Illusions
and mirages
in public policy

RICHARD H. THALER

Like most people, I have always found optical illusions fascinating. Figure I is a scale drawing of the world’s largest man-made optical illusion—the Gateway Arch in St. Louis. Although it appears to be at least 50 percent taller than it is wide, the height and width are actually equal. This optical illusion is an example of what I will call “judgmental illusions”: Somehow the mind is fooled into making an error of judgment. We all erroneously judge the arch’s height to be greater than its width.

Another type of optical illusion is the mirage. We have all experienced the illusion of “seeing” water on a perfectly dry highway on a hot day. Such mirages on the desert are commonplace. Mirages, like judgmental illusions, fool the mind. We are fooled into believing that an object exists when it does not.

The subject of this essay is not optical illusions, but rather the related concept of cognitive illusion. Like optical illusions, cognitive illusions can be of two types. Judgmental cognitive illusions induce people to mis-estimate magnitudes, and in a specific direction. Other cognitive illusions are like mirages: A situation is structured such that we are fooled into thinking we have many choices when in fact only one really exists. Both kinds of cognitive illu-
sions have powerful influences on how people make choices—in their private lives and in the realm of public policy.

**Four illusions**

The following example of a judgmental cognitive illusion will be familiar to anyone who has taken a course in probability theory:

*A class has 25 students in it. What is the chance that at least two students will have a common birthday?*

Most people guess that the chance of a match is pretty small, perhaps one in ten or one in 20. In fact, the chance of at least one pair of students having the same birthday is better than 50-50.

The interesting thing about this problem is that it affects almost everyone the same way. We all judge the chance of a match to be smaller than it really is. This is the defining characteristic of a judgmental cognitive illusion: The problem induces predictable errors in a particular direction.

Can such cognitive illusions that create errors in judgment also create errors in contemporary public policy debates? Yes—and to illustrate this I have selected several examples that relate to our perceptions of risk and uncertainty. The first tests one’s ability to estimate magnitudes:
What is the relative frequency of homicides and suicides in the United States?

Most people think homicides are much more common, when in fact suicides are more common—in one recent year there were 27,300 suicides and 20,400 homicides. (This is true in spite of the fact that the official statistics understate the true level of suicides. Many suicides are classified as accidental deaths.) Why do we guess that homicides are more common? Well, often when we have to estimate the frequency of an event or class of events we do so by judging the ease with which we can recall instances of it. Psychologists Daniel Kahneman and Amos Tversky call this the availability heuristic.¹ The availability heuristic is usually a good way to estimate frequency because ease of recall is usually highly correlated with actual frequency. Sometimes, however, availability and frequency diverge. Since homicides receive more publicity than suicides, they are more available, and thus are erroneously judged to be more common.

The next example, first devised by Daniel Ellsberg, consists of an imaginary lottery:

You are shown three urns, each containing 100 balls. Urn A has 50 red and 50 black balls, urn B has 80 red and 20 black balls, and urn C has 20 red and 80 black balls. You are given a choice between two lotteries. You can take lottery A, in which a ball will be picked at random from urn A. If the ball picked is red you win $100, otherwise you win nothing. Alternatively, you can take lottery BC. In this case the lottery has two stages. The first step is to flip a coin. If it comes up heads you must choose a ball from urn B. If it comes up tails you must choose from urn C. The second step is to pick a ball from the urn determined by the coin flip. Again, if the ball is red you win $100, otherwise you win nothing.

Which lottery do you prefer?

Simple multiplication will confirm that the chance of winning either lottery is 50 percent, yet most people say that they prefer lottery A. Why? Two characteristics of the BC lottery make it un-

attractive. First, lottery A is simpler. Complexity itself is aversive. Second, the chance of winning the BC lottery is more ambiguous: Depending on the outcome of the coin flip it might be 80 percent or 20 percent. This ambiguity is also aversive. The moral is that most people—if forced to gamble—would prefer a simple, well-defined risk to a complex, ambiguous risk.²

The next set of three situations relates to the value people place on their lives. How much would someone pay to avoid a risk to his life? How much would he charge to take an additional risk?

