Thinking Like a Modern Economist

Economics is what economists do. — Jacob Viner

My son doesn’t think much of economists. I know that it’s rather common for kids not to have high regard for their parents, but it still hurts. Recently, however, when I was attending a conference and told him that I was on a panel with Steve Levitt, my ranking moved up. In fact my son asked me, “Can you get his autograph for me? He’s cool.” Steve Levitt’s book, *Freakonomics* (written jointly with Stephen Dubner), had hit a chord with my son, and judging from its sales, with lots of other people as well.

I raise this issue here not to sell more copies of Levitt’s book (he’s sold plenty), but instead to introduce you to what modern economists do, and how what modern economists do relates to the supply and demand model to which you were introduced in the last two chapters. I include this chapter to disabuse you from thinking that the supply and demand model is the holy grail of economics. Remember Carlyle’s comment, “teach a parrot the words ‘supply’ and ‘demand,’ and you have an economist.” He’s wrong; as I stated last chapter, economists are not parrots, and to understand modern economics you have to know that modern economics uses supply and demand analysis only as a stepping stone. It’s an important stepping stone, but still just a stepping stone.

*Freakonomics* makes the point nicely because if you look in its index, you won’t find any entries under supply or demand. The reason isn’t because the indexer goofed—it’s because Steve didn’t use the formal supply and demand model. Instead, he applied the general ideas behind supply and demand within a variety of other models; most of his conclusions derive from his creative ability to collect data and analyze them with statistical tools. His approach is typical of how modern applied economists approach problems—they collect data, or use data collected by others, and analyze them. The purpose of this chapter is to give you a sense of what modern economists do, and how what you will learn in principles of economics relates to what modern economists do.

A key lesson of this chapter is that supply and demand is not the glue that holds modern economics together. Rather, modeling is the glue. When you present a problem or question to an economist, he or she will automatically attempt to reduce that question to a model—a simplified representation of the problem or question that captures the essential issues—and then work with that model and empirical evidence to understand the problem. The modeling approach is the modern economics approach.

No single model characterizes modern economic models. Modern economists are a highly diverse group of social scientists. What ties them together is their...
training in modeling and their shared view that incentives are important, and that their models have to capture the importance of incentives.

The Nature of Economists’ Models

Economists aren’t the only people who use models. Most everyone does. An architect will often create on the computer or with wood a small model of a house he is building. Similarly, an engineer will test a new design with a model. So modeling alone does not distinguish an economist from other scientists and engineers. What does differentiate economists are:

1. The building blocks that economists use in their models and
2. The structure of formal models that economists find acceptable.

By building blocks I mean the assumptions that form the basis of economic models. All economists’ models hold that incentives are important, but they differ in how they picture people reacting to incentives. For example you can assume that individuals are selfish, or that individuals care about other people; the models would be different in each instance. By structure, I mean the form of the model—for example, a model can be verbal, graphical (for example: the supply/demand model), algebraic with simple equations (for example: \( q = 4 - 2p \)), or algebraic with highly complex equations2 (for example:

\[
\frac{\delta \theta(t)}{\delta \theta(0)} = -k \left( \frac{D \theta(t)}{\Delta \theta(0)} \right) + R \left( \frac{\theta(t)}{\theta(0)} \right)
\]

requiring mind-spinning graduate-level mathematics). The popular TV show Numb3rs is in many ways a description of how modern economists approach problems. In fact, many of the episodes of the show are built around models that modern economists have developed and use in their analysis.

Models don’t have to be mathematical; economists also use more informal verbal or heuristic models—models that are expressed informally in words. Models also can be made from physical components such as a small replica of a proposed house or as computer simulations such as software that models the growth of bacteria. Computer simulation models also can be interactive where individuals become part of the model. For example, Second-Life can be thought of as a model of society and its economy can provide insight for the real-world economy. (Check out how the central authority in Second-Life changes the money supply to affect the exchange rate of Second-Life currency.) Just like these models, economic models come in many different forms with many different building blocks.

The building blocks and structures of models that economists use have evolved over time. Early economists tended to use a highly restricted set of building blocks and a narrow set of relatively simple (at least compared to their modern alternatives) formal models. Modern economists are economists who are willing to use a wider range of models than did earlier economists. For example, as discussed in Chapter 1, a major change is that modern economists use much more inductive approach to modeling. Just to be sure you know the distinction, let’s review it. An inductive approach is an approach to understanding a problem or question in which understanding is developed empirically from statistically analyzing what is observed in the data. Models based on an inductive approach are developed by how well they fit the data. Earlier economists were much more likely to use a deductive approach—an approach that begins with certain self-evident principles from which implications are deduced (logically determined).

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2In case you were wondering, this is a reaction diffusion equation expressed in simplifying vector notation. What’s a reaction diffusion equation? It’s probably better not to ask.
Scientific and Engineering Models

Models can have many purposes. There are models primarily designed to provide understanding of what is happening for the sake of understanding—these are scientific models. Other models can be designed to provide insight into policy issues—these are applied-policy or engineering models. Still other models fall somewhere in between; there is no firm line distinguishing science from engineering. Most of the models you will be presented with in this book fall more within the applied-policy models. They are designed to provide insight into what is happening in a way that will serve as a foundation for a discussion of policy.

Behavioral and Traditional Building Blocks

The traditional building blocks of microeconomics are the assumptions that people are rational and self-interested. What we will call traditional economists are economists who study the logical implications of rationality and self-interest in relatively simple algebraic or graphical models such as the supply and demand model. (Yes, it is true; by a mathematician’s standards, supply and demand models are very simple models. But I agree with you; these simple models are often complicated enough.) Modern economists use supply and demand models, but they also use much more sophisticated models that integrate dynamics and strategic interactions into the analysis.

How much modern economists are willing to deviate from the traditional approach differs among modern economists. For example, some modern economists such as Nobel Prize winner Garry Becker advocate limiting economic models to these traditional building blocks. He writes: “The combined assumptions of maximizing behavior [note: maximizing behavior is how economists interpret rationality], market equilibrium, and stable preferences, used relentlessly and unflinchingly, form the heart of the economic approach.” Up until the end of the 1970s, Becker’s view predominated among economists. Since the 1980s, however, a group of modern economists has been edging away from these traditional building blocks.

Behavioral Economic Models

The study of models with alternative building blocks has grown so much in recent years that it has acquired a name—behavioral economics—microeconomic analysis that uses a broader set of building blocks than rationality and self-interest used in traditional economics. Instead of deductively assuming rationality and self-interest, behavioral economists inductively study people’s behavior and use those behaviors in their models. Based on these inductive studies, they argue that both rationality and self-interest should be broadened somewhat. Rationality should be broadened to purposeful behavior—behavior reflecting reasoned but not necessarily rational judgment—and self-interest, to enlightened self-interest in which people care about other people as well as themselves.

Behavioral economics is a leading field of research in economics today. The two important differences between traditional and behavioral building blocks are presented in Table 6-1.

### TABLE 6-1: The Different Building Blocks of Traditional and Behavioral Models

<table>
<thead>
<tr>
<th>Traditional Economics</th>
<th>Behavioral Economics</th>
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<tbody>
<tr>
<td>People are completely rational</td>
<td>People behave purposefully</td>
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<tr>
<td>People are self-interested</td>
<td>People follow their enlightened self-interest</td>
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Introduction to Thinking Like an Economist

Let’s consider another example of behavioral economist’s building blocks. Economists Matt Rabin and Ernst Fehr have developed models in which people care about fairness independently of what they themselves get. For example, they have found that when dividing up a sum of money, people try to divide the sum up fairly rather than giving it all to themselves, even though they could keep it all. In these modern models, the individuals would not be considered solely self-interested but, rather, enlightened self-interested; they care about fairness for its own sake. Economists Herbert Simon and Thomas Schelling have developed models in which people do not behave rationally, at least not in the traditional sense. For example, they have found that people will make choices based on rules of thumb such as “do what you see others doing” without rationally weighing the costs and benefits of each decision. Instead, people follow habit, which is purposeful behavior that reduces the costs of making decisions. Behavioral economists design their models accordingly.

