapter 4: Demand, Supply, and Equilibrium	**Chapter 4:** Demand, Supply, and Equilibrium	**Chapter 4:** Demand, Supply, and Equilibrium
Chapter 5: The Wealth of Nations: Defining and Measuring Macroeconomic Aggregates	**Chapter 5:** The Wealth of Nations: Defining and Measuring Macroeconomic Aggregates	**Chapter 5:** The Wealth of Nations: Defining and Measuring Macroeconomic Aggregates
Chapter 6: Aggregate Incomes	**Chapter 6:** Aggregate Incomes	**Section 6:** Aggregate Incomes
Chapter 7: Economic Growth	**Chapter 7:** Economic Growth	**Chapter 7:** Economic Growth
Chapter 8: Why Isn't the Whole World Developed? (optional)	**Chapter 8:** Why Isn't the Whole World Developed?	**Chapter 8:** Why Isn't the Whole World Developed? (optional)
Chapter 9: Employment and Unemployment	**Chapter 9:** Employment and Unemployment	**Chapter 9:** Employment and Unemployment
Chapter 10: Credit Markets	**Chapter 10:** Credit Markets	**Chapter 10:** Credit Markets
Chapter 11: The Monetary System	**Chapter 11:** The Monetary System	**Chapter 11:** The Monetary System
Chapter 12: Short-Run Fluctuations	**Chapter 12:** Short-Run Fluctuations	**Chapter 12:** Short-Run Fluctuations
Chapter 13: Countercyclical Macroeconomic Policy	**Chapter 13:** Countercyclical Macroeconomic Policy	**Chapter 13:** Countercyclical Macroeconomic Policy
Chapter 14: Macroeconomics and International Trade (optional)	**Chapter 14:** Macroeconomics and International Trade (optional)	**Chapter 14:** Macroeconomics and International Trade
Chapter 15: Open Economy Macroeconomics (optional)	**Chapter 15:** Open Economy Macroeconomics (optional)	**Chapter 15:** Open Economy Macroeconomics

1 The Principles and Practice of Economics

Is Facebook free?

Facebook doesn't charge you a monthly fee, so it's tempting to say "it's free."

Here's another way to think about it: what do you give up when you use Facebook? Stop reading for a moment and answer that question: *What do you give up when you use Facebook?*

Facebook may not take your money, but it does take your data and your time. For the moment, let's focus on your time (although your data are very valuable too!). When you spend time on Facebook, you are giving up an alternative use of your time. You could spend that time playing soccer, watching YouTube, napping, studying, listening to Spotify, or pursuing any other activity that generates something that you value. For example, you could spend the time earning money. If a typical college student went cold turkey on social media and reallocated just that time to paid work, they would earn enough money to pay the annual lease on a sports car.

A part-time job is just *one* alternative way to use the time you spend on Facebook, Instagram, TikTok, and hundreds of other social media apps. In *your* view, what is the best alternative use of your social media time? That's the economic way of thinking about the time *cost* of Facebook, which we'll explore further in the Evidence-Based Economics feature in this chapter.

In this chapter, we introduce you to the economic way of thinking about the world. Economists study all of the choices that people make, from the big decisions like choosing a job to the small decisions like logging onto Facebook or any other social media platform. To understand those choices, economists focus on the costs and benefits involved, including subtle costs like the activities that get *crowded out*.

How do people make all of these choices? How should people make these choices? Economists have answers that will occasionally surprise you and, most importantly, help you make choices that improve your well-being.

CHAPTER OUTLINE

1.1 The Scope of Economics

1.2 Three Principles of Economics

1.3 The First Principle of Economics: Optimization

EBE Is Facebook free?

1.4 The Second Principle of Economics: Equilibrium

1.5 The Third Principle of Economics: Empiricism

1.6 Is Economics Good for You?

KEY IDEAS

- Economics is the study of people's choices.
- The first principle of economics is that people try to *optimize*: they try to choose the best available option.
- The second principle of economics is that economic systems tend to be in *equilibrium*, a situation in which nobody believes they will benefit by changing his or her own behavior.
- The third principle of economics is *empiricism*—analysis that uses data. Economists use data to test theories and to determine what is causing things to happen in the world.

1.1 The Scope of Economics

Economics involves far more than money. Economists study *all* human behavior, from a person's decision to lease a car, to her decision not to wear a seat belt, to the speed the new driver chooses as she rounds a hairpin corner. These are all choices, and they are all fair game to economists. Choice—not money—is the unifying feature of all the things that economists study.

Choice—not money—is the unifying feature of all the things that economists study.

In fact, economists think of almost all human behavior as the outcome of choices. For instance, imagine that Dad tells his teenage daughter that she *must* wash the family car. The daughter has several options: she can wash it, she can negotiate for an easier chore, she can refuse to wash it and suffer the consequences, or she can move out (a drastic response, sure, but still an option). The way economists think about it, everything you do is the outcome of a choice that you are making.

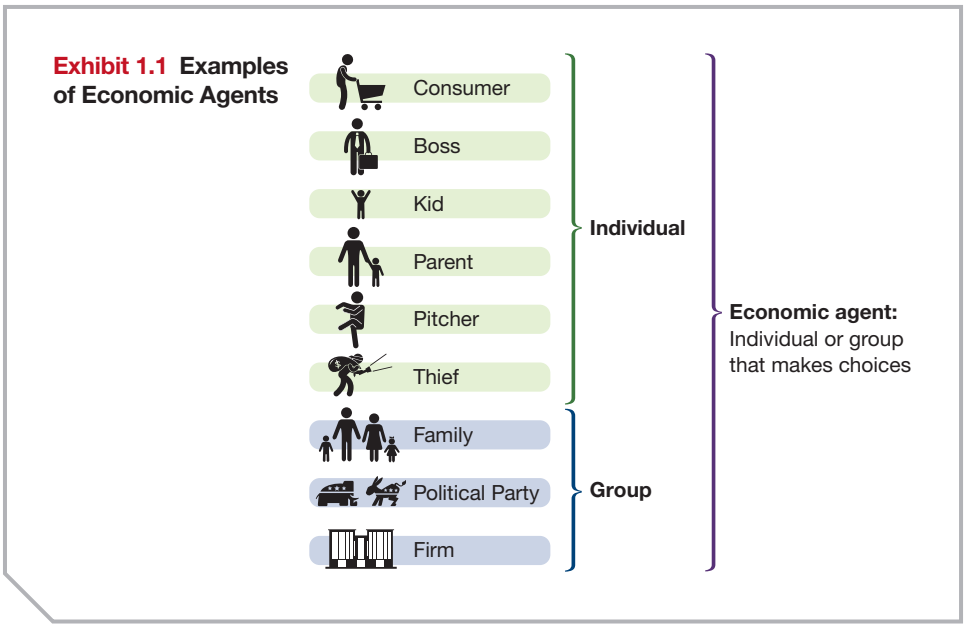
Economic Agents and Economic Resources

Saying that economics is all about choices is an easy way to summarize the topic of study. To give you a more precise definition, we first need to introduce two important concepts: *economic agents* and *resource allocation*.

