



Intermediate  
*Microeconomics*  
and Its  
*Application*

WALTER NICHOLSON

# INTERMEDIATE MICROECONOMICS AND ITS APPLICATION

WALTER NICHOLSON · Amherst College

**THE DRYDEN PRESS**  
Hinsdale, Illinois



Copyright © 1975 by The Dryden Press  
A division of Holt, Rinehart and Winston  
All rights reserved  
Library of Congress Catalog Card Number: 74-31851  
ISBN: 0-03-089204-X  
Printed in the United States of America  
8 9 032 9 8 7 6 5

## Preface

This book is intended for use by undergraduates in an intermediate microeconomics course. The basic purpose of the book is to provide an elementary, but rigorous, introduction to the tools that economists have developed for studying the allocation of resources. Formal prerequisites for using the book are minimal: some knowledge of introductory economics and a grasp of the basic principles of algebra and graphs (which are reviewed early in the book) should be sufficient. Calculus is used only in a few footnotes.

The book is different from its numerous competitors in two ways. First, it contains many empirical examples of the application of microeconomic theory to important policy problems. The examples have been chosen not only to illustrate the general principle that price theory is “useful” but also to reinforce the particular theoretical point being discussed. Each chapter contains at least one and generally two or three such applications. Second, there is a general expansion in the number of topics covered, to permit students to see the broad spectrum of issues which can be analyzed by using economic methodology, and to provide some guidance in determining what the important unanswered questions in each area are. The specific “nonstandard” features of the book are:

1. A complete discussion of pricing in factor markets including separate chapters on capital and labor.
2. A fairly detailed treatment of general equilibrium and welfare which clearly separates the notion of economic efficiency from the role of a price system in achieving efficiency.
3. An entire part (Part VII) on the role of government. One of the

three chapters in this part provides a detailed discussion of public goods and the problems they pose for allocational efficiency; another discusses property rights and associated issues related to both allocation and equity; and the third chapter concerns the distribution of income and examines both conceptual and practical problems involved in obtaining “equality.”

Those extensions are more-or-less independent of one another, and not all need be covered. By having this material (much of which is of a normative nature) available, however, it is possible for the instructor to extend a student’s understanding of the kinds of questions which interest economists.

The twenty-two chapters of the book are organized into seven parts. The first part provides an introduction to the analysis that follows, but it introduces no new concepts beyond those encountered in an introductory economics course. Parts II, III, and IV form the heart of the book; these develop the basic model of supply and demand. Except for a few appendixes, these parts are integrally connected to the rest of the book. Many instructors will choose to use all the chapters in them (that is, Chapters 3–12). The final three parts of the book may be covered selectively or in order. Part V discusses pricing in factor markets, Part VI treats general equilibrium and welfare, and Part VII analyzes the role of government. In my courses I have managed to cover each of those subjects, but others may prefer a more leisurely (and comprehensive) pace. The organization of the book is intended to accommodate a variety of divergent preferences in that regard.

In some respects this book is an abridged version of my earlier book *Microeconomic Theory: Basic Principles and Extensions* (Dryden Press, 1972). The organization here is very similar to that book (though some changes were made for pedagogic convenience); some of the material in the previous book has been repeated (especially in the final six chapters). Nevertheless, this is a different book with a rather different focus and a different intended audience. It is less concerned with economic theory per se than was its predecessor, although both do aim for precision in this regard. The present book, however, makes a more serious attempt at introducing empirical information into the study of economic theory. This changed emphasis arises in part from a desire to make microeconomics more appealing to students interested in “relevance” and in part from the author’s increasing research interest in empirical economics. It is hoped that the interweaving of theory with empirical evidence presented here will provide students with an opportunity to see the important and difficult questions that modern economists are attempting to answer.

