Contents

1 Nature of Behavioral Economics

1.1 Behavioral economics and the standard economic model

What is behavioral economics?

Economic phenomena relate to any aspect of human behavior that involves the allocation of scarce resources; thus it is very wide-ranging in its subject area. For example, all of the following can be described as economic phenomena, although they may also of course involve other disciplines of study: searching for a sexual partner on the Internet, watching a documentary on television, making a charitable donation, giving a lift to one's neighbor in order to make it easier to ask them for a favor later, deciding to take a nap rather than mow the lawn, teaching one's child to play tennis, and going to church.

Economics, like all sciences, is concerned with developing theories. Theories attempt to describe and explain relationships between phenomena we observe. In order to do this they need to proceed on the basis of a number of assumptions or premises. Sometimes these assumptions are made explicit, but in many cases they are implicit, and it is often important to tease out these implicit assumptions because if a theory proves to be inaccurate it is usually because the assumptions on which it is based are incorrect.

This is where behavioral economics is relevant. As Camerer and Loewenstein (2004) succinctly put it,

> Behavioural economics increases the explanatory power of economics by providing it with more realistic psychological foundations.
>
> (p. 3)

Ho, Lim, and Camerer (2006) also state,

> It is important to emphasize that the behavioural economics approach *extends* rational choice and equilibrium models; it does not advocate abandoning these models entirely.
>
> (p. 308)

In order to understand these claims, and also to understand various critiques of behavioral economics, we now need to examine the major assumptions underlying the standard economic model (SEM), and then consider various important and widespread phenomena that this model is unable to explain.

The standard economic model

Throughout this book we will make comparisons between the SEM and various theories that relate to behavioral economics that we can summarize for the sake of brevity into a Behavioral Economic Model (BEM). This is not to imply that all the aspects of either the SEM or the BEM are complementary and nonconflicting; we will encounter various controversies within the BEM, where different theories are based on different premises and make different predictions. However, in spite of such conflicts, there are greater similarities between the different theories within each model than there are when comparing the two main models in general.

In some ways the contrast between the two models above parallels the contrast that is often drawn between what is sometimes referred to as the Standard Social Science Model (SSSM) and the Evolutionary Psychology Model (EPM), first described by Tooby and Cosmides (1984). The relationship between behavioral economics and evolutionary psychology (EP) is discussed further in the section on objectives later in this chapter.

The key components of the SEM that are relevant from the point of view of behavioral economics include the following assumptions:

- Economic agents are rational.
- Economic agents are motivated by expected utility maximization.
- An agent's utility is governed by purely selfish concerns, in the narrow sense that it does not take into consideration the utility of others.
- Agents are Bayesian probability operators.
- Agents have consistent time preferences according to the discounted utility model (DUM).
- All income and assets are completely fungible.

We will examine the meaning and implications of these assumptions in detail in the relevant chapters, since in some cases this will merit a considerable amount of discussion. However, at this point there are two fundamental and related issues that need some discussion, and these concern the role and interpretation of the "assumptions." In a highly influential article, Friedman (1953) claimed that the scientific worth of a theory is determined purely in terms of congruence with reality (discussed in more detail later in this section). According to Friedman, testing the reality of a theory's assumptions is

> fundamentally wrong and productive of much mischief . . . [I]t only confuses the issue, promotes misunderstanding about the significance of empirical evidence for economic theory, produces a misdirection of much intellectual effort . . . The relevant question to ask about the "assumptions" of theory is not whether they are descriptively "realistic", for they never are, but whether they are sufficiently good approximations for the purpose at hand.

According to this view, a good theory that makes accurate predictions means that individuals behave "as if" they follow the behavioral assumptions. Most economists, even critics of the SEM, agree regarding this aspect of the role of assumptions, and concede that economic theories cannot be falsified on the basis of their assumptions alone, however unrealistic these may appear to be; they can only be falsified on the basis of their inability to make accurate predictions.

The second and related issue concerns the interpretation of the term "assumptions." Some economists, notably Gul and Pesendorfer (2005), have argued that the assumptions described above are not to be treated as **axioms** or fundamental premises that are "self-evident." They claim instead that, as far as rationality is concerned, this is not an assumption in economics but a **methodological stance**. Their paper also implies that at least some of the other "assumptions" need to be treated in a similar manner. Expanding this claim they state,

> This stance reflects economists' decision to view the individual as the unit of agency and investigate the interaction of the purposeful behaviours of different individuals within various economic institutions. One can question the usefulness of this methodological stance by challenging individual economic models or the combined output of economics but one cannot disprove it.
>
> (p. 42)

However, we must take issue with Gul and Pesendorfer when they compare the situation of critics of the rationality assumption with the situation of critics of experimental economics. In this context they claim that "a critic cannot expect to disprove the usefulness of experimental methods for understanding choice behaviour." In principle it is possible to demonstrate the *usefulness* or lack of usefulness of experimental methods. If various types of experiment fail to predict behavior in the real world then it could be claimed that such methods are not useful. These methods are also discussed in more detail

later in the chapter, in the section on methodology. The important point here is that, although theories cannot be falsified simply on the basis of their assumptions, these assumptions, or methodological stance, may be shown not to be useful, at least in certain circumstances. We will see numerous examples of this throughout the remaining chapters, but a simple one will suffice here for illustration. It is generally assumed in the SEM that people use exponential discounting when evaluating future preferences. This results in the normatively desirable behavior of having time-consistent preferences. However, empirical evidence shows that people frequently display inconsistent preferences, for example by overestimating future utilities. Thus gym members often overestimate future usage when they join a club; gyms are aware of this and structure their membership fees accordingly, with high start-up costs or initiation fees and low peruse charges. In this situation, discussed in more detail in Chapter 6, the assumption of exponential discounting in the SEM is not *useful*, since it cannot explain the behavior of either consumers or producers.

Shortcomings of the standard economic model

Over the last two or three decades behavioral economists have drawn increasing attention to various problems in the standard model. Consider the following questions:

- Why is the return on stocks so much higher on average than the return on bonds?
- Why do sellers often value their goods or assets much higher than buyers?
- Why are people willing to drive across town to save $5 to purchase a $15 calculator but not to purchase a $125 jacket?
- Why are people delighted to hear they are going to get a 10% raise in salary, and then furious to find out that a colleague is going to get 15%?
- Why do people forever make resolutions to go on a diet or stop smoking, only to give in later?
- Why do people go to the ATM and withdraw a measly $50?
- Why do people prefer to postpone a treat like a luxury dinner rather than have it sooner?
- Why is someone unwilling to pay $500 for a product, but then delighted when their spouse buys them the same product for the same price using their joint bank account?

- Why is someone willing to drive through a blizzard to go to see a ball game when they have paid for the ticket, but not when they have been given the ticket for free?
- Why are people willing to bet long odds on the last race of the day, but not on previous races?

None of these questions are answerable using the SEM, because of the restrictive nature of the assumptions involved. In some cases there are anomalies, meaning that the SEM makes inaccurate predictions; in other cases the SEM is incomplete or silent, meaning that it cannot make predictions at all. However, as will be seen, the questions are all answerable using the richer BEM. Before moving on to discuss the development of behavioral economics it is necessary to examine the nature of theories and their evaluation, in order to gain a better understanding of the advantages and disadvantages of different approaches and models.

Evaluating theories

There are various criteria that scientists in general propose as being relevant in terms of evaluating theories. For example, Stigler (1965) proposes three essential criteria for judging economic theories: congruence with reality, generality, and tractability. The evolutionary biologist E.O. Wilson adds a further criterion, parsimony, which ironically is particularly pertinent for the SEM. These criteria are now discussed in more detail.

