



# **- MICRO -** **ECONOMICS**

**FIFTEENTH EDITION**  
**PAUL A. SAMUELSON**  
**WILLIAM D. NORDHAUS**



# MICROECONOMICS

FIFTEENTH EDITION

**PAUL A. SAMUELSON**

*Institute Professor Emeritus  
Massachusetts Institute of Technology*

**WILLIAM D. NORDHAUS**

*A. Whitney Griswold Professor of Economics  
Yale University*

*With the assistance of*

**MICHAEL J. MANDEL**

*Economics Editor  
Business Week*

**McGRAW-HILL, INC.**

New York	St. Louis	San Francisco	Auckland
Bogotá	Caracas	Lisbon	London
Madrid	Mexico City	Milan	Montreal
New Delhi	San Juan	Singapore	
Sydney	Tokyo	Toronto	

## **MICROECONOMICS**

Copyright © 1995, 1992 by McGraw-Hill, Inc. All rights reserved.  
Previously published under the title of *Microeconomics: A Version of Economics*. Copyright © 1989 by McGraw-Hill, Inc. All rights reserved.  
Portions of this text have been taken from *Economics*, Fifteenth Edition.  
Copyright © 1995, 1992, 1989, 1985, 1980, 1976, 1973, 1970, 1967, 1964, 1961, 1958, 1955, 1951, 1948 by McGraw-Hill, Inc. All rights reserved. Copyright renewed 1976, 1979, 1983 by Paul A. Samuelson.  
Printed in the United States of America. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a data base or retrieval system, without the prior written permission of the publisher.

This book is printed on acid-free paper.

1 2 3 4 5 6 7 8 9 0 VN H VN H 9 0 9 8 7 6 5 4

ISBN 0-07-054993-1

This book was set in New Baskerville by York Graphic Services, Inc.  
The editors were Lucille Sutton and Elaine Rosenberg;  
the designer was Joseph A. Piliero;  
the cover illustrator was Robert Burger;  
the production supervisor was Annette Mayeski.  
Von Hoffmann Press, Inc., was printer and binder.

### **Library of Congress Cataloging-in-Publication Data**

Samuelson, Paul Anthony, (date).

*Microeconomics* / Paul A. Samuelson, William D. Nordhaus; with contributions by Michael J. Mandel.—15th ed.

p. cm.

“Portions of this text have been taken from *Economics*, fifteenth edition”—T.p. verso.

Includes index.

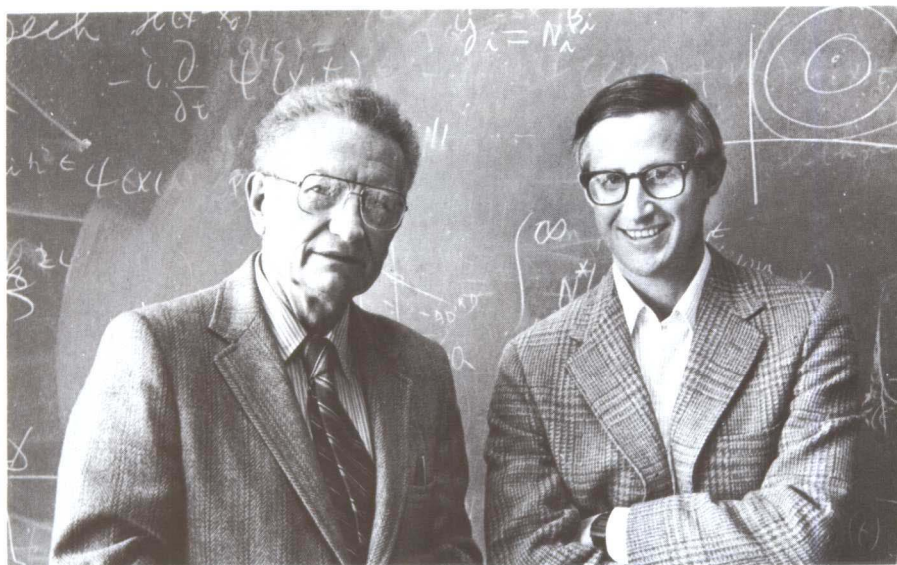
ISBN 0-07-054993-1

I. Microeconomics. I. Nordhaus, William D. II. Mandel, Michael J. III. Samuelson, Paul Anthony, (date). Economics.  
IV. Title.

