TWELFTH EDITION

MICROECONOMIC THEORY

Basic Principles & Extensions

WALTER NICHOLSON
CHRISTOPHER SNYDER

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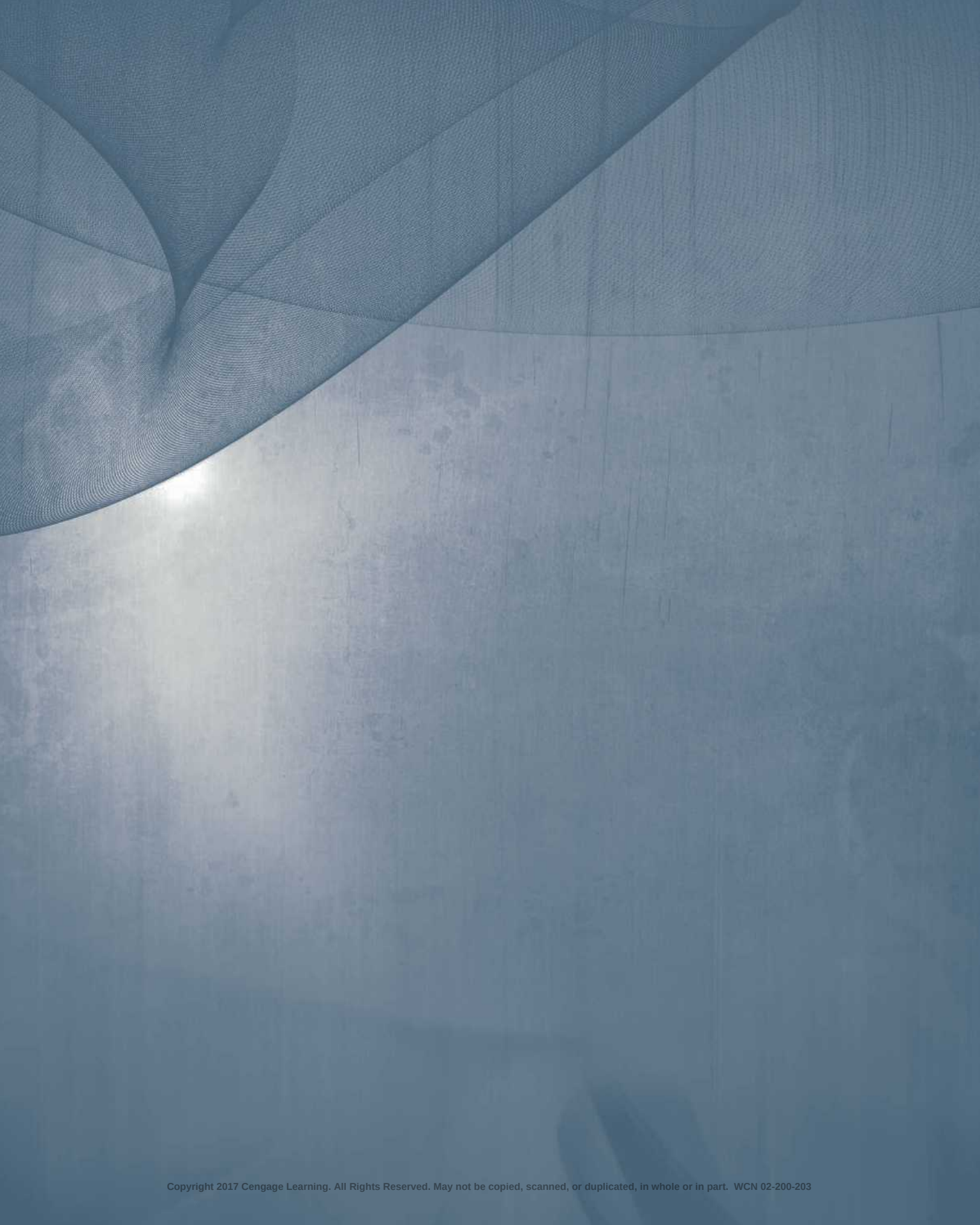

Microeconomic Theory

Basic Principles and Extensions

TWELFTH EDITION

WALTER NICHOLSON
Amherst College

CHRISTOPHER SNYDER
Dartmouth College

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Walter Nicholson, Christopher Snyder

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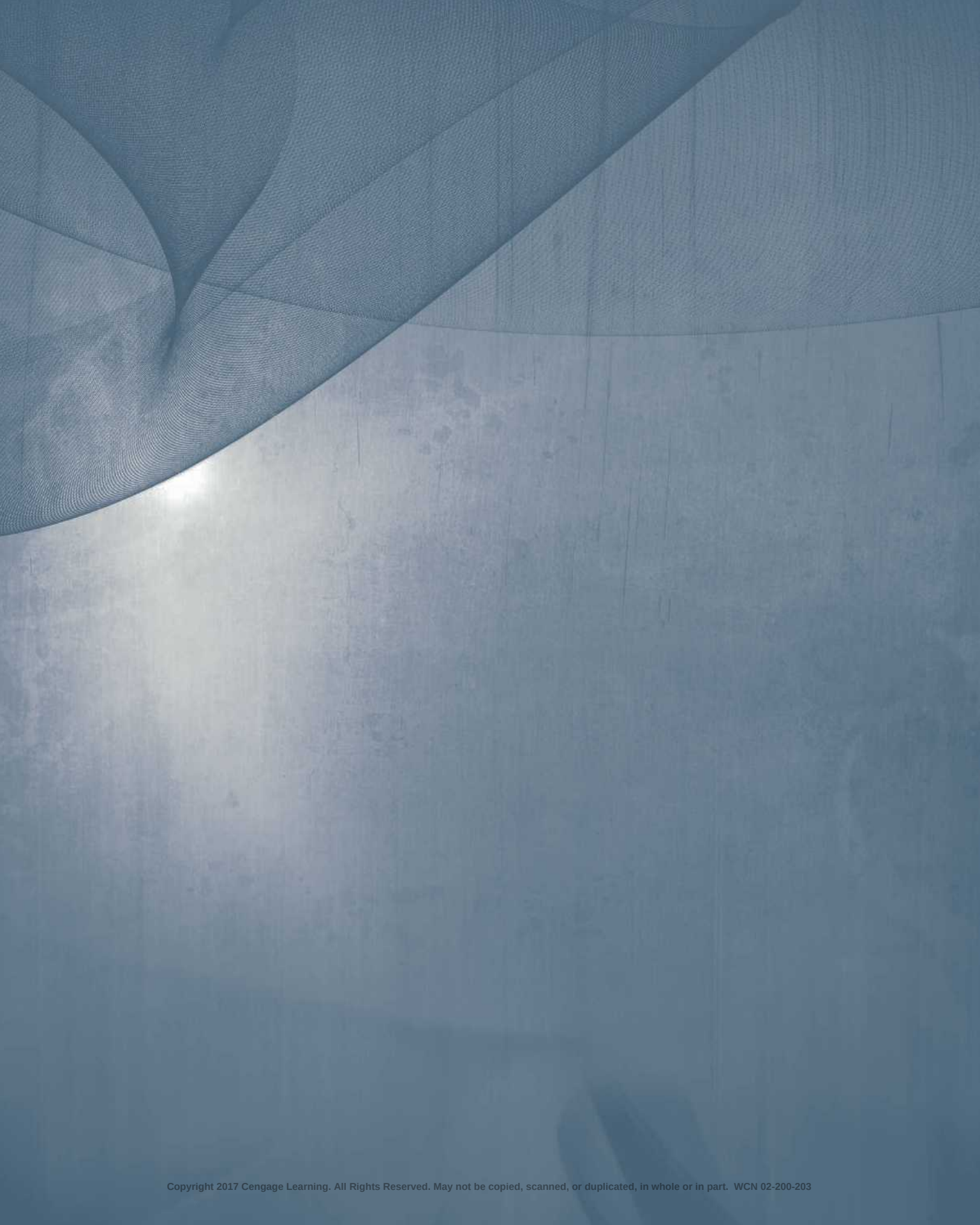
Walter: To Beth, Sarah, David, Sophia, Abby, Nate, Christopher, and Ava