1. *Congruence with reality*
   This factor is generally recognized as being the most important for any scientific theory. Good theories are able both to explain or fit existing observations and to make testable predictions which later prove to be correct. In this respect Newton's laws of motion represent a good theory, but not as good as Einstein's theory of relativity, since they do not fit reality as well on a cosmic scale. It is notable that such theories are sometimes referred to as "laws," in the sense that they represent regularities; this is particularly applicable when such "laws" involve general principles with widespread application, which leads us on to the second criterion.
2. *Generality*
   Good theories apply to a wide selection of phenomena; Newton's and Einstein's theories qualify again, although again Einstein's is better, in terms of applying to a larger range of situations. Theories of quantum mechanics and evolution by natural selection are further examples of general

theories. Examples from economics are the law of diminishing returns, the law of demand regarding the inverse relationship between quantity and price, and the law of comparative advantage.

3. *Tractability*
   This criterion refers to how easy it is to apply theoretical models to different situations in terms of making testable predictions. In practice this relates in particular to the complexity of the theory involved. More complex theories take into account more parameters (usually by making fewer assumptions) and are therefore more difficult to represent as models. In many sciences, including economics, these models are often best represented in mathematical form. There are two reasons for this: first, mathematics allows the theory to be represented most concisely and unambiguously, including the assumptions involved; second, it allows manipulation to be performed, resulting in precise predictions for given values of the parameters involved in the model. However, highly complex theories may prove to be somewhat intractable if the resulting mathematical analysis becomes unmanageable. In practice there is often a trade-off between tractability and the final criterion, parsimony.
4. *Parsimony*
   This criterion refers to the principle of Occam's razor, named after the philosopher William of Occam, and first expressed in the 1320s. He said, "What can be done with fewer assumptions is done in vain with more." In the words of E.O. Wilson (1998), "Scientists attempt to abstract the information into the form that is the simplest and aesthetically the most pleasing – the combination called elegance – while yielding the largest amount of information with the least amount of effort." This criterion is particularly relevant as far as the SEM is concerned, since parsimony is one of its great virtues. By assuming that economic agents are selfish utility maximizers the SEM is able to derive a large number of predictions regarding the behavior of individuals and firms. However, there may be another trade-off here: if a theory is too parsimonious, it may not satisfy the first criterion so well, since it may make too many assumptions to apply to real-world situations. This is the main criticism behavioral economists level at the SEM, since it cannot explain the anomalies described earlier, or indeed many others.

The behavioral economists Ho, Lim, and Camerer (2006) propose a somewhat different list of desirable properties of theories. They include generality and congruence with reality (they refer to this as "empirical accuracy"), but they

add the features of **precision** and **psychological plausibility**. Precision refers to the ability to give exact numerical predictions about behavior, and they give the example of Nash equilibrium analysis in game theory, which is discussed in Chapter 7. Ho, Lim, and Camerer also argue that generality and precision are particularly important in economic models, while empirical accuracy and psychological plausibility have been given more importance in psychology. The authors then claim that the goal in behavioral economics is to have all four properties. As we have already argued, psychological plausibility is likely to lead to more accurate and useful models, albeit more complex ones. Numerous examples will be given of such models in the remainder of the book.

1.2 History and evolution of behavioral economics

The classical and neoclassical approaches

There tends to be a widespread belief that the economists of the eighteenth and nineteenth centuries who pioneered the discipline had no time for psychology. The neoclassicists in particular are often portrayed as systematizers who wanted to bring some mathematical rigour to their subject by imposing some simplifying assumptions regarding motivation. A good example is the work of Daniel Bernoulli (1738), who might be regarded as the originator of the theory of choice under risk, explaining risk-aversion in terms of the diminishing marginal utility of money. However, the portrayal of the classicists and neoclassicists as mathematical systematizers actually gives somewhat of a false impression, obscuring some important realities. Although Adam Smith, the father of economics, is best known for his work *The Wealth of Nations*, in 1776, he was also the author of a less well known work, *The Theory of Moral Sentiments*, in 1759. The latter work contains a number of vital psychological insights and foreshadows many more recent developments in behavioral economics, particularly relating to the role of emotions in decision-making.

Similarly, Jeremy Bentham, best known for introducing the concept of utility, had much to say about the underlying psychology of consumers. Francis Edgeworth wrote *The Theory of Mathematical Psychics* in 1881, the title indicating his concern with psychology; this is reflected in his well-known "Edgeworth Box," which relates to two-person bargaining situations and involves a simple model of social utility. However, psychology was in its infancy at this time as an academic discipline, and many economists wanted the also-new science of economics (it was still largely referred to as political economy) to have a surer and more rigourous grounding, similar to that

of the natural sciences. Hence sprang the neoclassical revolution, and the birth of the concept of *Homo economicus*, that rational self-interested utility maximizer.

Post-war economic approaches

In the first half of the twentieth century there were still economists who considered and discussed psychological factors in their work, for example Irving Fisher, Vilfredo Pareto, and John Maynard Keynes. The latter famously speculated, both figuratively and literally, on the stock market, with notable success. However, the general trend during this time was to ignore psychology, and by World War II psychologists were *persona non grata* in economists' circles.

This trend continued after the war, aided in many ways by the advent of better computational methods. As computers became more powerful it became possible to build and estimate mathematical models of both markets and the economic system as a whole. The sub-discipline of econometrics became a vital tool for economists as a means of both developing and testing theories. Economists became obsessed with mensuration, meaning the measurement of variables, and the estimation of economic parameters using mathematical equations and econometric methods. Much progress was made in terms of theoretical development, and the emphasis on mathematical treatment led to greater rigour and more precise, if not accurate, results.

Some economists realized that the behavioral assumptions underlying their models were unrealistic, but we have seen earlier that there was a methodological approach, typified by Milton Friedman, that economic theory had little to do with the accuracy of these behavioral assumptions or with understanding why individuals behave as they do.

The resurgence of psychology

Some heretics, like Herbert Simon, viewed this approach as somewhat blinkered. He was not prepared to accept the host of ready excuses that were offered when predictions went astray: temporary "blips," the introduction of new and unpredictable factors, measurement discrepancies, and so on. He believed it important to understand the underlying motivation behind the behavior of economic agents in order to improve existing theories and make more accurate predictions. Simon (1956) introduced the term "bounded rationality" to refer to the cognitive limitations facing decision-makers in terms of acquiring and processing information.

There were a number of seminal papers written in the 1950s and 1960s which complemented the work of Simon and pointed to various anomalies, suggesting some theoretical improvements. Notable contributions were made by Markowitz (1952), Allais (1953), Strotz (1955), Schelling (1960), and Ellsberg (1961). However, it was really at the end of the 1970s that behavioral economics was born. Two papers were largely responsible for this. The first, in 1979, was entitled "Prospect theory: An analysis of decision under risk" and was written by two psychologists, Daniel Kahneman and Amos Tversky, being published in the prestigious and technical economic journal *Econometrica*. These two researchers had already published a number of papers relating to heuristic decision-making, but prospect theory (PT) introduced several new and fundamental concepts relating to reference points, loss-aversion, utility measurement, and subjective probability judgments. All of these are discussed in detail in Chapter 3, and repeated references are made to them throughout this work.

The second paper, "Toward a positive theory of consumer choice," was published by the economist Richard Thaler in 1980. In particular he introduced the concept of "mental accounting," closely related to the concepts of Kahneman and Tversky, and this is discussed at length in Chapter 4.

Since 1980 the field of behavioral economics has become a burgeoning one, as both economists and psychologists have expanded and developed the work of the pioneers mentioned above. As more success has been achieved in explaining the anomalies of the SEM and in developing a more complete body of theory, the field has now become a more respectable one, with a variety of journals publishing relevant research.

However, it should be made clear that behavioral economists do not conform to a uniform school of thought. Although they all are concerned with the psychological foundations of economic behavior, they may have quite conflicting beliefs regarding fundamental aspects. For example, we will see that the views of Kahneman and Tversky, Vernon Smith, and Gigerenzer all differ substantially regarding the role and nature of assumptions, appropriate methods of investigation, the value of various kinds of empirical evidence, and conclusions regarding such issues as rationality, efficiency, and optimization.