HB172.5.S255 1995

338.5—dc20

94-31485

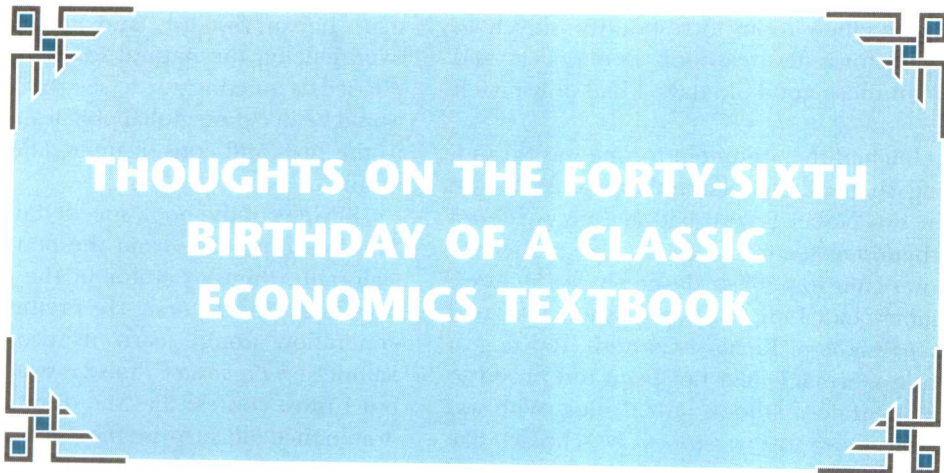


## ABOUT THE AUTHORS

**PAUL A. SAMUELSON**, founder of the renowned MIT graduate department of economics, was trained at the University of Chicago and Harvard. His many scientific writings brought him world fame at a young age, and in 1970 he was the first American to receive a Nobel Prize in economics. One of those rare scientists who can communicate with the lay public, Professor Samuelson wrote an economics column for *Newsweek* for many years. He testifies often before Congress and serves as academic consultant to the Federal Reserve, the U.S. Treasury, and various private, nonprofit organizations. He was economic adviser to President John F. Kennedy. Professor Samuelson, between researches at MIT and tennis games, is a visiting professor at New York University. His six children (including three triplet boys) have contributed 15 grandchildren.

**WILLIAM D. NORDHAUS** is one of America's eminent economists. Born in New Mexico, he was an undergraduate at Yale, received his Ph.D. in economics at MIT, and is now the A. Whitney Griswold Professor of Economics at Yale University and on the staff of the Cowles Foundation for Research in Economics. His economic research has spanned a wide variety of topics—including the environment, inflation, energy, technological change, regulation, resource economics, and trends in profits and productivity. In addition, Professor Nordhaus takes a keen interest in economic policy. He served as a member of President Carter's Council of Economic Advisers from 1977 to 1979, was Provost of Yale University from 1986 to 1988, and writes occasionally for *The New York Times* and other periodicals. He regularly teaches the Principles of Economics course at Yale. Professor Nordhaus and his family live in New Haven, Connecticut, and share an enthusiasm for music, hiking, and skiing.





## THOUGHTS ON THE FORTY-SIXTH BIRTHDAY OF A CLASSIC ECONOMICS TEXTBOOK

As a brash young scholar, I did not know in 1948 that this brainchild, *Economics*, would set the pattern for two generations of introductory texts. Although I did not then lack in self-confidence, I never dreamed that the book would sell millions and millions of copies and be translated into more than 40 languages. Even the former Soviet Union let this Trojan horse get translated into Russian, thereby contributing to the downfall of a command economy run inefficiently by totalitarian bureaucrats.

How did this textbook come to be? Gaze back to 1945. Germany and Japan were defeated, while American colleges were nearly overflowing with people returning from World War II. Meanwhile, the science of economics was entering a golden age. The Great Depression of 1929–1935 had finally been licked by forceful programs that threw out the window the old orthodoxies of do-nothing monetary and fiscal policies. Britain and America had later mobilized their economies for a successful war in a way that Hitler, Mussolini, and the Emperor Hirohito's chieftains never dreamed of. And, though we could not know it in 1945, the Marshall Plan and American occupation of Japan were about to set the stage for miracle decades of postwar economic growth.

College students deserved to understand all this. But, as teachers of my generation knew to our sorrow, the best-selling economics textbooks were seriously out-of-date. No wonder beginners were bored. My students at Harvard and MIT often had that glassy look.

This account must not turn textbook writing into fiction. If Newton had not invented calculus when he did, Leibniz or someone named Smith would have done so. If my 1948 *Economics* had not brought guns-and-butter choices into elementary microeconomics, someone somewhere would soon have done so. At the time of my first edition, even the word “macroeconomics”—the study of what determines a society's unemployment, its price level and inflation rate, and its rate of real GNP growth—was not yet in the dictionary! Some scholar just had to come along and revolutionize the introductory textbooks of economics.

But why me? I was back from the MIT Radiation Laboratory, where I had worked at the mathematical job of designing automatic servomechanisms to ward off enemy bombers. So to speak, I thirsted for a return to economic research and teaching. I was 30, the best age to write a text or innovate a treatise. By good chance, my advanced *Foundations of Economic Analysis*, which was to win me a Nobel Prize in economics 25 years later, was already in press. It was now or never to author a textbook.

But first I must tell a secret. Back in those days, a promising scholar was not supposed to write textbooks—certainly not basic texts for beginning sophomores and freshmen. Only hacks were supposed to do that. But because I had already published so many research articles, it seemed that my reputation and prospects for lifetime tenure could

afford me the elbow room to respond positively to MIT's request for a new textbook. Being cocky and even brash in those good old days, I had only myself to please.

What clinched the argument for me was this: Linus Pauling, so great a scholar and humanist that he was to win two Nobel Prizes, had already written a leading chemistry text—just as the great Richard Feynman was later to publish classic physics lectures. William James had long since published his great *Principles of Psychology*. Richard Courant, top dog at Göttingen in Germany, had not been too proud to author an accurate textbook on calculus. Who was Paul Samuelson to throw stones at scholars like these? And, working the other side of the street, I thought it was high time that we got the leaders in economics back in the trenches of general education.

### The Long Grind of Creation

Starting a baby is easy. Bringing it to full term involves labor and travail. As soon as each chapter was written, the mimeograph machine ground it out for testing on our MIT students. I found it demanding but pleasant work.

Rome wasn't built in a day. And what I naively thought might be a year's job turned into 3 years of writing and rewriting. For once my tennis suffered, as weekends and summer vacations had to be devoted to the task of reducing to plain and understandable prose the fundamental complexities of economic science. Even the traditional diagrams of economics, I discovered, were overdue for redesigning if the "dismal science of economics" was to become the exciting subject it really is.

### The Moment of Truth

In the autumn of 1948 the first edition of *Economics* rolled off the presses. No matter how hard the advance work or how optimistic the dreams, one can never be sure how the future will turn out. Fortunately, from the word "go" this novel approach to economics hit a responsive chord. Colleges big and small opted for the new. As each fresh printing was sold out, *Economics* was back again for new runs of the press.