Christopher: To Maura



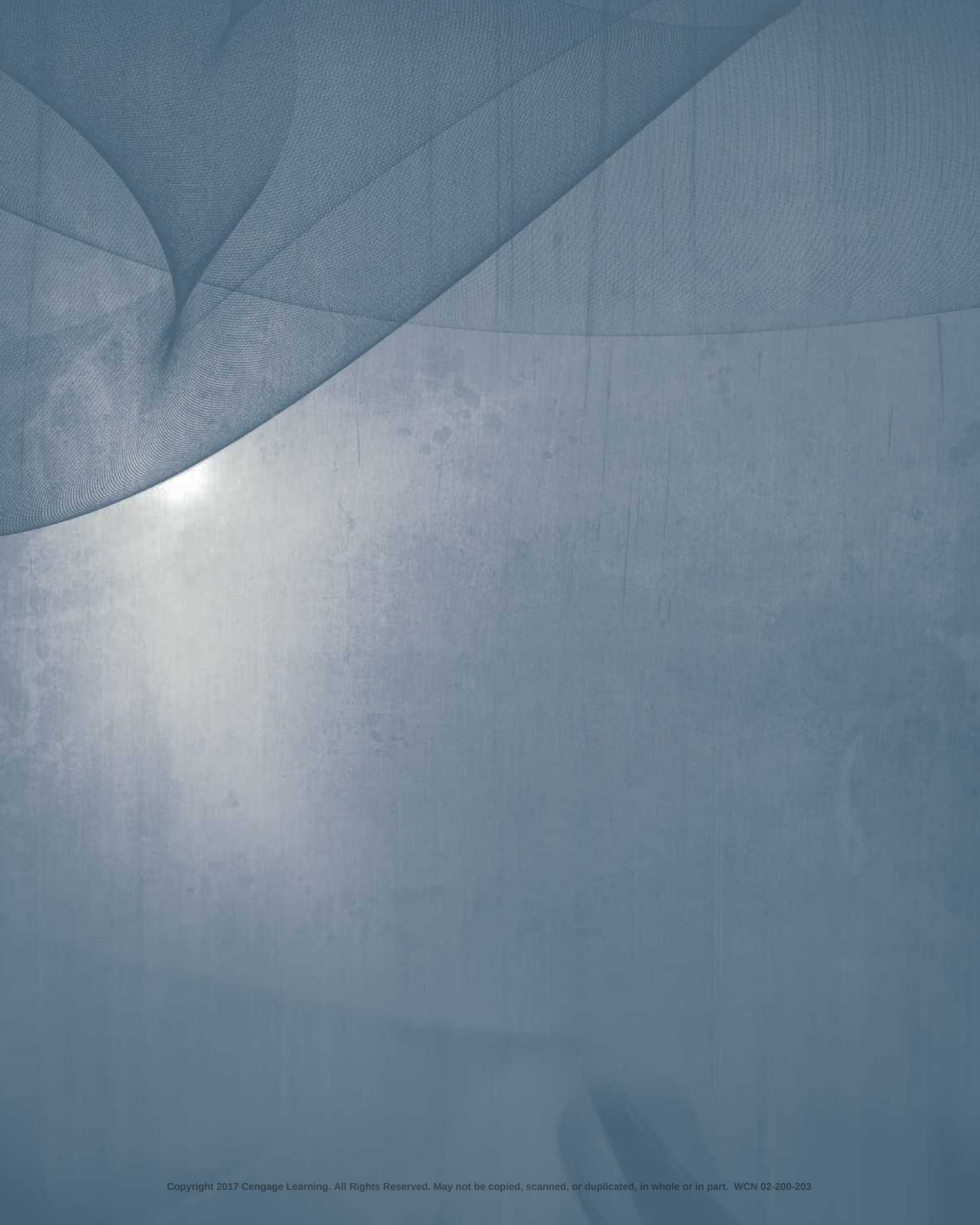
About the Authors

Walter Nicholson is the Ward H. Patton Professor of Economics (Emeritus) at Amherst College. He received a B.A. in mathematics from Williams College and a Ph.D. in economics from the Massachusetts Institute of Technology (MIT). Professor Nicholson's primary research interests are in the econometric analyses of labor market problems, including welfare, unemployment, and the impact of international trade. For many years, he has been Senior Fellow at Mathematica, Inc. and has served as an advisor to the U.S. and Canadian governments. He and his wife, Susan, live in Naples, Florida, and Montague, Massachusetts.