An **economic agent** is an individual or a group that makes choices.

An **economic agent** is an individual or a group that makes choices. To demonstrate the enormous range of this concept, let's start with a few illustrative types of *individual* economic agents and one choice that they make. For example, a *consumer* chooses which cell phone to purchase. A *parent* chooses whether and how to reward their teenager for good behavior. A *student* chooses to attend classes or skip them. A *citizen* chooses whether or not to vote, and if so, which candidate to support. A *worker* chooses to do her job or slack off. A *criminal* chooses to sell meth or opioids (or neither or both). A *business leader* chooses where in the world to open a new production facility. A *senator* chooses to vote for or against a Supreme Court nominee. Of course, you are also an economic agent because you make an enormous number of choices every day.

Not all economic agents, however, are individuals. An economic agent can also be a group—a government, an army, a firm, a university, a political party, a labor union, a sports team, a family, or a street gang (Exhibit 1.1). Sometimes economists simplify their analysis by treating these groups as a single decision maker, without worrying about the details of how the different individuals in the group contributed to the decision. For example, an economist might say that "Apple prices the iPhone to maximize its profits," glossing over the fact that many employees participated in the internal debates that led to the choice of the price.



Scarce resources are things that people want, where the quantity that people want exceeds the quantity that is available.

Scarcity is the situation of having unlimited wants in a world of limited resources.

The second important concept to understand is that economics studies the allocation of *scarce resources*. **Scarce resources** are things that people want, where the quantity that people want (if the resources were being given away for free) exceeds the quantity that is available. Gold wedding bands, Shiatsu massages, Italian handbags, Broadway shows, iPhones, triple-chocolate-fudge ice cream, and rooms with a view are all scarce resources. But a resource doesn't need to be luxurious to be scarce—everyday goods are also scarce, like toilet paper, subway seats, and clean drinking water. **Scarcity** exists because people have unlimited wants in a world of limited resources. The world does not have enough resources to give everyone *everything* they want (for free).

Consider cars: if cars were given away at a zero price, there would not be enough of them to go around. So how does society determine who gets the limited supply of cars? In general, how does society allocate all of the scarce resources in the economy?

In a modern economy, consumers like you play a key role in this resource allocation process. You have 24 hours to allocate each day—this is your daily time budget. You choose how many of those 24 hours you will allocate to Facebook. You choose how many of those 24 hours you will allocate to other activities, including schoolwork and/or a job. If you have a job, you choose how to spend your hard-earned wages. These types of decisions determine how scarce resources are allocated in a modern economy: to the consumers who are able and willing to pay for them.

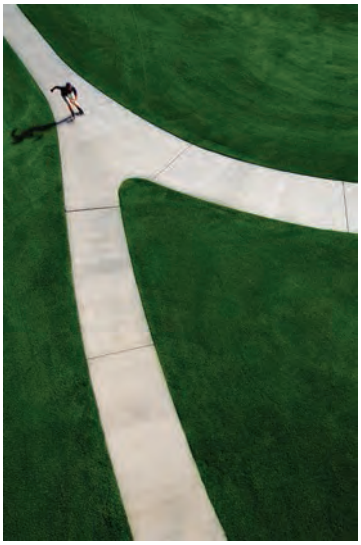
Economists don't want to impose our personal tastes on you. Imagine that you needed to decide whether to commute by car, bicycle, foot, Uber/Lyft, taxi, or public transportation. We are interested in showing you how to use economic reasoning so that *you* can compare the costs and benefits of the alternative options and make the choices that are best for you.

Definition of Economics

Economics is the study of how agents choose to allocate scarce resources and how those choices affect society.

We are now ready to define economics precisely. **Economics** is the study of how agents choose to allocate scarce resources and how those choices affect society.

Our earlier examples all emphasized people's *choices,* and choices play a key role in the formal definition of economics. However, the definition of economics also adds a new element to our discussion: the effects of any individual agent's choices on society. For example, the sale of a new car doesn't just affect the person driving off the dealer's lot. The sale generates sales tax, which the government uses to fund projects like highways and hospitals. The purchase of the new car also generates some congestion—that's one more car in rush-hour gridlock. It's another car that might grab the last parking spot on your street. If the new owner drives recklessly, the car may generate risks to other drivers. Economists study the original choice and its multiple consequences for other people in the world.



Economics is the study of choice.

Positive economics is analysis that generates objective descriptions or predictions, which can be verified with data.

Normative economics is analysis that recommends what an individual or society ought to do.

Positive Economics and Normative Economics

We now have an idea of what economics is about: people's choices. But why study these choices? Part of the answer is that economists are just curious, but that's only a small piece of the picture. Understanding people's choices is practically useful for two key reasons. Economic analysis:

1. Describes what people *actually* do (positive economics)
2. Recommends what people, including society, *ought* to do (normative economics)

The first application is descriptive, and the second is advisory.

Positive Economics Describes What People Actually Do Descriptions of what economic agents actually do are *objective* statements about the world—in other words, statements that can be confirmed or tested with data. For instance, from March to April 2020, the percentage of the U.S. labor force that was unemployed increased from 4.4 percent to 14.7 percent, the largest jump ever recorded.[1] During this month COVID-19 lockdowns caused firms to close for business and, in many cases, to lay off their workers. Describing what has happened or predicting what will happen is referred to as **positive economics** or positive economic analysis.