When a Guggenheim fellowship took me to Europe, I checked each main bookstore in major cities for the availability of translations into French, Ger-

man, Italian, Swedish, and Portuguese. Aside from experiencing the natural vanity of an author, I was pleased as an educator to see that the citizenry, who would be deciding global policies, was being exposed to the pros and cons of up-to-date mainstream economics.

Reviews of the book speeded up the bandwagon. The first one came from the pen of John Kenneth Galbraith, then an editor of the conservative business magazine *Fortune*. He predicted that the next generation would learn its economics from the Samuelson *Economics*. Praise is sweet in authors' ears, but I must confess that the durability of the book's dominance did surprise me. Galbraith turned out to be more prescient than I. *Economics* did set a new and lasting pattern. Most of its successful rivals are written in its general mode, and it is heartwarming that much of the competition has come from the pens of good personal friends.

One summer the U.S. Chamber of Commerce put out over the Associated Press news wires the mock charge that McGraw-Hill's Samuelson, who wrote about the need for antitrust control of monopolies, ought to be indicted for controlling a lopsided share of the total textbook market! When I attended the annual meetings of the American Economic Association, instructors frequently came up to me and said, "We use your book at Siwash" or "Winsockie" or some other far-flung place. There was always an awkward pause, as I never knew quite what to say. My problem got solved when, one day, I heard myself saying, "Mrs. Samuelson will be pleased."

When success comes into an autobiography, the going gets boring. And Joseph Schumpeter, the great Harvard expert on innovations, will remind me from the grave how important *luck* was in all this. I happened to be there, at the right time in the right place. True, luck does favor the prepared mind. But the prepared minds were those who had been debating the pros and cons of the Keynesian revolution in *macroeconomics* and thirsting for a "general-equilibrium" approach in *microeconomics*.

### The Ever-Young Child

Actually, this account is not primarily about me as an author. Just as a child takes on an individual identity distinct from the parent, so it was with the brainchild *Economics*. At first I was in command of it.

But then it took over in its own right and came to be in charge of me.

The years passed. My hair turned from blond to brown. Then to gray. But like the portrait of Dorian Gray, which never grew old, the textbook *Economics* remained forever 21. Its cover turned from green to blue, to brown and black, and then to many-splendored hues. And aided by hundreds of letters and suggestions to the author from students and from professors with classroom experience, the economics inside the covers evolved and developed. A historian of mainstream-economic doctrines, like a paleontologist who studies the bones and fossils in different layers of earth, could date the ebb and flow of ideas by analyzing how Edition 1 was revised to Edition 2 and, eventually, to Edition 15.

And so it went. Hard, hard work—but ever so rewarding. Finally came the day when tennis beckoned. To McGraw-Hill I said: “I’ve paid my dues. Let others carry on as I enjoy the good life of an emeritus professor, cultivating the researches that interest me most.”

McGraw-Hill had a ready answer: “Become a joint author. We’ll make a list of congenial economists whose competence and views you admire.” And so the search for the perfect William Nordhaus began. Yale is only 150 miles from MIT, and it was there that the real Nordhaus was to be found. It only helped that Bill had earned his Ph.D. at MIT. And in the days since then he has won his spurs serving on the President’s Council of Economic Advisers and doing tours of duty in Cambridge, England; Delhi, India; and Vienna, Austria. Like Gilbert and Sullivan or Rogers and Hart, we turned out to form a congenial team.

And so, as in the classic tales, we have lived happily ever after. What matters is that the book stays young, pointing ahead to where the mainstream of economics will be flowing.

### **Rough Pebbles along the Way**

Not always has it been fun and games. In the reactionary days of Senator Joseph McCarthy, when accusations of radicalism were being launched at the pulpit and in the classroom, my book got its share of condemnation. A conservative alumnus of MIT warned the university’s president, Karl Compton, that Paul Samuelson would jeopardize his scholarly reputation if he were allowed to publish his apolo-

getics for the “mixed economy.” Dr. Compton replied that the day his faculty was subjected to censorship would be the day of his resignation from office. It all seems slightly comical four decades later, but it was no joke to be a teacher at a public university when many of the fashionable textbooks were at that time being denounced as subversive. (One excellent text, which came out a year before mine, was killed in its infancy by vicious charges of Marxism that were false on their face.) Actually, when your cheek is smacked from the Right, the pain may be assuaged in part by a slap from the Left. *Anti-Samuelson*, a two-volume critique, was authored in the 1960s when student activism was boiling over on campuses here and abroad. Apparently I was an apologist for the laissez-faire world of markets where dog eats dog.

Each cold wind imparts a useful lesson. I learned to write with special care wherever controversial matters were concerned. It was not that I was a veritable Sir Galahad in all things. Rather, it was that I could only gain by leaning over backward to state fairly the arguments against the positions popular in mainstream economics. That is why conservative schools like my Chicago alma mater were motivated to assign *Economics* at the same time that prairie progressives found it an optimal choice. Even Soviet Russia felt a translation was mandatory, and within a month the entire supply of translated copies there had been exhausted. (Experts tell me that back in Stalin’s day my book was kept on the special reserve shelf in the library, along with books on sex, forbidden to all but the specially licensed readers.) New translations are planned in Hungary, Czechoslovakia, Yugoslavia, Romania, and other Eastern European countries, as well as in China, Japan, Vietnam, and other Asian lands.

### **Tales, Tall but True**

Legends abound concerning the saga of the textbook *Economics*. Here are a few from the dregs of my memory.