## **ACKNOWLEDGMENTS**

Many individuals contributed to both the substance and the style of this book. On matters of substance I owe a special debt to Kenneth Gordon of

Smith College. He read the entire manuscript several times and offered helpful comments throughout. Others who read various drafts include Dan Blake (California State University at Northridge), Edwin G. Dolan (Dartmouth College), Roger L. Miller (University of Miami), and Donald Nichols (University of Wisconsin, Madison). All these individuals provided important inputs that changed my thinking on some matters and clarified it on others. Once again Dorothy Ives demonstrated her special talents in bringing this manuscript into being. Her insistence on consistency and clarity was both constraining and most welcome. And Ellen Farrow added much to the style and flow of the book. If it proves readable, students have her to thank. My wife Susan sat through endless evenings of drafts and corrections. Both she and my daughter Kate deserve special thanks. My son missed these pleasures, but seems none the worse for it.

# Contents

<b>PREFACE</b>	<b>xv</b>
<b>PART I: Introduction</b>	<b>1</b>
<b>Chapter 1: Science and Economics</b>	<b>3</b>
INTRODUCTION: DEFINITIONS OF ECONOMICS	3
THEORETICAL MODELS	4
VERIFICATION OF MODELS	5
POSITIVE-NORMATIVE DISTINCTION	7
OVERVIEW OF THE BOOK	8
RECURRENT THEMES	9
SUGGESTED READINGS	10
<b>Chapter 2: Brief History of Economics</b>	<b>11</b>
INTRODUCTION	11
THEORY OF VALUE	12
GENERAL EQUILIBRIUM ANALYSIS	16
UNSOLVED PROBLEMS IN ECONOMICS	18
SUGGESTED READINGS	19
<b>Appendix: Functions and Graphs</b>	<b>20</b>
USE OF MATHEMATICS IN ECONOMICS	20
FUNCTIONS OF ONE VARIABLE	20
GRAPHING FUNCTIONS OF ONE VARIABLE	22
FUNCTIONS OF TWO OR MORE VARIABLES	29
GRAPHING FUNCTIONS OF TWO VARIABLES	30
SPECIAL FEATURES OF THE MATHEMATICAL TOOLS	31
SUGGESTED READINGS	34
DISCUSSION QUESTIONS AND PROBLEMS FOR PART I	35

<b>PART II: Demand</b>	<b>39</b>
INTRODUCTION	39
Chapter 3: Utility and the Utility Maximization Hypothesis	41
INTRODUCTION	41
DEFINITION OF UTILITY	42
MEASURABILITY OF UTILITY	45
SHAPE OF THE UTILITY FUNCTION: SOME ASSUMPTIONS	46
MRS AS A FORMALIZATION OF THE NOTION OF TRADE-OFFS	53
ALTERNATIVE DERIVATION OF THE MRS USING THE CONCEPT OF MARGINAL UTILITY	55
UTILITY-MAXIMIZATION HYPOTHESIS: AN INITIAL SURVEY	58
GRAPHIC ANALYSIS	59
ALTERNATIVE STATEMENT OF THE RESULTS OF THE UTILITY-MAXIMIZATION ASSUMPTION	63
SIMPLE NUMERICAL EXAMPLE OF UTILITY MAXIMIZATION	65
CONCLUSION	66
SUGGESTED READINGS	68
Appendix: Utility in Uncertain Situations	69
INTRODUCTION	69
CONCLUSION: UNCERTAINTY AND INFORMATION	76
SUGGESTED READINGS	77
Chapter 4: Comparative Statics Analyses of Utility Maximization	78
INTRODUCTION	78
DEMAND FUNCTION	79
CHANGES IN INCOME	80
CHANGES IN A GOOD'S PRICE	83
CHANGES IN THE PRICE OF ANOTHER GOOD	91
SUBSTITUTES AND COMPLEMENTS	93
CONSTRUCTION OF INDIVIDUAL DEMAND CURVES	93
SHIFTS IN AN INDIVIDUAL'S DEMAND CURVE	96
TWO APPLICATIONS OF THE COMPARATIVE STATICS ANALYSIS OF UTILITY MAXIMIZATION	98
CONCLUSION	102
SUGGESTED READINGS	103
Chapter 5: Market Demand	104
INTRODUCTION	104
MARKET DEMAND CURVES	104
CONCEPT OF ELASTICITY	108
FORMS OF DEMAND CURVES	112
EMPIRICAL STUDIES OF DEMAND: SOME SELECTED ELASTICITIES	115
CONCLUSION	119
SUGGESTED READINGS	119
DISCUSSION QUESTIONS AND PROBLEMS FOR PART II	121



