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chapter one

An overview

This opening chapter sets out some basic concepts and philosophy for the rest of the book. In particular, we address four questions: What are the basic categories in microeconomic theory? What are the purposes of microeconomic theory? How does one's purpose influence the levels of scope, detail, and emphasis in one's model? How will the development of the theory proceed in this book?

1.1. The basic categories: Actors, behavior, institutions, and equilibrium

Microeconomic theory concerns the behavior of individual economic actors and the aggregation of their actions in different institutional frameworks. This one-sentence description introduces four categories: The individual *actor*, traditionally either a consumer or a firm; the *behavior* of the actor, traditionally utility maximization by consumers and profit maximization by firms; an *institutional framework*, which describes what options the individual actors have and what outcomes they receive as a function of the actions of others, traditionally the price mechanism in an impersonal marketplace; and the mode of analysis for modeling how the various actors' behaviors will aggregate within a given framework, traditionally *equilibrium* analysis.

The actors

In the standard treatment of microeconomics, the two types of actors are the individual *consumer* and the *firm*. We will follow the standard approach by regarding the consumer as an actor. For the firm, we will follow the standard approach for a while by treating the firm as an actor. But firms can also be thought of as institutions within which the behavior of various sorts of constituent consumers (workers, managers, suppliers, customers) are aggregated. From this alternative perspective, what a firm does results from the varying desires and behavior of its constituent consumers, the institutional framework the firm provides, and the equilibrium

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that is attained among the constituent consumers within that institutional framework. Much recent work in microeconomics has been directed towards treating the firm in this fashion, and we will take up this approach in the final part of the book.

Behavior

In the standard approach, behavior always takes the form of constrained maximization. The actor chooses from some specified set of options, selecting the option that maximizes some objective function. In orthodox theory, consumers have *preferences* that are represented by a *utility function*, and they choose in a way that maximizes their utility subject to a *budget constraint*. Firms, on the other hand, are modeled as *maximizing profits* subject to the constraints imposed by their *technological production possibilities set*.

These models of consumer and firm behavior typically strike people as fairly obnoxious. We don't find consumers strolling down the aisles of supermarkets consulting a utility function to maximize when making their choices, nor do we typically think of business executives being guided completely and solely (or even mainly) by the effect of their decisions on business profits. Nonetheless, we will use the standard model of consumer behavior throughout, and we will use the standard model of the firm for most of the book. It behooves us, then, to say why we think such models are useful.

Three rationales are often given. First, our models don't presume that consumers actively maximize some tangible utility function; the presumption is that consumers act *as if* this is what they do. Hence an important part of the theory of individual behavior concerns *testable restrictions* of the models we use: What behavior, if observed, would clearly falsify our models? If the models are not falsified by our observations, then our models are good positive models — perhaps not descriptive as to *why* things happen, but good in describing *what* happens.

Unhappily, rather a lot of data has been collected, especially experimentally, which falsifies the models we will employ. At this we fall back to our second line of defense by saying that such violations may be minor and not amount to much. That is, the standard models may be good approximations of individual behavior, and the conclusions of models built from such approximations may thus be approximately valid. This requires a leap of faith, but it is still a leap that has some intuitive appeal. In fact, we can take this a step further: In many (but not all) of our models, the behavior of the individual is unimportant; instead the aggregate behavior of many individuals matters. If we believe that violations of our models

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tend to exhibit no particular biases and cancel out at the level of aggregate behavior, then the models may work well. If all we care about are the implications of our models for aggregate behavior, then we will be content to look for testable implications (and falsifications) of our models at the level of aggregate behavior.

The third line of defense is the most subtle. Even if we know that there are systematic violations of our models by individuals, violations that do not cancel out, we can still gain insight into questions of interest by studying models where we assume away those violations. This line of defense is delicate because it requires the theorist to have a deep understanding of which assumptions drive the conclusions that are generated by the theory; we will return to this in the next two sections.

The institutional framework

The actions taken by any individual depend on the opportunities that are presented to the individual. Those opportunities, in turn, often depend upon the collective actions of others. And the consequences for an individual of that individual's actions usually depend on what others have chosen to do. The term *institutional framework* is used throughout to refer to those parts of a model that describe (a) the general nature of options that an individual has, and (b) the options available to and outcomes ensuing for each individual, as a function of other individuals' actions.

In the traditional models of microeconomics, *prices in an impersonal marketplace* constitute the institutional framework; consumers can choose any bundle they can afford, where what is affordable is determined by prices. The market is impersonal in the sense that all consumers face the same array of prices. And the precise choices available to one consumer depend on the consumption choices of all consumers (and the production choices of firms) through these prices.

