



Microeconomics

Theory and Policy, 2nd Edition

By B. Modjtahedi

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MICROeconomics

Theory and Policy | 2nd Edition

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University Readers™

San Diego, CA

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To My Mother and the Memory of My Father

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Preface

This book has been written for students taking an economics course for the first time. In writing this text I had in mind not only the traditional full-time student, but also a large number of professionals who seek to pursue degrees in economics, finance, or related fields. This book has grown out of the decade's worth of lectures that I have given both at the University of California, Davis and other universities.

Around the beginning of the twentieth century, Alfred Marshal, a British economist, defined economics as the study of human beings in their ordinary business of life. Economics, and especially microeconomics, studies the economic decisions made by people in their everyday lives. You have made a decision to go to college, to buy this book, and to read it. I have made a decision to write this book so that you buy and read it. For us, the definition conveys two messages. First, economics should not be a terribly difficult topic to study. Second, the issues discussed in economics texts and classes should be relevant to our lives.

Keeping with the spirit of Marshal's definition, I have tried to explain everything using simple language without sacrificing rigor. Both microeconomic and macroeconomic portions of the text pursue an overarching objective of achieving a desired or optimal economic outcome. In the macro portion this is full employment, price stability, and long-term growth. In the micro portion it is economic efficiency. I have tried to have tight transitions from one chapter to the next. Every chapter explains what we have learned, what we don't know yet, and what we are going to learn in the upcoming chapter.

There are major differences between this text and others in the market. Many students find microeconomics texts to be merely a collection of dry topics without a common thread. Moreover, most textbooks do not stress economic policy. Students do not quite understand how, for example, perfect competition, monopoly pricing, externalities, and public goods are related to each other and in what way they affect their own lives. This text makes clear how these seemingly unrelated topics are related to each other. Moreover, it emphasizes the role of economic policy from the beginning.

Students learn from repetition and continuity. I have tried to apply this concept in the book to the extent possible. I define the rule for making optimal decisions at the very beginning. I then apply the rule repeatedly to decisions made by different decision makers. Every decision maker in the book, be it a consumer, a producer, a worker, or an employer uses the same rule to make her or his decision. The rule involves comparing the costs and benefits of a decision and taking an action whenever the benefits of the action outweigh the costs. These concepts are carefully defined early on in the text and applied consistently throughout the book.

Continuity derives from pursuing the goal of economic efficiency and the role of economic policy. Unlike many other texts, I define the concept of economic efficiency early on so that the student knows from the beginning what the overall goal is. Then in

the remainder of the book I delineate the conditions under which we can achieve economic efficiency, whether a particular economic situation is economically efficient, and if not, whether we need the government to take a corrective action. I show early on that economic policy might be justified when the marginal private costs and benefits of a decision deviate from marginal social costs and benefits. In these situations the private incentives of individual decision makers are in conflict with public interest. I explicitly show this conflict in all such situations. These are the only situations in which a government intervention might be justified. I however caution that like any other decision, we should compare the marginal cost and benefit of the policy decision before undertaking it.

This book is both analysis and policy oriented. After reading this book you will be able to apply the microeconomic concepts to different situations. You will be able to tell whether a particular situation is economically inefficient and, if so, whether a government policy might be justified. You will also learn some of the problems that exist in the democratic political processes and why even democracies may produce economically inefficient outcomes.

The mathematics background for this book is minimal. Nevertheless, a section in Chapter 1 covers the entire math you need to know to follow the materials in the text.

Several individuals read and made valuable comments on different chapters of the microeconomics and macroeconomics texts. I would particularly like to thank Kevin Hoover, Esen Onur, Nahid Movassagh, Bob Modjtahedi, and Kate Griaznova for taking time to read and provide feedback on several chapters of the microeconomics and macroeconomics portions of the text. Special thanks are due to Theodore J. McCarthy who edited the entire manuscripts for both the micro and macro portions and provided numerous insightful comments that significantly improved the exposition of the materials in several places. I am also grateful to Fayha Lakhani who patiently and competently compiled the index, glossary, and the table of contents for both macro and micro portions of the text.