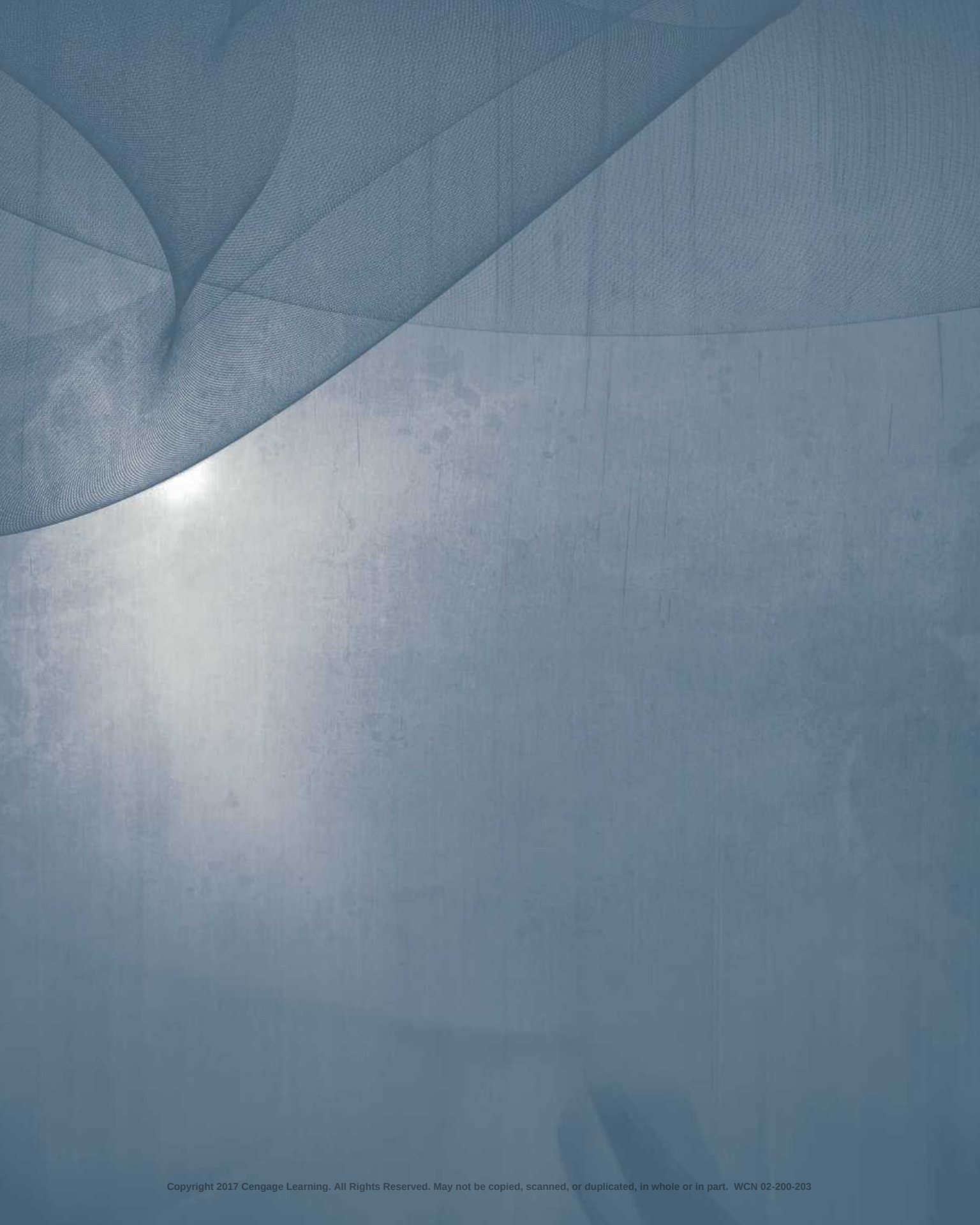
Christopher M. Snyder is the Joel and Susan Hyatt Professor of Economics at Dartmouth College, currently serving as Chair of the Economics Department. He received his B.A. in economics and mathematics from Fordham University and his Ph.D. in economics from MIT. He is Research Associate in the National Bureau of Economic Research, Secretary-Treasurer of the Industrial Organization Society, and Associate Editor of the *Review of Industrial Organization*. His research covers various theoretical and empirical topics in industrial organization, contract theory, and law and economics.

Professor Snyder and his wife Maura Doyle (who also teaches economics at Dartmouth) live within walking distance of campus in Hanover, New Hampshire, with their three daughters.

Professors Nicholson and Snyder are also the authors of *Intermediate Microeconomics and Its Application* (Cengage Learning, 2015), an intuitive treatment of intermediate microeconomics emphasizing concepts and real-world applications over mathematical derivations.



Brief Contents



Contents

PART EIGHT Market Failure

Preface

The 12th edition of *Microeconomic Theory: Basic Principles and Extensions* continues a successful collaboration between the authors starting with the 10th edition. This edition represents our efforts to continue refining and modernizing our treatment of microeconomic theory. Despite the significant changes appearing in virtually every chapter, the text retains all of the elements that have made it successful for so many editions. The basic approach is to focus on building intuition about economic models while providing students with the mathematical tools needed to go further in their studies. The text also seeks to facilitate that linkage by providing many numerical examples, advanced problems, and extended discussions of empirical implementation—all of which are intended to show students how microeconomic theory is used today. New developments continue to keep the field exciting, and we hope this edition manages to capture that excitement.

NEW TO THE TWELFTH EDITION

We took a fresh look at every chapter to make sure that they continue to provide clear and up-to-date coverage of all of the topics examined. The major revisions include the following.

- Many of the topics in our introductory chapter on mathematics (Chapter 2) have been further revised to conform more closely to methods encountered in the recent economics literature. Significant new material has been added on comparative statics analysis (including the use of Cramer's rule) and on the interpretation of the envelope theorem.
- New figures have been added to illustrate the most basic concepts (risk aversion, certainty equivalence) in Chapter 7 on uncertainty and the notation streamlined throughout.
- For all the figures exhibiting the game-theory examples in Chapter 8, detailed captions have been added providing synopses and further analytical points. We tightened the exposition by removing several extraneous examples.
- Passages have been added to Chapter 10 to help clear up perennial sources of student confusion regarding different categories of costs—economic versus accounting, fixed versus sunk, and so forth—illustrating with examples from real-world industries.
- Our discussion of the comparative statics of the competitive model in Chapter 12 has been extensively updated and expanded using the new mathematical material provided in Chapter 2.