As we will discuss at length, the workings of the price mechanism are quite fuzzy and ambiguous. Where do prices come from? How are they set, and how do they reflect the actions of individual consumers? Note also the potential of circularity in this; prices constrain the choices of individual consumers, and those choices simultaneously determine prices.

Spurred by these questions, we will look at more concrete and detailed institutional frameworks that are more precise about the connection between the choices of some individuals and the options available to and outcomes resulting for other individuals. An example of a more concrete mechanism, which in some sense leads to the establishment of a "price," is the institution of a sealed bid, first price auction: Anyone who wishes to may submit a bid for an object, with the high bidder winning the

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object and paying his or her bid. A different institutional framework for the same purpose is a progressive oral auction — an auction where bids are made openly, and each new bid must beat the previous high bid by some minimal amount.

Predicting the outcome: Equilibrium analysis

Having modeled the behavior of individuals, the nature of the choices they have, and the ways in which their actions affect each other, we are left with the task of saying just what the product of these things will be, that is, predicting what actions will be selected and what results will ensue. We will use various forms of *equilibrium analysis* to address this task. Generally speaking, an equilibrium is a situation in which each individual agent is doing as well as it can for itself, given the array of actions taken by others and given the institutional framework that defines the options of individuals and links their actions.

Although it is not quite how we will conduct business, you might think of this as a feedback system; individuals make individual choices, and the institutional framework aggregates those actions into an aggregate outcome which then determines constraints that individuals face and outcomes they receive. If individuals take a "trial shot" at an action, after the aggregation is accomplished and the feedback is fed back, they may learn that their actions are incompatible or didn't have quite the consequences they foresaw. This leads individuals to change their individual actions, which changes the feedback, and so on. An equilibrium is a collection of individual choices whereby the feedback process would lead to no subsequent change in behavior.

You might suppose that instead of studying only the equilibria of such a system, we will dive in and look at the dynamics of the feedback, change in behavior, change in feedback, ..., cycle, that is, the *disequilibrium dynamics* for the institutions we pose. We will do something like this in a few cases. But when we do, we will turn it into a study of *equilibrium dynamics*, where the institutional framework is expanded to include the feedback loops that are entailed and where individuals' behaviors are dynamically in equilibrium — each individual doing as well as possible given the institutional framework and the dynamic behaviors of others.

Our use of equilibrium analysis raises the question: Why are equilibria germane? Put another way, why do we think that what happens corresponds to an equilibrium? *We make no such blanket assumption.* As we will make especially clear in chapter 12, we rely on intuition and experience to say when this sort of analysis is germane, and while we will sketch a variety of reasons that equilibria might be achieved and

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equilibrium analysis might be relevant, we try never to *presume* in a particular application that this is so.

1.2. The purpose of microeconomic theory

Having set out the basic categories of microeconomic theory (at least as practiced in this book), we come to the question: What do we intend to get out of the theory? The simple answer is a better understanding of economic activity and outcomes.

Why do we seek a better understanding? One reason that needs no explanation is simple intellectual curiosity. But beyond that, a better understanding of economic activity can be useful in at least two ways. First, as a participant in the economic system, better understanding can lead to better outcomes for oneself. That is why budding business executives (are told to) study microeconomics; a better understanding of the ways in which markets work will allow them to make markets work better for themselves. And second, part of the study of microeconomics concerns the efficiency and specific inefficiencies in various institutional frameworks with a view towards policy. One tries to see whether a particular institution can, by tinkering or by drastic change, be made to yield a socially better outcome; the vague presumption is that changes that improve the social weal might be made via social and political processes. In this book, we will touch on the efficiency of various institutions, although this will be relatively deemphasized.

What constitutes better understanding? Put differently, how does one know when one has learned something from an exercise in microeconomic theory? The standard acid test is that the theory should be (a) testable and (b) tested empirically, either in the real world or in the lab.[1] But many of the models and theories given in this book have not been subjected to a rigorous empirical test, and some of them may never be. Yet, I maintain, models untested rigorously may still lead to better understanding, through a process that combines casual empiricism and intuition.

By casual empiricism joined with intuition I mean that the reader should look at any given model or idea and ask: Based on personal experience and intuition about how things are, does this make sense? Does it help put into perspective things that have been observed? Does it help organize thoughts about a number of "facts?" When and if so, the exercise of theory construction has been useful.