Last but not the least; I would like to thank my many past students at UC Davis and elsewhere for their comments and questions on the previous edition of the texts. In fact it was mostly my students who encouraged me to convert my lecture notes into a textbook. I am very grateful to them all.

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Davis, California January 2008

Chapter 1

What Do Economists Do? We Model for Food

Introduction and Review

Alfred Marshall, a British economist, defined economics as “the study of mankind in his ordinary business of life.” You can study “mankind” with respect to many different attributes. Economics generally analyzes the behavior of people and institutions that arise because of *scarcity*. Scarcity means that human wants are unlimited in relation to the available resources in the economy. Unlimited wants means that people in general prefer to have more of everything. They want to be able to buy more food, more appliances, better homes, better cars, and so on so forth. Resources are those things we use to produce goods and services. They are also called *production inputs* or *factors of production*. Economists distinguish three types of resources:

1. **Land.** Land is all the resources given to us by the nature. Perhaps “*natural resource*” would be a better term for this production factor. Land includes land itself that is used in agriculture as well as forests, underground resources, minerals, and underwater resources. If we stretch the definition a bit, we can also include such things as solar energy or wind power to produce electricity in this category. At any given point in time, these are limited in supply. In the long run we might be able to increase their supply somewhat using more efficient cultivation techniques, better fertilizers, new discoveries, and so on. In this book we will generally assume that the amount of land is constant and we will ignore it. This is to keep our stories simple without affecting any of our conclusions.
2. **Labor.** Labor is human effort. It is measured by the “person-hour.” If we have one worker working 10 hours and another working 5 hours, then the total is 15 person-hours. This resource is limited for two reasons:
 - a. There are a limited number of people in any society over a given period of time.
 - b. Each person has a limited number of hours available to him or her during that time period.
3. **Capital.** By capital we mean all *produced means of production*. There are goods that human beings produce in order to use them to produce other goods. They include *private capital* owned by private citizens, such as trucks, tractors, and manufacturing plants, as well as *public capital* owned collectively by the public, such as roads, bridges, or national parks. Another capital category is the *human capital*. By this term economists mean all the knowledge, skills, and expertise *acquired and possessed* by an individual. This fits the definition of capital because an individual acquires it through education or learning by doing.

Scarcity means that with the available resources we cannot satisfy the collective wants of all the members of the society. In other words, if we asked all members of society how much of each good and service they would like to have if money was no object, we

would realize that we do not have enough resources to produce all those things. We will analyze the question of scarcity more fully in the next chapter.

Scarcity implies that every society has to answer three questions. These are called the “what,” “how,” and “for whom” questions.

1. **What** goods and services should the society produce? Should we produce more consumer goods such as food and clothing, or more capital goods such as trucks, tractors, and computers? Should we produce more civilian goods or more military goods?
2. **How** to produce those goods and services? There are generally different ways of producing the same good. We can produce cars either using a lot of labor and not much capital equipment, or a lot of robotics and not much labor. We can produce agricultural products using a lot of land but without any fertilizers and pesticides, or with less land and a lot of fertilizers and pesticides. We can produce electricity using fossil fuel such as oil and natural gas, or using renewable sources such as wind, water, or solar energy.
3. **For whom** should we produce these goods and services? This question is about the distribution of income in the society. Should the distribution be nearly equal so that all members of the society can buy the same amounts of the goods and services produced, or should we allow some inequality in the distribution of income? How much inequality is tolerable?

Every society, whether small or large, primitive or modern, capitalistic or socialistic, has to answer these questions. In a small traditional village the elderly might decide on these questions. In a free market capitalist system this question is answered mostly by the private sector of the economy, but governments heavily influence the choices made by the public. In socialist economies a central planning bureau generally makes all the decisions.

Microeconomics

Economics is broadly divided into two fields: microeconomics and macroeconomics.