Some years back one of MIT’s graduate students, who later became a college president, went to a summer program at the London School of Economics. Attending were students from all over the world, from the jungles of Africa to the rice paddies of Asia. Only one thing did they have in common, he reported. All of them had begun their study of economics with the same textbook. He said his own stock

went up because he could explain what some of the American idioms meant and could pinpoint Fort Knox, Kentucky, as the place where the U.S. government stored its gold.

Japanese students are great buyers of books. *Economics* sells well there in English as well as in Japanese. The erudite translator is my old Harvard classmate, Shigeto Tsuru, later to become president of Hitotsubashi University in Tokyo. With the royalties he received as translator, Dr. Tsuru purchased a luxurious condominium, and he invited various distinguished scholars to reside there during their visits to Japan. As a special honor, he asked me to suggest a name for it. After some thought I came up with Royalty House, and thus it has been known ever since.

Once I received a letter from a diligent reader:

Sir, in your textbook you say that the \$24 that was paid to the Indians for the island of Manhattan—if invested at 6 percent compound interest—would have accumulated to about what all the real estate is worth today in Manhattan Island. I make that out, sir, to be several hundred billions of dollars. I don't think you can buy it for that little.

How was I to respond to her challenge? I asked my research assistant to look into the matter. The next day, Felicity Skidmore came back to say: "Tell her that, if 6 percent won't do it, try 6½!"

Samuel Butler once quipped: "While others polish their style, I perfect my handwriting." That is not my way. When I try to account for the textbook's durability, I suspect that its relaxed, almost colloquial style deserves some of the credit. That ease is not easily come by. Like Macaulay the historian, I write and rewrite in the hope that each sentence and clause will, at first reading, reveal its meaning. I don't always succeed, but I do try. For this reason I take private pleasure in the fact that the book is used to teach English to foreigners; excerpts appear in anthologies for Japanese students and also in case materials used in teaching English as a second language to immigrants. Spread the gospel of economics any way we can, I say.

Here is not the place to describe how the various editions have changed along with the evolution of modern mainstream economics. The first edition put much stress on what might be called "Model T Keynesian macro." With each new edition, the empha-

sis on monetary policy grew. And with the worst wastes of the Great Depression banished, the microeconomics of efficient market pricing has come to occupy more and more of the text's pages.

### Science or Art?

Economics is not an exact science; yet it is more than an art. We cannot predict with accuracy next year's national income—just as meteorologists cannot forecast next week's weather as precisely as they can tomorrow's. But no bank or big business would be so rash as to consult astrologers rather than trained econometricians, or try to wing it by guess and by gosh.

Firms budget their machine replacements by microeconomic principles. Several of my former students earn a million dollars a year on Wall Street. Why? Because they know rich clients or are masters of slick sales techniques? Certainly not. It is because modern theories of finance, worked out intricately in seminar rooms at the business schools of Stanford, Wharton, Chicago, MIT, and Berkeley, really do stand up to statistical testing in the real world of markets.

A beginning textbook won't teach anyone to be an expert. Still, a journey of a thousand miles begins with the first hundred yards. The great Winston Churchill, clever at writing history and heroic in leading nations, was color-blind all his life when it came to basic economic understanding. That kind of unnecessary illiteracy I and 10,000 teachers have vowed to fight.

Mine was the first generation of economists who were sought out by governments. I am the exception who never spent a full year in Washington. Still, I treasure in memory the many times I was called to testify before congressional committees or to serve as a Treasury and Federal Reserve academic consultant. Personally, most memorable were the years in which I had a chance to give economic counsel to John F. Kennedy (senator, presidential candidate, President-elect, and President in Camelot). Republican friends of mind—Fed Chairman Arthur F. Burns and Council of Economic Advisers Chairman Paul MacCracken—have similar stories to tell. Now that post-cold-war Eastern Europe has the need to move toward the market economy, Bill Nordhaus's generation is being drafted right and left.



A pseudoscience could not stand the Darwinian test of time. It was President Harry S. Truman who used to insist, "Give me a one-armed economist." Not for decisive Harry the adviser who says, "On the one hand this; on the other hand that." Having advised legislators, candidates, and presidents, I have learned over a long lifetime: The prince or queen does not really want a one-armed economist. For in our profession, one-armed economists often come in two varieties: those with a Right arm only and those with only a Left arm. And then the sovereign must call in an eclectic economist like me to adjudicate between the rival zealots.

Economists are accused of not being able to make up their minds. In particular the brilliant John Maynard Keynes was accused of having volatile opinions. When a royal commission asked five economists for an opinion, it was said they would get six answers—two from Mr. Keynes. Keynes himself was quite unrepentant when pressed on the matter. He would say: "When my information changes, I change my opinion. What do you do, Sir?" He did not want to be the stopped clock that is right only twice a day.

The subject of economics is an ancient and honorable one, still growing and still having a long way to go before approaching the state of a tolerably accurate science. It began really with Adam Smith—our veritable Adam—who wrote in 1776 that great text called *The Wealth of Nations*. Then in 1848 John Stuart Mill, clocked with the highest IQ of all time, wrote *The Principles of Political Economy*, which served as the layperson's bible until 1890, when Alfred Marshall prepared his definitive *Principles of Economics*.

I would be an ingrate not to feel thrilled that, on my watch, the baton has been carried forward by this serendipitous brainchild. Science is a cooperative affair, a matter of public knowledge and never the product of one person's hand. Mostly I have been the mouthpiece of late-twentieth-century mainstream economics, but occasionally I have been able, so to speak, to get my own few licks in. Could any scholar lust for more?

Fortunately, as coauthors, William Nordhaus and I bring independent viewpoints to problems. But we are enough alike in our experiences and judgment to work the canoe forward on its steady course. The book has been lucky for the continuity and change of its authors.