- Chapter 14 on monopoly has been extensively revised. A passage has been added making basic points about the monopoly problem, connecting it to general profit maximization from Chapter 11. Our revamped approach to comparative statics is now featured in several places in this chapter. We cover recent advances in price discrimination, tractable functional forms, and innovation.
- A significant amount of new material has been added to Chapter 17 on capital by looking at savings decisions under uncertainty. The concept of the stochastic discount factor is introduced and used to describe a number of issues in modern finance theory.
- Coverage of behavioral economics has been further expanded with a number of added references throughout the relevant chapters. One or more new behavioral economics problems have been added to most chapters covering topics such as decision utility, spurious product differentiation, and the role of competition and advertising in unshrouding information about prices to consumers. These appear at the end of the list of problems, highlighted by the icon of the head with psychological gears turning.

Many new problems have been added with the goal of sharpening the focus on ones that will help students to develop their analytical skills.

SUPPLEMENTS TO THE TEXT

The thoroughly revised ancillaries for this edition include the following.

- The *Solutions Manual* and *Test Bank* (by the text authors). The *Solutions Manual* contains comments and solutions to all problems, and the *Test Bank* has been revised to include additional questions. Both are available to all adopting instructors in electronic version on Instructor's companion site.
- PowerPoint Lecture Presentation Slides. PowerPoint slides for each chapter of the text provide a thorough set of outlines for classroom use or for students as a study aid. The slides are available on Instructor's companion site.
- MindTap® for *Microeconomic Theory: Basic Principles & Extensions*, 12th Edition, is a digital learning solution allowing instructors to chart paths of dynamic assignments and applications personalized for their own courses. MindTap also includes real-time course analytics and an accessible reader to help engage students and encourage their high-level thinking rather than memorization.
- Cengage Learning Testing powered by Cognero® is a flexible, online system that allows instructors to import, edit, and manipulate content from the text's test bank or elsewhere, including the instructors own favorite test questions; create multiple test versions in an instant; and deliver tests from learning management system used for the course, the classroom, or wherever the instructor wants.

ONLINE RESOURCES

Cengage Learning provides instructors with a set of valuable online resources that are an effective complement to this text. Each new copy of the book comes with a registration card that provides access to Economic Applications and InfoTrac College Edition.

ACKNOWLEDGMENTS

We are indebted to the team at Cengage, most importantly Anita Verma, for keeping all of the moving parts of this new edition moving and on schedule. The copyeditors at Lumina Datamatics, Inc did a great job of making sense of our messy manuscripts. Joseph Malcolm coordinated the copyediting and supervised the production of page proofs, dealing expertly with many of the technical problems that arise in going from text to print equations. We very much appreciate his attention to the complexities of this process and are grateful for his professionalism and hard work.

We thank our colleagues at Amherst and Dartmouth College for valuable conversations and understanding. Several colleagues who used the book for their courses offered us detailed suggestions for revision. We have also benefitted from the reactions of generations of students to the use of the book in our own microeconomics classes. Over the years, Amherst students Eric Budish, Adrian Dillon, David Macoy, Tatyana Mamut, Anoop Menon, Katie Merrill, Jordan Milev, and Doug Norton and Dartmouth students Wills Begor, Paulina Karpis, Glynnis Kearny, and Henry Senkfor worked with us revising various chapters.

Walter again gives special thanks to his wife Susan; after providing much-needed support through twenty-four editions of his microeconomics texts, she is happy for the success but continues to wonder about his sanity. Walter's children (Kate, David, Tory, and Paul) still seem to be living happy and productive lives despite a severe lack of microeconomic education. Perhaps this will be remedied as the next generation grows older. At least he hopes they will wonder what the books dedicated to them are all about. He is offering a prize for the first to read the entire text.

Chris gives special thanks to his family—his wife, Maura Doyle, and their daughters, Clare, Tess, and Meg—for their patience during the revision process. Maura has extensive experience using the book in her popular microeconomics courses at Dartmouth College and has been a rich source of suggestions reflected in this revision.

Perhaps our greatest debt is to instructors who adopt the text, who share a similar view of how microeconomics should be taught. We are grateful for the suggestions that teachers and students have shared with us over the years. Special mention in this regard is due Genevieve Briand, Ramez Guirguis, Ron Harstad, Bradley Ruffle, and Adriaan Soetevent, who provided pages of detailed, perceptive comments on the previous edition. We encourage teachers and students to continue to e-mail us with any comments on the text (wenicholson@amherst.edu or chris.snyder@dartmouth.edu.