<b>PART III: Production and the Firm</b>	<b>125</b>
INTRODUCTION	125
<b>Chapter 6: Technology of Production</b>	<b>127</b>
PRODUCTION FUNCTIONS	127
VARIATIONS IN ONE INPUT	128
ISOQUANT MAPS AND THE RATE OF TECHNICAL SUBSTITUTION	134
CLASSIFYING PRODUCTION FUNCTIONS: RETURNS TO SCALE	138
CLASSIFYING PRODUCTION FUNCTIONS: ELASTICITY OF SUBSTITUTION	140
THREE COMMON CONSTANT RETURNS TO SCALE PRODUCTION FUNCTIONS	141
NUMERICAL EXAMPLE OF A PRODUCTION FUNCTION	147
USES OF PRODUCTION FUNCTIONS	151
CONCLUSION	157
SUGGESTED READINGS	158
<b>Appendix: Technical Progress and the Production Function</b>	<b>159</b>
INTRODUCTION	159
QUANTITATIVE IMPORTANCE OF TECHNICAL PROGRESS	160
HOW TECHNICAL PROGRESS MAY HAVE TAKEN PLACE	163
CAUSES OF TECHNICAL PROGRESS	166
SUGGESTED READINGS	169
<b>Chapter 7: Costs of Production</b>	<b>170</b>
INTRODUCTION	170
COST-MINIMIZING INPUT CHOICE	173
FIRM'S EXPANSION PATH	176
NUMERICAL EXAMPLE	178
DISTINCTION BETWEEN THE SHORT RUN AND THE LONG RUN	181
SHORT-RUN TOTAL COSTS	183
OTHER SHORT-RUN COST CURVES	185
NUMERICAL EXAMPLE	190
LONG-RUN TOTAL COST CURVE	193
LONG-RUN AVERAGE AND MARGINAL COST CURVES	195
NUMERICAL EXAMPLE	200
SHIFTS IN COST CURVES	202
QUANTITATIVE ANALYSES OF COST CURVES	204
CONCLUSION	209
SUGGESTED READINGS	211
<b>Chapter 8: Profit-Maximization Hypothesis</b>	<b>212</b>
INTRODUCTION	212
PROFIT MAXIMIZATION AND MARGINALISM	213
MARGINAL REVENUE	216
CONTROVERSY OVER THE PROFIT-MAXIMIZATION HYPOTHESIS	221