### End-of-Century Advice

Still, the future is longer than the present. You readers will look deep into the twenty-first century. What pearls of wisdom can I cast before students who will learn their economics from this book?

1. My first word is that economics can be *interesting*. That is not merely my opinion as a professional economist. Actual experience at hundreds of colleges testifies that usually the largest class enrollment in the university is in beginning economics. And most who sign up are volunteers and not majors in the subject who are required to take the course.

How a nation advances economically is exciting stuff. And so are the cogent stories of how societies fail to progress. Why did the mixed economies in Europe, North America, and the Pacific Rim succeed in growing after World War II so much better than they had done after World War I? How much was due to improvements in the science and art of economics? These are questions you will be weighing for the rest of your lives.

2. But economics is not merely a game, not merely a neat puzzle to test your powers of logic, arithmetic, and mathematical virtuosity. Economics wouldn't stay interesting if it didn't deal with matters vital for you *as a self-interested individual* and essential for you *as a human being hoping for a better society*.

I walked into my first economics class because I hoped to learn how not to go broke in the stock market as so many people were then doing. But I stayed for the second lesson to learn how my generation could avoid great depressions, like that of 1929–1933, which was causing my midwestern neighbors to lose their savings at a time when thousands of American banks were failing. To sum up this second point, economics matters.

3. People differ about economic policies. Tempers flare out, arguments are shrill, and different schools and ideologies grow up—each convinced that its view of the simple truth is the one-and-only correct version. After a lifetime in the trenches, my advice to beginning students when you contemplate any such hot debate is this: Hang on to your wallet. Economic laws are truly complicated.

Does that justify concluding: "A plague on all your houses; each of many economic theories is as bad—or as good—as any other"? No. In the long run the facts win out. The fanatical simplicities perish in the Darwinian struggle for survival of useful principles.

To illustrate this, listen to what I used to say to one of my generation's leading economists (a warm friend with a strong ideology that differed considerably from my own eclectic value judgments and methodology):

You are a brilliant scholar, dazzlingly creative, with clear-cut economic convictions. But for you, things are either *simply absurd* or *absurdly simple*. Indeed the good fairies gave you every gift save one—the invaluable gift of "maybe."

4. Coauthors William Nordhaus and I try to look ahead a quarter-century to that time when this generation of students will be the movers and shakers. That's why we have introduced health and environmental economics to this edition. Analysis of how supply and demand can cause the American dollar to float upward or downward relative to the Japanese yen or the German mark was not in this book's first edition. Neither was the reckoning up of how environmental progress and decay figure into the Gross Domestic Product (GDP). You can bet that these topics will remain hot ones into the new century ahead, and that is why we give them the ample space they deserve. This edition is not your parent's version. Economics must be forever young.

5. One major theme must weave in and out of our new edition and every turn-of-the-century economics textbook. With the final collapse of the Lenin-Stalin-Gorbachev totalitarian Soviet system, victory has been declared in favor of the *market-pricing* mechanism over the *command* mechanism of regulatory bureaucracy. But of course it was not the pure capitalism of a laissez-faire, government-less system that overturned forever the communist societies of Eastern Europe and China. Rather, it was the mixed economy: markets as modified by governmental taxes and transfers to limit inequality in welfare and opportunity; and as modified by stabilizing monetary and fiscal policies to curb depressions and inflations.

How mixed is "mixed"? When is regulation too much? When too little? The real world out

there is, and had better be, the limited mixed economy. The search is on and will continue to try to narrow down where the Aristotelian golden mean of the good society is to be found. *After you* have completed your first course in economics you will appreciate the subtleties of the debate between the market and the state.

6. Few can experience the thrill of viewing Halley's comet twice. And remembered forever is one's first date. In this spirit I have to envy you who are just embarking on the study of economics.

Paul A. Samuelson  
Massachusetts Institute of Technology,  
Cambridge, Massachusetts,  
August 1994





## PREFACE

Human societies are many times wealthier than they were when Adam Smith wrote *The Wealth of Nations* more than 200 years ago. Yet paradoxically, an understanding of the enduring truths of economics has become even more vital in the affairs of people and nations. The last decade has seen the fall of centrally planned Communist states of Russia and Eastern Europe and the impressive growth of the East Asian economies. The United States has grappled with slow growth in living standards and large government budget deficits, even as structural changes in American industries have shaken managers, workers, and entire communities. The world has become increasingly interconnected as computers and communications create an ever-more-competitive global marketplace. At the same time, there is growing concern about international environmental problems and the need to forge agreements to preserve our natural heritage. All these fascinating changes are part of the modern drama that we call economics.

For almost half a century, this book has served as the standard-bearer for the teaching of elementary economics in classrooms in America and throughout the world. Each new edition has distilled the best thinking of economists about how markets function and about what society can do to improve people's living standards.

But economics has changed profoundly since the first edition of this text appeared in 1948. Economics is above all a living and evolving organism, and the need to keep *Microeconomics* at the frontier in the rapidly evolving world economy affords the authors an exciting opportunity to present the latest thinking of modern economists and to show how economics can contribute to a more prosperous world.

Our task in these pages is straightforward: to present a clear, accurate, and interesting introduction to the principles of modern economics and to the institutions of the American and world economy. Our primary goal is to survey economics. In doing this we emphasize the basic economic principle that will endure beyond today's headlines.

### THE FIFTEENTH EDITION

Economics is a dynamic science—changing to reflect the shifting trends in economic affairs, in the environment, in the world economy, and in society at large. As economics and the larger world around us evolve, so does this book. Every chapter has kept pace with changes in economic analysis and policy. What are the major changes?