Walter Nicholson Amherst, Massachusetts
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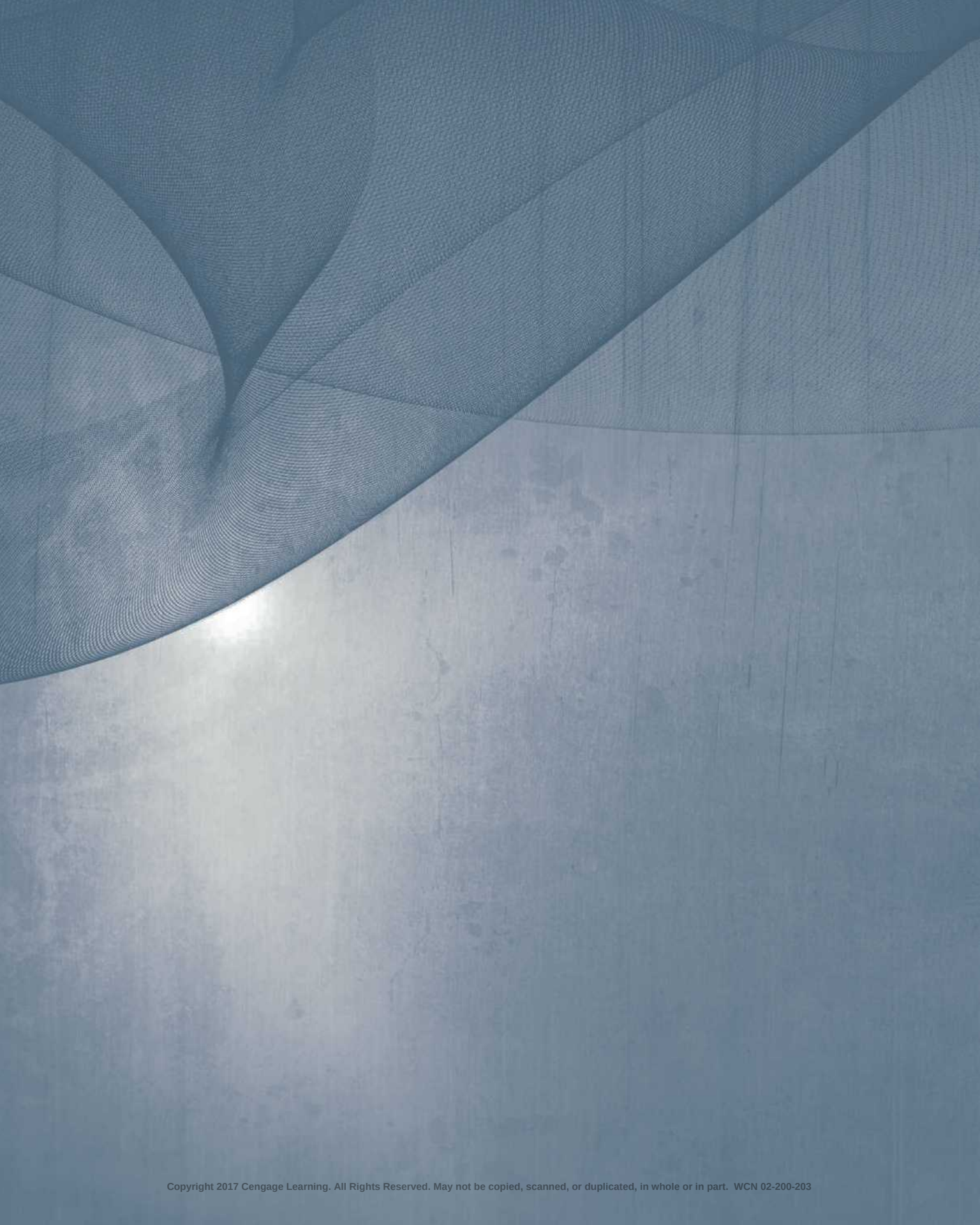
June 2016



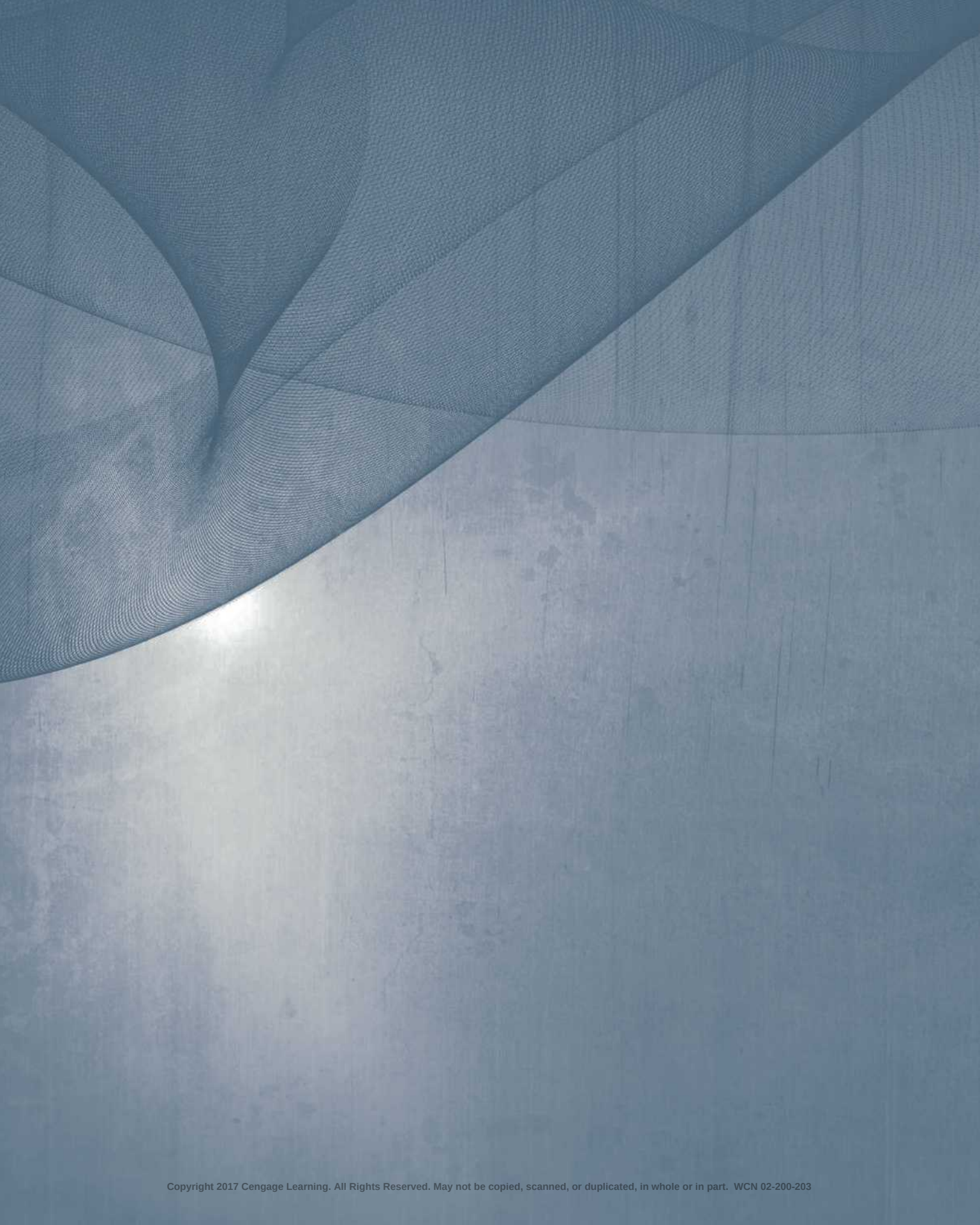
PART **ONE**

Introduction

Chapter 1
Economic Models

Chapter 2
Mathematics for Microeconomics

This part contains two chapters. Chapter 1 examines the general philosophy of how economists build models of economic behavior. Chapter 2 then reviews some of the mathematical tools used in the construction of these models. The mathematical tools from Chapter 2 will be used throughout the remainder of this book.



CHAPTER **ONE**

Economic Models

The main goal of this book is to introduce you to the models that economists use to explain the behavior of consumers, firms, and markets. These models are central to the study of all areas of economics. Therefore, it is essential to understand both the need for such models and the basic framework used to develop them. This chapter begins by outlining some of the ways in which economists study practically every question that interests them.