**X Contents**

	SIMPLE ALTERNATIVES TO PROFIT MAXIMIZATION	222
	PROFIT GOALS OF LARGE CORPORATIONS	224
	CONCLUSION	228
	SUGGESTED READINGS	228
	DISCUSSION QUESTIONS AND PROBLEMS FOR PART III	229
<b>PART IV:</b>	<b>Pricing in the Goods Market</b>	<b>233</b>
	INTRODUCTION	233
	HOMOGENEOUS AND DIFFERENTIATED PRODUCTS	234
	INTEGRATING DEMAND AND SUPPLY	235
	TAXONOMY OF MARKET TYPES	236
	OVERVIEW OF PART IV	238
<b>Chapter 9:</b>	<b>Perfectly Competitive Pricing in the Short Run</b>	<b>241</b>
	INTRODUCTION	241
	PRICING IN THE VERY SHORT RUN	242
	PRICING IN THE SHORT RUN	243
	SHIFTS IN SUPPLY AND DEMAND CURVES	249
	TWO EXAMPLES OF THE USE OF EMPIRICAL DATA TO STUDY SHIFTS IN DEMAND CURVES	252
	CONCLUSION	257
	SUGGESTED READINGS	257
<b>Appendix:</b>	<b>Short-run Supply-Demand Dynamics</b>	<b>259</b>
	INTRODUCTION	259
	ADJUSTMENT PROCESSES: BASIC CONCEPTS	260
	COBWEB MODEL OF PRICE ADJUSTMENT	262
	TRANSACTIONS COSTS AND NONEQUILIBRIUM MARKET BEHAVIOR	265
	SUGGESTED READINGS	267
<b>Chapter 10:</b>	<b>Perfectly Competitive Pricing in the Long Run</b>	<b>268</b>
	INTRODUCTION	268
	LONG-RUN EQUILIBRIUM: CONSTANT COST CASE	270
	SHAPE OF THE LONG-RUN SUPPLY CURVE	271
	SOME EXAMPLES OF LONG-RUN PERFECTLY COMPETITIVE ANALYSIS	275
	CONCLUSION	281
	SUGGESTED READINGS	282
<b>Chapter 11:</b>	<b>Pricing in Monopoly Markets</b>	<b>283</b>
	INTRODUCTION	283
	CAUSES OF MONOPOLY	283
	PROFIT MAXIMIZATION	285
	MARKET SEPARATION AND PRICE DISCRIMINATION	287
	WHAT'S WRONG WITH MONOPOLY?	289
	MEASURING MONOPOLISTIC DISTORTIONS	292
	REGULATION OF MONOPOLY	296
	BROADER VIEW OF MONOPOLY	299
	CONCLUSION	300
	SUGGESTED READINGS	300

Chapter 12: Industrial Organization: A Brief Summary	301
INTRODUCTION	301
CONCENTRATION IN MARKETS	303
OTHER CHOICE VARIABLES	305
ASSESSING PRODUCT DIFFERENTIATION AND ADVERTISING	306
ENTRY CONDITIONS	308
PRICING IN OLIGOPOLY MARKETS	309
DECISION MAKING IN OLIGOPOLY MARKETS: STRATEGY AND THE THEORY OF GAMES	312
CONCLUSION	318
SUGGESTED READINGS	319
Appendix: Duopoly Model of Interdependent Output	
Decisions	320
INTRODUCTION	320
BASIC MODEL: MONOPOLY SITUATION	320
COURNOT MODEL OF DUOPOLY	321
STACKELBERG LEADERSHIP MODEL	324
OTHER FORMAL MODELS OF IMPERFECT COMPETITION	326
SUGGESTED READINGS	327
DISCUSSION QUESTIONS AND PROBLEMS FOR PART IV	328

**PART V: Pricing in the Factor Market** 333

INTRODUCTION	333
Chapter 13: Pricing in Perfectly Competitive Factor Markets	337
INTRODUCTION: SUPPLY AND DEMAND IN FACTOR MARKETS	337
ECONOMIC RENT	339
RICARDIAN RENT	342
MARGINAL PRODUCTIVITY THEORY OF FACTOR DEMAND	344
COMPARATIVE STATICS OF FACTOR DEMAND	346
APPLICATION OF THE COMPETITIVE MODEL OF FACTOR PRICING: THE CASE AGAINST A MINIMUM WAGE	351
CONCLUSION	353
SUGGESTED READINGS	353
Chapter 14: Pricing in Imperfectly Competitive Factor Markets	355
INTRODUCTION	355
MONOPSONY IN THE LABOR MARKET	358
MINIMUM WAGES AND MONOPSONIES	360
DISCRIMINATION IN HIRING	362
CONCLUSION	364
SUGGESTED READINGS	365