Building blocks are important: they affect how one interprets the results of an analysis; they influence the patterns one sees in a picture. For example, say you observe a firm not taking advantage of its market position. Using traditional building blocks of rationality and self-interest, this would seem very strange. You would look for some hidden reason why the firm isn’t taking advantage of that position and keep searching until you find the selfish motive underlying the behavior.

Models based on behavioral building blocks, in which people and firms have goals beyond self-interest, allow researchers to consider the possibility that the firm is not taking advantage of its market position for reasons other than self-interest. Pharmaceutical companies, for example, sell AIDS drugs in African countries at prices far below market price. This could be because of political pressure, but it could also be out of a sense of fairness. A traditional economist would focus on the first; a behavioral economist would consider both possibilities and use empirical data to decide which it is. The point of this example is that an economist who is willing to use a wider set of building blocks sees different information in data than does an economist who uses the traditional building blocks. In modern economics there is a lively debate about what building blocks economists should use.

**Predictable Irrationality** The key to understanding the difference between behavioral economics and modern traditional economics is to recognize that behavioral economists are not just arguing that people are irrational; they are arguing that people are predictably irrational and that actions that traditional economists call irrational might not be irrational when considered in context. For a behavioral economist, rationality comes in many forms, and what’s important is that the model captures how people actually behave. Capturing this real-world nature of humans requires giving up some of the universality and power of models based on the traditional assumptions. Instead of having one model, one has a collection of models from which to choose for a variety of situations.

Let’s consider an example of the difference. Say you are given a choice between two income streams. In the first scenario, you will earn $30,000 the first year, $27,000 the second, and $24,000 the third. In the second scenario, you will earn $24,000 the first year, $27,000 the second, and $30,000 the third. Which would you choose? A model based on traditional rationality predicts you would choose the first, since you will be able to save the additional $6,000 earned the first year, put it in the bank, and end up

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1 An entire book could be written on what is meant by rationality and self-interest, and in some ways, all types of behavior can be considered rational and selfish. So it can be argued that behavioral economists are not arguing purposeful behavior includes irrational behavior, only that it includes a different type of rationality than is allowed within traditional economics.
with more than $30,000 of income in the third year. Since you get more total income with the first stream of income ($24,000 plus the $6,000 from the first year, plus two years of interest on that $6,000), it is “rationally” preferred to the second. But when economists have asked people which stream of income they preferred, economists have found that most people choose the second stream, even when it is explained that they could be better off by choosing the first.

What’s going on? Behavioral economists argue that most people recognize that they don’t have complete self-control; people believe that they will spend the extra $6,000 earned in the first year rather than save it. Thus, while it may be possible for people to switch the first income stream into an income stream that is preferred to the second, they don’t believe that they have the discipline to do so. Thus, they actually prefer the second to the first because it precommits them to saving, and thereby constrains them from doing something they believe they will do, but which they actually don’t want to do. They have developed what is called a precommitment strategy—a strategy in which people consciously place limitations on their future actions, thereby limiting their choices. The behavior is irrational because people tend to choose the stream that results in less total income; it’s predictable because in experiments time and time again, people make the same choice. This seemingly irrational choice is not unique to this example but occurs in a variety of contexts.

Are You Predictably Irrational? Economist Dan Ariely, from whose book Predictably Irrational many of these examples have been developed, has created a test as a fun way to introduce people to these ideas and to determine whether they exhibit predictably irrational tendencies. (You can take the full test at his book Web site, www.predictablyirrational.com.)

- Does how happy you are with your salary depend on how much you make relative to what your friends, family members, and neighbors make?
- When you are facing a decision to buy something, do you make your decision by considering the pleasure that this item will bring to you and contrast it with all the other possible things that you could buy for the same amount of money, now and in the future?
- How often have you watched your weight, and wanted to skip the dessert at the end of a nice meal out, but once the waiter stopped by with the dessert cart, you ended up ordering the chocolate soufflé?
- Have you ever had a romantic partner in whom you started to lose interest, but when he or she all of a sudden began to grow more distant, your interest rekindled?
- Would you be more likely to take a pencil home from work than to take 10 cents from a petty cash box?

Most people answer these questions yes, no, yes, yes, and yes. These answers are the opposite of what an economist using the traditional building blocks would predict people would answer. Behavioral economics says that we must develop additional economic models that take these predictable behaviors into account.

The Advantages and Disadvantages of Modern Traditional and Behavioral Models

While it may seem that economists would want models that most closely reflect people’s behavior, that is not so obvious—models that reflect people’s actual behavior don’t provide significant insight. For example, a pool player probably does not calculate the
angles and spin of a ball to determine how to hit it, but it may make the most sense to assume that she dies if one were modeling her behavior. The model may be easier to solve, and may be a better predictor of what will happen, than a model built on her actual behavior. Modern traditional economists emphasize the advantage of simplicity and ease of testing. Having one model means that you can test it and see if it fits reality. With many models, you have to do much more testing. For policy purposes, modern traditional economists argue that a single model that is easy to apply and test is the most useful model.

The Difficulty with Behavioral Building Blocks: Testing  Modern traditional economists point out that formally moving away from the traditional building blocks is difficult because following one’s enlightened self-interest rather than self-interest, and acting purposefully rather than rationally, lead to much less clear-cut models and results. By their nature, behavioral models depend on the specific context of the choices involved, so instead of a single model, there are many. This means that the broader building blocks allow many more patterns to be discerned in the data. That’s both an advantage and a disadvantage because it is hard to know which pattern to focus on.

The behavioral economist’s answer to this problem is that economists can use laboratory and field experiments, or what is called experimental economics, to test alternative building blocks and find those that best describe how people actually behave. Let’s consider an example: In an experiment, half the participants are given a mug; the other half are given a pen, each of approximately the same value. The participants were then allowed to exchange one for the other simply by returning the first item. Since who got the pen or the mug was random, the rationality building block would suggest that about half of each group would choose to trade for the other. In fact, only 10 percent of each group chose to trade, suggesting that what one has influences what one wants—in contradiction to the traditional building block of rationality. A behavioral economist would then include endowment effects (people value something more just because they have it) in their building blocks for models. Endowment effects fit the broader “behaving purposefully” building block; they do not fit the narrower “rationality” building block.

Behavioral economists using evolutionary models—models of how an individual’s preferences are determined on the basis of natural selection of what is useful for survival—argue that the endowment effect is hardwired into people’s brains because it serves a very useful evolutionary function. It makes people happier with what they have, which decreases the social conflict over who gets what. The endowment effect probably makes it possible for parents to put up with their children, and to actually believe that they are close to perfect, even though, to an objective observer, they are far from perfect. In fact, without the endowment effect, we would probably have an online market in children, where you could trade yours for someone else’s.

Traditional Models Provide Simplicity and Insight  Modern traditional economists don’t agree with the direction that behavioral economics is heading in terms of giving up the old building blocks; they strongly prefer staying with the narrower building blocks of rationality and self-interest. The reason is the simplicity and clarity that come from models with these traditional building blocks; these traditional models give clear-cut results that nicely highlight issues in ways that the modern building blocks do not. This view was expressed by University of Chicago economist Gary Becker when he said that traditional building blocks, used unflinchingly, are the
Neuroeconomics and Microeconomics

Both traditional and behavioral economics generally assume that the most basic building block of economic analysis is the individual. Where the two groups differ is in the assumptions they make about how the individual behaves. Some economists, such as Cal-Tech economist Colin Camerer and University of Zurich economist Ernst Fehr, have questioned whether economists should study building blocks more basic than the individual. They argue that individuals are made up of cells, and that behavior is the result of chemical and electrical processes in the brain. By studying these brain processes, we can better understand an individual’s behavior. To do this they perform CT scans of people’s brains under a variety of controlled conditions and see what part of the brain is reacting. Their work goes under the name neuroeconomics.