1.1 THEORETICAL MODELS

A modern economy is a complicated place. Thousands of firms engage in producing millions of different goods. Many millions of people work in all sorts of occupations and make decisions about which of these goods to buy. Let's use peanuts as an example. Peanuts must be harvested at the right time and shipped to processors who turn them into peanut butter, peanut oil, peanut brittle, and numerous other peanut delicacies. These processors, in turn, must make certain that their products arrive at thousands of retail outlets in the proper quantities to meet demand.

Because it would be impossible to describe the features of even these peanut markets in complete detail, economists must abstract from the complexities of the real world and develop rather simple models that capture the "essentials." Just as a road map is helpful, even though it does not record every house or every store, the economic models of, say, the market for peanuts are also useful, even though they do not record every minute feature of the peanut economy. In this book, we will study the most widely used economic models. We will see that, even though these models often make significant abstractions from the complexities of the real world, they nonetheless capture the essential features that are common to all economic activities.

The use of models is widespread in the physical and social sciences. In physics, the notion of a "perfect" vacuum or an "ideal" gas is an abstraction that permits scientists to study real-world phenomena in simplified settings. In chemistry, the idea of an atom or a molecule is actually a simplified model of the structure of matter. Architects use mock-up models to plan buildings. Television repairers refer to wiring diagrams to locate problems. Economists' models perform similar functions. They provide simplified portraits of the way individuals make decisions, the way firms behave, and the way in which these two groups interact to establish markets.

1.2 VERIFICATION OF ECONOMIC MODELS

Of course, not all models prove to be "good." For example, the earth-centered model of planetary motion devised by Ptolemy was eventually discarded because it proved incapable of accurately explaining how the planets move around the sun. An important purpose of scientific investigation is to sort out the "bad" models from the "good" models. Two general methods have been used to verify economic models: (1) a direct approach, which seeks to establish the validity of the basic assumptions on which a model is based, and (2) an indirect approach, which attempts to confirm validity by showing that a simplified model correctly predicts real-world events. To illustrate the basic differences between the two approaches, let's briefly examine a model that we will use extensively in later chapters of this book—the model of a firm that seeks to maximize profits.

1.2.1 The profit-maximization model

The model of a firm seeking to maximize profits is obviously a simplification of reality. It ignores the personal motivations of the firm's managers and does not consider conflicts among them. It assumes that profits are the only relevant goal of the firm; other possible goals, such as obtaining power or prestige, are treated as unimportant. The model also assumes that the firm has sufficient information about its costs and the nature of the market to which it sells to discover its profit-maximizing options. Most real-world firms, of course, do not have this information available, at least not at zero cost. Yet such shortcomings in the model are not necessarily serious. No model can exactly describe reality. The real question is whether this simple model has any claim to being a good one.

1.2.2 Testing assumptions

One test of the model of a profit-maximizing firm investigates its basic assumption: Do firms really seek maximum profits? Some economists have examined this question by sending questionnaires to executives, asking them to specify the goals they pursue. The results of such studies have been varied. Businesspeople often mention goals other than profits or claim they only do "the best they can" to increase profits given their limited information. On the other hand, most respondents also mention a strong "interest" in profits and express the view that profit maximization is an appropriate goal. Therefore, testing the profit-maximizing model by testing its assumptions has provided inconclusive results.

1.2.3 Testing predictions

Some economists, most notably Milton Friedman, deny that a model can be tested by inquiring into the "reality" of its assumptions.[1] They argue that all theoretical models are based on "unrealistic" assumptions; the very nature of theorizing demands that we make certain abstractions. These economists conclude that the only way to determine the validity of a model is to see whether it is capable of predicting and explaining real-world events. The ultimate test of an economic model comes when it is confronted with data from the economy itself.

Friedman provides an important illustration of that principle. He asks what kind of theory one should use to explain the shots expert pool players will make. He argues that the laws of velocity, momentum, and angles from theoretical physics would be a suitable model.

[1] *See* M. Friedman, *Essays in Positive Economics* (Chicago: University of Chicago Press, 1953), chap. 1. For an alternative view stressing the importance of using "realistic" assumptions, see H. A. Simon, "Rational Decision Making in Business Organizations," *American Economic Review* 69, no. 4 (September 1979): 493–513.

Pool players shoot shots *as if* they follow these laws. But most players asked whether they precisely understand the physical principles behind the game of pool will undoubtedly answer that they do not. Nonetheless, Friedman argues, the physical laws provide accurate predictions and therefore should be accepted as appropriate theoretical models of how experts play pool.

Thus, a test of the profit-maximization model would be provided by predicting the behavior of real-world firms by assuming that these firms behave *as if* they were maximizing profits. (See Example 1.1 later in this chapter.) If these predictions are reasonably in accord with reality, we may accept the profit-maximization hypothesis. However, we would reject the model if real-world data seem inconsistent with it. Hence the ultimate test of any theory is its ability to predict *real-world events*.

1.2.4 Importance of empirical analysis

The primary concern of this book is the construction of theoretical models. But the goal of such models is always to learn something about the real world. Although the inclusion of a lengthy set of applied examples would needlessly expand an already bulky book,[2] the Extensions included at the end of many chapters are intended to provide a transition between the theory presented here and the ways that theory is applied in empirical studies.

1.3 GENERAL FEATURES OF ECONOMIC MODELS

The number of economic models in current use is, of course, large. Specific assumptions used and the degree of detail provided vary greatly depending on the problem being addressed. The models used to explain the overall level of economic activity in the United States, for example, must be considerably more aggregated and complex than those that seek to interpret the pricing of Arizona strawberries. Despite this variety, practically all economic models incorporate three common elements: (1) the *ceteris paribus* (other things the same) assumption; (2) the supposition that economic decision-makers seek to optimize something; and (3) a careful distinction between "positive" and "normative" questions. Because we will encounter these elements throughout this book, it may be helpful at the outset to describe the philosophy behind each of them.