For instance, consider the prediction that renewable power capacity will expand by 50 percent between 2019 and 2024 (especially solar, wind, hydropower, and bioenergy).[2] This forecast can be compared to future data and either confirmed or disproven. Because a prediction is eventually testable—after the passage of time—it is also part of positive economics.

Normative Economics Recommends What People Ought to Do **Normative economics**, the second of the two types of economic analysis, advises individuals and society on their choices. Normative economics is about what people ought to do. Normative economics is almost always dependent on *subjective* judgments, which means that normative analysis depends at least in part on personal feelings, tastes, or opinions. So whose subjective judgments do we try to use? Economists believe that the people being advised should determine the preferences to be used.

For example, consider an economist who is helping a worker to decide how much risk to take in her investments. The economist might ask the worker about her own preferences regarding investment risk. Suppose the worker said that she wouldn't sleep well at night if her retirement savings were invested in the stock market, which does fall sharply (and unpredictably) from time to time—for example, the Dow Jones Industrial Average (a U.S. stock index) fell 38 percent at the start of the COVID-19 crisis in February and March 2020. The economist would explain that eliminating risk comes at a cost—riskless investments have a lower *average* rate of return in the long run than investments in the stock market. Stocks have had an annual average return that is about 6 percentage points higher per year than the return on riskless investments. If the worker acknowledged this difference and still wanted the riskless investments, the economist would help the worker find such riskless investments. Here the economist plays the role of engineer, finding the investment portfolio that will deliver the level of risk that the worker wants.

And that's the key—*what the worker wants*. In the mind of most economists, it is legitimate for the worker to choose any level of risk, as long as she understands the implications of that risk for her average rate of return—less risk implies a lower average rate of return. When economic analysis is used to help *individual* economic agents choose what is in their personal best interest, this type of normative economics is referred to as *prescriptive economics*.

Sometimes the normative analysis gets more complicated because there are many economic agents in the picture. We turn to these harder normative analyses next.

Normative Analysis and Public Policy Normative analysis also generates advice to society in general. For example, economists are often asked to evaluate public policies, like taxes or regulations. When public policies create winners and losers, citizens tend to have opposing views about the desirability of the government program. One person's migratory bird sanctuary is another person's mosquito-infested swamp. Protecting a wetland with environmental regulations benefits bird-watchers but may harm a landowner who would like to develop that land.

Economic agents have divergent views on the future of this swamp. The owner of the property wants to build housing units. An environmentalist wants to preserve the wetland to protect the whooping crane, an endangered species. What should happen?

When a government policy creates winners and losers, economists need to make some ethical judgments to conduct normative analysis. Economists must make ethical judgments when evaluating policies that make one group worse off so another group can be made better off.

Ethical judgments are usually unavoidable when economists think about government policies because there are few policies that make everyone better off. Deciding whether the costs experienced by the losers are justified by the benefits experienced by the winners is partly an ethical judgment. Is it ethical to create environmental regulations that prevent a real estate developer from draining a swamp so she can build new homes? What if those environmental regulations protect migratory birds that other people value? Are there possible compromises—should the government, for example, try to buy the land from the real estate developer? These public policy questions—which all ask what society *should* do—are normative economic questions.

Microeconomics and Macroeconomics

There is one other distinction that you need to know to understand the scope of economics. Economics can be divided into two broad fields of study, though many economists do a bit of both.

Microeconomics is the study of how individuals, households, firms, and governments make choices, and how those choices affect prices, the allocation of resources, and the well-being of other agents. In general, microeconomists are called on when we want to understand a particular piece of the overall economy, like the market for coal-fired electricity generation.

Microeconomics is the study of how individuals, households, firms, and governments make choices, and how those choices affect prices, the allocation of resources, and the well-being of other agents.

For example, some microeconomists study pollution generated by coal-fired power plants. A microeconomist might predict the level of coal-based pollution over the next decade, basing her forecast on the overall demand for electricity and likely technological developments in the energy industry—including solar- and wind-energy substitutes for coal-fired power plants. Predicting future levels of pollution from coal-fired plants is part of positive economic analysis.

Some microeconomists undertake normative analysis of coal-based pollution. For example, because global warming is largely caused by carbon emissions from coal, oil, and other fossil fuels, microeconomists design new government policies that attempt to reduce the use of these fuels. For example, a "carbon tax" targets carbon emissions. Under a carbon tax, relatively carbon-intensive energy sources—like coal-fired power plants—pay more tax per unit of energy produced than do energy sources with lower carbon emissions—like wind farms. Some microeconomists have the job of designing interventions like carbon taxes and determining how such interventions will affect the energy choices of households and firms.

Macroeconomics is the study of the economy as a whole. Macroeconomists study economy-wide phenomena, like the growth rate of a country's *total* economic output, the percentage increase in *overall* prices (the inflation rate), or the fraction of the *nation's* labor force that is looking for work but cannot find a job (the unemployment rate). Macroeconomists design government policies that improve overall, or "aggregate," economic performance.

Macroeconomics is the study of the economy as a whole. Macroeconomists study economy-wide phenomena, like the growth rate of a country's total economic output, the inflation rate, or the unemployment rate.

For example, macroeconomists try to identify the best policies for stimulating an economy that is experiencing a sustained period of negative growth—in other words, an economy in recession. Macroeconomists played an active role in the policy responses to the 2020 economic contraction caused by the COVID-19 crisis. Macroeconomists *also* worry about how to manage an economy that is growing well. For example, in 2018, with a historically low unemployment rate below 4 percent and strong (inflation-adjusted) annual economic growth above 3 percent, macroeconomists debated whether it was prudent for the Federal Reserve System to raise interest rates to head off the potential threat of rising inflation.

1.2 Three Principles of Economics

You now have a sense of what economics is about. But you might be wondering what distinguishes it from the other social sciences, including anthropology, history, political science, psychology, and sociology. All social sciences study human behavior, so what sets economics apart?

Economists emphasize three key concepts.

Optimization means trying to pick the best feasible option, given whatever limited information, knowledge, experience, and training the economic agent has.

1. **Optimization:** We have explained economics as the study of people's choices. The study of all human choices may initially seem like an impossibly huge and diverse topic. At first glance, your decision to log on to Facebook tonight does not appear to have much in common with a corporate executive's decision to build a $500 million laptop factory in China. However, economists have identified some powerful concepts that unify the enormous range of choices that economic agents make. One such insight is that choices are tied together by the concept of *optimization*: trying to pick the best feasible option. Economists do *not* believe that people always succeed in picking the best feasible option. Rather, economists believe that people *try* to pick the best feasible option. People don't always succeed because we are not perfect, all-knowing decision makers. There is a great deal of discussion among economists about how well people succeed in actually picking the best feasible option, a discussion that we will return to in Chapter 3.

