MANAGERIAL ECONOMICS

Theory, Applications, and Cases

Edwin Mansfield

SECOND EDITION

Managerial Economics

Second Edition

Edwin Mansfield

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University of Pennsylvania

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To Katherine . . .
and her parents too

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About the Author

Edwin Mansfield is Professor of Economics and Director of the Center for Economics and Technology at the University of Pennsylvania. A graduate of Dartmouth College, he received his M.A. and Ph.D degrees from Duke University, as well as the Certificate and Diploma of the Royal Statistical Society. Before joining the University of Pennsylvania faculty, he taught at Carnegie-Mellon, Yale, Harvard, and the California Institute of Technology. He has been a consultant to many industrial firms and government agencies, and has been a member of the Advisory Committee of the U.S. Bureau of the Census, and the AAAS's Committee on Science, Engineering, and Public Policy. He has been chairman of the Visiting Committee at Rensselaer Polytechnic Institute. He has received the Certificate of Appreciation from the U.S. Secretary of Commerce, and in 1984 was appointed to the National Technology Medal Committee.

Professor Mansfield has been elected a fellow of the American Academy of Arts and Sciences, of the Econometric Society, of the Center for Advanced Study in the Behavioral Sciences, and he has held Fulbright and Ford Foundation fellowships. He has been a member of the board of directors of the American Productivity and Quality Center. He has served as U.S. chairman of the U.S.-U.S.S.R. Working Party on the Economics of Science and Technology, and was the first U.S. economist to be invited to visit and lecture in the People's Republic of China under the 1979 Sino-American agreements.

He is the author of 190 articles and 25 books. His textbooks on eco-

nomics, microeconomics, managerial economics, and statistics have been adopted at over 1,000 colleges and universities, and have been translated for use abroad. He has been on the editorial board of eight journals, including the *Journal of the American Statistical Association,* and has been general editor of a series of books on technological change published by the University of Wisconsin Press. He has received the Publication Award of the Patent Law Association and the Honor Award of the National Technological University for research, teaching, and public service. He was included on the *Journal of Economic Perspectives'* list of 20 most cited economists in the United States.

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Preface

The success of the first edition of this book was very gratifying, but, like any new textbook, extensive use in the classroom has produced lots of good ideas for improvements. Many of the hundreds of teachers who adopted the book have provided valuable comments and suggestions, which I appreciate very much. While the book's general structure and approach remain the same in this edition as in the previous one, there are many noteworthy improvements, described below.

New Chapter on Managerial Economics in an International Setting. Without question, the most important feature of this new edition is a chapter on managerial economics in the world economy. Competition in international markets is much rougher than in the past, and managers must be aware of the relevant principles of international economics and how they apply to real-world situations. Despite this fact, which has been trumpeted by many leading managers and teachers, no managerial economics textbook (that I know of) includes an extended discussion of this topic. One important aim of this new edition is to fill that void.

New Introductory Material on Supply and Demand and on Principal-Agent Problems. In Chapter 1, there is now a brief discussion of demand and supply curves and of price determination in competitive markets. This material will provide a useful orientation and review. Also, there is a treatment of principal-agent problems. Given the importance of these topics, it seems appropriate to introduce them at the outset.

More Complete Discussion of Indifference Curves, Pricing Techniques, Externalities, and Public Goods. Based on the reactions of users of the first edition, many teachers would like to have a fuller treatment of indifference curves, which is now included in a new appendix to Chapter 3. Also, a more extensive discussion of the long-run adjustment process and resource allocation under perfect competition is provided in Chapter 10, and new sections on two-part tariffs and bundling have been added. Further, in Chapter 15, there are more complete treatments of externalities and public goods.

Revised Treatments of Game Theory and of Regression Techniques. In Chapter 11, the material on game theory has been reorganized and beefed up; in particular, the discussions of Nash equilibrium and of reaction curves have been extended. In Chapter 4, the material on multiple regression techniques has been simplified. Also, much more emphasis has been put on the use of computer software and the interpretation of computer printouts, rather than on statistical formulas. In Chapter 13, there is a new discussion of the winner's curse.