1.3.1 The ceteris paribus assumption

As in most sciences, models used in economics attempt to portray relatively simple relationships. A model of the wheat market, for example, might seek to explain wheat prices with a small number of quantifiable variables, such as wages of farmworkers, rainfall, and consumer incomes. This parsimony in model specification permits the study of wheat pricing in a simplified setting in which it is possible to understand how the specific forces operate. Although any researcher will recognize that many "outside" forces (e.g., presence of wheat diseases, changes in the prices of fertilizers or of tractors, or shifts in consumer attitudes about eating bread) affect the price of wheat, these other forces are held constant in the construction of the model. It is important to recognize that economists are *not* assuming that other factors do not affect wheat prices; rather, such other variables are assumed to be unchanged during the period of study. In this way, the effect of only a few forces can be studied in a simplified setting. Such ceteris paribus (other things equal) assumptions are used in all economic modeling.

[2]For an intermediate-level text containing an extensive set of real-world applications, see W. Nicholson and C. Snyder, *Intermediate Microeconomics and Its Application,* 12th ed. (Mason, OH: Thomson/Southwestern, 2015).

Use of the ceteris paribus assumption does pose some difficulties for the verification of economic models from real-world data. In other sciences, the problems may not be so severe because of the ability to conduct controlled experiments. For example, a physicist who wishes to test a model of the force of gravity probably would not do so by dropping objects from the Empire State Building. Experiments conducted in that way would be subject to too many extraneous forces (e.g., wind currents, particles in the air, variations in temperature) to permit a precise test of the theory. Rather, the physicist would conduct experiments in a laboratory, using a partial vacuum in which most other forces could be controlled or eliminated. In this way, the theory could be verified in a simple setting, without considering all the other forces that affect falling bodies in the real world.

With a few notable exceptions, economists have not been able to conduct controlled experiments to test their models. Instead, they have been forced to rely on various statistical methods to control for other forces when testing their theories. Although these statistical methods are as valid in principle as the controlled experiment methods used by other scientists, in practice they raise a number of thorny issues. For that reason, the limitations and precise meaning of the ceteris paribus assumption in economics are subject to greater controversy than in the laboratory sciences.

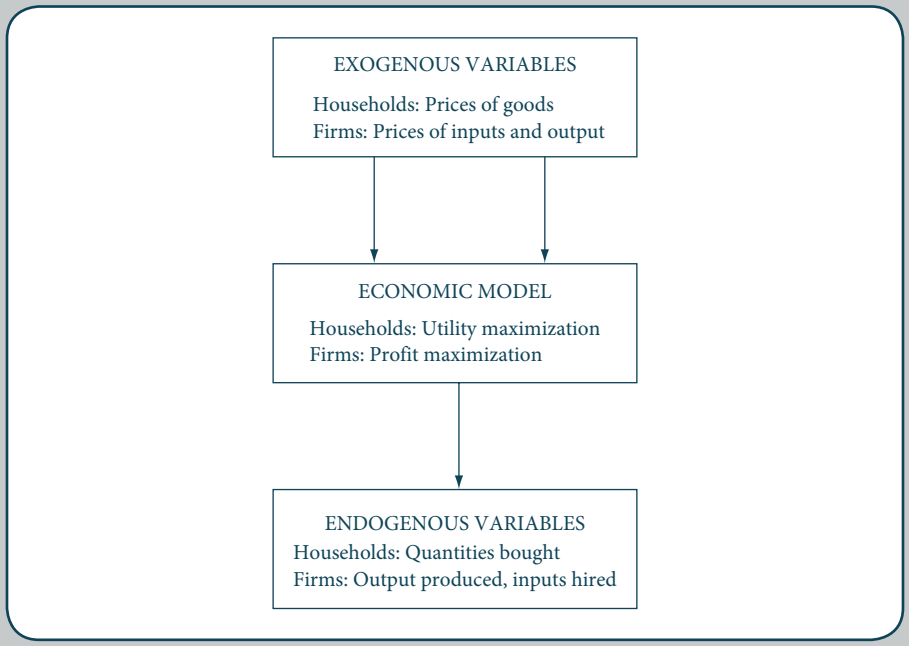
1.4 STRUCTURE OF ECONOMIC MODELS

Most of the economic models you will encounter in this book have a mathematical structure. They highlight the relationships between factors that affect the decisions of households and firms and the results of those decisions. Economists tend to use different names for these two types of factors (or, in mathematical terms, *variables)*. Variables that are outside of a decision-maker's control are called *exogenous variables*. Such variables are inputs into economic models. For example, in consumer theory we will usually treat individuals as price-takers. The prices of goods are determined outside of our models of consumer behavior, and we wish to study how consumers adjust to them. The results of such decisions (e.g., the quantities of each good that a consumer buys) are *endogenous variables*. These variables are determined within our models. This distinction is pictured schematically in Figure 1.1. Although the actual models developed by economists may be complicated, they all have this basic structure. A good way to start studying a particular model is to identify precisely how it fits into this framework.

This distinction between exogenous and endogenous variables will become clearer as we explore a variety of economic models. Keeping straight which variables are determined outside a particular model and which variables are determined within a model can be confusing; therefore, we will try to remind you about this as we go along. The distinction between exogenous and endogenous variables is also helpful in understanding the way in which the ceteris paribus assumption is incorporated into economic models. In most cases we will want to study how the results of our models change when one of the exogenous variables (such as a price or a person's income) changes. It is possible, even likely, that the change in such a single variable will change all the results calculated from the model. For example, as we will see, it is likely that the change in the price of a single good will cause an individual to change the quantities of practically every good he or she buys. Examining all such responses is precisely why economists build models. The ceteris paribus assumption is enforced by changing only one exogenous variable, holding all others constant. If we wish to study the effects of a change in the price of gasoline on a household's purchases, we change that price in our model, but we do not change the prices of other goods (and in some cases we do not change the individual's income either). Holding the other prices constant is what is meant by studying the ceteris paribus effect of an increase in the price of gasoline.

FIGURE 1.1
Structure of a Typical Microeconomic Model

Values for exogenous variables are inputs into most economic models. Model outputs (results) are values for the endogenous variables.



1.4.1 Optimization assumptions

Many economic models start from the assumption that the economic actors being studied are rationally pursuing some goal. We briefly discussed such an assumption when investigating the notion of firms maximizing profits. Example 1.1 shows how that model can be used to make testable predictions. Other examples we will encounter in this book include consumers maximizing their own well-being (utility), firms minimizing costs, and government regulators attempting to maximize public welfare. As we will show, even though all these assumptions are unrealistic, all have won widespread acceptance as good starting places for developing economic models. There seem to be two reasons for this acceptance. First, the optimization assumptions are useful for generating precise, solvable models, primarily because such models can draw on a variety of mathematical techniques suitable for optimization problems. Many of these techniques, together with the logic behind them, are reviewed in Chapter 2. A second reason for the popularity of optimization models concerns their apparent empirical validity. As some of our Extensions show, such models seem to be fairly good at explaining reality. In all, then, optimization models have come to occupy a prominent position in modern economic theory.