**1. The Logos of Microeconomics.** The fifteenth edition introduces a new set of in-text logos and material to help illustrate the central topics. We have designated four different sets of topics: examples of economics in action, biographical material on the great economists of the past and present, warnings for the fledgling economist, and reminders on key issues. Each set has its own distinctive logo to alert students. But these central topics are not sitting off by themselves in unattached boxes. Rather, they are integrated right into the chapter so that students can read them without breaking their train of thought.

**2. Merging of Classroom and Boardroom.** In this edition, the two principal authors have been joined by Dr. Michael Mandel, one of the nation's leading economic journalists and economics editor

at *Business Week*. Dr. Mandel received his Ph.D. in economics from Harvard University in 1985, and then joined the faculty at New York University's Stern School of Business. At NYU he taught microeconomics, game theory, and information economics. In 1989 he moved to *Business Week*, where he has written influential stories on such topics as immigration, the information economy, the economics of crime, and problems of economic growth in the post-cold-war era.

As a result, Dr. Mandel brings the depth of a Ph.D. in economics and an academic career of teaching and research with front-line reporting experience at America's leading economics and business magazine. This collaboration allows us to integrate the economic theories from the classroom and research library with a fresh set of applications and examples from the nation's boardrooms, financial markets, and factories. But this collaboration is definitely not a simple division of topics between "theory" and "real-world." Rather, the theories must stand the test of experience and the examples are chosen to illustrate the central message of economic analysis. This innovation approach to economics is woven through the fifteenth edition.

**3. Emerging Policy Issues.** Each generation finds new challenges that it must grapple with, and these new challenges are taken up as economists attempt to understand the economic issues involved. Three areas that have been at the forefront of economics in the last decade have received expanded treatment in the fifteenth edition. As human societies grow, they begin to overwhelm the environment and ecosystems of the natural world around us. *Environmental economics*, presented in a brand-new Chapter 19, helps understand the externalities associated with production and consumption and analyzes different approaches to making human economies compatible with natural systems. A second area of growing importance has been *health-care economics*. As humans become more affluent, they naturally pay more attention to their own health and longevity, and the result is a rapidly growing share of national output devoted to health care. But health care poses fundamental economic dilemmas as the principles of equality and universal coverage collides with the fact of scarcity. Chapter 16 presents a new treatment of the economics of health care and shows how different approaches balance the need for effi-

ciency with the desire for equity. A third growing area is *international economics*. Our treatment of international economics has been expanded and integrated into every section of the text. In addition, we have rewritten the last chapter to emphasize the difficulties of managing the global economy.

**4. Emphasis on the Analytical Core of Economics.** Often, economics appears to be an endless procession of new puzzles, problems, and difficult dilemmas. But as experienced teachers have learned, there are a few basic concepts that underpin all of economics; once these basic concepts have been mastered, learning is much quicker and enjoyable. We have therefore chosen to focus on the central core of economics, on those enduring truths that will be just as important in the twenty-first century as they are in the twentieth. Microeconomic concepts such as scarcity, efficiency, the balancing of marginal costs with marginal benefits, the gains to trade, and the principle of comparative advantage will never lose their central role in economics as long as scarcity itself exists. Students of macroeconomics must receive a firm grounding in the notion of aggregate supply and demand, must understand the role of national and international monies, and must master the debate between Keynesian and classical economists of the traditional and modern varieties.

**5. Small Is beautiful.** Over the last few editions, *Microeconomics* had gained bulk as new topics were added and new economic problems were analyzed. In combination with the decision to cut to the core topics, we recognized that for many instructors and students, small is beautiful. Over the last edition, we surveyed teachers to determine which material was least used. In addition, we questioned leading scholars to ascertain which topics could be omitted at least cost to educating an informed citizenry and a new generation of economists. We drew up a list of deletions and said sad farewell to many appendices and sections. But at every stage, the question we asked was whether the material was, as best as we could predict, necessary for a student's understanding of the economics of the twenty-first century. Only when a subject failed this test was it deleted. The result of this campaign was a book that lost more than one-quarter of its pages in the last two editions. This edition's Part I was severely trimmed so that we can



get into the core material more quickly. We have deleted much institutional material that is less relevant to today's economy. Farming, labor unions, and Marxian economics have stood aside to make way for environmental economics, the rising cost of health care, the evolution of cooperation, and real business cycles.

**6. Rediscovery of the Market.** One key leit-motif in this edition is what we call "rediscovery of the market." All around the world, nations are discovering the power of the market as a tool for allocating resources. The most dramatic example of this, of course, was the fall of Communism in the former Soviet Union and Eastern Europe. Nation after nation rejected the command economy and began to move to the market. In 1990, Poland undertook a grand experiment of undergoing "shock therapy" by introducing markets into much of its economy; Russia started down the road by liberalizing prices in 1991 but seemed to take one step backwards for every two steps forward. Nowhere was the transition painless. Virtually every country found that the road to the market was filled with obstacles such as raging inflation, high unemployment, and sharp declines in real wages and outputs.

The rediscovery of the market was found in market economies as well. Many countries deregulated industries or "privatized" industries that had been in the public sectors. The results were generally favorable as productivity rose and prices fell. Some economists have recommended using market mechanisms to promote environmental goals; for instance, the levying of pollution taxes as a way of curbing harmful pollution in the most efficient manner. These topics are part of the fifteenth edition's analysis of market economies.

**7. The Incredible Shrinking Globe.** President Bill Clinton wrote in 1994, "There is simply no way to close our borders and return to the insular days. To try to do so would be an exercise in futility, doomed not only to fail but to lower living standards in the process." Americans are learning that no nation is an island. Our living standards are affected by technological developments in Japan and Europe; domestic producers must contend with competitors from Korea and Mexico. Similarly, no complete understanding of modern economics is possible with-

out a thorough grounding in the world economy. The fifteenth edition continues to increase the material devoted to international economics and the interaction between international trade and domestic economic events.