[1] See chapters 3, 6, and 15 if the concept of a laboratory test of an economic theory is new to you.

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Imagine that you are trying to explain a particular phenomenon with one of two competing theories. Neither fits the data perfectly, but the first does a somewhat better job according to standard statistical measures. At the same time, the first theory is built on some hypotheses about behavior by individuals that are entirely ad hoc, whereas the second is based on a model of behavior that appeals to your intuition about how people act in this sort of situation. I assert that trying to decide which model does a better job of "explaining" is *not* simply a matter of looking at which fits better statistically. The second model should gain credence because of its greater face validity, which brings to bear, in an informal sense, other data.[2]

Needless to say, one's intuition is a personal thing. Judging models on the basis of their level of intuitive credibility is a risky business. One can be misled by models, especially when one is the creator of the model, and one is more prone to be misled the more complex the model is. Empirical verification should be more than an ideal to which one pays lip service; one should try honestly to construct (and even test) testable models. But intuition honestly applied is not worthless and should not be completely abandoned. Moreover, exercises can be performed to see what drives the conclusions of a model; examine how robust the results are to changes in specification and precise assumptions.

There is something of a "market test" here: one's ability to convince others of one's personal intuitive insights arising from specific models. Microeconomic theorists have a tendency to overresearch "fashionable" topics; insofar as they can be convinced by something because it is fashionable and not because it rings true, they are less than ideal for this market test. But less theoretically and more empirically inclined colleagues (and, sometimes even better, practitioners) are typically good and skeptical judges of the value of a particular model. Attempts to convince them, while sometimes frustrating, are usually helpful both to understand and improve upon a model.

The usefulness of falsified models

To push this even further, I would argue that sometimes a model whose predictions are clearly falsified is still useful. This can happen in at least three ways. First, insofar as one understands how the assumptions led to the falsified conclusions, one understands which assumptions *don't*

[2] Readers who know about Bayesian inference should think of this as a case in which the likelihood of the first model is greater, but the second has higher prior probability. Which has a greater posterior probability is then unclear and depends on the relative strengths of the priors and likelihoods.

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lead to the "truth." Knowing what doesn't work is often a good place to begin to figure out what does.

Second, theory building is a cumulative process. Under the presumption that most economic contexts share some fundamental characteristics, there is value in having models that conform to "generally accepted principles" that have served well in other contexts. Compared with a model that is radically different from standard models, a model that conforms to standard assumptions and principles will be better understood, both by the theory creator and by the audience. Moreover, unification of theory is valuable for its own sake to gain a better understanding of the shared characteristics. Of course, not all contexts are the same, and sometimes what economists think of as "generally acceptable and universally applicable principles" are pushed too far. Economists are well-known among social scientists as imperialists in the sense that economists attempt to reduce everything to economic notions and paradigms. But a real case still can be made for tradition and conservatism in the development of economic (and other) theory.

Granting this, when looking at an economic phenomenon that is poorly understood, economic theorists will attempt to build models that fit into the general rules of the discipline. Such attempts are rarely successful on the first trial. But insofar as first trials do lead to second and third trials, each of which gets one closer, the first trial is of value, and learning about another's first trial may help you construct the second and third.[3]

Economists tell a parable about theory and theorists that relates to this. An economic theorist lost his wallet in a field by a road and proceeded to search futilely for the wallet in the road under the illumination of a street light on the grounds that "that is where the light is." So, the folktale goes, it is with using theoretically "correct" but otherwise inappropriate theory. But an amendment to this tale is suggested by José Scheinkman: Without defending the actions of this particular theorist, perhaps one could try to construct a string of lights that begins in the road and that will eventually reach the field, on the grounds that the road is where electricity presently is found.

Third, and perhaps most subtly, models that fail to predict because they lack certain realistic features can still help clarify the analyst's thinking about the features they do encompass, as long as the analyst is able to combine intuitively and informally what has been omitted from the model

[3] That said, I cannot help but note that the journals contain many more papers that begin "This paper takes a first step in..." than papers that take second or third steps. Not every attempt at widening the scope of economic theory is successful!

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with what has been learned from it. Of course, everything else held equal, it is "better" to have a model that captures formally more of the salient aspects of the situation than to have one that omits important features. But all else is rarely equal, and one shouldn't preclude building intuition with models that make somewhat falsified assumptions or give somewhat falsified conclusions, as long as one can understand and integrate informally what is missing formally.

1.3. Scope, detail, emphasis, and complexity

This leads to a third point about the theories and models that will be encountered in this book: their levels of scope, detail, emphasis, and complexity.