Decisions aren't made with a crystal ball. People try to do as well as they can.

Optimization is the first principle of economics. Economists believe that optimization—trying to pick the best feasible option—explains the choices that people make, including minor decisions like accepting an invitation to see a movie and major decisions like deciding whom to marry. Decisions aren't made with a crystal ball. People try to do as well as they can, given the limited information, knowledge, experience, and training that they have.

Equilibrium is the special situation in which *everyone* is simultaneously optimizing, so nobody believes they would benefit personally by changing their own behavior, given the choices of others.

2. **Equilibrium:** The second principle of economics holds that economic systems tend to be in *equilibrium*, a situation in which no agent believes they would benefit personally by changing their own behavior, given the choices of others. The economic system is in equilibrium when *all* agents believe they cannot do any better by picking another course of action. In other words, equilibrium is a situation in which everyone is simultaneously optimizing.

Empiricism is analysis that uses data—evidence-based analysis. Economists use data to develop theories, to test theories, to evaluate the success of different government policies, and to determine what is causing things to happen in the world.

3. **Empiricism:** The third principle of economics is an emphasis on *empiricism*—evidence-based analysis. In other words, analysis that uses data. Economists use data to develop theories, to test theories, to evaluate the success of different government policies, and to determine what is causing things to happen in the world.

1.3 The First Principle of Economics: Optimization

Let's now consider our first principle in more detail. Economics is the study of choices, and economists have a leading theory about how choices are made. Economists believe that people optimize, meaning that economic agents try to choose the best feasible option, given whatever (limited) information, knowledge, experience, and training the economic agents have. Feasible options are those that are available and affordable to an economic agent. If you have $10 in your wallet and no credit/debit/ATM cards, then a $5 veggie burger is a feasible dinner option, while a $50 lobster dinner is not.

The concept of feasibility goes beyond the financial budget of the agent. Many different constraints can determine what is feasible. For instance, it is not feasible to work more than 24 hours in a day. It is not feasible to attend meetings *in person* in London and Beijing at the same time.

In cases where agents make predictable mistakes, normative (prescriptive) economic analysis can help them realize their mistakes and make better choices in the future.

Any decision can depend only on the information available at the time of the choice. For example, if you choose to drive from San Diego to Los Angeles and your car is hit by a drunk driver, you are unlucky, but you haven't necessarily failed to optimize. Optimization means that you weigh the information that you have, not that you perfectly foresee the future. When someone chooses the best feasible option *given the information that is available*, economists say that the decision maker is being rational or, equivalently, that he or she is exhibiting rationality. Rational action does not require a crystal ball, just a logical appraisal of the costs, benefits, and risks that are known to the economic agent.

However, if you decide to let a friend drive you from San Diego to Los Angeles and you know that your friend is drunk, this is likely a case in which you are not choosing the best feasible option. Again, evaluating the rationality of a decision means examining the quality of your initial decision, not the outcome. Even if you and your drunk driver arrive at your destination without a crash, your choice to let your friend drive is still a bad choice. Fortunately, you got lucky despite making a bad decision.

We devote much of this book to the analysis of optimization. We explain how to choose the best feasible option, and we discuss some evidence that supports the theory that economic agents often do choose the best feasible option (or something close to it). We also discuss important cases where people consistently fail to choose the best feasible option. In cases where agents make predictable mistakes, normative (prescriptive) economic analysis can help them realize their mistakes and make better choices in the future.

Finally, it is important to note that *what* we optimize varies from person to person and group to group. Many firms try to maximize profits, but most individual people are not trying to maximize their personal income. If that were our goal, we'd work far more than 40 hours per week, and we'd keep working long past retirement age. Most households are trying to maximize their overall well-being, which involves a mix of income, leisure, health, and a host of other factors, like social networks, personal relationships, and a sense of purpose in life. Most governments, meanwhile, are optimizing a complex mix of policy goals. For most economic agents, then, optimization (and economics) is about much more than money.

The COVID-19 crisis is a good example of the complexity of optimization. If governments were simply trying to maximize total economic output, firms and employees would have kept working through the pandemic despite the health consequences. Instead, almost all countries adopted aggressive public health measures during the crisis, including lockdowns and shelter-in-place rules, causing their overall economies to sharply contract. Accordingly, the policy response to the COVID-19 crisis involved a trade-off between health and economic output. Almost all countries accepted a sharp drop in economic output as the price for partially reducing illness and deaths—morbidity and mortality—resulting from the pandemic. You can think of this as the first recession that was equivalent to intentionally putting the economy into a coma.

Trade-offs and Budget Constraints

An economic agent faces a **trade-off** when the agent needs to give up one thing to get something else.

All optimization problems involve trade-offs. **Trade-offs** arise when some benefits must be given up to gain others. Think again about the simple case of Facebook. If you spend an hour on Facebook, then you cannot spend that hour doing other things. For example, you cannot work at most part-time jobs at the same time you are editing your Facebook profile. (However, some students believe that they can read their friends' posts while listening to a lecture. When the authors of this textbook try to do this ourselves, we find that we don't learn very much from that lecture.)

A **budget constraint** shows the bundles of goods or services that a consumer can choose given her limited budget.

Economists use budget constraints to describe trade-offs. A **budget constraint** is the set of things that a person can choose to do (or buy) without breaking her budget.

Here's an illustration. To keep the analysis simple, suppose that you can do only one of two activities with each hour of your free time: use social media sites or work at a part-time job. Suppose that you have 5 free hours in a day (once we take away necessities like sleeping, eating, bathing, attending classes, doing problem sets, and studying for exams). Think of these 5 free hours as your budget of free time. Then your budget constraint would be:

$$5 \text{ hours} = \text{Hours on social media} + \text{Hours working at part-time job.}$$

This equation, which is also called a budget constraint, implies that you face a trade-off. If you spend an extra hour on social media, you need to spend one less hour working at a part-time job (unless you secretly use Facebook while you are being paid for a job—in this case, don't put your boss on your friend list). Likewise, if you spend an extra hour working at the part-time job, you need to spend one less hour surfing the Web. More of one activity implies less of the other. We can see this in Exhibit 1.2, where we list all the ways that you could allocate your 5 free hours.