Behavioral economics, experimental economics, and neuroeconomics

These three areas of economics are all relatively new, taking off in the 1980s, and there are significant overlaps between them. The relationships between these subjects need to be explained in order to appreciate the methodological

issues discussed in the following section. We have already covered the subject area of behavioral economics in general terms, so let us now consider experimental economics. This is not a distinct area of study, as are most categories of economics; rather it is a method of study that can be applied to any subject area. However, it has particular application to behavioral economics, since the latter is concerned with psychological processes that are difficult to observe directly in terms of revealed preference. By using controlled experiments and asking hypothetical questions researchers can gain more insight into such psychological processes.

The field of experimental economics was largely pioneered by Vernon Smith, who believed that economics could be enriched by experimental methods that would not only lend insight into psychological processes, but also enable a tighter control over the relevant variables in order to come to more specific and reliable conclusions than is often possible with conventional observational studies. These aspects, and examples, are discussed in more detail in the following section.

Neuroeconomics refers to the use of empirical evidence relating to brain activity in order to come to conclusions relating to economic behavior. It has been made possible by a number of recent technological developments, particularly in terms of brain scanning and imaging techniques like PET (positron emission tomography), fMRI (functional magnetic resonance imaging), EEG (electroencephalography), and rCBF (regional cerebral blood flow). These methods detect brain activity in particular areas in terms of electrical activity or increased blood flow, and this can shed considerable light on various topics of interest in behavioral economics. The findings are especially relevant in terms of decision-making heuristics, learning processes, and the role of the emotions. Researchers are discovering that different types of thinking or mental process are performed in different parts of the brain, indicating the importance of brain structure or anatomy. They are also finding that different chemicals and hormones have dramatic effects on behavior. Various examples of neuroeconomic studies will be given throughout the book, the first being Case 1.3 at the end of this chapter, which examines altruistic activity in terms of the different parts of the brain that may be stimulated. This in turn enables conclusions to be drawn regarding motivation, since it is largely known what parts of the brain are associated with certain types of process or emotion. Thus it appears that giving to others may in turn give joy to the giver, while other acts we perform are designed to punish.

The relevance and application of both experimental economics and neuroeconomics have been controversial issues, and this controversy is discussed in the next section.

1.3 Methods

Economists' methods

Traditionally there has been a contrast between the methods used by economists and those used by psychologists, and this has sometimes caused a considerable degree of mutual suspicion and distrust. Fudenberg (2006) gives an apocryphal quotation at the beginning of a recent paper evaluating the status of behavioral economics:

> The difference between economics and psychology is that we psychologists never start our talks with assumptions that are wrong.
>
> That's because you psychologists never make any assumptions at all.

Economists would then go on to claim that when scientists claim to be proceeding on the basis of not making any assumptions, this means that they are unwittingly making implicit assumptions and that these are probably stupid ones.

It is important for students of behavioral economics to be familiar with the historical differences between the two disciplines and their implications if they are to understand the critical attitudes that are sometimes expressed by the different camps.

Although both branches of social science make use of empirical studies in order to test their theories, economists have tended to rely more on observational studies while psychologists have relied largely on experimental studies. There have been three main reasons for this.

1. Economists are primarily concerned with studying behavior, what people do; this is shown by their revealed preference in terms of what products they buy. Psychologists are primarily concerned with studying motivation, why they behave as they do.
2. It has often been impossible or impractical to use experiments in economic situations, for the researcher may lack the relevant control. Even when such control is possible, as when an economic adviser is able to influence or determine government policy, experimentation may have damaging or unethical consequences. Governments may be unwilling to experiment with tax levels (for example, based on the infamous Laffer curve) or with using different policies for different groups (for example, by giving educational vouchers to one group and general subsidies to another). Although observational studies do not allow the kind of manipulation of

relevant variables that is possible in experimental studies, economists have often been able to overcome the resulting problems by using sophisticated statistical or econometric techniques that enable them to isolate the effects of specific variables.

3. Economists have also been more concerned with studying the behavior of groups of agents, in particular markets, rather than single individuals.

As a result of these factors economists tend to shrug off criticisms of psychologists who claim that their experiments show that individuals do not act according to the assumptions of the SEM. Economists have various counter-arguments here:

1. The assumptions are merely a methodological stance; the SEM makes no claim to say anything about the underlying psychological processes of agents. This argument was discussed earlier.
2. Markets average out individual deviations in behavior; individuals who deviate will tend to be eliminated from the market by competitive forces similar to natural selection.
3. The experiments of psychologists tend to be flawed. This last accusation is discussed in the next subsection.

As already stated, the result of these differences in approach has been a significant parting of the ways between economics and psychology for much of the twentieth century. Only in the last 25 years or so has some degree of *rapprochement* been achieved, as discussed in the subsection relating to consilience.

Psychologists' methods

The experimental approach traditionally used by psychologists has significant advantages over the observational approach in terms of control over the relevant variables, allowing investigators to manipulate them in order to determine their influence directly. Thus one group of subjects may play a game of chance against a player who is shabbily dressed and deliberately acts diffidently, while another group may play the same game against a professionally dressed and confident opponent. Evidence indicates that subjects bet more against the first type of player, even though the outcome of the game is entirely governed by chance.

It is thus possible to design experiments and divide subjects into different groups to reveal a large amount of information regarding the influences of

different factors that would be impossible or impractical to achieve in observational studies. However, such experiments, including those performed under the rubric of behavioral economics, are often viewed by economists as being flawed, for a variety of reasons. We now need to discuss the methodological issues related to behavioral economics in general terms.

Methodological issues

There are five main issues that have been raised relating to the methods used in behavioral economics. The first issue follows on from the discussion above, that mainstream economists often view behavioral experiments as flawed. A second issue relates to assumptions. The other three issues relate specifically to neuroeconomics, which we have mentioned as being a key tool in behavioral economics. Two of these issues are raised by Gul and Pesendorfer (2005) in their article entitled "The case for 'mindless economics,' " and the final issue has been raised by Fudenberg (2006).

1. *Experimental design*
   There are three main issues here. These relate to the use of financial incentives, the use of deception, and lack of control.

   a) *The use of financial incentives*
      These incentives are used in order to motivate participants. They are widely used in economic experiments, but not in psychological ones. Economists tend to believe that financial incentives are vital in order to ensure that subjects behave in the same manner that they would in the real world and that they invest appropriate cognitive attention to the demands of the experiment. Psychologists frequently counter that such incentives may distort the results, by vitiating the intrinsic interest that subjects may have in participating in the experiment. Evidence is mixed here, but let us give one example that will illustrate the importance of the issue. A study by Hoffman, McCabe, and Smith (1996), using unearned rewards, had found that people acted more generously in dictator games than the SEM predicts, sharing on average 40 % of their wealth when acting in complete anonymity. However, a later study by Cherry, Frykblom, and Shogren (2002) found that when subjects earned rewards, as opposed to receiving them "as manna from heaven," the majority of them behaved in a significantly different way, acting as pure self-interested agents as the SEM would predict. Ninety-five percent of them shared none of their wealth with their partners under conditions of complete anonymity. These experiments and the nature of dictator games are discussed in

more detail in Chapter 8, in terms of their implications for the concept of fairness.

b) *The use of deception*

Another criticism of many psychological experiments is that the necessary manipulation involves a deception of at least some of the subjects. A number of studies, in particular by Hertwig and Ortmann (2001), have indicated the widespread use of deception in experimental studies, with between 30 % and 50 % of studies published in top journals like the *Journal of Personality and Social Psychology* and the *Journal of Experimental Social Psychology* using deception.

Deception is often justified by practitioners on two grounds. First, it allows investigators to create situations that they would not otherwise be able to observe under normal circumstances, such as how people react in emergencies. Second and more important, it enables the investigator to camouflage the real purpose of the experiment from the subjects, in order to prevent them reacting strategically and producing a misleading result. This is particularly important when researching people's behavior and attitudes on sensitive social issues. For example, a study involving racial prejudice may need to be disguised in order to prevent people realizing the purpose of the experiment and reacting with a political correctness that they might not otherwise observe.