What they have found is that choice is a very complicated electrochemical phenomenon. For example, inconsistencies are often not the result of a mistake that would have been corrected if someone had pointed out the inconsistency, but, instead, the result of different electrochemical processes occurring in the brain. People are essentially hardwired to be inconsistent. In a sense, more than one “you” are making decisions. There is the “emotional you” when your emotions hold sway and the “rational you” when the rational side of your brain holds sway. Depending on which “you” is being affected, the choice that “you” prefer can be quite different. And when both you’s are affected, the result is often confusion. (This is a reason why advertisers appeal to both emotion and rationality simultaneously.)

This supports the behavioral economists’ argument that we need to use building blocks that are different than the traditional ones. It also opens up a whole new set of possibilities about controlling behavior, such as the precommitment savings strategy discussed in the text. Another example of that precommitment strategy is not keeping a dessert in the refrigerator to avoid temptation. Such precommitment strategies allow the “rational you” to win out over the “emotional you.”

essence of the economic approach. He would argue that behavioral economists have flinched.³

Because Becker and other similarly minded economists taught at the University of Chicago, until recently, this unflinching approach was associated with what was called the Chicago approach to economics. Recently, however, a number of University of Chicago school economists such as Richard Thaler have begun using a broader set of building blocks, and, as I will discuss below, have been in the forefront of drawing policy implications from models based on modern building blocks.

Behavioral Economic Models Reflect Observed Behavior Behavioral economists’ response to Becker and others who advocate sticking with the traditional building blocks is that they agree that the traditional model provides enormous insights and that they do not advocate discarding the supply/demand model or the traditional building

³Some economists, called evolutionary economists, believe that even this group of building blocks does not go far enough. They advocate thinking of individuals as reflecting their evolutionary tendencies and being shaped by the market into the type of individuals that more economists assume are their inherent nature. Others, called econophysicists because they are often trained as physicists, argue that for many aggregate issues individual behavior is irrelevant; what happens in the aggregate reflects statistical properties of interactions that are independent of agents and that are independent of the building blocks used within the model.
blocks, especially when teaching economics. Their argument is not that models built on the traditional building blocks—such as supply and demand—are irrelevant; it is simply that the traditional building blocks do not explain everything, and that attempts to use them to explain everything actually undermine our understanding of what models using the traditional building blocks do explain. Behavioral economists argue that empirical work has convincingly shown that people are predictably irrational in some of their behaviors, and modern economics must take that into account.

Eventually, the hope of modern economics is that economists will have a set of models that “explain” the decisions we observe, along with a guide explaining which models fit what situations. Alas, you’re not going to get that guide in this book (or in any other textbook). Economists are just not there yet. In fact, we’re far from it, and even those who use the new building blocks do not believe that the behavioral models are sufficiently developed to replace the traditional models as the pedagogical core of economics. That’s why I focus on the traditional building blocks and the standard supply/demand model throughout the book. But that focus should not lead you to think of the supply/demand model and its assumptions as anything more than a beginning of an introduction to modern economics.

Types of Models

As I stated above, economists have many types of models—verbal, empirical, and formal models. Modern economists use all of them. Thus, to understand modern economics, you need to know the various types and their advantages and disadvantages. Let’s consider each briefly.

Behavioral and Traditional Informal (Heuristic) Models

Most of the time when laypeople hear about the results of an economist’s analysis, they don’t see the underlying formal model. Instead, all they see is a heuristic or verbal discussion that conveys the essence of the model. But if you search deeper into the discussion, you can generally extract the model and see whether the economist is using the behavioral or traditional building blocks.

To show you the difference between heuristic models based on traditional building blocks and ones based on broader behavioral building blocks, let’s consider some discussions in two popular books applying economic reasoning to everyday events. That consideration will help clarify the difference between an economist using traditional building blocks and one using behavioral building blocks.

The Armchair Economist: Heuristic Models Using Traditional Building Blocks

Let’s begin with a consideration of a model of University of Rochester economist Steven Landsburg. Landsburg calls himself an “armchair economist,” by which he means that he provides heuristic models to explain everyday events. For the most part, Landsburg’s heuristic models use traditional economic building blocks; he unflinchingly and happily pulls out unexpected implications from models built on those assumptions. Thus, Landsburg is an excellent example of a modern economist who sticks to traditional building blocks.

The particular model of his that I will consider deals with a sometimes taboo topic—sex. His model is designed to make the reader think, and to see how economic reasoning can come to counterintuitive conclusions. Coming to such highly counterintuitive ideas is seen as a strong plus for these models based on traditional building blocks. An important purpose of the traditional model is to get people to think of questions in a different way than they normally do, and in the process provide important insights.
More Sex Is Safer Sex In one of his more provocative models (available on Slate, www.slate.com/id/20539), Landsburg considers the problem facing Martin, "a charming and generally prudent young man with a limited sexual history, who has been gently flirting with his coworker Joan." Landsburg describes a situation in which Martin and Joan were both thinking that they might go home together after an office party that would be held the next day. However, on the way to the party, Martin notices a Center for Disease Control subway advertisement advocating the virtues of abstinence. Feeling guilty about his thoughts, he decides to stay home rather than to tempt himself. He is being virtuous.

Joan shows up at the party and, in Martin’s absence, she hooks up with an "equally charming but considerably less prudent Maxwell." Maxwell is rather careless in practicing safe sex, and the end result of this hookup is that Joan ends up with AIDS—all because Martin was virtuous. (Economic models conveying these parables of the problems with being virtuous have a long history in economics, going back to Bernard Mandeville who wrote The Fable of the Bees back in the 1700s.)

Landsburg then argues that this story demonstrates that Martin’s withdrawal from the mating game has made the mating game more dangerous for others. He argues that it follows that the world would be better off (specifically, we could slow the spread of AIDS) if “the Martins of the world would loosen up a little.” He then reports some empirical estimates by a Harvard professor that if everyone with fewer than about 2.25 partners per year were to take additional partners more frequently, we could actually slow the spread of AIDS. Landsburg argues the following: “To an economist, it’s crystal clear why people with limited sexual pasts choose to supply too little sex in the present: their services are underpriced.”

Landsburg’s model is meant to shock, which it does. But it is also meant to hone people’s reasoning ability, which it also does. It captures the economic insight that decisions about sexual activity may have externalities—the decision will not lead to the aggregate outcome that most people would prefer. But they are the decisions that Landsburg thinks people will make. Landsburg’s model is based on the traditional building block of strong self-interest.

Why Car Insurance Costs More Some Places Than Others While Landsburg is traditional in his building blocks, he is not always traditional in the formal models he uses, and in some of the issues he studies, he goes far beyond the simple supply/demand model. For example, in another model, he considers the issue of why car insurance costs three times as much in Philadelphia, Pennsylvania, than in Ithaca, New York, even though the theft and accident rates are not significantly different between the two cities. The model he uses is a “path-dependent tipping-point” model with two, rather than one, equilibria. In a tipping-point model, the model can arrive at quite different results depending on people’s initial choice. The results are path dependent, and without knowing the path, one cannot predict the equilibrium. Tipping-point models are a type of a broader group of models called path-dependent models—models in which the path to equilibrium affects the equilibrium. Path-dependent models require a knowledge of the relevant history to reach a conclusion. Were the supply/demand model a path-dependent model, it would not lead to a unique equilibrium price.

The argument Landsburg gives is the following. In the pricing of insurance, there is a feedback effect of the initial choices people make of whether to buy insurance that affects the cost of insurance. If a few people decide not to buy insurance, the costs of insurance to others who do buy insurance will be higher since, if they have an accident with an uninsured driver, their insurance will have to pay. Because insurance costs are higher, even more people drive without insurance, further increasing

Decisions about sexual activity may have externalities and therefore what is best for the individuals involved may not be best for society.
the rates for those who do buy insurance. Landsburg argues that that is what happened in Philadelphia. In Ithaca, however, the situation went the other way—many initially bought insurance, which meant that insurance costs for everyone were lower, which led others to buy insurance, which led to even lower rates. Both equilibria are self-reinforcing, and, once chosen, are very difficult to change, without a major intervention by government.

