A Short Course in Intermediate Microeconomics with Calculus

Second edition

This second edition retains the positive features of being clearly written, well organized, and incorporating calculus in the text while adding expanded coverage on game theory, experimental economics, and behavioral economics. It remains more focused and manageable than similar textbooks, and provides a concise yet comprehensive treatment of the core topics of microeconomics, including theories of the consumer and of the firm, market structure, partial and general equilibrium, and market failures caused by public goods, externalities, and asymmetric information. It includes helpful solved problems in all the substantive chapters, as well as over seventy new mathematical exercises and enhanced versions of the ones in the first edition. The authors make use of the book's full color with sharp and helpful graphs and illustrations. This mathematically rigorous textbook is meant for students at the intermediate level who have already had an introductory course in microeconomics, and a calculus course.

Roberto Serrano is the Harrison S. Kravis University Professor of Economics at Brown University. He received his BA in economics from Universidad Complutense de Madrid in 1987, and a PhD in economics from Harvard University in 1992, when he began teaching at Brown. He is the co-author (with Feldman) of *Welfare Economics and Social Choice Theory*, 2nd edition. He was elected Fellow of the Game Theory Society in 2017, member of its Council from 2005 to 2011, Fellow of the Econometric Society in 2013, Alfred P. Sloan Foundation Fellow in 1998, and received the Fundacion Banco Herrero Prize in 2004 (awarded to the best Spanish economist under 40). He has delivered a high number of plenary and keynote lectures at economic theory and game theory meetings, and his editorial responsibilities include being an Associate Editor of *Games and Economic Behavior* and the *International Journal of Game Theory*, and having been the Editor-in-Chief of *Economics Letters*.

Allan M. Feldman is Professor Emeritus of Economics at Brown University. He received an ScB in mathematics from the University of Chicago in 1965, an MA in anthropology from the University of Chicago in 1967, and a PhD in economics from Johns Hopkins University in 1972. His articles have been published in *Review of Economic Studies, Econometrica, American Economic Review, Public Choice, Journal of Public Economics, Journal of Economic Theory,* and other journals. He is author (with Serrano) of *Welfare Economics and Social Choice Theory*, 2nd edition. He taught economics at Brown University for 38 years, where he taught intermediate microeconomics course to thousands of students, and developed Brown's calculus-based version of the microeconomics course. He was a winner of the department's teacher of the year award; he was director of undergraduate studies in the economics department at Brown for around 15 years, director of graduate studies for two years, and an economics concentration advisor for around 20 years.

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PREFACE

How We Started

This textbook grew out of lecture notes that Roberto Serrano developed to teach the Intermediate Microeconomics course at Brown University. The notes were shared with other instructors at Brown over the years. One of these instructors, Amy Serrano (Roberto's wife), first suggested turning the notes into a book: "This looks like a good skeleton of something; perhaps flesh can be put around these bones." Following this suggestion, Roberto and Allan Feldman began work on the book project. Our first edition saw the light in 2013, published by Cambridge University Press. We are now happy to introduce the second edition.

Main Features of This Book

When we conceived this book project, we saw an opportunity to offer something new in the market for intermediate microeconomics textbooks. Here are what we think are some key strengths of this text. (Happily, colleagues in the profession who have adopted the book for their courses seem to agree.)

Clear, concise, and uncluttered approach. We try to be short and to the point, to cover what is essential but leave out what is not.

Integration of calculus in the main body of the text. When our first edition was published, other intermediate level microeconomics textbooks typically had no calculus, or stuck the calculus in footnotes. Most students have now taken at least one calculus course, and we take advantage of their preparation by using the math where it should be used. Much of microeconomics is about maximizing or minimizing something, and calculus provides the tools for solving maximization and minimization problems.

End-of-chapter solved problems. At the end of each chapter except the first, we include at least one long problem with a thoroughly explained solution.

End-of-chapter student exercises. At the end of each chapter except the first, we now include an improved and expanded section consisting of ten exercises for students.

Narrative cohesion. We think our book is well organized and its parts are well connected; it covers all the basics in intermediate level economics but it leaves out topics that are tangential.

Affordably priced. The price is right!

What Is New in this Second Edition

To produce this second edition, we have modified our first edition in the following ways:

In response to the most popular suggestion from reviewers, we have increased the number of exercises at the end of each chapter from six to ten. The addition of 76 new exercises is a significant improvement for students and instructors. We continue to have two files which provide solutions to all the exercises. "Solutions for Instructors" has detailed solutions with explanations. It will be sent to instructors who contact us directly. (Also, Cambridge University Press will make it available to adopters.) The second solutions file is "Solutions for Students"– this file only has bottom line solutions for each exercise. It omits intermediate steps and explanations. This file is available on Roberto Serrano's website. It is useful for students who want to work out exercises, assigned or unassigned, and check to see if their answers are right.