New Case Studies and Applications. I have found from my own teaching experience, at the University of Pennsylvania (both in the Wharton School and in the College of Arts and Sciences) and at Carnegie-Mellon's Graduate School of Industrial Administration, that existing textbooks do not go far enough in demonstrating how the techniques presented in a managerial economics course are actually used by firms and analysts. In this second edition, there are well over 100 case studies and real-world applications (about 25 percent more than in the previous edition), of which the following are new: (1) The Comeback of the Xerox Corporation, (2) Harley-Davidson versus the Japanese Goliaths, (3) Bantam's Big Bet on Schwartzkopf's Book, (4) How Banc One Deals with the Principal-Agent Problem, (5) The 1991 Collapse of Wool Prices, (6) Why the Drop in the Price of Radio Stations?, (7) How the Japanese Motorcycle Makers Used the Coefficient of Determination, (8) Poultry Production in the United States, (9) The Time-Cost Trade-Off Function for Airliners, (10) Should We Continue to Make Autos from Steel?, (11) Economies of Scope in Advertising Agencies, (12) How Linear Programming Improves Aircraft Operations, (13) Acrimony in the OPEC Oil Cartel, (14) Pricing Electricity by the Hour, (15) Using Simulation Techniques in the Computer Industry, (16) Buying and Selling Pollution Permits at the Chicago Board of Trade, (17) Why Bridgestone Paid $2.6 Billion for Firestone's Tire Plants, (18) Airbus versus Boeing: Strategic Trade Policy in Action, (19) Is Airbus Playing by the Rules?, (20) Why So Many U.S. Plants Are Located South of the Border, (21) Reorganizing a Firm's Global R and D Network, and (22) A Free Trade Agreement for North America?

Continued Emphasis on a Variety of Types of Cases. As in the previous edition, a variety of types of cases are presented. Some ("Concepts in Context") describe how various important techniques have been used. Others ("Analyzing Managerial Decisions") go further and ask the student to answer questions related to the techniques being described. (Answers to

these questions are included.) In addition, each chapter contains a section ("Consultant's Corner") that provides a brief case, generally based on an actual situation, where the student is asked to provide practical advice to a manager. Answers are provided at the end of the book. Further, each part of the book contains a case ("Managerial Economics in Context") that tries to bridge the material in various chapters, thus helping the student to integrate the material. Answers to these cases too are provided at the end of the book. For all of these types of cases, I have updated the material to make it as timely as possible.

Numerical Examples and Answers to Problems. Because managerial economics centers on the application of quantitative techniques, it is important that the student be ushered through many numerical examples. For example, to understand how price should be set under various sets of circumstances, the student should be given numerical examples that help to lay bare the essence of each price-setting technique. I have included many sections that are devoted entirely to working out such numerical examples. Also, answers to the odd-numbered end-of-chapter problems are included at the end of the book. This provides the student with useful feedback: he or she can see how a problem can be solved and whether he or she really understood the principles involved. In contrast to the previous edition, the answers to the even-numbered problems are in the *Instructor's Manual*, not the study guide, so these problems can be used to test students. New problems have been added, and old ones have been updated if needed.

Chapter on Industrial Innovation and Technological Change. American firms—as well as those in other countries—are constantly faced with decisions concerning innovation and technological change. It is no exaggeration to say that these decisions are among the most important facing any firm, particularly now that the traditional U.S. technological lead over other major countries has evaporated in many industries. Other textbooks in managerial economics devote little or no space to this topic. This is the first —and to date, only—one to provide a full chapter on this score.

Chapter on Oligopoly and Strategic Behavior. Advances in the analysis of strategic behavior have had an impact on thinking in boardrooms as well as classrooms. The previous edition was the first managerial economics textbook to devote a full chapter to oligopoly and strategic behavior. The reaction of instructors was enthusiastic, and we continue this practice in this new edition.

Software Packages. Given the major role played by the computer in today's firms, it is important in any modern managerial economics text that the student be introduced to the software packages available to help solve managerial problems. This is particularly important in the case of regression techniques and linear programming, where few real calculations are carried out any longer by hand. In this book, Chapter 4 and the appendix to Chapter 9 describe leading software packages in detail. Although the material is optional, experience indicates that it will be useful in many classes.

Organization, Coverage, and Level. Although this book contains a number of innovations, its overall organization and coverage is reasonably standard. All the topics usually taken up in a book of this sort are included, and the order in which they appear is similar to that in other books. Those instructors who wish to ignore the material on international economics, industrial innovation, strategic behavior, or software packages will find it easy to do so, since this material—included in Chapter 16, Chapter 7, the latter part of Chapter 11, and segments of Chapters 4 and 9—is self-contained and can be omitted without loss of continuity. Alternatively, some teachers omit Chapters 4, 5, and 9; this too can readily be done. It is important to note as well that this book is designed to be used by students with a wide range of abilities and backgrounds, not just a highly select few.