Microeconomics studies the decisions made by one individual decision making unit and economic conditions prevailing in one particular market or industry.

A **decision-making unit**, or a decision maker for short, can be an individual or a firm. A **market** is any institution that brings buyers and sellers of a good or service together. The market could be small, like the garage sale market in a small town, or big, like the currency markets in which world currencies are traded. It could be in a physical location, like weekend farmers markets, or it could be the interconnection of computers, such as some financial markets. An **industry** is a collection of firms that produce identical or nearly identical products. Examples are the textile industry and the automobile industry.

Economists assume that a decision maker makes an economic decision or takes an action to *maximize satisfaction*. Generally, that action or decision is either to *buy* something or to *sell* something. Satisfaction could be either in monetary or subjective terms. The managers of business firms would measure satisfaction in terms of their profits. The higher their profits, the more satisfied they are. A consumer's satisfaction, on the other hand, could be subjective—"happiness" he or she would derive from consuming goods and services. Meet a few decision makers that you will encounter frequently in this book.

A **consumer** decides how much of a particular good to buy on the basis of the price of that good, the prices of related goods, and the level of your income. Her objective is to maximize her satisfaction. For example, in buying a car the consumer will consider its price, will compare it to the prices of other cars, will have one eye on the price of gasoline, and will be mindful of her budget.

A **worker** decides how much labor service to supply to business firms on the basis of the wage she will receive and the prices of goods and services she will consume. She will be mindful of prices because ultimately she is working in order to make money to be able to buy goods and services. Therefore, it is always the relationship between the wages she is paid and the prices of the goods she buys that is important for her decision. For example, in a city with a relatively low cost of living she may accept a job that is paying only \$30,000 per year. However, she cannot maintain the same quality of life with that kind of money in New York or Chicago. Therefore, she might accept that money for a job located in a small city with low prices, but not in New York.

An **employer** decides how much labor to hire given the price of the product it is producing and the wage it has to pay for the labor. The employer hires labor to produce some products and sell them in the market at some market prices. The revenue that the additional unit of labor would bring into the company is the benefit of hiring that person, while the wage that the employer would have to pay for that unit constitutes its cost. The employer will be inclined to hire more labor if the price of the product it is selling increases or the wage that it is paying decreases.

A **producer** decides how much of a good to produce and sell given the market price of its product and the cost of producing that product. The cost of production involves the wage the producer has to pay to hire labor, the rent to use the land and office buildings, and the interest for the money borrowed, among other things. Obviously, the producer would be willing to produce and sell more if the price of the good he is selling increases or the cost of producing it decreases.

A lot of times one person or entity makes more than one decision. In the above examples, the consumer and the worker are generally the same person. They make consumption decisions on the basis of the money they earn from working. Occasionally we combine these two decision makers into one unit and call it the **household**. Similarly, the employer and the producer are the same person. An employer hires workers to produce

things. Sometimes we combine employers and producers into one decision-making unit called the **firm**.

These are, of course, not the only decisions faced by households and firms in a society. People also decide on how much of their money to invest in stocks, bonds, and real estate and how much to keep in the banks. They also decide how much to lend and borrow. Moreover, the same person sometimes makes all these decisions. For example, the owner of a restaurant employs people to produce and sell meals. He also works in his own restaurant. Finally, with the money he makes from his business, he decides how much to consume, and how much to invest in stocks and bonds.

Microeconomics takes a typical consumer and studies her decision to buy a particular good, such as car. Then it takes a typical producer and analyzes his decision to produce and sell cars. It finally assumes that there are many such consumers and producers who come together in the **market** for cars. The collection of all the producers of cars constitutes the car **industry**. Similarly, microeconomics studies the market for labor by considering the workers who are willing to supply their labor services and the employers who are willing to hire them.