The main problem arising from the widespread use of deception is that it becomes common knowledge that psychologists use such methods, and this also influences the behavior of subjects who tend to react cynically in the knowledge that they may be deceived. Psychologists are then forced to continually search for new and naïve pools of subjects in order to obtain reliable results from their experiments. The studies of Hertwig and Ortmann indicate the increasing use of freshman students for such experiments.

c) *Lack of control*

A final problem relating to experimental design is that economists often criticize experiments performed by behaviorists for their lack of control, resulting in a misinterpretation or confounding of effects. This is particularly important when the objective is the elicitation of subjects' preferences. A good illustration of this relates to the endowment effect, discussed in Chapter 3. We will see that some studies show a strong endowment effect, with sellers demanding twice the price that buyers are willing to pay, while other studies with different experimental protocols show no endowment effect at all. Another example concerns the issue of discounting, discussed in Chapters 5 and 6. Many studies show that

people discount heavily over the short-term time frame compared with the long-term one, but this effect may arise because of greater transactions costs for delayed payments compared with immediate payments. The higher short-term discount rate may therefore be a result of confounding two different effects: "pure" time preference and transactions costs. We will see that this problem can be eliminated by greater experimental control, involving the comparison of two delayed payments.

2. *A set of assumptions needs to be evaluated as a whole*
   This is a recommendation of Fudenberg (2006) in his article "Advancing beyond 'Advances in Behavioral Economics.' " He observes that the normal approach in developing theories in behavioral economics has been to modify one or two assumptions in the SEM in the direction of greater psychological realism. Fudenberg points to the dangers of this step-by-step approach, particularly in the analysis of equilibrium and strategic interaction and in self-control theories. Relaxing one assumption may have a "knock-on" effect on other assumptions, making the new set inconsistent, and this needs to be taken into consideration. Therefore modelers need to take all the assumptions as a set and see how many need to be modified in order to end up with a new set that is self-consistent. This problem is examined in more detail in Chapters 6 and 7.
3. *Neuroeconomic studies are irrelevant to economics*
   Gul and Pesendorfer take issue in particular with the approach of Camerer, Loewenstein, and Prelec (2005), expressed as follows:

> First, we show that neuroscience findings raise questions about the usefulness of some of the most common constructs that economists commonly use, such as risk-aversion, time preference, and altruism.
>
> (pp. 31–32)

Gul and Pesendorfer then state, "The argument that evidence from brain science can falsify economic theories is . . . absurd" (p. 10). The basis for their view is that economics makes no claims regarding the psychological or neurological processes involved in making choice decisions. They draw an analogy, by considering the reverse situation, concluding that an economic study cannot invalidate a theory relating to neuroscience, on the similar grounds that neuroscience takes no position regarding economic axioms like revealed preference.

There appears to be some misunderstanding here regarding the claims of the behaviorists. Gul and Pesendorfer are correct in saying that economics

makes no claims regarding psychological processes and also that evidence from brain science cannot falsify economic theories. Models in the SEM tend to involve "as if" statements, meaning that agents behave as if a particular mental calculus was being performed. Gul and Pesendorfer explain that this is "an expositional device not meant to be taken literally." They then give an example relating to consumer behavior, where it is predicted that consumers will buy the amount of a good which equates the marginal utility of the last dollar spent with the marginal utility of the last dollar spent on other goods. This does not imply that consumers actually perform the mental processes involved, but it does make the implicit assumption that consumers aim to maximize their total utility.

This is all fine; I remarked earlier that economists and most behaviorists have no problem with such "as if" models *provided that* they make accurate predictions. However, behaviorists do not generally claim that evidence from brain science can falsify economic theories. Instead the behaviorist claim is that economic theories are often falsified by empirical studies involving economic data relating to revealed preference; in other words, they are falsified on their own terms. Where studies in brain science are useful is in understanding *why* the theories are falsified, in terms of the underlying psychological or neurological processes. These studies may then indicate that certain implicit assumptions in the "as if" statements of the SEM may be bad assumptions to make because they lead to false predictions.

A good illustration of this issue concerns credit card spending. People spend more on credit cards than if they pay cash, contradicting the SEM. Evidence falsifying the model comes from economic data. However, brain studies, like that conducted by Knutson *et al.* (2007), can help us to understand why people act in this way. There is also evidence from neuroeconomic studies that neural imaging data can be used to predict future behavior. For example, the Knutson *et al.* study shows that brain activity in different regions can predict purchasing behavior above and beyond self-report variables. Relationships between consumer preferences, prices, spending, and brain activation are discussed in more detail in Chapter 4, in connection with mental accounting.

Further evidence of the ability of neural imaging to predict economic behavior comes from a study by De Quervain *et al*. (2004). This indicated that activation of a particular neuron during one game was correlated with punishment in a different game. The De Quervain *et al*. study is discussed in more detail in Chapter 8 in relation to fairness. The finding here may have large implications for economics, since it indicates that data relating

to neural states can be a better predictor of behavior than other aspects of subjects' behavior.

Although Gul and Pesendorfer (2005) maintain that brain scans are not economic phenomena and are therefore not relevant to economic theory, it seems fair to say that if they can be used to predict economic phenomena better than existing economic models then they may suggest how to construct better economic models.

We will return to the apparent conflict of claims between the two schools of thought in the next subsection related to consilience, but before that we should discuss two other main areas of dissent.

4. *Neuroeconomics is not relevant in discussions of economic welfare*
Gul and Pesendorfer argue that behaviorists not only make invalid claims of a positive nature regarding the value of neuroscientific studies, but also make invalid normative claims, in particular that the economic choices people make do not maximize their happiness. In particular they dispute the claim by Kahneman (1994) that "the term 'utility' can be anchored in the hedonic experience of outcomes, or in the preference or desire for that outcome." They also challenge the following claim of Camerer, Lowenstein, and Prelec (2005):

> If likes and wants diverge, this would pose a fundamental challenge to welfare economics.
>
> (p. 36)

behaviorists therefore tend to form conclusions regarding rationality based on this divergence, and these are discussed in detail in Chapter 9, once we have a large number of examples on which to draw.

Gul and Pesendorfer respond by saying,

> Welfare in economics is a *definition* and *not a theory* (of happiness). Therefore, the divergence between "liking and wanting" does not pose any challenge to the standard definition of welfare, no matter how the former is defined.

As a consequence of their view, behaviorists tend to take a paternalistic approach to welfare policy, according to Gul and Pesendorfer, since people need to be "prodded" in order to take actions that will make them happier.

Once again, Gul and Pesendorfer are correct in saying that the SEM has nothing to say about happiness and that it makes no normative or "therapeutic" claims in terms of helping decision-makers to make choices

that will make them happier. However, contrary their claim, neuroeconomics does not try to improve an individual's objectives. It can clarify the different implications of pursuing different objectives, for example happiness and welfare, but it does not as a science propose any moral philosophy regarding what people "should" do. Individual behaviorists may of course make normative statements, as do other economists, but this is not an element of neuroeconomics *per se*. Furthermore, defining welfare purely in terms of revealed preferences does narrow down the scope of economic analysis. We will see examples in later chapters of situations where the difference between liking and wanting is significant and where preference and choice are not identical. There are important policy implications here. It is not just a matter of people making "mistakes," in terms of bad judgments based on bounded rationality, for example looking the wrong way when crossing the road in a foreign country. There are other reasons why individuals may take actions that they regret afterwards in terms of not maximizing their welfare. Decisions involving intertemporal choice frequently involve this situation; for example, experimenting with drugs and then becoming an addict, or choosing a lump-sum pension instead of an annuity. If we can analyze the reasons for these nonoptimal decisions, this can help both the individuals involved and the policy-makers. Some may still regard this is being outside the scope of economics, but, if we are concerned with the study and achievement of the optimal allocation of resources, it seems curious not to extend the SEM in ways that may better enable us to attain this end.