Budget constraints are useful economic tools because they quantify trade-offs. When economists talk about the choices that people make, the economist always takes into account the budget constraint. It's important to identify the feasible options and the trade-offs—the budget constraint gives us that information.

Exhibit 1.2 Possible Allocations of 5 Free Hours (Round Numbers Only)

Each row reports a different way that a person could allocate 5 free hours, assuming that the time must be divided between social media and working at a part-time job. To keep things simple, the table only reports allocations in round numbers.

Budget	Hours on Social Media	Hours at Part-Time Job
5 hours	0 hours	5 hours
5 hours	1 hours	4 hours
5 hours	2 hours	3 hours
5 hours	3 hours	2 hours
5 hours	4 hours	1 hours
5 hours	5 hours	0 hours

Opportunity Cost

We are now ready to introduce another critical tool in the optimization toolbox: opportunity cost. Social media provides an illustration of the concept. The time that we spend on social media is time that we could have spent in some other way. In the illustrative example just discussed, the only two alternative activities were social media and working at a part-time job. But in real life, there are an enormous number of activities that might get squeezed out when you use social media—for instance, playing soccer, jogging, daydreaming, taking a yoga class, meditating, sleeping, eating with friends, or working on a problem set. You implicitly sacrifice time on some alternative activities when you spend time on social media.

Generate your own list of alternative activities that are squeezed out when you use social media. Think about the best alternative to an extra hour of social media, and put that at the top. Pause here and write that alternative activity down. Having a cup of coffee with a friend? Studying for an exam? Going for a jog? What is your best alternative to an extra hour of social media?

We face trade-offs whenever we allocate our time. When we do one thing, something else gets squeezed out. Joining the basketball team might mean dropping lacrosse. During exam week, an extra hour of sleep means one less hour spent studying or decompressing with friends. You can't write a term paper and update your Facebook page at the same moment. And postponement is not an escape hatch from this ironclad logic. For example, even if you only postpone writing that term paper, something has got to give when the paper deadline rolls around. (Perhaps studying for your economics final?)

Evaluating trade-offs can be difficult because so many options are under consideration. Economists tend to focus on the *best* alternative activity. We refer to this best alternative activity as the **opportunity cost**. This is what an optimizer is effectively giving up when she allocates an hour of her time. Recall your own best alternative to an extra hour of social media. That's your opportunity cost of an hour of social media time.

Opportunity cost is the best alternative use of a resource.

Here's another example to drive home the concept. Assume that your family is taking a vacation over spring break. Your choices are a Caribbean cruise, a trip to Miami, or a trip to Los Angeles. (Assume that they all have the same monetary cost and use the same amount of time.) If your first choice is the cruise and your *second* choice is Miami, then your opportunity cost of taking the cruise is the Miami trip. The cruise is crowding out the Miami trip, so the Miami trip is what you are giving up to take the cruise.

The concept of opportunity cost applies to all trade-offs, not just your daily time budget of 24 hours. Suppose that a woodworker has a beautiful piece of maple that can be used to make a sculpture, a bowl, or a picture frame. (Assume that they all use the same amount of wood and take the same amount of time.) If the woodworker's first choice is the sculpture and the second choice is the bowl, then the bowl is the opportunity cost of making the sculpture.

Assigning a Monetary Value to an Opportunity Cost Economists sometimes try to put a monetary value on opportunity cost. One way to estimate the monetary value of an hour of your time is to analyze the consequences of taking a part-time job or working additional hours at the part-time job you already have.

The opportunity cost of an hour of your time spent on social media is at least the value that you would receive from an hour of work at a job, assuming that you can find one that fits your schedule. Here's why. A part-time job is one item in the long list of alternative

ways to spend your time. If the part-time job is at the top of your list, then it's the best alternative, and the part-time job is your opportunity cost of spending time on social media. What if the part-time job is not at the top of your list, so it's not the best alternative? Then the best alternative is even better than the part-time job, so the best alternative is worth more than the part-time job. To sum up, your opportunity cost is either the value of a part-time job or a value that is even greater than that.

To turn these insights into something quantitative, it helps to note that the median wage for U.S. workers between 16 and 24 years of age was $14.70 in 2020—this statistic is from the U.S. Bureau of Labor Statistics.[3] A job has many attributes other than the wage you are paid: unpleasant tasks (like being nice to obnoxious customers), on-the-job training, friendly or unfriendly coworkers, and resume building, to name a few.

If we ignore these non-wage attributes, the value of an hour of work is just the wage (minus taxes paid). However, if the positive and negative non-wage attributes don't cancel each other, the calculation is much harder. To keep things simple, we'll focus only on the after-tax wage in the analysis that follows—about $13 per hour for young workers—but we urge you to keep in mind all of the non-wage consequences that flow from a job.

Cost-Benefit Analysis

Let's use opportunity cost to solve an optimization problem. Specifically, we want to compare a set of feasible alternatives and pick the best one. We call this process *cost-benefit analysis*. **Cost-benefit analysis** is a calculation that identifies the best option by summing benefits and subtracting costs, with both benefits and costs denominated in a common unit of measurement, like dollars. Cost-benefit analysis is used to identify the alternative that has the greatest **net benefit**, which is the sum of the benefits of choosing an alternative minus the sum of the costs of choosing that alternative.

Cost-benefit analysis is a calculation that identifies the best alternative, by summing benefits and subtracting costs, with both benefits and costs denominated in a common unit of measurement, like dollars.

Net benefit is the sum of the benefits of choosing an alternative minus the sum of the costs of choosing that alternative.

To see these ideas in action, suppose that you and a friend are going to Miami Beach from Boston for spring break. Imagine that the only question is whether you should drive or fly. Your friend argues that you should drive because splitting the cost of a rental car and gas "will only cost $200 each." He tries to seal the deal by pointing out "that's much better than a $300 plane ticket."

To analyze this problem using cost-benefit analysis, you need to list all benefits and costs of driving compared to the alternative of flying. Here we'll express these benefits and costs comparatively, which means the benefits of driving compared to flying and the costs of driving compared to flying. We'll need to translate those benefits and costs into a common unit of measurement.