Macroeconomics

Macroeconomics, on the other hand, analyzes broad economic aggregates. What this means is that macroeconomics studies economy-wide variables. Macroeconomics is not concerned with one particular product such as bread. It instead looks at the sum total of all the goods and services produced in a country. This is called the *aggregate level of output*. Instead of studying the price of one particular product, macroeconomics analyzes the behavior of the prices of *all* the goods and services produced in the country. It studies some average of all these prices. This average is called the *general price level*. Finally, instead of studying just one worker, one employer, or one labor market, macroeconomics studies the *overall employment* in the economy. Overall employment means, of all the people who are willing to work, the number who have jobs.

Of course, these are not the only variables we study in macroeconomics. We also analyze the behavior of some other variables such as aggregate or national consumption, national saving, interest rates, and wage rates. But, ultimately, we are interested in these other variables because of their effects on the aggregate level of output, the overall price level, and overall employment.

Macroeconomics studies the behavior of aggregate economic variables such as the aggregate level of output, the general price level, and overall employment.

Why do we need two different fields? Macroeconomics and microeconomics are *related* but *different*. They are related because the total production in the economy of all the goods and services must be just the sum of the products produced by individual producers. Similarly, if the price of every good and service increases by 5%, then the

general price level must increase by 5%. The same is true for consumption. We expect that if the consumers' incomes in the society increase with the overall prices remaining the same, each individual consumer will consume more of everything and so the aggregate level of consumption will increase. Or, if the wage rate drops in the society relative to goods prices, then the cost of production for every producer will go down, resulting in more employment and more production.

However, the two fields are also different. A lot of times microeconomic relationships do not carry over to aggregate relationships. There are problems that are aggregate in nature and cannot be analyzed by microeconomic tools. A couple of examples will clarify this.

Example 1:

Microeconomics: Suppose you go shopping in the morning to find that the price of corn flakes has gone down by 5%, *everything else is the same*. You will buy more corn flakes for two reasons. First, you will substitute the corn flakes for the other kinds of cereals because their price is now relatively lower. This is called the *substitution effect* of a price reduction. Second, since the price of corn flakes has decreased, if you buy the same amount of corn flakes, you will have more money left in your pocket that you can spend on every good, including corn flakes. It is as if your income has increased. This is called the *income effect* of the price reduction.

Macroeconomics: What if the price of every good goes down by 5%? Then, unlike the above example, the relative prices will remain the same and there will be no substitution effect. But will the nation buy more of all the goods because of the income effect? We cannot even answer this question without further information. As you will see in a later chapter, if the prices of every good and service go down by 5%, the total income earned by everyone in the economy will also go down by 5%. This is because, if you pay \$100 to buy a textbook, it is expenditure for you but is income for the recipients of that \$100. Suppose the bookstore pays \$70 of that \$100 to buy the textbook from the publisher. This \$70 constitutes part of the incomes of the people in the publishing company. The bookstore pays \$20 out of that \$100 as wages to the workers, rent for the shop, and interest to the bank. These constitute the incomes of the recipients of this \$20. Finally, the bookstore owner pockets the remaining \$10 as profit. This \$10 becomes the owner's income.

You see that if all the prices fall by 5%, the total income will also fall by 5% and there will be no income effect from this general fall in prices. The aggregate purchasing power of all the people in the economy will remain the same. It seems that people overall will not increase their purchases of goods and services. However, *this conclusion* may not be correct either. We will address this question later in the book. The intent of this example was merely to show that we cannot always analyze questions involving overall or aggregate magnitudes using microeconomic tools.

The above example demonstrates what is called the *fallacy of composition*. This is the notion that what is true for one individual may not be true for the sum of all the individuals. If an individual fan at a football game stands up, he will see the game better,

but if everyone stands up, no one will see the game better. If one bidder at an auction shouts loudly, she will succeed in attracting the attention of the auctioneer, but if every bidder does the same, none will succeed. The following example applies this concept to further demonstrate the distinction between microeconomics and macroeconomics.