5. *Neuroeconomic studies may be inconclusive*
   There are many problems involved in applying and interpreting brain scans, certainly with the current level of technology. One particular problem, described by Fudenberg (2006), concerns the relationship between behavior and neural correlates. Because there is a high level of interactivity between different brain areas, it is difficult to unravel cause from effect in terms of neural processes and functions. Correlation does not imply causation. Therefore, just because there is activity in a certain part of the brain, this does not mean that this part of the brain is initiating the activity; there may be an underlying cause elsewhere, involving "upstream" neurons. Thus it is difficult to draw conclusions regarding the neural causes of behavior.

Consilience

From the birth of behavioral economics the methods used by researchers in the area have tended to combine the traditional methods used by economists

with those more commonly used by psychologists. In particular, experiments have become more popular, and this has led to the development of the field of experimental economics discussed earlier. The advantages of control are clear compared with the ambiguity often resulting from observational studies. A good example is the study of bargaining situations that often result in deadlock or impasses, such as the failure of legal cases to settle before trial and labor strikes, where the concept of fairness is relevant. Mere observation of such situations in the real world often cannot lead to definite conclusions. Failure to reach agreement could be caused by agency problems, by reputation-building effects in repeated negotiations, or simply by a lack of cognitive understanding by the participants. However, by modeling the negotiation process into an ultimatum bargaining game experiment (discussed at length in Part III), it is possible to eliminate the last three possibilities and test in isolation the nature of people's concept of fairness.

So what does consilience mean, and why is it relevant? First, it is necessary to explain the origin of this term. It is perhaps best known as the title of a book by the sociobiologist E.O. Wilson, although he borrowed it from the philosopher of science Whewell, who in 1840 defined consilience as follows:

> The Consilience of Inductions takes place when an Induction, obtained from one class of facts, coincides with an Induction, obtained from another different class. This Consilience is a test of the truth of the Theory in which it occurs.

Consilience thus involves horizontal integration between disciplines, and it can relate not only to the sciences, both natural and social, but also to philosophy and the humanities in general. A couple of examples will aid an understanding of its practical application.

An example illustrated by Wilson himself concerns the problem of regulating forest reserves. Many different disciplines can provide input as far as solving this problem: ecology, economics, biology, geography, history, ethics, sociology can all aid an informed environmental policy. If any one of these disciplines is ignored, the policy is likely to prove less than optimal. Of course, given an issue of such worldwide scale, one can question the use of the term "optimal," and its meaning must be clarified in this context.

A different kind of example, more in keeping with Whewell's definition and more relevant in terms of the traditional conflict between economics and psychology, is provided by research into the role of the emotions in human decision-making. The majority of philosophers in the past, notably Kant, have held that the emotions should be kept out of decision-making, as being an enemy of reason. However, recent empirical evidence from different disciplines questions this assertion. Frank (1988), an economist, has used an essentially game-

theoretic approach to conclude that emotions are a valuable aid in making optimal decisions, because they provide credible commitments. Pinker (1997), an evolutionary psychologist and psycholinguist, has arrived at the same conclusion in terms of emotions having evolved as adaptive psychological mechanisms. Damasio (1994), a neuroscientist, has again arrived at the same conclusion regarding the value of the emotions in decision-making, by studying patients with brain damage and developing a "somatic marker" hypothesis. These different kinds of approach, all making use of independent facts and methodologies, provide strong evidence against the traditional Kantian model.

The examples above indicate first that the disciplines of economics and psychology can complement each other, as the pioneering studies of Kahneman and Tversky, and Thaler have demonstrated, along with many more recent studies in behavioral economics. They also indicate that both disciplines can be further enriched by research from other new disciplines, notably evolutionary psychology and neuroscience. It is important to stress that the relationship is one of *complementarity* here, not *substitution*. This appears to be one of the concerns of Gul and Pesendorfer. Brain scans are not a substitute for studies involving revealed preference or actual behavior, but the latter cannot substitute for brain scans either in terms of the information revealed. This is not to say that brain scans are some panacea for understanding human behavior, for we have seen that their interpretation is problematic.

We can gain a further insight into the relationship between different disciplines by considering another example discussed by Gul and Pesendorfer. Section 3 of their 2005 article is entitled "Different objectives demand different abstractions." They claim that economics and psychology have different rather than similar objectives and that therefore they use different concepts and different methods. I am in agreement with this, because I do not believe it detracts from the complementarity of the different disciplines. In order to discuss this issue further we need to explore the concept of reductionism.

Reductionism

Ernest Rutherford once famously said, "All science is either physics or stamp-collecting." This statement pithily summarizes a reductionist approach to science. However, the term "reductionism" has come to take on many different interpretations over the years; thus we have, for example, ontological reductionism, explanatory reductionism, eliminative reductionism, classical reductionism, derivational reductionism, hierarchical reductionism, precipice reductionism, and "greedy" reductionism. The type of reductionism that is espoused in this book can be labeled as "explanatory and hierarchical." This version proposes that complex entities and concepts are best explained in terms

of entities and concepts only one level down the hierarchy; these in turn may be explained in terms related to one level further down, and so on. An example from economics will aid an understanding of this approach, in particular what is meant by the term "hierarchy" in this context. We may seek an explanation for the poor level of economic performance of a country. The immediate cause may be the low level of productivity. We then ask why productivity is low; maybe the reason is a lack of investment. In turn, the main reason (there may be multiple causal factors here) for the lack of investment may be poor managerial practices. So far the explanations have related to phenomena at the economic level of hierarchy. When we ask why managerial practices have been poor, the explanation is likely to lie in social, political, or institutional factors, which are at a lower level of the hierarchy. These in turn may need to be explained in terms of social psychology; then explanations may become biological, then chemical, and finally we get down to physics at the bottom of the hierarchy. However, by reducing things one level at a time we can obtain explanations for phenomena at the appropriate level. Similarly, if someone wants an explanation for how an internal combustion engine works, normally they are looking for an explanation at the mechanical level, not one in terms of chemistry or particle physics.

This hierarchical approach has proved extremely successful in the physical sciences. For example, the phenomenon of light can now be explained in terms of electromagnetic radiation, and the outstanding achievement of Maxwell was in providing a unified explanation for visible light, heat, x-rays, ultraviolet rays, and radio waves.

Social scientists have been more reluctant to accept reductionism, perhaps fearing encroachment on their specialist areas by outsiders who show a cavalier disrespect for the formalities of the subject. However, to others it is unsatisfactory to be told that, for example, procrastination is just a human psychological failure, without asking why procrastination should be such a widespread phenomenon. In view of this problem behavioral economists are sometimes accused of ignoring the psychological underpinnings of their findings and presenting their accounts of people's behavior as "just-so stories." In other cases, when they do venture psychological explanations for different aspects of economic behavior, the explanations seem to be of an *ad hoc* nature, with no coherent universal framework that can embrace the different psychological phenomena. This is a problem referred to by Fudenberg (2006), when commenting that there were "too many behavioral theories, most of which have too few applications." Fudenberg compares this situation with the evolution of game theory, which until the 1970s, when the work of Nash, Harsanyi, and Selton became appreciated, had the same *ad hoc* status. This challenge is

discussed further in the concluding chapter, but it is suggested at this point that the discipline of evolutionary psychology, described in more detail in the following section, may hold the key to providing a more unifying framework for behavioral economics in terms of relating the underlying psychological mechanisms.

1.4 Objectives, scope, and structure

Objectives

In view of the foregoing discussion, this book has the following major objectives:

1. Present the principles and methods of behavioral economics in a logical and amenable manner, contrasting them with those of the SEM.
2. Illustrate how the BEM is superior to the SEM in terms of power of explanation and prediction, using a wide variety of empirical examples from both observational and experimental studies.
3. Provide a critical examination of the existing literature relating to the BEM.
4. Explain the policy implications of the BEM, particularly when these differ from those of the SEM.
5. Provide a coherent psychological framework underpinning the findings of behavioral economics.
6. Indicate the way forward for the subject, in terms of future challenges and areas meriting further research.