Such government interventions go against Landsburg’s (and most traditional economists’) intuition—traditional models based on the traditional building blocks without externalities almost inevitably lead to a laissez-faire policy. He states, “For ideological free marketers (like myself), theories (like this one) can be intellectually jarring. We are accustomed to defending free markets as the guarantors of both liberty and prosperity, but here’s a case where liberty and prosperity are at odds: by forcing people to act against their own self-interest in the short run, governments can make everybody more prosperous in the long run. . . . Is it worth sacrificing a small amount of freedom for cheaper auto insurance? I am inclined to believe that the answer is yes, but the question makes me squirm a bit.”

Here we see a heuristic model based on reasoning that people are rational and self-interested, as in the supply/demand model. But because it is not a supply/demand model with a single equilibrium, it leads to a quite nontraditional result of two possible equilibria. It also leads to a potential policy solution—one requiring all individuals to get insurance. The policy discussion highlighted by this model is highly relevant because it is now part of the debate about health care in the United States. Advocates of government-mandated health insurance argue that an individual’s decision to go without health-care insurance increases the costs of health care for all, and this has pushed the United States to an undesirable equilibrium. They argue that mandatory insurance would switch the United States to a preferable alternative equilibrium.
The Economic Naturalist: Heuristic Models Using Behavioral Building Blocks

Let's now turn to some models from another popular book, this one by Cornell economist Robert Frank, entitled The Economic Naturalist. Frank's approach is very similar to Landsburg's—he observes the events around him and tries to understand them using economic building blocks. The difference between Frank and Landsburg is that Frank is much more willing than Landsburg to go beyond the traditional building blocks. He assumes that people are only purposeful, not rational, and that they follow behavioral economic models similar to Landsburg's—he observes the events around him and tries to understand those models. He begins by reporting the results of a survey in which 90 percent of the respondents said they would return $20 to a store if given that amount extra in change, but only 10 percent said they would return a $20 lampshade if the cashier had neglected to charge for it. If people took only their own interests into account, they shouldn't return either.

He explains this difference in behavior by arguing that people take into account who will be hurt by the action. In the case of the cash, the "cashier will have to pay out of her own pocket." Thus, he reasons most people will not want her to be penalized. In the case of the lampshade, it is the store, not the individual, that will suffer the loss, and people are much less worried about hurting stores than they are about hurting people. Notice the difference in Frank's assumption as compared to Landsburg's. In Frank's model, people are somewhat self-interested (they keep the $20 lampshade), but not totally self-interested (they return the $20). Using a model with traditional building blocks, the prediction would be that no one would return the money. Frank's behavioral model allows for the possibility that individuals care about the impact of their actions on others.

Why Are People More Likely to Return Cash Than a Lampshade? The first of his models that we will consider is designed to explain why people are more likely to return cash to a store when given too much change by a cashier than to return a piece of merchandise for which they were not charged. He begins by reporting the results of a survey in which 90 percent of the respondents said they would return $20 to a store if given that amount extra in change, but only 10 percent said they would return a $20 lampshade if the cashier had neglected to charge for it. If people took only their own interests into account, they shouldn't return either.

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Why Don't More People Wear Velcro Shoes? A second model found in Frank's book deals with why people continue to wear shoes with shoelaces, even though Velcro shoes are more practical, and, according to Frank, "offer clear advantages over laces" because lace shoes can become untied, causing people to fall and trip. He argues that the reason why shoelaces are still predominant is that the very young (who don't know how to tie shoes) and the very old (who are too feeble to bend down and tie shoes) wear lace shoes, and that therefore Velcro shoes have become associated with what Frank calls "incompetence and fragility"—characteristics with which most people don't want to be associated.

Where this explanation deviates from the traditional building blocks is the rationality assumption. Using a technology that is less efficient than another (shoelaces over Velcro) is irrational, and thus doesn't make sense. The behavioral assumption in Frank's model is that people care about what other people think about them and thus take social issues, not just economic issues, into account when making their decisions. Behavioral economic models take social dimensions of problems into account; traditional economic models don't.

I should add an addendum (confession?) to this model; I've worn Velcro shoes for the last 20 years, much to the horror of my children, who asked me not to be seen with them when I wear them. Why do I wear them? I suspect because of my training in traditional economic models. That training has shaped me so that I value efficiency for its own sake. The reason why shoelaces are still predominant is that the very young (who don't know how to tie shoes) and the very old (who are too feeble to bend down and tie shoes) wear lace shoes, and that therefore Velcro shoes have become associated with what Frank calls "incompetence and fragility"—characteristics with which most people don't want to be associated.

That people return a $20 lampshade that was mistakenly not scanned less often than they will return an overpayment of $20 in change supports the assumption of purposeful behavior.
own sake. By wearing Velcro shoes I am making a statement to society (I am as much a social creature as others) that I am not driven by social norms about dressing—anyone who has seen my standard attire can attest to the fact that I am not. I consciously do it (at least in the sense of not allowing my wife to put out the clothes she wants me to wear) and, to some degree, I revel in the looks I get because it means that I am free, and efficient, allowing me to consider others slaves of some designer. I tell my kids that some day the world will follow me. They tell me, “Don’t hold your breath.”

My behavior represents another dimension of behavior that behavioral economists have discovered. Studying a model and using its assumptions can lead you to adopt its assumptions as your own; thus, the models you choose to use to look at the world can influence your behavior. This means that studying economics may not only provide you with insights; it also may change you.

The Limits of Heuristic Models

I could go on with hundreds of these vignettes; they are entertaining, fun, and good practice for the mind. If my sole purpose were to entertain you, I’d include a lot more. But the principles course is meant to do more than entertain; it is meant to teach, and except when they are writing for laypeople, most economists see heuristic models as simply a stepping stone to a more formal model. The reason is that heuristic models are not sufficiently precise, making their validity impossible to test. Thank back to the heuristic models we presented and ask yourself how convinced you were by the arguments. Each was relatively easy to modify to come to a different conclusion.

For example, what if Joan had chosen not to hook up with anyone? Or what if she had seen the same abstinence ad as had Martin? Then the argument would have been reversed. Would that mean that the Martins of the world should have less sex? Or what if Velcro shoes suddenly became “in.” Would that mean that the more practical solution...
wrestling matches did not involve cheating, whether a wrestler was close to winning or not. To structure his empirical study, for example, he reasoned that if who won sumo looks at the data, creates simple informal models and hypotheses, and uses those models in her heuristic model. That's what Steve Levitt has done with enormous creativity and success. He has looked at a variety of issues: Do sumo wrestlers throw matches? Do basketball teams cheat? And why do drug dealers often live with their mothers? He stands out in the data—"letting the data speak." To let the data speak, you collect data and analyze them with statistical and econometric tools.

Empirical Models

Scientists are very hesitant to base any knowledge on anecdotes or heuristic models, even highly convincing ones. The reason is that they have found that the human mind is extremely good at creating convincing stories that make sense within its own world view or frame, but not necessarily outside of it. They have found that the human mind is what psychologists call a fast pattern constructor. Heuristic models exploit this tendency in humans that gives people a sense of understanding, but not necessarily a true understanding. Scientists argue that to extend a heuristic model to true understanding, you have to quantify and empirically test your arguments.

The Importance of Empirical Work in Modern Economics

This leads us to a second important element of modern economics: it is highly empirical. That is, modern economics is based on experiments that can be replicated, or on statistical analysis of real-world observations. While the importance of empirical work has a long history in economics, going back to William Petty in the 1600s, up until the 1940s, economics primarily concentrated on deductive, not inductive, reasoning. That occurred because of the lack of data and the lack of computational power to analyze data.