**8. Emphasis on History and Policy.** Students study economics to understand the rapidly changing world around them. For this reason, economics is at its core an empirical science. It first aims to explain the world around us and then helps us devise economic policies, based on sound economic principles, that can enhance the living standards of people at home and abroad.

Drawing upon history, economic chronicles, the experience of the authors along with Dr. Mandel's invaluable journalistic background, the fifteenth edition continues to emphasize the use of case studies and empirical evidence to illustrate economic theories. The rediscovery of the market is made vivid when we examine how central planning failed or the way the East Asian economies have grown so rapidly. The dilemmas involved in combating poverty become real when we understand the shortcomings of the present welfare system and the history of discrimination. Our comprehension of macroeconomic analysis increases when we see how government deficits in the 1980s lowered national saving and slowed capital accumulation in the United States or how deficit-reduction programs can help reverse our declining savings rate.

The microeconomic chapters draw upon case studies, economic history, business decisions, and real-world experience to illustrate the fundamental principles. Examples such as airline pricing, the health-care crisis, coping with the threat of greenhouse warming, gasoline taxation, collective bargaining by labor unions, and the history of stock markets help bring the theorems of microeconomics to life.

This "hands-on" approach to economics allows students to understand better the relevance of economic analysis to real-world problems.

**9. Above All: A Clear Explanation of Modern Economics.** Although there are many new features in the fifteenth edition, the pole star for our pilgrimage in preparing this edition has been to present economics in a clear and student-friendly way. Students come into economics from a wide range of

different backgrounds and with even more preconceptions about the way the world works. Our role is not to change their values. Rather, we want students first to understand the enduring principles and then to be able to apply them to make the world a better place for them, their families, and their communities. Nothing aids understanding better than a clear and simple exposition. We have labored over every page to improve this survey of introductory economics. We have received thousands of comments and suggestions from teachers, experts, and students and have incorporated their counsel in the fifteenth edition.

The attention to improved exposition will be seen in the redesign of this edition, with clearer figures and new typeface. We have introduced scores of new end-of-chapter questions as well as new examples in the textual material. Above all, we believe that cutting out superfluous appendices, sections, and even chapters will lead to greater focus and ultimately to better understanding by the beginning student.

The Glossary has been carefully tuned to meet the needs of this edition. All major terms now have a capsule definition that students can easily turn to. As a study aid, the most important terms are printed in boldface when first defined in the text; they all then appear again in the Glossary to reinforce the indispensable vocabulary of economics in the student's mind.

### Optional Matter

Economics courses range from one-quarter surveys to year-long intensive honors courses. This textbook has been carefully designed to meet all situations. The more advanced materials have been put in separate appendices or specially designated sections. These will appeal to curious students and to students in demanding courses that survey the entire discipline thoroughly. We have included advanced problems to test the mettle of the most dedicated student.

If yours is a fast-paced course, you will appreciate the careful layering of the more advanced material. Hard-pressed courses can skip the advanced sections, covering the core of economic analysis without losing the thread of the economic reasoning. This book will challenge the most advanced young scholar. Indeed, many of today's leading economists have written to say they've relied upon *Microeconomics* all along their pilgrimage to the Ph.D.

### Format

The fifteenth edition has changed its format to improve the readability and to emphasize the major points. The new logos present warnings, reminders, biographies, and useful illustrations of the core material in the chapter. Every figure has been redrawn with an eye to crystallizing the essential parts of the analysis.

New features in this edition include fresh end-of-chapter questions, with a special accent upon short problems that reinforce the major concepts surveyed in the chapter. Terms printed in bold type mark the first occurrence and definition of the most important words that constitute the language of economics.

But these many changes have not altered one bit the central stylistic beacon that has guided *Microeconomics* since the first edition: to use simple sentences, clear explanations, and concise tables and graphs.

### Auxiliary Teaching and Study Aids

Students of this edition will benefit greatly from the *Study Guide*. This carefully designed aid has been prepared by Laurence Miners and Kathryn Nantz of Fairfield University who worked in close collaboration with us in our revision. Both when used alongside classroom discussions and when employed independently for self-study, the *Study Guide* has proved to be an impressive success. There is a full-text *Study Guide* and, for the first time, micro and macro versions are also available.

In addition, instructors will find the *Instructor's Manual and Test Bank* useful for planning their courses and preparing multiple sets of test questions in both print and computerized formats. Moreover, McGraw-Hill has designed a beautiful set of two-color overhead transparencies for presenting the tabular and graphical material in the classroom. These items can all be obtained by contacting your local McGraw-Hill sales representative.

### Economics in the Computer Age

This edition is accompanied by the *Interactive Economic Graphics Tutorial* to accompany Samuelson-Nordhaus. IGT is an upgraded version of McGraw-Hill's very successful economics software program developed by H. Scott Bierman at Carlton College and Todd Proebsting at the University of Arizona. Thousands of students have used the *Interactive Graphics Tutorial* to learn, understand, and reinforce their study of economic graphics. This updated and technically



advanced version includes microcomputer simulations, and is available for the IBM compatibles.

### Acknowledgments

This book has two authors but a multitude of collaborators. Mike Mandel helped develop the philosophy of the fifteenth edition from day one, and we drew upon his wisdom and experience at every turn of the road. In addition, we are profoundly grateful to colleagues, reviewers, students, and McGraw-Hill's staff for contributing to the timely completion of the fifteenth edition of *Microeconomics*.