Evolutionary psychology

While it may be hazardous to try and condense all psychological explanations into a universal protocol, there is one aspect of psychological analysis, again controversial, that we believe can be a significant aid in understanding and relating many of the different findings from empirical studies. This is the relatively new discipline of evolutionary psychology. The foundation of this area of science is that, just as our anatomical and physiological systems evolved over millions of years in the crucible of natural selection, so did the anatomy and physiology of our brains, resulting in evolved psychological mechanisms (EPMs) which are essentially mental adaptations. Our preferences and decision-making processes are therefore heavily shaped by our evolutionary past. One important implication of this, which will be explored in various aspects of the book, is that some of our EPMs may be obsolete and even harmful in our current vastly changed social and natural environment;

an often-quoted example is our nearly universal desire for sweet and fatty food. This may indeed have aided the survival of our Pleistocene ancestors, but when food is plentiful it causes obesity and disease. Readers who are interested in learning about evolutionary psychology in more detail should peruse one of the many good texts on the subject, for example that by Buss (1999). The more casual reader can be referred to *Mean Genes*, an eminently readable bedside book, written by Burnham and Phelan (2001), who combine the disciplines of economist and biologist.

Now it should be made clear from the start that it is certainly not proposed that every psychological mechanism determining behavior is of genetic origin resulting from natural selection. This caricature of evolutionary psychology, combined with the misleading label of "genetic determinism," is one that is unfortunately both pervasive and pernicious in many social sciences. There are many differences between individuals, groups, and societies that have obviously arisen for cultural reasons, and no evolutionary psychologist denies this. However, what is also striking in many of the empirical studies that will be examined throughout this book is that there are certain universal features of human, and even primate, psychology, which lend themselves to an evolutionary explanation. Such explanations will not be attempted here in terms of argument; suggestions will be made, but it is not appropriate to delve at length into the various factors that relate to whether psychological mechanisms are likely to be evolutionary or cultural.

Many economists and psychologists reject the theories of evolutionary psychology as being largely speculative. They are frequently dismissed in the social sciences as being "just-so" stories, meaning that they are not true scientific theories in terms of proposing testable hypotheses. This view is caused by two main factors: (1) it is impossible by definition to perform experiments on the past; and (2) the past record of facts is highly incomplete. I will show that this dismissal is largely unjustified and that evolutionary psychology can indeed produce testable hypotheses, many of which have been confirmed by substantial empirical evidence. Furthermore, the tendency of many economists to limit explanations to economic phenomena is even more unsatisfactory as far as "just-so" stories are concerned. For example, many readers would not be satisfied with the explanations that people tend to succumb to temptation because they have short time horizons in decision-making and that they make bad decisions when they are angry. These are also fundamentally "just-so" stories because they both beg the questions regarding *why* people have short time horizons and *why* we have seemingly harmful emotional responses like anger.

Normative aspects

Unfortunately the term "normative" is used in two main different senses by economists, causing confusion. Sometimes it is used in the sense of being opposite to positive. **Positive statements** relate to descriptions involving factual information. Such statements can be judged to be correct or incorrect, often with a margin of error, based on empirical observation. **Normative statements** in this context relate to value judgments, which are necessarily subjective and cannot be judged to be correct or incorrect empirically. An example is statement 1:

Statement 1 It is not fair that Firm A pays its workers such a low wage.

Such statements often include the words "ought" or "should"; for example, we might modify the above statement by saying as follows:

Statement 2 Firm A ought to pay its workers a higher wage.

However, care must be exercised here, because statements including these words are not always normative in the sense of involving a value judgment. An example is statement 3:

Statement 3 Firm A ought to pay its workers a higher wage if it wants to maximize profit.

Statement 3 does not involve a value judgment, and can be evaluated empirically. Of course one can question the social value of profit, but that is a separate issue.

Confusion can arise because the last type of statement is also often referred to as normative. It is perhaps preferable to label it as prescriptive, as opposed to descriptive. **Prescriptive statements** can be considered as policy implications, for individuals, firms, or governments, in terms of being guides to behavior, *assuming* a particular objective or set of values. Thus such statements, or "normative theories" as they are often referred to, tend to involve some kind of optimization. A fundamental example is the theory of expected utility maximization. Prescriptive statements in the above sense always follow logically from descriptive statements; for example, Statement 3 can be restated as follows:

Statement 4 In Firm A's situation a higher wage will maximize profit.

A more precise prescription would determine the specific level of wage that would maximize profit. Thus such prescriptive statements can also always be evaluated empirically.

Sciences in general, including social sciences like economics, are not in any privileged position in terms of making normative statements in the sense of value judgments. The privilege which scientists enjoy is that they are better able to understand the factual implications of value judgments. Thus while an economist may not have any superior "moral authority" in judging whether Firm A is acting fairly, she may be able to point out that its existing low wage strategy is likely to cause more labor unrest, higher labor turnover, and higher recruiting and training costs.

As a final point in this discussion, it is relevant to mention that there is a third category of statement that can be made, apart from positive and normative. These are **coherent statements**. A coherent statement is one that "makes sense" in terms of obeying the rules of logic and conveying some meaning. Self-contradictory statements, for example, are said to be incoherent. Good theories obviously have to be coherent; however, the coherence of a statement or theory is not judged by empirical evidence.

As far as this book is concerned we will not be concerned with the validity of normative statements as value judgments. However, we will be concerned with the question *why* people make certain value judgments; this is a psychological issue that has important policy implications in the prescriptive sense. We will also see that the SEM is essentially a normative model in this prescriptive sense, while the BEM is essentially a descriptive model. Indeed, Tversky and Kahneman (1986) claim that no theory of choice can be both normatively adequate and descriptively accurate. This statement will have to be explained and discussed in the remainder of the book.

Structure

In order to achieve the objectives described at the beginning of the section, the book is divided into five parts. Following the introduction there is a part on foundations of behavioral economics, in which the fundamental concepts of preference, decision-making under risk and uncertainty, and mental accounting are discussed. The third part of the book examines intertemporal decision-making, where costs and benefits of decisions are incurred in different time periods. The fourth part examines strategic interaction and the applications of game theory. The final part involves a discussion of rationality and a conclusion; in particular we are concerned here with achieving the sixth objective stated earlier, looking at the future of the discipline.

Within each chapter there is also frequently a typical structure. The principles and assumptions of the relevant aspects of the SEM are examined first,

with a description of shortcomings or anomalies. Various behavioral models are then introduced, and these are evaluated in the light of the empirical evidence available, with comparisons being made between different models. Normative or policy implications are also discussed. Finally, some important applications of the BEM are examined in more detail in case studies at the end of each chapter.

1.5 Summary

- Behavioral economics is concerned with improving the explanatory power of economic theories by giving them a sounder psychological basis.
- The BEM relaxes the restrictive assumptions of the SEM in order to explain a wide variety of anomalies in the SEM.
- There are four main criteria for evaluating and comparing theories: congruence with reality, generality, tractability, and parsimony.
- Behavioral economics is a relatively new discipline, becoming recognized around 1980; before that time psychology had largely been ignored by economists for many decades.
- Behavioral economists use a variety of methods or approaches, based on both traditional economics and psychology, and also borrowing from those commonly used in other sciences as well. Thus both observational and experimental studies are used, and sometimes computer simulations and brain scans. This relates to the concept of consilience.
- There are various methodological issues related to the behavioral approach, and in particular to the application of neuroeconomics.
- Reductionism is a vital key to success in developing science in spite of its bad press. It is a means of relating explanations at different levels of science to each other and integrating them into a whole.
- Evolutionary psychology is an important discipline in helping to provide a unifying psychological framework for understanding the findings of behavioral economics.