With the development of econometrics—the statistical analysis of economic data—in the 1940s, that started to change. But because of limited data and computing power, empirical work in economics did not move to the forefront in economics until the late 1980s when computer power had expanded enough to begin making such an empirical approach useful. At that point, induction started to supplement deduction as the economist's method for understanding the real world. Since the late 1980s this movement toward induction has accelerated, so that today it is fair to say that the development of computing power has fundamentally changed the way economics research is done.

The strong reliance on empirical work is true of all modern economists—both those who use traditional building blocks and those who use behavioral building blocks. Today, much empirical work in economics is not based on formal deductive models, but rather on heuristic models—relatively simple and informal models that capture a possible insight, such as those we discussed above by Frank and Landsburg.

The difference between an economic scientist's heuristic model and those of Frank and Landsburg presented above is that the economic scientist doesn't stop with the heuristic model, as did Frank and Landsburg's presentations. He or she builds an empirical model around that heuristic model and supports the argument with empirical evidence. Essentially, what he or she does is to take relationships found in the heuristic model and see if these relationships can be generalized subject to scientifically based statistical studies. Economists call this approach "letting the data speak." To let the data speak, you collect data and analyze them with statistical and econometric tools.

To analyze an issue with an empirical model—a model that statistically discovers a pattern in the data—the researcher empirically studies the relationship he or she arrived at in her heuristic model. That's what Steve Levitt has done with enormous creativity and success. He has looked at a variety of issues: Do sumo wrestlers throw matches? Do basketball teams cheat? And why do drug dealers often live with their mothers? He looks at the data, creates simple informal models and hypotheses, and uses those models to structure his empirical study. For example, he reasoned that if who won sumo wrestling matches did not involve cheating, whether a wrestler was close to winning or not, economics would be on the forefront in economics until the late 1940s. Modern economics—models based on both traditional and behavioral building blocks—relies on experiments and statistical analysis of real-world observations.
Introduction ■ Thinking Like an Economist

enough matches to raise his ranking would not make a difference as to whether he won a match or not. But he reasoned further that if wrestlers are self-interested and rational, they will have an incentive to agree to quid pro quo arrangements to cheat and throw a match, allowing opponents to win a match in exchange for their throwing a future match. So now he had a testable hypothesis. His hypothesis was:

the closer a wrestler is to raising his rank, the more often his opponent will intentionally lose

He then collected and statistically analyzed the data. What he discovered was that how close a wrestler was to elimination did make a difference, which allowed him to conclude that sumo wrestlers “cheat.”

Regression Models

A primary tool of an empirical economist is a regression model, an empirical model in which one statistically relates one set of variables to another, and the statistical tools that accompany it. For example, say you are wondering if a professor giving higher grades increases the number of students in his class. You would collect data about two variables—the grades he gives and enrollment in his classes—giving you a relationship shown in Figure 6-1. Then you would “run a regression,” which essentially means that you use a statistical package to find a line that “best fits” the data, where by “best fit” one means making the distances between that line and the points as small as possible. If the “best fit” line is upward-sloping, as it would be here, then the regression model’s answer to the question is a tentative yes, subject to all the things that were held constant.

The “goodness of fit” between the two variables is described by the coefficient of determination, which is a measure of the proportion of the variability in the data that is accounted for by the statistical model. The larger the coefficient of determination, the better the fit, and if it is a perfect fit, then every point will be on the “best fit” line. This isn’t a statistics class so I won’t go into further explanation, but that short description should give you a sense of how empirical regression models work. Regression models are the workhorses of much of what applied microeconomists do, and modern economists become almost magicians at pulling information out from data.

Often economist’s empirical models explore issues far from the standard domain of economics. One example recounted in Ian Ayres’ book Super Crunchers (a book that nicely explains the importance of data analysis to modern society) is by Princeton professor Orley Ashenfelter. He developed a model that predicted whether a particular year’s wine would be a good one. He hypothesized that the quality of a wine in a particular year depended on rainfall, weather, and similar elements in that year. He

![Figure 6-1: Grades versus Class Size](image)

A regression model is a model that statistically relates one set of variables to another.

Grades versus Class Size

A regression finds a line that best fits a combination of points such as the one shown here. It appears from this scatter plot that class size affects the average grade.
they play an important role in the modern microeconomic tool kit and have increased in importance because of the enormous increase in computing power and statistical software. This increase in computer power allows economic researchers to find stable patterns in data much more easily than before. This pattern-finding process of modeling is itself being automated, and with sophisticated econometric software, economists can have the computer automatically find patterns and turn those patterns into models.

Summarizing: The development of computer power and these empirical models has led to an enormous change in how modern microeconomics is done. For example, when I asked top graduate students as part of an interview what differentiated an economist from another social scientist, they did not say that they differed from other social scientists in the building blocks they used. Instead, they said that the difference was the economist’s reliance on formal empirical methods.4

Simple Data Models: Charts, Graphs, and Quantitative Argumentation

As a principles student, you will likely not be developing regression models, but you will be building models based on data by developing a chart or a graph that demonstrates how something is changing over time or a pattern that captures the co-movement of two variables. These charts and graphs might not have the full scientific look of a regression model, but they are often more useful. What characterizes the modern economic way of thinking is not the regression model per se, but using quantitative data to make an argument, often by presenting those data with a simple chart or graph.

*That may change in the future since other social sciences are becoming much more empirical as well, but for the next decade they will likely still lag behind economics.
The Role of Formal Models

Were economic modeling only a matter of data mining, empirical models would replace all other types of modeling, but it is not, and they haven’t. Data, by themselves, have no meaning; they have to be interpreted and given meaning, and how one interprets the data depends on the model and the building blocks one has in one’s mind. Either implicitly or explicitly, one’s model guides how one organizes the data. That’s why theory remains important, and an important part of this principles course is meant to give you practice in understanding the theoretical structure of economic thinking.

You can see the importance of theory by thinking about a magic eye picture—as you change your focus, what you see will change. (You can see a magic eye picture at www.magiceye.com/blankimage2.shtml.) A simpler such example is conveyed by the figure of the old woman shown here. Did you see an “old woman”? Most of you will have because that’s how I described it. But what if I had said “beautiful young woman” rather than “old woman”? If I had, I suspect you might have seen the picture in a different light. The moral: Which pattern your eye sees in pictures, and even more so in data, depends on the implicit model or frame that you bring to the picture or the data. (If you only see one, keep looking; the eye of the “old woman” is the ear of the beautiful young woman.)

I raise this issue of framing because it highlights the difficulty of pulling information from an empirical model. Two different economists may well see different results even with the same empirical model. Let’s consider an example of such a recent debate in economics. The debate concerns the deterrent effect of the death penalty.

In natural science one would determine whether the death penalty has a deterrent effect by doing a controlled experiment that isolates specific variables and changing one variable to see if it causes another to change. But in economics such controlled experiments are generally impossible. An economist can’t suggest that we try out the death penalty to see what its deterrent effect would be. So instead of using controlled experiments, economists need to be creative and search for what they call a natural experiment—an event created by nature that can serve as an experiment—for instance, comparing states that have and have not the death penalty. Economists can’t conduct controlled experiments, letting the data speak will not necessarily provide the definitive answer. This means that economists, and other social scientists, must rely on their theoretical models to guide them in interpreting data and in drawing out policy implications from their work.

Different Types of Formal Models That Economists Use

The above discussion led us to a third difference between earlier economics and modern economics. Earlier economics used models with relatively simple relationships among variables; the supply/demand model is an example of such a simple model. Modern economists—both modern traditional and modern behavioral economists—still use simple models, but they also use models that allow for much more complex relationships among variables than do the simple models. These analytically sophisticated models cannot be expressed in a single, definitive answer. This means that economists, and other social scientists, must rely on their theoretical models to guide them in interpreting data and in drawing out policy implications from their work.
in the two-dimensional graphs used by earlier economists. Table 6-2 summarizes the three primary differences between earlier economists and modern economists.