Colleagues at MIT, at Yale, and elsewhere who graciously contributed their comments and suggestions include William C. Brainard, William Buiter, E. Cary Brown, John Geanakoplos, Robert J. Gordon, Lyle Gramley, Paul Joskow, Alfred Kahn, Richard Levin, Robert Litan, Barry Nalebuff, Merton J. Peck, Gustav Ranis, Paul Craig Roberts, Herbert Scarf, Robert M. Solow, James Tobin, Janet Yellen, and Gary Yohe.

In addition, we have benefitted from the tireless devotion of those whose experience in teaching elementary economics is embodied in this edition. We are particularly grateful to the reviewers of the fifteenth edition. They include:

**Robert Averitt**, Smith College; **Daniel Bergan**, Northeastern Illinois University; **Charles Berry**, University of Cincinnati; **J. S. Butler**, Vanderbilt University; **Albert Culver**, California State University—Chico; **Paul Estenson**, Gustavus Adolphus College; **William Goffe**, University of Southern Mississippi; **Ed Greenberg**, Washington University—St. Louis; **Eric Jensen**, College of William and Mary; **Robert Jordan**, University of Southern Maine; **Dennis Leyden**, Mississippi State University; **Alfred Lubell**, State University of New York—Oneonta; **Douglas Morgan**, University of California—Santa Barbara; **Thomas Pogue**, University of Iowa; **James Price**, Syracuse University; **Sandra Rivera**, University of Kentucky; **John Solow**, University of Iowa; **Timothy Taylor**, *Journal of Economic Perspectives*; **William Weber**, Eastern Illinois University; **David Weinberg**, Xavier University; and **William Wood**, James Madison University.

Students at MIT, Yale, and other colleges and universities have served as an “invisible college.” They constantly challenge and test us, helping to make this edition less imperfect than its predecessor. Although they are too numerous to enumerate, their influence is wo-

ven through every chapter. The statistical and historical material was prepared and double-checked by Sujoy Mukerji. Simon Evenett, Nancy King, and Elisabetta Magnani provided assistance in reviewing drafts. Word processing assistance was provided by Glena Ames.

This project would have been impossible without the skilled team from McGraw-Hill who nurtured the book at every stage. We particularly would like to thank, in chronological order to their appearance on the scene, Economics Editor Scott Stratford, Editing Supervisor Elaine Rosenberg, Designer Joseph Piliero, Copy Editor Susan Gottfried, and Editorial Assistant Victoria Richardson. This group of skilled professionals turned a pile of floppy disks and a mountain of paper into a finely polished work of art.

### A WORD TO THE SOVEREIGN STUDENT

You have read in the history books of waves of revolutions that shake civilizations to their roots—religious conflicts, wars for political liberation, struggles against colonialism, and nationalism. Over the last decade, economic revolutions in Eastern Europe, in the former Soviet Union, in China, and elsewhere have wrenched those societies. Young people are battering down walls, overthrowing established authority, and agitating for a “market economy” because of discontent with their centralized socialist governments. Students like yourselves are marching, and even going to jail, to win the right to study radical ideas and learn from Western textbooks like this one in hopes that they may enjoy the freedom and economic prosperity of market economies.

### The Intellectual Marketplace

Just what is this market that Russian and Chinese students are agitating for? In the pages that follow, you will learn about the markets for stocks and bonds, French francs and Russian rubles, unskilled labor and highly trained neurosurgeons. You have probably read in the newspaper about the gross domestic product, the consumer price index, the stock market, and the unemployment rate. After you have completed a thorough study of the chapters in this textbook, you will know precisely what these words mean. Even more important, you will also understand the economic forces that influence and determine them.

There is also a marketplace of ideas, where contending schools of economists fashion their theories and try to persuade their scientific peers. You will find in the chapters that follow a fair and impartial review of the thinking of the intellectual giants of our profession—from the early economists like Adam Smith, David Ricardo, and Karl Marx to modern-day titans like John Maynard Keynes, Milton Friedman, and Robert Solow.

### **Skoal!**

As you begin your journey into the land of markets, you may feel some apprehension. But take heart. The fact is that we envy you, the beginning student, as you set out to explore the exciting world of economics for the first time. This is a thrill that, alas, you can experience only once in a lifetime. So, as you embark, we wish you bon voyage!

Paul A. Samuelson  
William D. Nordhaus

## CONTENTS IN BRIEF

THOUGHTS ON THE FORTY-SIXTH BIRTHDAY OF A CLASSIC  
ECONOMICS TEXTBOOK   xxi

PREFACE   xxvii

### **PART ONE   BASIC CONCEPTS   1**

- Chapter 1 The Fundamentals of Economics 3  
Appendix 1 How to Read Graphs 15  
Chapter 2 Markets and Government in a Modern Economy 22  
Chapter 3 Basic Elements of Supply and Demand 38

### **PART TWO   MICROECONOMICS: SUPPLY, DEMAND, AND PRODUCT MARKETS**

55

- Chapter 4 Applications of Supply and Demand 57  
Chapter 5 Demand and Consumer Behavior 73  
Appendix 5 Geometrical Analysis of Consumer Equilibrium 87  
Chapter 6 Production and Business Organization 93  
Chapter 7 Analysis of Costs 106  
Appendix 7 Production, Cost Theory, and Decisions of the Firm 123  
Chapter 8 Supply and Allocation in Competitive Markets 128  
Appendix 8 Special Cases of Competitive Markets: Supply and Demand  
at Work 144  
Chapter 9 Imperfect Competition and the Monopoly Problem 148  
Chapter 10 Oligopoly and Monopolistic Competition 164  
Chapter 11 Risk, Uncertainty, and Game Theory 180