1.6 Applications

Three situations where the BEM can be usefully applied are now presented. In each case it is not appropriate at this stage to engage in a detailed discussion of the issues involved, since these are examined in the remainder of the book;

instead a summary of the important relevant behavioral issues is given in an outline form. However, these applications should serve to give the reader a flavor of what behavioral economics is about in general terms.

Case 1.1 Loss-aversion in monkeys

Monkeys show the same "irrational" aversion to risks as humans

ECONOMISTS often like to speak of *Homo economicus*—rational economic man. In practice, human economic behaviour is not quite as rational as the relentless logic of theoretical economics suggests it ought to be. When buying things in a straight exchange of money for goods, people often respond to changes in price in exactly the way that theoretical economics predicts. But when faced with an exchange whose outcome is predictable only on average, most people prefer to avoid the risk of making a loss than to take the chance of making a gain in circumstances when the average expected outcome of the two actions would be the same.

There has been a lot of discussion about this discrepancy in the economic literature—in particular about whether it is the product of cultural experience or is a reflection of a deeper biological phenomenon. So Keith Chen, of the Yale School of Management, and his colleagues decided to investigate its evolutionary past. They reasoned that if they could find similar behaviour in another species of primate (none of which has yet invented a cash economy) this would suggest that loss-aversion evolved in a common ancestor. They chose the capuchin monkey, *Cebus apella*, a South American species often used for behavioural experiments.

First, the researchers had to introduce their monkeys to the idea of a cash economy. They did this by giving them small metal discs while showing them food. The monkeys quickly learned that humans valued these inedible discs so much that they were willing to trade them for scrumptious pieces of apple, grapes and jelly.

Preliminary experiments established the amount of apple that was valued as much as either a grape or a cube of jelly, and set the price accordingly, at one disc per food item. The monkeys were then given 12 discs and allowed to trade them one at a time for whichever foodstuff they preferred.

Once the price had been established, though, it was changed. The size of the apple portions was doubled, effectively halving the price of apple. At the same time, the number of discs a monkey was given to spend fell from 12 to nine. The result was that apple consumption went up in exactly the way that price theory (as applied to humans) would predict. Indeed, averaged over the course of ten sessions it was within 1% of the theory's prediction. One up to *Cebus economicus*.

The experimenters then began to test their animals' risk aversion. They did this by offering them three different trading regimes in succession. Each required choosing between the wares of two experimental "salesmen''. In the first regime one salesman offered one piece of apple for a disc, while the other offered two. However, half the time the second salesman only handed over one piece. Despite

this deception, the monkeys quickly worked out that the second salesman offered the better overall deal, and came to prefer him.

In the second trading regime, the salesman offering one piece of apple would, half the time, add a free bonus piece once the disc had been handed over. The salesman offering two pieces would, as in the first regime, actually hand over only one of them half the time. In this case, the average outcome was identical, but the monkeys quickly reversed their behaviour from the first regime and came to prefer trading with the first salesman.

In the third regime, the second salesman always took the second piece of apple away before handing over the goods, while the first never gave freebies. So, once again, the outcomes were identical. In this case, however, the monkeys preferred the first salesman even more strongly than in the second regime.

What the responses to the second and third regimes seem to have in common is a preference for avoiding apparent loss, even though that loss does not, in strictly economic terms, exist. That such behaviour occurs in two primates suggests a common evolutionary origin. It must, therefore, have an adaptive explanation.

What that explanation is has yet to be worked out. One possibility is that in nature, with a food supply that is often barely adequate, losses that lead to the pangs of hunger are felt more keenly than gains that lead to the comfort of satiety. Agriculture has changed that calculus, but people still have the attitudes of the hunter-gatherer wired into them. Economists take note.

Issues

This ingenious experimental study illustrates three particularly important aspects of behavioral economics:

1. *Methods*
   The experimental approach, traditionally followed by psychologists, is used here, in order to achieve a degree of control that would be impossible to gain through mere observation. Three different trading regimes are used in order to compare responses and test the basic hypothesis of loss-aversion. Note the use of deception, although it is unlikely in this case to cause a general increase in cynicism among the population of capuchin monkeys available as subjects.
2. *Evolutionary psychology*
   The purpose of the experiment is not just to test whether capuchin monkeys have loss-aversion, but more importantly to test whether the widely observed loss-aversion in humans is likely to have an evolutionary explanation. The fact that loss-aversion has been observed in many different countries and societies constitutes evidence of an evolutionary origin, but the observation of the same characteristic in a fairly closely related species is even stronger evidence. This is a typical type of experiment carried out by evolutionary psychologists to test their hypotheses. It is also notable that the issue regarding why loss-aversion should be an evolved psychological mechanism or adaptation is also raised. This issue will be discussed in more detail in Chapter 3 on PT.

Case 1.1 *continued*

3. *Rationality*
   This concept is examined in detail in Chapter 9, and we will see that it is a highly ambiguous term, which can be used in many different senses. However, in the current context, a "rational'' individual behaving according to the SEM should have no preference between the two "salesmen'' in the second and third trading regimes, since the outcomes from each are ultimately identical. The "irrationality'' observed in the monkeys is explained by the concept of loss-aversion, an important aspect of PT. Thus the BEM is better able to explain the behavior observed in the experiment.

Source: *The Economist,* June 23, 2005

Case 1.2 Money illusion

The issue of money illusion is one that has been much discussed by economists, since the days of Irving Fisher (1928). It has been defined in various ways, which has been the cause of some confusion, but a brief and useful interpretation has been given by Shafir, Diamond, and Tversky (1997) in a classic article:

A bias in the assessment of the real value of transactions induced by their nominal representation.

It should be noted that such an interpretation does not limit money illusion to the effects of inflation, as will be seen.

Economists have tended to take an attitude to the assumption of money illusion that Howitt describes in the *New Palgrave Dictionary of Economics* (1987) as "equivocal.'' At one extreme there is the damning quotation by Tobin (1972): "An economic theorist can, of course, commit no greater crime than to assume money illusion.'' The reason for this view is that money illusion is basically incompatible with the assumption of rationality in the SEM. Thus a rational individual should be indifferent between the following two options:

Option A Receiving a 2 % yearly pay increase after a year when there has been inflation of 4 %.

Option B Receiving a pay cut of 2 % after a year when there has been zero inflation.

In each case the individual suffers a decrease in pay in real terms of 2 %. However, some empirical studies indicate that people do not show preferences that are consistent with rationality in the traditional sense and that money illusion is widespread.

Perhaps the best-known study of this type is the one quoted earlier by Shafir, Diamond, and Tversky (SDT). This used a questionnaire method, asking people questions about a number of issues related to earnings, transactions, contracts, investments, mental accounting, and fairness and morale. We will concern ourselves here with questions related to earnings and contracts, since these will illustrate the main findings.

An earnings-related situation was presented as follows:

Consider two individuals, Ann and Barbara, who graduated from the same college a year apart. Upon graduation, both took similar jobs with publishing firms. Ann started with a yearly salary of $30 000. During her first year on the job there was no inflation, and in her second year Ann received a 2 % ($600) raise in salary. Barbara also started with a yearly salary of $30 000. During her first year on the job there was a 4 % inflation, and in her second year Barbara received a 5 % ($1500) increase in salary.

The respondents were then asked three questions relating to economic terms, happiness, and job attractiveness:

1. As they entered the second year on the job, who was doing better in economic terms?
2. As they entered the second year on the job, who do you think was happier?
3. As they entered the second year on the job, each received a job offer from another firm. Who do you think was more likely to leave her present position for another job?

Seventy-one per cent of the respondents thought that Ann was better off, while 29 % thought that Barbara was better off. However, only 36 % thought Ann was happier, while 64 % thought that Barbara was happier. In the same vein, 65 % thought that Ann was more likely to leave her job, with only 35 % thinking Barbara was more likely to leave.