**xii**    **Contents**

Chapter 15: The Labor Market	366
INTRODUCTION	366
ALLOCATION OF TIME	367
INCOME AND SUBSTITUTION EFFECTS OF A CHANGE IN THE REAL WAGE RATE ( $w$ )	371
SUPPLY OF LABOR	372
EXAMPLE OF SUPPLY-DEMAND ANALYSIS: INCIDENCE OF A PAYROLL TAX	375
OCCUPATIONAL CHOICE AND COMPENSATING WAGE DIFFERENTIALS	377
LABOR UNIONS	380
CONCLUSIONS	384
SUGGESTED READINGS	384
Chapter 16: Capital	386
INTRODUCTION	386
RATE OF RETURN	387
DETERMINATION OF RATE OF RETURN	389
RENTAL RATE ON MACHINES AND THE THEORY OF INVESTMENT	393
EXAMPLE OF THE DEMAND FOR CAPITAL: EFFECTS OF "ACCELERATED DEPRECIATION"	396
PRESENT DISCOUNTED VALUE CRITERION	400
HUMAN CAPITAL	403
CONCLUSION	406
SUGGESTED READINGS	406
Appendix: Mathematics of Compound Interest	408
INTRODUCTION	408
PRESENT DISCOUNTED VALUE	409
ANNUITIES AND PERPETUITIES	409
SPECIAL CASE OF A BOND	410
PRESENT DISCOUNTED VALUE CRITERION AND INVESTMENT DECISION	411
SUGGESTED READINGS	412
DISCUSSION QUESTIONS AND PROBLEMS FOR PART V	414
PART VI: General Equilibrium and Welfare	417
INTRODUCTION	417
Chapter 17: Economic Efficiency	421
INTRODUCTION	421
EFFICIENCY IN EXCHANGE	423
EXCHANGE WITH INITIAL ENDOWMENTS: GAINS FROM TRADE	427
EFFICIENCY IN PRODUCTION	429
OPTIMAL CHOICE OF INPUTS FOR A SINGLE FIRM	430
PRODUCTION POSSIBILITY FRONTIER	432
EFFICIENT ALLOCATION OF RESOURCES AMONG FIRMS	436

EFFICIENT CHOICE OF OUTPUT BY FIRMS	438
SUMMARY OF EFFICIENCY IN PRODUCTION	440
EFFICIENCY IN PRODUCTION AND EXCHANGE	441
CONCLUSION	443
SUGGESTED READINGS	444
Chapter 18: Efficiency of Perfect Competition	446
INTRODUCTION	446
PERFECTLY COMPETITIVE PRICE SYSTEM	447
PRICES AND EFFICIENCY	448
WHEN THE MARKET SYSTEM FAILS TO ACHIEVE EFFICIENCY	454
THEORY OF THE SECOND BEST	459
SO WHY STUDY PERFECT COMPETITION?	461
LANGE MODEL OF SOCIALIST PRICING	463
EXAMPLE OF MARGINAL COST PRICING: CONGESTION TOLLS	465
CONCLUSION	467
SUGGESTED READINGS	468
Appendix: Linear Programming, Pricing of Inputs, and Quality	470
INTRODUCTION	470
A LINEAR PROGRAMMING STATEMENT OF THE PROBLEM	472
DUALITY AND THE PRICING OF INPUTS	476
SUGGESTED READINGS	478
Chapter 19: Welfare Economics	480
INTRODUCTION	480
NEED FOR WELFARE CRITERIA IN AN EXCHANGE MODEL	481
SOCIAL WELFARE FUNCTIONS	484
CONCLUSION	488
SUGGESTED READINGS	489
DISCUSSION QUESTIONS AND PROBLEMS FOR PART VI	490
 <b>PART VII: Government</b>	 <b>495</b>
INTRODUCTION	495
Chapter 20: Theory of Government	499
INTRODUCTION: GOVERNMENT AND PUBLIC GOODS	499
KINDS OF PUBLIC GOODS AND THE ECONOMIC ACTIVITIES OF GOVERNMENT	502
EFFICIENT PRODUCTION OF PUBLIC GOODS	504
PROBLEMS IN THE DEFINITION OF PUBLIC GOODS	506
CONCEPTUAL PROBLEMS IN MEASURING THE DEMAND FOR PUBLIC GOODS	510
COST-BENEFIT ANALYSIS OF GOVERNMENT PROJECTS	511