Several appendices to chapters have been added or extended in order to cover material that is more mathematical than the rest of the text. Topics include coverage of optimization with inequality constraints, the Slutsky equation, Kuhn–Tucker conditions, the competitive limit of large oligopolies, and a simple proof of the first theorem of welfare economics.

We have expanded our coverage of game theory. The expansion includes a longer section devoted to experimental economics and to notions of behavioral economics.

Figures have been redrawn where appropriate, and color has been added to all the figures. The figures have also been enlarged.

Some of the material in later chapters (that is, in the market failures part of the book) has been rewritten to improve clarity. All errata and typos that we knew about have been corrected.

Course Prerequisites and their Rationale

A student in a course that uses this book should already have taken an introductory economics class, exposing him or her to the main ideas of the two parts of economic theory, microeconomics and macroeconomics. The concise style of this text assumes familiarity with basic economic jargon.

In addition, the student should also have taken a calculus course. Calculus is basic to microeconomics, much of which is about maximizing something (for instance, utility, or output, or profit), or about minimizing something else (for instance, costs). Calculus is the area of mathematics most connected to maximization and minimization problems, and using it makes microeconomics straightforward, transparent, and precise.

The Contents of the Book

Microeconomics begins with the study of how economic agents (*consumers* and *firms*) in the economy's private sector make their decisions. We start this course with a brief

introduction in Chapter 1. Then we turn to the main events: Part I of our course (Chapters 2 through 7) is about the theory of the consumer, and Part II (Chapters 8 through 10) is about the theory of the producer; that is, the firm. Part I provides a foundation for the *demand curves* seen in a principles course, and Part II provides a foundation for the *supply curves*.

Economic decisions are mostly made in the private sector, but governments also make many important economic decisions. We touch on these throughout the course, particularly when we discuss taxes, monopolies, externalities, and public goods. Our main focus, though, is the private sector, since in *market economies* the private sector is the main protagonist.

Next, Part III (Chapters 11 through 13) combines theories of the consumer and the producer into theories of *markets*. Here, our focus is on different types of market structure, depending on the market power of the firms producing the goods. Market power is related to the number of firms in the market. We begin, in Chapter 11, with the case of *perfect competition*, where each firm is powerless to affect the price of the good it sells; this is usually a consequence of there being many firms selling the same good. In Chapter 12, we analyze the polar opposite case, called *monopoly*, where only one firm sells the good. We also consider intermediate cases between these extremes: in Chapter 13, we analyze *duopoly*, where two firms compete in the market. One important point that we emphasize is the strong connection between competition and the welfare of a society. This is the connection that was first described in 1776 by Adam Smith in *The Wealth of Nations*. Smith famously argued that the *invisible hand* of market competition leads self-interested buyers and sellers to an outcome that is beneficial to society as a whole.

Our analysis in Part III is sometimes called *partial equilibrium* analysis, because it focuses on *one market in isolation*. In Part IV (Chapters 15 and 16), we develop models that look at *all markets simultaneously;* this is called *general equilibrium* analysis. The general equilibrium approach is useful to understand the implications of interactions among the different markets. These interactions are, of course, essential in the economy. A main theme in Part IV is the generalization of the invisible hand idea that market competition leads to the social good. We shall see that under certain conditions there are strong connections between competition in markets and the efficient allocation of resources. These connections, or *fundamental theorems of welfare economics* as economists call them, are important both to people interested in economic ideas, and to people simply interested in what kind of economic world they want to inhabit.

Finally, Part V (Chapters 17, 18, and 20) focus on the circumstances under which even competitive markets, left by themselves, fail to allocate resources efficiently. This is a very important area of study because these *market failures* are common, and, when they occur, governments, policy makers, and informed citizens must consider what *policy interventions* would best improve the performance of the unregulated market.

Two Special Chapters and Suggestions about What to Teach

Our course includes two chapters that are not really part of the building blocks flow from consumer theory through market failure. Chapter 14 is a basic introduction to

game theory. The use of game theory is so prevalent in economics today that we think it is important to provide a treatment here, even if the theories of the consumer, of the firm, of competitive markets, and of market failure could get along without it. A similar comment applies to Chapter 19 on uncertainty and expected utility. While most of this course describes decision problems and markets under complete information, the presence of uncertainty is crucial in much of economic life, and much modern microeconomic analysis centers around it. Some instructors may choose to ignore these chapters in their intermediate microeconomics courses, but others may want to cover them. In order to free up some time to do that, we offer some suggestions:

We include two alternative treatments of the theory of the firm in this book. The first is contained in Chapter 8, the single-input model of the firm, which abstracts from the cost-minimization problem. The second is contained in Chapters 9 and 10, the multiple-input model of the firm, which includes the cost-minimization problem. Chapter 8 can be viewed as a quick route to the supply curve. An instructor looking for time to teach some of the newer topics covered in Chapter 14 or Chapter 19 might cover Chapter 8 and omit Chapters 9 and/or 10. Also, our chapters on market failure generally contain basic theory in their first sections and applications in later sections. Instructors might choose to include or omit some of the theory or some of the applications, depending on time.

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