From a benefit perspective, driving saves you $100—the difference between driving direct costs of $200 and a plane ticket of $300. We sometimes refer to these direct costs as "out-of-pocket" costs. But out-of-pocket costs aren't the only thing to consider. Driving also costs you an extra 40 hours of time—the difference between 50 hours of round-trip driving time and about 10 hours of round-trip airport/flying time. Spending 40 extra hours traveling is a *cost* of driving, even if it isn't a direct out-of-pocket cost.

We're now ready to decide whether it is optimal to drive or fly to Florida. We need to express all benefits and costs in common units, which will be dollars for our example. Recall that driving will take an additional 40 hours of travel time. To complete the analysis, we must translate this time cost into dollars. To make this translation, we will use a $13 per hour opportunity cost of time. The net benefit of driving compared to flying is the *benefit* of driving (saving $100 in out-of-pocket costs) minus the *cost* of driving (40 additional hours of your time):

$$(\$100 \text{ reduction in out-of-pocket costs}) - (40 \text{ hours of additional travel time}) \times (\$13/\text{hour})$$
$$= \$100 - \$520 = -\$420.$$

Hence, the net benefit of driving is overwhelmingly negative. Using the numbers in this example, an optimizer would choose to fly.

This analysis about travel to Miami is a simple example of cost-benefit analysis, which is a great tool for collapsing all sorts of things down to a single number: a dollar-denominated net benefit. This course will guide you in making such calculations. When you are making almost any choice, cost-benefit analysis can help.

To an economist, cost-benefit analysis is an example of optimization. When you pick the option with the greatest net benefits, you are optimizing. Cost-benefit analysis is useful for

normative economic analysis. It enables an economist to determine what an individual or a society should do. Cost-benefit analysis also yields many useful positive economic insights. In many cases, cost-benefit analysis correctly predicts the choices made by actual consumers.

We'll see hundreds of examples of optimization throughout this course. Moreover, we dedicate a whole chapter to optimization (Chapter 3) to give you a more complete grounding in this foundational principle of economics.

EVIDENCE-BASED ECONOMICS

Q: Is Facebook free?

We can now turn to the question posed at the beginning of the chapter. By now you know that Facebook has an opportunity cost—the best alternative use of your time. We now estimate this cost. To do this, we're going to need some data. Whenever you see a section in this textbook titled "Evidence-Based Economics," you'll know that we are using data to analyze an economic question.

U.S. adults are estimated to spend 56 minutes per day on social media platforms in 2019, which includes sites like Facebook, TikTok, Instagram, Snapchat, Twitter, Pinterest, Tumblr, and LinkedIn.[4] To simplify our calculation, let's round this up to 1 hour per day. Even if we pick a relatively conservative opportunity cost of time of $13/hour, this amounts to $4,745 per year per U.S. adult:

$$(1 \text{ hour/day}) \times (365 \text{ days/year}) \times (\$13/\text{hour}) = \$4{,}745 \text{ per year.}$$

In 2019, there were 254 million adults (ages 18 and older) in the United States, so the opportunity cost of social media use among U.S. adults was at least

$$(\$4{,}745/\text{adult}) \times (254 \text{ million adults}) = \$1.2 \text{ trillion per year.}$$

We can also think about this calculation another way. If U.S. adults had substituted their time on social media for work with average pay of $13 per hour, the U.S. economy would have produced about $1.2 trillion more measured output in 2019. This is more than the annual combined economic output of Austria and Sweden.

So far, we have gone through a purely positive economic analysis, describing the frequency of social media usage and the trade-offs that this usage implies. None of this analysis, however, answers the related question: Are Facebook and other social media users optimizing? We've seen that the time spent on sites like Facebook has valuable alternative uses (see Exhibit 1.3). But Facebook users are deriving substantial benefits that may justify this allocation of time. For example, social networking sites keep us up-to-date on the activities of our friends and family. They facilitate the formation of new friendships and new connections. And Facebook and similar sites are entertaining. Indeed, it is possible that we should spend more time on Facebook!

Because we cannot easily quantify these benefits, we're going to leave that judgment to you. Economists won't tell you what to do, but we will help you identify the trade-offs that you are making in your decisions. Here is how an economist would summarize the prescriptive issues that are on the table:

> Assuming a $13/hour opportunity cost, the opportunity cost of using social media for an hour per day is $4,745 per year. Do you receive benefits from Facebook that exceed this opportunity cost? If the annual benefits that you receive are less than $4,745, you should scale down your Facebook usage.

Economists don't want to impose their tastes on other people. In the view of an economist, people who get big benefits from frequent use of Facebook should stay the course. However, we do want economic agents to recognize the implied trade-offs that are being made. Economists are interested in helping people make the best use of scarce resources

EVIDENCE-BASED ECONOMICS *(continued)*

like budgets of money and leisure time. In many circumstances, people are already putting their resources to best use. Occasionally, however, economic reasoning can help people make better choices. In other words, economic reasoning can help you be a better optimizer.

	Cost per unit	Number of units	Total cost
Starbucks cappuccino	$4	52 cups	$208
iPhone	$740	1	$740
Round trip: NYC to Paris	$1,200	1	$1,200
Hotel in Paris	$275	5 nights	$1,375
Round trip: NYC to U.S. Virgin Islands	$300	1	$300
Hotel in Virgin Islands	$180	5 nights	$900
Eleven iPhone apps	$2	11	$22
Total			**$4,745**

Exhibit 1.3 What Could You Buy with $4,745?

Everyone would choose to spend $4,745 in their own particular way. This list illustrates one feasible basket of goods and services. Note that this list includes just the monetary costs of these items. A complete economic analysis would also include the opportunity cost of the time that you would need to consume them.

Question

Is Facebook free?

Answer

No. The opportunity cost of time spent on Facebook and other social media was over $1.2 trillion in the United States in 2019.

Data

Facebook usage statistics estimated by www.eMarketer.com. Wage data from U.S. Department of Labor.

Caveat

We have only presented a calculation for U.S. social media users. It would be useful to extend these calculations to cover the billions of social media users worldwide. For example, Facebook alone has more than 1.7 billion worldwide users.

Use the concepts presented in this feature by working through the Evidence-Based Economics Problems at the end of this chapter.