On scope, chapter 8 presents an excellent illustration. Chapter 8 concerns the theory of perfect competition. It begins with the analysis of a market for a single good — the theory of perfect competition that will be familiar to you from intermediate microeconomics. You may recall from intermediate micro that the industry supply curve is the horizontal sum of the individual supply curves of firms, and the supply curves of firms are their marginal cost curves. (If you don't recall this or never heard of it before, just read on for the flow of what I'm about to say.) This would lead to inaccurate predictions of, say, how price will move with shifts in demand, if one factor of production of the good in question comes from a market that itself has an upward sloping supply curve. To illustrate this, we move in chapter 8 from the traditional model of a single market to consideration of two linked markets, both of which are perfectly competitive. But why stop with two markets? Why not consider all markets together? At the end of chapter 8, under the assumption that all markets are perfectly competitive, we will see what can be said about such a (so-called) general equilibrium.

So what is the appropriate scope for a given model? There is a natural inclination to say that larger scope is better. But there are drawbacks to larger scope. The larger the scope, the more intractable the model, and the harder it is to draw out sharp and/or intuitively comprehensible results. One might feel relatively comfortable making strong assumptions in a model with a narrow scope about how the "outside" affects what is inside the model, assumptions that are (or seem) likely to be true and hence good modeling assumptions but that cannot easily be deduced generally in a model with an expanded scope.

For level of detail, consider how one should treat the family unit in a model of consumer demand. The standard model of consumer demand

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envisions a single individual who maximizes his or her utility subject to a budget constraint. Almost anyone who has lived in a family will recognize that family expenditure decisions are a bit more involved than this. Individual members of the family, presumably, have their own tastes. But they recognize a strong interdependence in their personal consumption decisions. (Family members may like, or dislike, taking their vacations in the same location, for example.) And they often pool resources, so that their individual budget constraints get mixed together. Should we treat the family unit as a single consumer or attempt to build a more detailed model about interactions among family members? The answer will depend on what phenomena we are trying to explain. In most models, families are treated "coarsely," as consuming units, each family conforming to the standard model of the consumer. But for models of the labor supply decisions of families, for example, the detailed modeling of family interaction is sometimes crucial to what is being explained and so is included within the formal model. In general, one pays a cost in tractability and comprehension for increased detail. But in some contexts, greater detail is essential to get at the point in question.

Emphasis is meant to connote something like scope and like detail that isn't quite either. When looking at a particular phenomenon, the analyst may wish to emphasize certain aspects. To do this, the model may become unbalanced — heavy on one aspect of detail, or wide in one aspect of scope, but simple and narrow in all others. Especially when building a model to develop intuition concerning one facet of a larger problem, and where one will rely on less formal methods to integrate in other facets, models that (over)emphasize the facet of immediate interest are warranted.

This discussion is meant to alert the reader to a crucial aspect of microeconomic models and a crucial skill for microeconomists: Building a model is a matter of selecting the appropriate scope, level of detail, and matters to emphasize. There is no set formula to do this, because the appropriate levels of each depend on what the model seeks to accomplish. When "proving" the efficiency of the market system (see chapters 6 and 8), a wide scope is appropriate because overall efficiency is an economy-wide phenomenon. To demonstrate the *possibility* of a particular form of inefficiency in a particular form of market, narrower scope and greater emphasis on a few crucial details are called for. In this book you will see a wide variety of models that vary in their levels of scope, detail, and emphasis, and it is hoped that you will both get a taste for the variety of "types" of models that are used by microeconomic theorists and get a sense of the strengths and weaknesses of those types.

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Let me add two further considerations, using the general notion of the level of complexity of one's models. Complexity combines scope and detail, but has other aspects as well, such as the level of mathematics required. Insofar as the model is meant to generate insights and to build intuition, too great a level of complexity in any form is usually bad. Insights and intuition are built from understanding — recognizing (in the model) which assumptions are crucial and what leads to what. The more complex a model is, the harder it is to achieve that sort of understanding. At the same time, simple models too often lead to flawed insights, because the conclusions depend too heavily on the simple setting that is assumed. Lessons that seem obvious from models of single markets in isolation are too easily overturned when one examines the interaction between markets. Balancing these considerations is not easy.