EXAMPLE 1.1 Profit Maximization

The profit-maximization hypothesis provides a good illustration of how optimization assumptions can be used to generate empirically testable propositions about economic behavior. Suppose that a firm can sell all the output that it wishes at an exogenously determined price of p per unit and that the total costs of production, C, depend on the amount produced, q. Then profits are given by

$$\text{profits} = \pi = pq - C(q). \tag{1.1}$$

Maximization of profits consists of finding that value of q that maximizes the profit expression in Equation 1.1. This is a simple problem in calculus. Differentiation of Equation 1.1 and setting that derivative equal to 0 give the following first-order condition for a maximum:

$$\frac{d\pi}{dq} = p - C'(q) = 0 \quad \text{or} \quad p = C'(q). \tag{1.2}$$

In words, the profit-maximizing output level (q^*) is found by selecting that output level for which price is equal to marginal cost, $C'(q)$. This result should be familiar to you from your introductory economics course. Notice that in this derivation, the price for the firm's output is treated as a constant because the firm is a price-taker. That is, price is an exogenous variable in this model.

Equation 1.2 is only the first-order condition for a maximum. Taking account of the second-order condition can help us to derive a testable implication of this model. The second-order condition for a maximum is that at q^* it must be the case that

$$\frac{d^2\pi}{dq^2} = -C''(q) < 0 \quad \text{or} \quad C''(q^*) > 0. \tag{1.3}$$

That is, marginal cost must be increasing at q^* for this to be a true point of maximum profits.

Our model can now be used to "predict" how a firm will react to a change in price. To do so, we differentiate Equation 1.2 with respect to price (p), assuming that the firm continues to choose a profit-maximizing level of q:

$$\frac{d[p - C'(q^*) = 0]}{dp} = 1 - C''(q^*).\frac{dq^*}{dp} = 0. \tag{1.4}$$

Rearranging terms a bit gives

$$\frac{dq^*}{dp} = \frac{1}{C''(q^*)} > 0. \tag{1.5}$$

Here the final inequality again reflects the fact that marginal cost must be increasing at q^* if this point is to be a true maximum. This then is one of the testable propositions of the profit-maximization hypothesis—if other things do not change, a price-taking firm should respond to an increase in price by increasing output. On the other hand, if firms respond to increases in price by reducing output, there must be something wrong with our model.

Although this is a simple model, it reflects the way we will proceed throughout much of this book. Specifically, the fact that the primary implication of the model is derived by calculus, and consists of showing what sign a derivative should have, is the kind of result we will see many times. Notice that in this model there is only one endogenous variable—q, the quantity the firm chooses to produce. There is also only one exogenous variable—p, the price of the product, which the firm takes as a given. Our model makes a specific prediction about how changes in this exogenous variable affect the firm's output choice.

QUERY: In general terms, how would the implications of this model be changed if the price a firm obtains for its output were a function of how much it sold? That is, how would the model work if the price-taking assumptions were abandoned?

1.4.2 Positive-normative distinction

A final feature of most economic models is the attempt to differentiate carefully between "positive" and "normative" questions. Thus far we have been concerned primarily with *positive* economic theories. Such theories take the real world as an object to be studied, attempting to explain those economic phenomena that are observed. Positive economics

seeks to determine how resources are *in fact* allocated in an economy. A somewhat different use of economic theory is *normative* analysis, taking a definite stance about what *should* be done. Under the heading of normative analysis, economists have a great deal to say about how resources *should* be allocated. For example, an economist engaged in positive analysis might investigate how prices are determined in the U.S. health-care economy. The economist also might want to measure the costs and benefits of devoting even more resources to health care by, for example, offering government-subsidized health insurance. But when he or she specifically advocates that such an insurance plan should be adopted, the analysis becomes normative.

Some economists believe that the only proper economic analysis is positive analysis. Drawing an analogy with the physical sciences, they argue that "scientific" economics should concern itself only with the description (and possibly prediction) of real-world economic events. To take political positions and to plead for special interests are considered to be outside the competence of an economist acting as such. Of course, an economist, like any other citizen, is free to express his or her views on political matters. But when doing so he or she is acting as a citizen, not an economist. For other economists, however, the positive-normative distinction seems artificial. They believe that the study of economics necessarily involves the researchers' own views about ethics, morality, and fairness. According to these economists, searching for scientific "objectivity" in such circumstances is hopeless. Despite some ambiguity, this book tries to adopt a positivist tone, leaving normative concerns for you to decide for yourself.

1.5 DEVELOPMENT OF THE ECONOMIC THEORY OF VALUE

Because economic activity has been a central feature of all societies, it is surprising that these activities were not studied in any detail until fairly recently. For the most part, economic phenomena were treated as a basic aspect of human behavior that was not sufficiently interesting to deserve specific attention. It is, of course, true that individuals have always studied economic activities with a view toward making some kind of personal gain. Roman traders were not above making profits on their transactions. But investigations into the basic nature of these activities did not begin in any depth until the eighteenth century.[3] Because this book is about economic theory as it stands today, rather than the history of economic thought, our discussion of the evolution of economic theory will be brief. Only one area of economic study will be examined in its historical setting: the *theory of value*.

1.5.1 Early economic thoughts on value

The theory of value, not surprisingly, concerns the determinants of the "value" of a commodity. This subject is at the center of modern microeconomic theory and is closely intertwined with the fundamental economic problem of allocating scarce resources to alternative uses. The logical place to start is with a definition of the word "value." Unfortunately, the meaning of this term has not been unambiguous throughout the history of economics. Today we regard value as being synonymous with the price of a commodity.[4] Much of the early writings about economics, however, sought to establish the idea of a "just price" for some items and examine how actual market prices conformed to this ideal. In many cases these discussions touched on modern concerns. For example, early

[3]For a detailed treatment of early economic thought, see the classic work by J. A. Schumpeter, *History of Economic Analysis* (New York: Oxford University Press, 1954), pt. II, chaps. 1–3.

[4]This is not completely true when "externalities" are involved, and a distinction must be made between private and social value (see Chapter 19).