1.4 The Second Principle of Economics: Equilibrium

In most economic situations, you aren't the only one trying to optimize. Other people's behavior will influence what you decide to do. Economists think of the world as a large number of economic agents who are interacting and influencing one another's efforts at optimization. Recall that *equilibrium* is the special situation in which everyone is trying to optimize, so nobody believes that they would benefit personally by changing his or her own behavior.

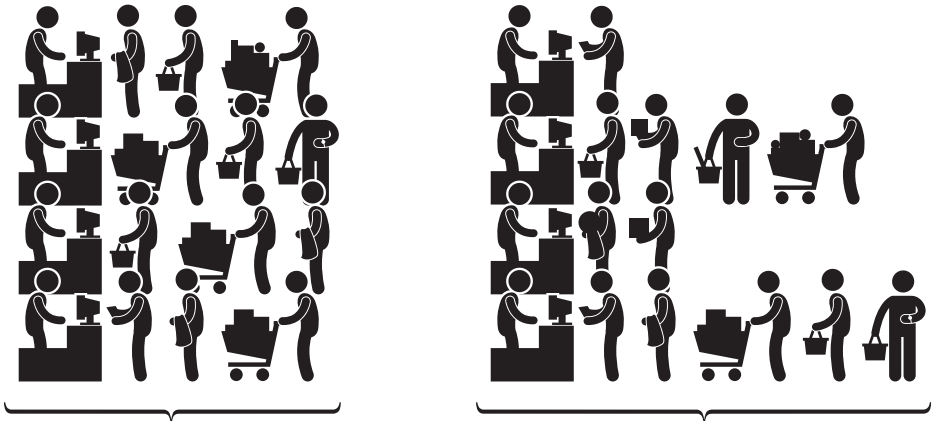
An important but subtle point is embedded in this definition. We say that in equilibrium, nobody *believes* he or she would benefit from changing their own behavior. In equilibrium, all economic agents are trying to make their best feasible choices, taking into account the information they have, including their beliefs about the behavior of others.

To build intuition for the concept of equilibrium, consider the length of the standard checkout lines at your local supermarket (ignore the express lines). If any line has a shorter wait than the others, optimizers will choose that line. If any line has a longer wait than the others, optimizers will avoid that line. So the short lines will attract shoppers, and the long lines will drive them away. And it's not just the length of the lines that matters. You may pick your line by estimating which line will move the fastest, an estimate that incorporates what you can see, including the number of items in each person's shopping cart. Sometimes, you might end up waiting longer because of twists you didn't anticipate: a customer who takes five minutes to find the right change, or someone with a sea of tiny items at the bottom of their cart. Still, economists say that "in equilibrium," all checkout lines will have roughly the same wait time. When the wait times are expected to be the same, no shopper has an incentive to switch lines. In other words, nobody believes that they will benefit by switching lines.

Here's another example. Suppose the market price of gasoline is $2 per gallon and the gasoline market is in equilibrium. Three conditions will need to be satisfied:

1. The amount of gasoline produced by gasoline sellers—energy companies—will equal the amount of gasoline purchased by buyers.
2. Energy companies will only operate wells where they can extract crude oil and produce gasoline at a cost that is less than the market price of gasoline: $2 per gallon.
3. The buyers of gasoline will only use it for activities that are worth at least $2 per gallon—like driving to their best friend's wedding—and they won't use it for activities that are worth less than $2 per gallon.

In equilibrium, both the sellers and the buyers of gasoline are optimizing, given the market price of gasoline. Nobody would benefit by changing their own behavior. (We'll



In equilibrium, everyone is simultaneously optimizing, so nobody would benefit by changing his or her own behavior.

A free rider in the New York subway system. Are you paying for this person to ride the subway?

have much more to say about this example of equilibrium analysis in Chapter 4.)

Notice that we've started to think about what happens when many economic agents interact. This could be two chess players, thirty participants in an eBay auction, hundreds of millions of investors buying and selling shares on the New York Stock Exchange, or billions of households buying gasoline to fuel their tractors, trucks, mopeds, motorcycles, and cars. In all these cases, we assume that everyone is constantly simultaneously optimizing—for instance, at every move in a chess game and during every trade on the New York Stock Exchange. Combined, these choices produce an equilibrium—and economists believe that this kind of equilibrium analysis provides a good description of what actually happens when many people interact.

The Free-Rider Problem

Let's use the concept of equilibrium to analyze an economic problem that may interest you: roommates. Assume that five roommates live in a rented house. Each roommate can spend some of their time contributing to the general well-being of all the roommates by throwing away empty pizza boxes and soda cans. Or each roommate can spend all their time on activities that only benefit themselves—for instance, watching TikTok videos or listening to Spotify.

Imagine that one roommate hates the mess and starts spending time cleaning up the kitchen. Although the other roommates appreciate it, they may have no incentive to chip in. If the public-spirited roommate spends 30 minutes doing the dishes, all the other roommates benefit without having to lift a finger. It would be beneficial to each of the roommates if everyone chipped in and did a little cleaning. But each of the five roommates has an incentive to leave that to others. Consequently, rentals with lots of roommates are often a mess. The *equilibrium* prediction is that when people live in large rooming groups, they will have messier apartments than if the same people each had their own apartment.

Roommates who leave the cleaning to others are an example of something that economists call the *free-rider problem*. Most people want to let someone else do the dirty work. We would like to be the free riders who don't contribute but still benefit from the work done by others.

Sometimes free riders get away with it. When there are few free riders and lots of contributors, the free riders might be overlooked. For example, a small number of people sneak onto public transportation without paying. These turnstile jumpers are so rare that they don't jeopardize the subway system. But if everyone started jumping turnstiles, the subway would soon run out of cash. Indeed, that is happening more and more often in New York City. The government agency that oversees New York City's mass transit system released a report in December 2018 estimating that *each day,* 208,000 people take the subway without paying and 350,000 people take the bus without paying.[5] You can see videos capturing New Yorkers in the act.[6]

In the subway system, free riding is discouraged by security patrols. In rooming groups, free riding is discouraged by social pressure. Free riding is a problem because it's not easy to catch the free rider in the act. It's possible to slip over a turnstile in a subway station. It's easy to leave crumbs on the couch when nobody is watching.