By the same token, building models to explain one's own insights to others requires a balance between complexity and simplicity. Recall that the proposed "market test" was whether you could convince an economist or practitioner who is perhaps not up-to-date with the latest fashion in economic theory but who instead has a well-developed intuitive understanding of how things are. Very complex models that require either a lot of knowledge about the latest techniques or incredible patience to work through mathematical detail will not pass this test. But, at the same time, a lot of the more complex techniques in microeconomic theory are there to check the *consistency* of models; however appealing the conclusions are, a model that is predicated on assumptions that are logically inconsistent or inconsistent with most standard theory is unsatisfactory. The best theories and models are those that pass (possibly complex) tests of consistency or validity and, at the same time, provide insights that are clear and intuitive and don't depend on some mathematical sleight-of-hand. Not all the theories and models that are presented here will pass this dual test. All will pass the consistency test (I hope), so you can anticipate that those that fail will fail on grounds of being too complex to be intuitive.[4] And those that do fail on grounds of complexity are, by virtue of that failure, somewhat of second (or lower) quality.

1.4. *A précis of the plot*

This book may be thought of as a collection of somewhat interconnected models that are interesting in their own right. But, at the same

[4] Put an X in the margin by this sentence. When we get to analysis of the centipede game in chapter 14, I will remind you that I gave fair warning.

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time, the book has been written to convey the strengths and weaknesses of the tools that microeconomic theory has at its disposal. You should have little problem seeing the individual pieces from the table of contents, but it may be helpful to discuss the more global development that I intend.

First, insofar as one can split the subject of microeconomic theory into (1) actors and their behavior and (2) institutions and equilibrium, this is a book that stresses institutions and equilibrium. I don't mean to disparage the theories of individual behavior that are a cornerstone of microeconomic theory. I've even written a different book on one aspect of that subject. But I believe that *detailed* study of this topic can wait until one studies institutions and equilibrium, and the latter subject is of greater immediate interest and appeal. Still, it is necessary to understand the basics of the standard models of consumer (and firm) behavior before you can understand models of equilibrium, and part I and chapter 7 in part II provide the necessary background. Some readers of this book will have already taken a course that stressed the standard theories of the consumer and the firm. Such readers will probably find a light skim of chapters 2 and 7 adequate, but chapters 3, 4, and 5 present important background for the rest of the book that is treated here in greater depth than is typical in the traditional first course in microeconomics.

Part II takes up the classic "mechanism" by which individuals' diverse desires are meant to be brought into equilibrium: the price mechanism. We progress from situations of perfect competition in which, except for ambiguity about how prices are set, the price mechanism works both clearly and well, to monopoly and oligopoly, where it is less clear that prices alone are doing the equilibrating. By the time we reach the end of oligopoly, we see rather large holes in our understanding of how prices work, and we tentatively attribute those holes to a lack of specification of what precisely is "the price mechanism."

In part III we look at techniques that are meant to help us fill in those holes, techniques from noncooperative game theory. Game theoretic analyses have been extremely fashionable in microeconomic theory since the mid-1970s because such analyses are quite precise concerning institutional framework and because they help us see how institutions matter. Indeed, we will see cases in which, according to the theory, the institutional framework seems to matter too much. But we develop at the same time two weaknesses in such analyses. One, in many important cases, the theory is not determinative — many "equilibria" are possible, and which equilibrium if any arises depends on conjectures that are not provided for by the theory. Two, insofar as institutions matter, one has to wonder where existing institutions come from. Game theoretic analyses take the institutions

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as exogenously given. Until we understand where institutions come from and how they evolve, an important part of the puzzle is left unsolved.

Part IV exhibits some of the most important achievements of microeconomic theory in the 1970s and 1980s, developments in the so-called *economics of information*. You are meant to come away from part IV impressed by the insights that can be gleaned by the close analysis of market institutions, both with and without the techniques of noncooperative game theory. To be sure, the problems with our techniques that are discussed throughout part III are not resolved here, and many important questions are left unanswered. But insofar as microeconomic theory has made progress on substantial questions over the past twenty years, this is an area of progress.

In part V we take up the theory of the firm. In standard microeconomic theory firms are actors very much like consumers. We will criticize this classical view and consider instead a view of the firm as something in the category of a market — an institution within which diverse desires of consumers of various sorts are equilibrated. We are able to shed some light on what role firms and other nonmarket institutions play, but we will see that matters crucially important to this subject do not seem amenable to study with the tools at our disposal. In a sense we will come back full circle to individual behavior. The argument will be that we cannot do an adequate job studying firms and other institutions, and especially the origins and evolution of these institutions, unless and until we reformulate and refine the models we have of individual behavior.

All this is, presumably, a bit hard to fathom without a lot of fleshing out. But that's the point of the next eight hundred-odd pages.

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