**xiv**    **Contents**

	EXAMPLES OF COST-BENEFIT ANALYSIS	516
	ASPECTS OF A POSITIVE THEORY OF GOVERNMENT	520
	CONCLUSION	523
	SUGGESTED READINGS	524
Chapter 21:	Externalities and Property Rights	525
	INTRODUCTION	525
	EXTERNALITIES, MARKETS, AND ALLOCATIONAL EFFICIENCY	527
	TRADITIONAL WAYS OF COPING WITH EXTERNALITIES	528
	PROPERTY RIGHTS, ALLOCATION, AND EQUITY	531
	ENVIRONMENTAL EXTERNALITIES	534
	PROPERTY RIGHTS AND PRIVATE OWNERSHIP	538
	EXAMPLE OF PRIVATE VERSUS COMMON OWNERSHIP: OCEAN FISHERIES	540
	CONCLUSION	542
	SUGGESTED READINGS	543
Chapter 22:	Distribution of Income	544
	INTRODUCTION	544
	DISTRIBUTION OF INCOME AND RESOURCE ALLOCATION	545
	DETERMINANTS OF THE DISTRIBUTION OF INCOME	546
	DISTRIBUTION OF INCOME AS A PUBLIC GOOD	551
	REDISTRIBUTIONAL PROGRAMS	552
	WORK DISINCENTIVE EFFECT OF GOVERNMENT INCOME TRANSFER PROGRAMS	555
	CONCLUSION	559
	SUGGESTED READINGS	560
	DISCUSSION QUESTIONS AND PROBLEMS FOR PART VII	561
	GLOSSARY OF FREQUENTLY USED TERMS	565
	NAME INDEX	571
	SUBJECT INDEX	573

# INTRODUCTION

The purpose of Part I is to provide some background material basic to the study of economics. In Chapter 1 we will investigate various definitions of “economics” and discuss the role that economic theory plays in understanding how real-world economies operate. Since this book is primarily concerned with the development of theoretical tools, it is important for us to begin with an understanding of the purpose to which these tools will be put. Chapter 1 also provides us with a general outline of the book and illustrates several important themes that occur frequently throughout the text.

Chapter 2 continues as an introduction to the book by presenting a brief historical treatment of economic analysis. In this chapter we will, first, discuss the way in which economic theory has evolved over time and, second, review the simple supply-demand model of price determination. The chapter therefore offers both historical perspective and a common background for the more detailed analysis of price determination that follows.

The Appendix to Chapter 2 summarizes a few elementary concepts from high-school algebra. We will be especially concerned with the relationship between algebraic functions and the graphical representations of these functions. Since we will be using graphic

## **2 Introduction**

techniques a great deal throughout the book (and because they are widely used in the field of economics as a whole), readers uncomfortable with such concepts should carefully review this material.



# CHAPTER 1

## Science and Economics

### INTRODUCTION: DEFINITIONS OF ECONOMICS

Since several definitions of economics are in current usage, it should be useful for us to examine a few of them as an introduction to the subject. The most widely used definition describes economics as the *study of the allocation of scarce resources among alternative end uses*. Here we are introduced to two important aspects of society that are of concern to economists. First, productive resources are *scarce*—they are not able to satisfy all human wants. Any society is constrained in its production by the quantities of land, labor, and capital it has on hand and by the technology that exists for using those resources. Second, those productive resources that are available may be devoted to a variety of end uses. A society may choose to have television sets or automobiles or clean air or beautiful cities. In fact, a society is likely to choose some combination of all of those “ends.” And economists have been particularly interested in studying the *alternatives* that are open to a society and in discovering the ways in which it makes the final choices.

A second definition builds directly on those ideas and describes economics as the *study of the ways in which a society makes choices*. Not only does a society as a whole make choices about the allocation of its resources, but the individuals in that society must also make a wide variety of choices. Individuals must choose the goods they will purchase with their incomes and decide how to spend their leisure time, for whom to vote, how many children to have, even whether to have children at all, and so on. And beyond such personal matters, individuals also face various choices in connection