An example of the difference between earlier economists and modern economists can be seen by considering the “tipping point” model that Landsburg used to analyze differences in car insurance prices. As I stated earlier, that model was a path-dependent model, which technically means that any decision feeds back into the model. In a path-dependent model, you can only know what will happen if you know the path the model takes. Mathematically, specifying path-dependent models is much more complicated than specifying supply/demand models; you have to use an advanced-calculus, differential-equations model rather than a standard algebraic model, or you have to solve it computationally.

The reason why formal models have evolved from simple models to more complex and highly technical mathematical models, again, is that technology has changed. In this case, the technology is mathematics. Today’s economists are much better trained in mathematics than were earlier economists, which allows economists to go far beyond the interrelationships allowed in supply/demand models. With advances in mathematics, for example,

- You can have models with many equilibria, so it is difficult to know what an equilibrium is.
- You can have models in which not only are the variables related, so too are the changes in variables and the changes in changes in variables.
- You can have models in which systemic equilibrium involves enormous continual change in the parts so that even though the system is in equilibrium, the individual parts are not.
- You can have models in which relationships are nonlinear on various levels, and in which an infinitely small change can lead to drastically different results.

The potential interrelationships that can be captured in modern formal models are almost unending, and when one studies the broad range of models with all these potential interrelationships, the number of potential outcomes in the economy is awesome. There is a formal theoretical model that can arrive at just about any possible conclusion.

Which theoretical model is right? Do you choose models with more complex building blocks, as argued by behavioral economists? Or do you choose models with more limiting traditional building blocks? Do you not worry about building blocks? Or do you just worry about which model best fits the empirical evidence? Such questions are the grist of the modern economist’s debates. (And you thought we were boring people; if my kids only understood how wildly interesting these questions are—would you believe?)

The Trade-off between Simplicity and Completeness. One might think that one should use the most complex model with the broadest building blocks because that would give you the broadest approach. But that doesn’t necessarily follow. Each new interrelationship involves adding an additional level of technical difficulty, and the more complex the model, the harder it is to arrive at a conclusion. Thus, in their modeling,

<table>
<thead>
<tr>
<th>TABLE 6-2</th>
<th>What Characterizes a Modern Economist?</th>
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<tbody>
<tr>
<td>Earlier Economists</td>
<td>Modern Economists</td>
</tr>
<tr>
<td>Used traditional building blocks</td>
<td>May use traditional or behavioral building blocks</td>
</tr>
<tr>
<td>Primarily deductive methods</td>
<td>Much more empirical—use deductive and inductive methods</td>
</tr>
<tr>
<td>Used simple supply/demand models</td>
<td>Use both simple supply/demand models and more complicated models</td>
</tr>
</tbody>
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Q-9 Is the supply and demand model a path dependent model?
economists make a continual trade-off between simplicity and completeness. At the principles level, the choice is clear: KISS (Keep It Simple Stupid) rules, which is why the graphical supply/demand model is the workhorse of principles of economics. That’s why, even though modern economics goes far beyond supply and demand, the principles course focuses on supply and demand and teaches students the traditional model. Almost all economists agree that for introducing principles students to economic reasoning, used appropriately with sufficient caveats, the supply/demand model is a really neat model that the profession has had lots of experience teaching. It is the perfect calisthenics of the mind for moving on to models with more complicated behavioral building blocks.

Let me give an example of where the model one uses matters: the state of the aggregate economy in 2008. The question at issue is: Should we be worried about the economy going into a depression or not? The traditional aggregate-supply/aggregate-demand model, which has become the standard textbook model, suggests we should not be concerned. In it, the economy is close to equilibrium, and policies exist to move it to equilibrium if it isn’t. That isn’t the case for some of the more complex formal models. In these more complex models, the aggregate economy can suddenly change depending on what people believe. You can have what is called a self-confirming equilibrium—an equilibrium in a model in which people’s beliefs become self-fulfilling so if people think the economy will go into a depression, it will. In some models, what people believe might not even matter; you can have strange attractor models, sometimes called butterfly effect models—models in which a small change causes a large effect. For example, a butterfly flapping its wings in China can cause the output of the U.S. economy to fall significantly. In these models, a small change could tip the economy into a low-growth, high-unemployment equilibrium that would be difficult to escape. In these models, therefore, we have reason to be seriously concerned about the U.S. economy going into a depression.

Other Formal Models There are many other types of formal models as well. For example, set theory models are models based only on formal logical relationships. Yet another is a game theory model—a model in which one analyzes the strategic interaction of individuals when they take into account the likely response of other people to their actions. Game theory models form the core of much of what is studied in graduate microeconomics today. Thus, the standard graduate microeconomics text has only three supply-and-demand diagrams in an entire 1,000-plus-page book.

More complicated models often yield no analytic solution—that is, you can’t solve the set of equations to discover the equilibrium in the model. These complicated analytic models were unusable for a traditional economist because a model that you can’t solve analytically didn’t provide any insight. That isn’t the case for a modern economist. If a modern economist can’t solve a model analytically, he or she will estimate the solution by simulating the model with a computer to arrive at a numerical solution. Computational power replaces analytic elegance. Thus, computer simulation is an important tool of modern economists (both those using behavioral and those using traditional assumptions), and in his or her research a modern economist will often go from struggling with analytically solving a model to simulating it on the computer, and then back to trying to solve it analytically.

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1 Discuss the justification for why the textbooks focus on the supply/demand model and the traditional model and even as the economists in their research have moved from it in The Stories Economists Tell and a Journal of Economic Education article, “What Economists Teach and What We Believe.” While the supply/demand model captures these ideas, for mathematically inclined students, as the famous mathematical economist, once told his students, the laws can be generalized into a set of constrained-optimization models assuming convex functions, and if principles students were strongly mathematically inclined, many of the models could be presented in calculus format. A brief introduction to the calculus of constrained-optimization is available in the Honors Companion accompanying this book available on my Web site.
Economists use a number of different types of computer simulations. The one described above was a simulation designed to solve a model with a specified set of equations that can’t be solved analytically. In those types of simulations, the computer is a computational assistant that can arrive at estimated solutions to complicated analytic sets of equations. This approach is widespread. A more novel approach to computer simulation is designed to deal with problems that are so difficult that you don’t even know how to specify the equations. How do economists model when they can’t specify the equations that describe the relationships in the model? They use the computer to guide them in specifying the model itself.

This alternative approach to modeling is called the agent-based computational (ACE) model—a culture dish approach to the study of economic phenomena in which agents (encapsulated collections of data and methods representing an entity residing in that environment on the computer) are allowed to interact in a computationally constructed environment and the researcher observes the results of that interaction. (For more information about ACE models, see www.econ.iastate.edu/ressatis/ace.htm.) ACE modeling is fundamentally different than standard modeling. It is computer based, and it has no equations that have to be solved. Instead, ACE researchers simply try to create virtual computer models that capture the essence of the interdependencies, and then observe the results. So rather than solve a model, you build a computer model with computer agents; you then run the model thousands of times and keep track of the results.

This is a fascinating new approach to modeling complex systems because it allows for all types of interactions. It has the possibility of fundamentally changing the way economists model and how they understand the economy because it allows researchers to consider much more complicated interactions than they could if they had to “solve” the model on their own. For example, ACE models can allow multiple equilibria and the possibility of many levels of path dependency—complications that are beyond traditional models. Recognizing that the models may reflect path dependency, the ACE modeler doesn’t run the program once; he or she runs it thousands of times and sees the range of results. So just like engineers are now using virtual computer modeling to design planes and cars, economists are now using virtual computer models to understand how the economy works and to devise policies that might make it work better.