Example 2:

If a single wheat farmer produces more wheat in a year, he will make more money. This is because the additional output from one farmer will be too small relative to the whole market to have any effect on the price of wheat. Therefore, the farmer will sell more wheat at the same price, enjoying a greater amount of profit. However, if all the wheat farmers produce more wheat due to, say, better-than-normal weather, then the price of wheat will fall in the market and they may all suffer a loss.

Positive and Normative Statements

Economists distinguish between two types of statements. Some statements are about how things are, or how we think they are. These statements don't make any value judgment about whether any particular state or outcome is good or bad. Here are some examples:

- The average price of gasoline in the U.S. is \$4 per gallon.
- We are entering a recession and therefore unemployment could increase.
- OPEC raised the price of oil, so we expect goods prices to rise in the U.S.
- If the Fed increases the interest rate, the U.S. inflation rate could go down.
- More than fifty million people in the U.S. do not have health insurance.

Such statements are called *positive statements*.

Positive does not mean "true". You can affirm or refute a positive statement. In fact, you can use this as a criterion to tell whether a statement is a positive statement. You can say, "Yes that is true", or "No, that is not true", or "No, I don't think that is true". For example, the fifth statement probably is not true (in 2007). At the time of writing this book an estimated 47 million Americans did not have health insurance. Nevertheless, the statement is a positive statement.

Normative statements involve norms or judgments. The person making the statement considers the present state of things or the outcome of a decision to be good or bad. Here are some examples:

- The gasoline price is too high. (The present state is bad.)
- The government should pursue a pro-growth policy in order to increase the rate of growth of output to 3%. (The outcome is good.)
- We are entering a recession and therefore the government should try to keep unemployment from rising. (The outcome is good.)
- The current rate of inflation is too high; it is hurting people. (The present state is bad.)
- We should try to reduce the inflation rate. (The outcome is good.)
- We should not pursue active stabilization policies (The outcome is bad.)

Note that you cannot affirm or refute the above statements. When someone says, “gasoline prices are too high”, you won’t be able to affirm or refute that statement since you don’t know how high is too high. If you say, “Yes, I also think the gasoline prices are too high”, you are not affirming the statement. You are just making another normative statement. In economics we mostly concentrate on positive questions. For example, we tell the world that if you try to lower the unemployment rate, you may end up increasing the inflation rate. You cannot lower both in the short run. Then we leave it to others (e.g., politicians and voters) to decide whether they want to reduce inflation or unemployment.

A positive statement by an economist: In the short run you can either reduce inflation or unemployment, but not both.

A normative statement by a policymaker: The current unemployment is a more serious problem. We should reduce unemployment and forget about inflation.

This is not to say that economists do not make *any* normative statements. The very fact that economists propose policies to change the course of some events indicates that they regard the status quo as undesirable. For example, they mostly advocate free trade policies among different countries since they generally believe that trade restrictions such as tariffs or quotas between nations have economically undesirable effects, and that easing of these restrictions will produce better outcomes. However, even then they specify what they mean by “good” or “desirable”—in this case increased social welfare, somehow defined.

Economic Models

Economists conduct analyses using economic models. It is fair to say that almost anything you will study in economics is in terms of some type of a model. Economic models are simplified versions of reality that economists develop to analyze and understand the complex economic relationships that exist in the real world. As such, they are approximations to the real world. Decades ago a famous Cambridge economist named Joan Robinson likened economic models to area or road maps. In the same way that road maps help us organize our *trips*, economic models help us organize our *thoughts*. Suppose, for example, that you are to attend a conference in a large city like Los Angeles. You arrive in the city Sunday evening and the next day you decide to find the place where the conference is held. Imagine leaving your hotel without any maps and without asking anyone for directions, and instead trying to find the place just by trial and error. Chances are you will never reach your destination.

Area maps would be useful in these circumstances for one reason. They do not include any unnecessary details such as all the buildings or the kinds and names of the shops in the streets. All you need is a few lines representing the streets connecting your hotel to the conference place, and this is exactly what the map would show you. A map is a simplified version of the reality that is only used to organize a particular kind of a trip. If instead you were going fishing or camping, you would need another kind of map with other kinds of information on it. The city map would not be helpful in *this* trip. In either

case a one-to-one map—a map the size of the area itself with all the details included—would be as useless as not having the map at all.