A contracts-related question was designed to test people's preferences for indexing contracts for future payment to inflation. From a seller's viewpoint this would be preferred by decision-makers who were risk-averse in real terms, while those who were risk-averse in nominal terms would prefer to fix the price now. The situation featured computer systems currently priced at $1000; sellers could either fix the price in 2 years at $1200, or link the price to inflation, which was expected to amount to 20 % over the 2 years. The options were framed first of all in real terms (based on 1991 as the current year) as follows:

Contract A You agree to sell the computer systems (in 1993) at $1200 a piece, no matter what the price of computer systems is at that time. Thus, if inflation is below 20 % you will be getting more than the 1993-price; whereas, if inflation exceeds 20 % you will be getting less than the 1993-price. Because you have agreed on a fixed price your profit level will depend on the rate of inflation.

Contract B You agree to sell the computer systems at 1993's price. Thus if inflation exceeds 20 % you will be paid more than $1200, and if inflation is below 20 % you will be paid less than $1200. Because both production costs and prices are tied to the rate of inflation, your "real'' profit will remain essentially the same regardless of the rate of inflation.

When the options of fixing the nominal price and index-linking were framed as above in real terms, a large majority of the respondents (81 %) favored the option of index-linking, indicating risk-aversion in real terms. However, when the equivalent options were framed in nominal terms, as shown below, a different result was obtained:

Case 1.2 *continued*

Contract C You agree to sell the computer systems (in 1993) at $1200 a piece, no matter what the price of computer systems is at the time.

Contract D You agree to sell the computer systems at 1993's price. Thus instead of selling at $1200 for sure, you will be paid more if inflation exceeds 20 %, and less if inflation is below 20 %.

In this case a much smaller majority (51 %) favored the index-linking option, which now seemed more risky.

When the contract situation was reversed, so that respondents were now in a buying situation, it was also found that the framing of the options affected the responses. Once again respondents were risk-averse in nominal terms when the options were framed in nominal terms and risk-averse in real terms when the options were framed in real terms.

Issues

The discussion of money illusion raises a number of important issues in behavioral economics. Some of these are similar to the previous case:

1. *Methods*
   Economists have criticized the validity of the SDT results on two main grounds. First, they have doubts about the questionnaire methodology, suspecting that there may be considerable differences between what people say they might do in a hypothetical situation and what they would actually do in the real world when motivated by economic incentives. Second, they point out that it is not sufficient to show money illusion at the level of individual behavior; it must also be present at the aggregate level in order to have real economic significance. Individual differences may cancel each other out, thus resulting in no overall economic effect.
2. *Rationality*
   It is usually argued that money illusion is not rational at the level of the individual. However, it is notable from the SDT study that the majority of the respondents realized that Ann was better off in economic terms, even though a majority thought that Barbara was happier. This perceived decoupling of absolute economic welfare from happiness is not necessarily irrational, and will be discussed further in the Chapter 9. Furthermore, it may well happen that a majority of individuals do not themselves suffer from money illusion at the individual level, but may believe that others do. Therefore, in order to understand the existence of money illusion at the aggregate level, it is necessary to examine the strategic interaction of individuals in the economy.
3. *Mental accounting*
   It is notable that the SDT study not only attempts to test for money illusion in a descriptive sense, it also goes some way toward trying to explain its existence in psychological terms. This involves in general aspects of mental accounting, more specifically the theory of multiple representations. These aspects are discussed in detail in Chapter 4, but at this stage we can outline the theory

by saying that it proposes that people tend to form not just a single mental or cognitive representation of information, but several simultaneously. Thus we may form both a nominal and a real mental representation of different options, but, depending on how they are framed, one or other may be salient. Thus the concepts of framing effects and saliency are important. The SDT study maintains that normally the nominal representation tends to be salient, since it is cognitively easier to handle, demanding less information. This therefore tends to give rise to money illusion. Later on we will see that there are similarities here with types of optical illusion.

4. *Strategic interaction*
   As already stated, it is important to consider strategic interaction in order to understand money illusion at the aggregate level. If some economic agents act irrationally, for example by raising prices without any inflationary cause, then it may be optimal for other agents who are rational to react in the same way and "follow the crowd." This effect is of vital importance in stock markets, as noted by many authors. Strategic interaction also has to take into account the possible existence of "super-rationality," as discussed by Fehr and Tyran (2003). These aspects are all examined in Chapter 7.

Case 1.3 Altruism

The Joy of giving

Donating to charity rewards the brain

PROVIDING for relatives comes more naturally than reaching out to strangers. Nevertheless, it may be worth being kind to people outside the family as the favour might be reciprocated in future. But when it comes to anonymous benevolence, directed to causes that, unlike people, can give nothing in return, what could motivate a donor? The answer, according to neuroscience, is that it feels good.

Researchers at the National Institute of Neurological Disorders and Stroke in Bethesda, Maryland, wanted to find the neural basis for unselfish acts. They decided to peek into the brains of 19 volunteers who were choosing whether to give money to charity, or keep it for themselves. To do so, they used a standard technique called functional magnetic resonance imaging, which can map the activity of the various parts of the brain. The results were reported in this week's *Proceedings of the National Academy of Sciences*.

The subjects of the study were each given $128 and told that they could donate anonymously to any of a range of potentially controversial charities. These embraced a wide range of causes, including support for abortion, euthanasia and sex equality, and opposition to the death penalty, nuclear power and war. The experiment was set up so that the volunteers could choose to accept or reject choices such as: to give away money that cost them nothing; to give money that was subtracted from their pots; to oppose donation but not be penalised for it; or to oppose donation and have money taken from them. The instances where money was to be taken away were defined as "costly". Such occasions set up a conflict

Case 1.3 *continued*

between each volunteer's motivation to reward themselves by keeping the money and the desire to donate to or oppose a cause they felt strongly about.

Faced with such dilemmas in the minds of their subjects, the researchers were able to examine what went on inside each person's head as they made decisions based on moral beliefs. They found that the part of the brain that was active when a person donated happened to be the brain's reward centre—the mesolimbic pathway, to give it its proper name—responsible for doling out the dopamine-mediated euphoria associated with sex, money, food and drugs. Thus the warm glow that accompanies charitable giving has a physiological basis.

But it seems there is more to altruism. Donating also engaged the part of the brain that plays a role in the bonding behaviour between mother and child, and in romantic love. This involves oxytocin, a hormone that increases trust and co-operation. When subjects opposed a cause, the part of the brain right next to it was active. This area is thought to be responsible for decisions involving punishment. And a third part of the brain, an area called the anterior prefrontal cortex—which lies just behind the forehead, evolved relatively recently and is thought to be unique to humans—was involved in the complex, costly decisions when self-interest and moral beliefs were in conflict. Giving may make all sorts of animals feel good, but grappling with this particular sort of dilemma would appear to rely on a uniquely human part of the brain.

Issues

1. *The nature of economic behavior*
   Economic behavior is not just about monetary transactions. "Altruistic'' acts and spiteful acts also are relevant. We need to understand the basis of such acts in order to explain and predict human behavior in a wide variety of different situations, such as donating to charity, labor strikes, lending the neighbor one's car, and remonstrating with people who litter the streets.
2. *Fairness and social preferences*
   This aspect is closely related to the first one. We need to understand the importance of inequality-aversion, the perceived kindness of others, reciprocity, and the intentions of others if we are to predict behavior in social situations when strategic interaction is important. This area is covered in Chapter 8.
3. *The role of neuroscience*
   The study described above demonstrates clearly how useful neuroscience can be in explaining behavior that cannot easily be explained by the SEM. In particular it shows that "self-interest'' needs to be understood in a broad context. Charitable acts are thus self-interested acts because they make us feel good, contrary to the common narrow understanding of self-interested acts. It is important to realize that only by performing neuroscientific studies involving techniques like fMRI can we establish firm evidence regarding the real motivations behind "altruistic'' and spiteful acts, since people often deny these motivations, and even "honest'' introspection may not reveal them. This aspect is discussed in more detail in the next chapter and also in the concluding chapter.

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