**Empirically Testing Formal Models** With so many different models, one must ask the question: How do you decide which model to use? To decide, economists empirically test alternative models and try to see which one fits best. Essentially it reverses the process used in heuristic empirical modeling, where the data were collected and analyzed before the hypothesis was determined and are then used to determine the hypothesis. With empirically tested formal models, the hypothesis is formulated first—without knowledge of the data—and then the hypothesis is tested to see if the data fit the model. Obviously, formulating hypotheses without knowing the data is difficult, and thus economists try to test hypotheses on “out of sample” data—data that were not used in the formulation of the hypothesis. If they don’t have such data, they try to develop the data, or something close to them, with experiments and clever observation of events.

Today, fitting the models to the data involves much of what modern economists do. “Bringing the model to the data” is a phrase you hear all the time from modern economists. Economists are continually asking questions such as: “How does the model work in ‘out of sample data’?” “Do we have a natural experiment that we can use to test the model?” “Can we develop a randomized experiment that will test the model?” “Can we design a lab experiment that will test the model?” and “Can we design a field experiment to test the model?”

Such empirical testing requires precision, which means that to truly bring the model to the data, one needs a formal model where all relationships are precisely specified.
rather than a heuristic model where relationships are imprecise. Thus, the “empirical models” discussed earlier are quite different from the “empirically tested formal models” that form the foundation of economic science. Empirical models based on heuristic models are fine for policy analysis, and for guiding real-world policy decisions that have to be made before one has a full scientific understanding of an issue. These models are absolutely necessary. But before one elevates the insights of the model to the level of full scientific knowledge, one needs much more precise models. As I stated at the beginning of the chapter, most of this book is concerned with engineering models, not scientific models, which is why we will not explore the intricacies of testing formal models.

The difference between the empirical models discussed earlier and the empirically tested formal models described here is a subtle, but important, difference. In a heuristic empirical model, one has only an informal model that lets the data speak first, as heard through your general worldview embodied in your building blocks. After you’ve heard the data, you can provide an explanation for what you have heard. That explanation will be based on your implicit formal model, but the empirical model cannot be an explicit test of the model since the actual model came from the data; there is no formal model to test. To empirically test a formal model or a formalized empirical model developed from a data set, the process is different. Here, one carefully develops the implications of the formal model as they relate to the issue. Then one empirically tests this model’s implications against another set of data.

Application: Why Did the Price of Chocolate Rise? To see how formal models can make a difference in how one thinks about real-world problems, let’s consider an example of a puzzle that economists are working on. This example gives you a sense of why modern economists have moved to these more complicated models and how the results of the two models differ—even with the same data. The puzzle is the following—the price of chocolate. From 2006 to 2009, the price of chocolate went up to $2,600 a ton from $1,500 a ton. The question is why.

You should be able to give the traditional economic analysis of what likely happened from the analysis of earlier chapters—that explanation would involve supply
falling, demand rising, or a combination of the two. (A good exercise is to graph these to see why that would be the explanation.) In a principles course, that would be the right answer. For real-world researchers it is not enough. The problem is that the data don’t reveal any apparent shifts in either supply or demand. So why did the price change when supply and demand did not?

Exploring the situation further, economists discovered that there was a structural change in the market. Hedge funds—investment funds representing rich investors that had few constraints on what they could buy—that had access to large amounts of credit were moving their investments out of real estate and into commodities over this time period. Chocolate was one of these commodities, but commodities whose prices rose also included oil and grains, both of which also experienced sudden large increases in price during this same time period. These hedge funds did not want the chocolate, and they did not buy chocolate and store it. Instead, they were buying what are called chocolate futures—the right to buy chocolate at a specified point in the future at a specified price—in large amounts. Specifically, they increased their demand for chocolate futures from 260 thousand tons to 706 thousand tons over a couple of years, which amounts to an increase from less than 10 percent to more than 20 percent of the total market demand.

The question that policy makers posed to economists was whether this hedge fund activity in the futures market was the cause of the rise in the price of chocolate (and other commodities), and if it were the cause, would the rise in price be permanent or temporary? The supply/demand model doesn’t directly answer that question. The answer requires an analysis that includes inventories and that captures the relationship between future expected prices—the futures prices of chocolates—and the current price of chocolate. That means that you need a model of intertemporal (across time periods) equilibrium with heterogeneous agents (agents that are not exactly alike).

You also need to figure out how the new behavioral economics building blocks might be playing a role in determining the outcome. For example, one key concept of behavioral economics is anchor points. Anchor points are points toward which people gravitate. The existence of anchor points can lead to multiple equilibria for the model. It is possible that the hedge funds increased other participants’ anchor point for chocolate prices, which in turn led them to increase their inventory of chocolate. The demand increases, and ratifies the increase in price, even though there was no need for price to increase had the anchor point not changed. (I should also point out that hedge funds pay economists large amounts of money to model the economy and to decide where they should invest their funds. So if hedge funds were doing this, it may be because they hired a modern economist who developed a model that showed them how they might do it.)

The analysis quickly becomes complicated, but what is clear is that one needs a more advanced formal model than the supply/demand model to deal with the question. As I was writing this chapter, the question was still unanswered, but the general result of the models that are reported in the press was that while the hedge fund purchases of the futures in the chocolate market could temporarily push up the price of chocolate, they were unlikely to do so permanently, unless they provoked a response by government that had feedback effects on the chocolate market.

However, that result isn’t much comfort to chocoholics since the models also suggested that it might take three or four years before the system adjusts, and in the meantime, significant disruption could continue in the chocolate market. Moreover, by then it is possible that the hedge funds could have sold their positions in chocolate futures to others, pocketing their gains. As they do so, one would expect a sudden fall in the price of chocolate significantly below its long-run average. Related puzzles exist in the oil and grain markets, and economists are hard at work on them. The lesson of this example: supply and demand are just the beginning for a modern economist.
What Difference Does All This Make to Policy?

Let me now turn to a consideration of what difference these modeling considerations have for policy. The answer is: a lot. Let me briefly distinguish the differences. An economist who concentrates on a single frame tends to be more consistent in his or her policy recommendation. Generally, for traditional economists, the framework is that the market is likely the best way to deal with a problem, and that, left alone, the market will guide people toward doing the best they can, given the constraints. Steven Landsburg nicely summed up what a traditional economist expects in his discussion of the insurance markets.

Modern economists, with their multiple frames, are less sure of the conclusion that the market will solve every problem. They accept that the market has nice properties, but they also find that it has limitations. They know that there are many models where there is a potential role for public policy in dealing with those limitations. That's why for a modern economist policy does not follow directly from a model. As I discussed in the introductory chapter, models provide theorems—results that follow logically from a model—not precepts—general rules for public policy. Precepts are developed from theorems that follow from various models, along with a knowledge and historical limitations of the models. In this book, when discussing theorems, I will concentrate on traditional economics, but when discussing precepts, I will go beyond traditional economics and report the combined judgments of modern economists—giving you a sense of some of the differences that arise when one uses more complicated models or the broader behavioral building blocks.

Let's consider three examples where a modern economist's precepts might differ from a traditional economist's precepts.

How much emphasis should be given to benefits of economic growth?

The traditional economist's precept is that more is preferred to less, and that more output is generally good; thus, policies directed at achieving more growth make society better off. The behavioral economic precept is that growth should be questioned. They point out that people’s happiness depends on their relative, not their absolute, income after an income of about $15,000 per capita is reached. That means that more growth will not necessarily benefit society, and suggests that more focus should be given to how the existing income is distributed, rather than just focusing on total income.

Should the government have done something about the rise in housing prices in the early 2000s?

The traditional precept is that no, government probably shouldn't have. The rise in prices of housing that occurred represented people's valuation of the worth of the house. They may have made a mistake in this instance, but there is no reason to believe that the government would have gotten it right, and you can only tell whether houses are overvalued after the fact, not before.

The modern precept (based on dynamic models of interacting agents) is that bubbles are possible, and that the housing market in the early 2000s had all the signs of a bubble, which means that the government might have usefully intervened. The bursting of the housing bubble was something that was predictable, and something that policy could have eliminated the need for.

Are people saving enough?