Economic models are similar. To understand a particular problem, economists construct a model that *assumes away* (ignores) all the unnecessary details in order to concentrate on the problem at hand. Since the reality is too complex, a very realistic model with a lot of details would be as useless as a one-to-one map. In this sense, all models are unrealistic. However, they are useful because they only include the details we care about and these details are based on reality. Moreover, like the area maps, we develop and use different models to answer different questions. A model that is useful to answer one question may be totally useless in answering another question.

In fact, people use models in their day-to-day lives to make decisions. Suppose a friend of yours is thinking of renting an apartment in your neighborhood. He therefore comes to you and asks, “What is your average speed on a typical winter day driving home from the school?” Your typical answer would be, “It depends. Under the average rain and traffic conditions I can drive 30 miles per hour”. These are the only important factors affecting your driving speed. You ignore other irrelevant details such as the kind of music you listen to or whether someone else is in the car with you. You also explain that if either the rain or the traffic condition turned out better than the average, you could drive faster. However, you explain, you cannot exceed the legal speed limit of 45 miles per hour. You just answered your friend’s question using a model.

Economic models contain two types of magnitudes: *constants* and *variables*. Constants are those magnitudes whose values do not change. In the above example, the speed limit of 45 miles per hour is a constant. We know you will never drive faster than that.¹ Variables are those magnitudes that can take different values. For example, your speed, the amount of rainfall, and the number of cars on the street can change from day to day. In any model, there are two types of variables. *Endogenous variables* are those variables whose values are determined *inside the model* on the basis of the values of the other variables. In other words, these are the variables whose values we don’t know but are interested in knowing. Simply put, these are the unknowns of the problem. In the above example, your friend was interested in knowing your daily average speed. So this was the endogenous variable of the model.

The other variables are called *exogenous variables*. The values of the exogenous variables are determined *outside the model* by factors other than the endogenous variables, and are therefore known to the analyst. Exogenous variables are the cause and the endogenous variables are the effect. Endogenous means *inside* and exogenous means *outside*. In mathematics these are called depended and independent variables, respectively. In the above example, the amount of rainfall and the number of cars on the street are exogenous variables. Their values are determined outside your model by other factors like climate or the number of residents in the city. They will not depend on your driving speed. Your friend was not interested in the values of these variables *per se*.

¹ We hope!

However, their values would affect your driving speed, something your friend was interested in knowing.

A lot of times we are interested in analyzing the effect of a change in an exogenous variable on the value of the endogenous variable, *keeping all the other exogenous variables unchanged*. For example, we ask, *all else the same*, what would happen to your driving speed on a particular winter day if the rainfall was heavier than normal? In this example, “all else the same” means keeping the other exogenous variable, the traffic condition, unchanged at its average level. A lot of times, economists use the Latin phrase *ceteris paribus* instead of its English equivalent *all else the same*.²

Suppose that now your friend asks a second question, “How long does it take you to get home from school on a typical winter day?” Now we have a second endogenous variable—a variable whose value we are interested in. Your friend’s second question cannot be answered with the existing set of exogenous variables and relationships. We need new pieces of information to answer this new question. You remember from high school algebra that to solve for two unknowns, we need two independent equations. We are talking about the same thing here.

You would answer, “*The distance from the school to my house is about 10 miles. Therefore, it takes about 20 minutes to get home.*” So you would add the relationship between speed and travel time to your model to answer both questions. Note that the second relation comes with another constant: the fixed distance between your home and the school, which is 10 miles.

In general, the number of relationships must be equal to the number of endogenous variables for us to be able to determine the values of the endogenous variables. The appendix to this chapter reviews most of the math, including an algebraic description of economic models that you will need to know in order to follow the arguments in this book.

² Like in medieval times, this is mainly to make us sound sophisticated!