Mathematical Sophistication. Only a very modest mathematical background is required for an understanding of *Managerial Economics.* The elements of differential calculus that are used are explained in Chapter 2. For many students, this material can be skipped, since they will already have taken calculus courses, or it can be used to review the mathematics they have learned before. The emphasis in this book is on providing students with solid and effective evidence concerning the power and applicability of modern managerial economics and on making sure that they can use these techniques correctly and imaginatively. To accomplish these objectives, it is neither necessary nor appropriate to deluge students with mathematics.

Problems and Problem Sets. While real cases and examples whet a student's interest and sharpen his or her competence and intuition, they ordinarily must be supplemented with a substantial number of problems and problem sets. Besides the numerical examples included in the body of the chapters, there are a substantial number of problems at the end of each chapter. (As pointed out above, the answers to the odd-numbered problems are given at the end of the book.)

Study Guide. Because of the importance of hands-on experience with the techniques of this course, I have written a study guide *(Study Guide and Casebook for Managerial Economics)* to supplement the text. This supplement contains hundreds of problem sets, problems, and review questions (as well as their answers), which should be helpful to students. These problems and questions have been tested for effectiveness in the classroom. A new feature of the second edition is the inclusion of the following eight full-length classroom-tested cases, which should be very helpful and illuminating to students: (1) Apple Computer, Inc., 1987 . . . The Second Decade (by Phyllis Feddeler, Thomas Wheelen, and David Croll), (2) K. M. Westelle and Associates, Inc. (by Rhonda Aull), (3) Production Functions and Cost Functions in Oil Pipelines (by Leslie Cookenboo), (4) A Managerial Application of Cost Functions by a Railroad (by Edwin Mansfield and Harold Wein), (5) Applied CAD Knowledge, Inc. (by John Seeger and Raymond Kinnunen), (6) Catco Electronics Corporation (by Patrick Schul, William Cunningham, and Lynn Gill), (7) The Carriage House Inn (by Michael Ever-

ett), and (8) Revving Up for Relief: Harley-Davidson at the ITC (by Dorothy Robyn with assistance from Don Lippincott).

Instructor's Manual. An *Instructor's Manual* by Craig J. McCann of the University of South Carolina will be available to accompany this text. It includes suggestions for lectures and classroom discussion, as well as a test bank of roughly 700 multiple-choice questions. It should be of great help to many instructors.

In writing this book, I have benefited from the comments and suggestions of many colleagues and students. Particular thanks go to the following teachers who have commented in detail on all or part of the manuscript: Richard S. Bower, The Tuck School; Robert Carbaugh, Central Washington University; Thomas M. Carroll, University of Nevada (Las Vegas); Michael Claudon, Middlebury College; Mark Correll, University of Colorado; Alan Daskin, Boston University; George C. Dery, University of Lowell; Constantine Glezakos, California State University (Long Beach); H. Peter Gray, Rensselaer Polytechnic Institute; Theodore Groves, University of California (San Diego); James Hamilton, Wayne State University; Robert Hansen, The Tuck School; Kevin Hassett, Columbia University; Charles Hegji, Auburn University; George Hoffer, Virginia Commonwealth University; Jack Hou, California State University (Long Beach); Todd Idson, University of Miami; Lowell Jacobsen, William Jewell College; Charles E. Krider, University of Kansas; Michael Magura, University of Toledo; J. Peter Mattila, Iowa State University; Craig J. McCann, University of South Carolina; Marshall Medoff, California State University (Long Beach); Martin Milkman, Murray State University; J. Wilson Mixon, Berry College; Stephen Sheppard, Virginia Polytechnic Institute and State University; Sheldon H. Stein, Cleveland State University; John Clair Thompson, University of Connecticut; Samuel Wagner, Franklin and Marshall College; James Wetzel, Virginia Commonwealth University; and Pamela Whalley, Western Washington University. Also, Anthony Romeo of Unilever and Lorne Switzer of Concordia University suggested useful material and made valuable comments.

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Philadelphia, 1992 E.M.

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