The traditional precept is that people make rational decisions and if they are choosing to save little, that reflects their desires and best estimates of their need. The behavioral economics precept is that how much people save depends on the institutional structure, and with so much of the institutional structure designed to get people to spend, people likely save far too little. But this does not mean that one has to tell people to save more. One simply has to change the institutional structure and people will save more. For example, as opposed to having to check a box to have
some income devoted to savings, saving would become the default option, and people would have to check a box if they don’t want to save. By changing the default option on retirement savings plans, one can significantly change the amount people choose to save, leaving people free to make their own decision in both cases. I could give many more such examples.

Conclusion
This has been a wide-ranging survey of just what it is that economists do, and what it means to think like a modern economist. Summarizing, briefly, modern economics goes far beyond supply and demand. Modern microeconomics is open to a wider range of building blocks and models, and is highly empirical. Thinking like a modern economist means approaching problems through modeling, and then relating the results of the model to the empirical evidence. Ultimately, the choice of models is made by empirically testing those models and choosing the one that does the best job of predicting.

The distinction between modern and traditional economists can be overdone. In many ways, the difference is just in when to put real-world complications into the model. Traditional economists use the traditional building blocks, and then adjust the model to fit the more complicated real world. That has the advantage of keeping the basic model clean and as simple as possible, but has the cost of not fitting many real-world situations. Modern economists use more complicated models so that fewer adjustments need to be made. The advantage is that the models better fit more real-world situations, but the disadvantage is that the models are not as clean and clear-cut as the traditional approach.

For teaching purposes, KISS reigns, and most economists, including me, continue to emphasize the traditional micro- and macroeconomic models. Modern insights are added as addenda and modifications.

Summary
- Models are the glue that holds economics together. But economists differ in the models that they use.
- A deductive approach is to begin with principles and logically deduce the implications of those principles. An inductive approach is to develop a model based on patterns in observed data. Modern economists tend to approach models inductively, while traditional economists approach models deductively.
- Behavioral economists replace the traditional assumption of rationality with purposeful behavior and replace self-interest with enlightened self-interested behavior.
- While models based on modern building blocks often better fit observed behavior, they often do not generalize to contexts outside the one being studied.
- Heuristic models are models expressed informally in words. They can be based on either traditional building blocks like the models of Landsburg or modern building blocks like the models of Frank.
- The validity of models often is determined based on their ability to explain real-world data. Thus, models must be tested against the data. This is part of the scientific method.
- An empirical model is a model that statistically discovers a pattern in the data. For such a model to be scientifically tested, it must be tested against another set of data. A regression model is an example of an empirical model.
- Two types of models used by modern economists are game-theory models and agent-based computational models.
- Modern economists use multiple frames and carefully distinguish theorems that follow from models and precepts that rely on theorems, but also on judgments about history, institutions, and the limitations of the models.
Questions and Exercises

1. How is a model different from the reality that it represents? Give an example. LO1
2. How does an inductive approach to economics differ from a deductive approach? LO1
3. What are the two main building blocks for traditional economics? How do they differ from the building blocks of behavioral economics? LO1
4. How does enlightened self-interest differ from self-interest? LO1
5. One rule of thumb many people follow is “eat until your plate is clean.” How does this rule of thumb violate the rationality assumption? LO1
6. Name two advantages and two disadvantages of the traditional model. LO1
7. Name two advantages and two disadvantages of the behavioral model. LO1
8. Is experimental economics best seen as an inductive or deductive science? Explain your answer. LO1
9. What is a heuristic model? Can a heuristic model be traditional? Why or why not? LO2
10. Even though the Betamax format is believed to have been better than the VHS format, early market leadership by VHS established VHS as the dominant choice for videocassette recorders. Some argue that if Betamax had an early lead, it would have been the dominant technology. What kind of equilibrium model best fits this description and why? LO2
11. Why might government intervention make sense in a model of path-dependency but not a supply/demand model? LO2
12. According to economist Robert Frank, why are people more likely to return $20 they’d been given in error in change than a lampshade that had not been scanned at checkout? What does this say about traditional building blocks? LO2
13. Why do economists rely more on empirical evidence today than they did 100 years ago? LO3
14. What does it mean to “let the data speak”? LO5
15. What is a regression? LO3
16. What characteristics would you look for in data to use as a natural experiment? LO3
17. What are the three major differences between earlier and modern economists? LO3
18. What is a self-confirming equilibrium? Use the supply/demand model to demonstrate how the expectation of lower prices can be self-confirming. LO4
19. What is an agent-based computational model? LO4
20. Why is “out-of-sample” data important for testing inductive models? LO4
21. A student is given the option of selecting two homework schedules—one in which three five-page papers and one one-page paper are due at the end of the semester and another in which the first papers are due the third, sixth, and ninth weeks of the semester and the last paper is due at the end.
   a. Why might a student choose the first option?
   b. Why might a student choose the second option?
   c. Which is the rational choice? LO5
22. In a recent study, when asked to choose between an iPod and $100, people were more likely to choose the money. But when they were given an iPod and then asked if they would trade it for $100, they were more likely to choose the iPod.
   a. What effect does this reflect?
   b. Is this behavior rational? LO5
Chapter 6 — Thinking Like a Modern Economist

Questions from Alternative Perspectives

1. How might modeling itself frame an economist’s analysis, making the economist unable to see basic truths about the way in which society subjugates women? (Feminist)
2. Was Mother Teresa rational? (Religious)
3. It is sometimes said that modern economists pose little large questions that cannot be answered. How might those assumptions be related to the economist’s modeling approach? (Radical)
4. The book talks as if modern economists have made a large break from traditional assumptions; many heterodox economists see the two as simply minor modifications of the same approach. In what way is that true? (Austrian)
5. If modern economics focuses on empirical models, does that mean that those aspects of life that cannot be quantified are shortchanged? (Institutionalist)

Issues to Ponder

1. What does it mean to assume that people are purposeful in their behavior instead of rational? LO1
2. In one study, a group of Asian-American women were asked to take a math exam. First they were divided into two groups. Before taking the test, individuals in the first group were asked their opinions about coed dorms while the second were asked their family history. Those who had been reminded by the questions that they were women performed worse than those who were reminded that they were Asian. How is this an example of predictably irrational behavior? LO1
3. Is the supply/demand model a path-dependent model? Why or why not? LO4
4. Can an economist who bases her models on traditional building blocks be a modern economist? Why or why not? LO1
5. What might an economist do if he cannot solve a model analytically? (Give up is not an option.) LO4

Answers to Margin Questions

1. Modeling, not supply and demand, is the glue that holds modern economics together. (128)
2. Because of technological changes in computing, modern economists are more likely to use inductive models compared to earlier economists who gave more weight to deductive models. (128)
3. These are both assumptions associated with behavioral economists. (129)
4. It depends on what model you use. In a traditional model, it cannot because people choose what is best for them. Thus a constraint upon choice must make them worse off. In a behavioral model, it may make them better off because people are not assumed to have complete self-control. (133)
5. It depends. Both have their advantages and disadvantages, and a choice can only be made when one knows the purpose of the model. (134)
6. No, it simply demonstrates that he is affected by them in different ways than are other people. (137)
7. Economists are hesitant to base knowledge on heuristic models because they are only suggestive, and are subject to people’s tendency to be fast pattern completers. Science involves slow, and precise, pattern completion. The rules of scientific models are in many ways rules designed to slow people down and make sure the patterns they complete really do fit together. (139)
8. False, while it would be nice if that were the case, the data speak very softly and what one hears depends upon one’s frame. Thus, in economics the data seldom provide definitive answers, and economists must rely on their theoretical models to guide them. (142)
9. No, in a path dependent model the path to equilibrium affects the equilibrium. The supply/demand model assumes that is not the case. (143)
10. No, one derives theorems (logical implications) from models. Policy is based on precepts. Thus, the fact that most economists oppose price controls is based on both a model and judgments about the appropriateness of that model. (145)