People's private benefits are sometimes out of sync with the public interest. Equilibrium analysis helps us predict the behavior of interacting economic agents and understand why free riding occurs. People sometimes pursue their own private interests and don't contribute voluntarily to the public interest. Unfortunately, selfless acts—like those of a war hero—are exceptional, and selfish acts are more common. When people interact, each individual might do what's best for themselves instead of acting in a way that optimizes the well-being of society.

Equilibrium analysis helps us design special institutions—like financial contracts—that reduce or even eliminate free riding. For example, what would happen in the rooming

group if everyone agreed to pay $5 per week so the roommates could hire a cleaning service? It would be easier to enforce $5 weekly payments than to monitor compliance with the rule "clean up after yourself, even when nobody is here to watch you." Pizza crumbs don't have identity tags. So equilibrium analysis explains both why individuals sometimes fail to serve the interest of society and how the incentive structure can be redesigned to fix these problems.

1.5 The Third Principle of Economics: Empiricism

Economists test their ideas with data. We refer to such evidence-based analysis as empirical analysis or *empiricism*. Economists use data to determine whether our theories about human behavior—like optimization and equilibrium—match up with actual human behavior. Of course, we want to know if our theories fail to explain what is happening in the world. In that case, we need to go back to the drawing board and come up with better theories. That is how economic science, and science in general, progresses.

Economists are also interested in understanding what is *causing* things to happen in the world. We can illustrate what causation is—and is not—with a simple example. Hot days and crowded beaches tend to occur at the same time of the year. What is the cause and what is the effect here? It is, of course, that high temperatures cause people to go swimming. It is not that swimming causes the outside air temperature to rise.

But there are some cases when cause and effect are hard to untangle. Does being relatively smart cause people to go to college, or does going to college cause people to be relatively smart? Perhaps both directions of causation apply. Or perhaps some other factor plays the causal role—for instance, a love for reading might cause people to become smarter *and* cause them to go to college.

We'll come back to the topic of empiricism in general, and causality in particular, in great detail in Chapter 2. Sometimes causes are easy to determine, but sometimes identifying cause and effect requires great ingenuity.

1.6 Is Economics Good for You?

Should you take this course? Cost-benefit analysis can help you think about this question.

Let's begin by assuming that you've already chosen to go to college. So we can assume that tuition costs and room and board are *sunk costs* (they won't be affected by your decision to take economics). With those costs accounted for, are there any other costs associated with this course? The key opportunity cost of this course is another course that you won't be able to take during your time spent as a student. What other course did economics crowd out? Japanese history? Biochemistry? Russian poetry? If you are taking the two-semester version of this course, then you need to consider the *two* other courses that economics is crowding out.

Learning how to make good choices is the biggest benefit you'll realize from learning economics.

Now consider the benefits of an economics education. The benefits come in a few different forms, but the biggest benefit is the ability to apply economic reasoning in your daily life. Whether you are deciding how to keep an apartment clean with four other roommates or deciding how to use your free time, economic reasoning will improve the quality of your decisions. These benefits will continue throughout your life as you make important decisions, such as where to invest your retirement savings and how to choose a house to buy.

Most decisions are guided by the logic of costs and benefits. Accordingly, you can use positive economic analysis to predict *other* people's behavior. Economics illuminates and clarifies human behavior.

We also want you to use economic principles when you give other people advice and when you make your own choices. This is normative economics. Learning how to make

good choices is the biggest benefit you'll realize from learning economics. That's why we have built our book around the concept of decision making. Looking at the world through the economic lens puts you at an enormous advantage throughout your life.

We also think that economics is a lot of fun. Understanding people's motivations is fascinating, particularly because there are many surprising insights along the way.

To realize these payoffs, you'll need to connect the ideas in this textbook to the economic activities around you. To make those connections, keep a few tips in mind:

- You can apply economic tools, such as trade-offs and cost-benefit analysis, to any economic decision, so learn to use them in your own daily decisions. This will help you master the tools and also appreciate their limitations.
- Even if you are not in the midst of making a decision, you will learn a lot of economics by keeping your eyes open when you walk through any environment in which people are using or exchanging resources. Think like an economist the next time you find yourself in a supermarket or at a used-car dealership, a poker game, or a soccer match. For example, why is it an equilibrium for a soccer player to randomize the side of the goal into which they launch a penalty kick? Why is it an equilibrium for the goal keeper to randomize the side of the goal that they jump to when the penalty kick occurs? (*Hint:* What would happen if the penalty kicker predictably kicked in one direction?)
- The easiest way to encounter economic ideas is to keep up with what's happening in the world. Go online and read a newspaper with excellent economics coverage like the *New York Times, The Wall Street Journal,* or the *Financial Times*. News magazines will also do the job. There's even a news magazine called *The Economist*, which is required reading for prime ministers and presidents. However, you don't need to read *The Economist* to learn about economics. Almost every page of any magazine—including *People, Sports Illustrated*, and *Vogue*—describes events driven by economic factors. Identifying and understanding these forces will be a challenge. Over time, though, you'll find that it gets easy to recognize and interpret the economic story behind every headline.

Once you realize that you are constantly making economic choices, you'll understand that this course is only a first step. You'll discover the most important applications outside class and after the final exam. The tools of economics will improve your performance in all kinds of situations—making you a better businessperson, a better consumer, and a better citizen. Keep your eyes open and remember that every choice is economics in action.

Summary

- Economics is the study of how agents choose to allocate scarce resources and how those choices affect society. Economics can be divided into two kinds of analysis: positive economic analysis (what people actually do) and normative economic analysis (what people ought to do). There are two key topics in economics: microeconomics (individual decisions and individual markets) and macroeconomics (the total economy).
- Economics is based on three key principles: optimization, equilibrium, and empiricism.
- Trying to choose the best feasible option, given the available information, is called optimization. To optimize, an economic agent needs to consider many issues, including trade-offs, budget constraints, opportunity costs, and cost-benefit analysis.
- Equilibrium is a situation in which nobody believes they would benefit personally by changing their own behavior, given their beliefs about the choices of others. In equilibrium, everyone is simultaneously optimizing.
- Economists test their ideas with data. We call such evidence-based analysis empirical analysis or empiricism. Economists use data to determine whether our theories about human behavior—like optimization and equilibrium—match actual human behavior. Economists also use data to determine what is causing things to happen in the world.