Risk Situation 1: While attending the movies last week you inadvertently exposed yourself to a rare, fatal disease. If you contract the disease, you will die a quick and painless death in one week. The chance that you will contract the disease is exactly .001—that is, one chance in 1,000. Once you get the disease there is no cure, but you can take an inoculation now which will prevent you from getting the disease. Unfortunately there is only a limited supply of the inoculation, and it will be sold to the highest bidders. What is the most you would be willing to pay for this inoculation? (If you wish, you may borrow the money to pay at a low rate of interest.)

Risk Situation 2: This is basically the same as situation 1 with the following modifications. The chance you will get this disease is now .004—that is, four in 1,000. The inoculation is only 25 percent effective—that is, it would reduce the risk to .003. What is the most you would pay for the inoculation in this case? (Again, you may borrow the money to pay.)

Risk Situation 3: Some professors at a medical school are doing research on the disease described above. They are recruiting volunteers who would be required to expose themselves to a .001 (one chance in 1,000) risk of getting the disease. No inoculations would be available, so this would entail a .001 chance of death. The 20 volunteers from this audience who demand the least money will be taken. What is the least amount of

I have asked these questions to numerous groups. The typical median responses are that people would pay $800 in Situation 1; pay $250 in Situation 2; and charge $100,000 in Situation 3. Obviously, people treat these as three quite different questions. Yet economists would argue that the answers should all be about the same. (They would allow for a small difference between Situation 3 and the other two, but nothing like the magnitude observed.) Essentially each situation presents the subject with a choice between more money or a greater chance of living. If Situations 1 and 2 are compared, we can see that people will pay over three times as much to reduce a risk from .001 to zero than to reduce a risk from .004 to .003. While the increase in the chance of living is the same in each case, the change is more attractive in Situation 1 because the risk is eliminated altogether. Generally, people will pay more to eliminate a risk than to achieve an equivalent reduction of a risk. Daniel Kahneman and Amos Tversky call this the certainty effect.3

If we compare the responses to Situation 3 with those given to Situations 1 and 2, we see that the median response to Situation 3 is several times larger. Yet this implies that a typical individual would refuse to pay $5,000 to eliminate a risk, and would refuse to take $5,000 to accept the same risk. How can $5,000 be both better and worse than bearing some risk?

This comparison illustrates another behavioral regularity which I have called the endowment effect.4 The endowment effect stipulates that an individual will demand much more money to give something up than he would be willing to pay to acquire it. The endowment effect can be observed in cases that do not involve any risk. Suppose you won a ticket to a sold-out concert that you would love to attend, and the ticket is priced at $15. Before the concert you are offered $50 for the ticket. Do you sell? Alternatively, suppose you won $50 in a lottery. Then, a few weeks later, you are offered a chance to buy a ticket to the same concert for $45. Do you buy? Many people say they would not sell for $50 in the first case and would not buy for $45 in the second case. Such responses are logically inconsistent.

Policy deceptions

These illusions can affect policy decisions in many ways. Take the endowment effect: Essentially it says that once people have something it is very hard to take it away. Residents of communities with declining school populations know how this has created problems for their school boards. People who would be unwilling to pay for a tax increase to add a school in their neighborhood nevertheless become incensed if an existing school in their neighborhood is closed in order to avoid a tax increase.

Similarly, most people know that when social security benefits were indexed, the formula used was inadvertently generous. The result has been that benefits have grown much faster than wages in recent years—clearly an unintended outcome. Nevertheless, any politician who dared to suggest a reduction in the rate at which benefits increase was considered an enemy of senior citizens. Just because it was a mistake to give people something does not mean it can be easily taken away. Even the most recent solution to this problem—a one-time postponement of cost of living increases for six months—is a curious sort of deception. We did not take anything away—we just postponed it!

An issue that is particularly interesting in the present context is nuclear power, the debate over which involves all of the illusions discussed so far. The specific question I wish to discuss is: Why is nuclear power so unpopular? I do not intend to evaluate the advantages and disadvantages of nuclear and conventional power plants, since I have no particular insights to offer. The question is why nuclear power generates so much vocal, emotional opposition. This is a puzzle, since the experts seem at least evenly divided. Yet how many demonstrations do we see opposing coal-fired plants? Surely it is not because conventional power sources are without risk to humans or to the environment. Coal mining accidents could be (but are not) attributed indirectly to coal-fired power plants. And acid rain is partly attributed to conventional power plants, but nuclear power is rarely suggested as a solution to the problems of acid rain. So why is nuclear power so unpopular? The four cognitive illusions each play a role:

Availability. As with homicide, the risks from nuclear power are widely publicized, while as with suicides, the risks from conventional sources are not as well known. The Three Mile Island incident and the popular movie *The China Syndrome* have helped keep the nuclear risks very "available," even though, so far as we know, there has not been a single death related to nuclear power.
Complexity and Ambiguity. As with the Ellsberg urn, the risks from nuclear power are complex and ambiguous. People are not confident that they have been estimated correctly. Future risks, such as those related to waste disposal, are especially ambiguous. The Ellsberg effect shows that such risks are particularly aversive. (It is rather ironic that Ellsberg is now so active in the anti-nuclear power movement. Has he fallen into his own trap?)

The certainty effect and the endowment effect. The responses to the three risk situations demonstrated that people are least willing to pay to decrease an existing risk (Situation 2) and demand great compensation for the introduction of a new risk (Situation 3). The way the nuclear power issue is generally discussed, replacing a conventional power plant with a nuclear power plant would reduce an existing risk and add a new risk—the least attractive combination possible.

I am not saying that opposition to nuclear power is silly or irrational. Rather, I have just tried to show how four cognitive illusions all happen to be working to make nuclear power seem highly unattractive, which may help explain why opposition to nuclear power is so widespread.

There is a good book on optical illusions by Stanley Coren and Joan Girgus called *Seeing is Deceiving*. That title might be applied to thinking: Seeming is deceiving. But like optical illusions, cognitive illusions can be overcome. We can measure the height and width of the Gateway Arch; similarly, we can look in the almanac to find out how many homicides and suicides there are. Nevertheless, there is no practical way of preventing cognitive illusions from influencing policy decisions. Cognitive illusions influence representatives, senators, presidents—even so-called experts are not immune. A physicist may fall for a cognitive illusion just as easily as an economist might fall for an optical illusion. But since informed judgment and explicit analysis can in principle mitigate the effects of illusions, we must encourage the use of scientific research, cost-benefit and cost-effectiveness analyses, and expert commissions in the making of policy decisions.

Mirages

The second class of policy problems involves mirages. Rather than illusory objects, these mirages are illusory choices, choices we perceive that do not really exist.

Economists tell us that we should keep our options open, and
that we should prefer having more choices to having fewer. This is good advice, like "buy low and sell high," but like all good advice it has exceptions. One exception would arise when the costs of deciding are exceptionally high, in which case any decision may be better than more costly pondering.

A second, more interesting, exception is illustrated by the following true story. A group of economists was sitting around having cocktails, awaiting the arrival of dinner. A large can of cashews was placed on the cocktail table, and within 90 seconds one half of the cashews were gone. A simple linear extrapolation would have predicted the total demise of the cashews and our appetites in another 90 seconds. Leaping into action, I grabbed the can and (while stealing a few more nuts on the way) hid it in the kitchen. Everyone seemed relieved, yet puzzled. How could removing the can, and thus removing a choice, have made us better off? Let us analyze this case with the help of the simple decision tree shown in Figure II.

At time 1 we have a decision: to leave the bowl or to remove it. If we remove the bowl, we have no further choices to make, and no more nuts to eat. We obtain Option C. If we leave the bowl, we must then decide how many more nuts to eat. Suppose we would most like to eat a few nuts (Option A) but that we would prefer to stop (Option C) rather than to end up eating the whole bowl (Option B). Given these preferences the rational thing would be to leave the bowl and pick Option A. But it is rational only so long as Option A is really feasible. At the dinner party, Option A was a mirage. As much as we might have liked at time 1 to eat only a few more nuts, at time 2 we would have devoured the whole can. If Option A is a mirage, then Option C becomes the rational choice. I will call taking Option C an act of precommitment: committing oneself to a particular choice in advance.

The first recorded act of precommitment was that taken by Ulysses in his encounter with the Sirens, a popular singing group in Ulysses's time whose songs were highly addictive. Anyone on the seas who heard their songs would feel compelled to draw ever nearer to land, inevitably crashing on the rocks near shore. Ulysses's strategy was to have himself tied to the mast so he could not alter the course of his ship.

Ulysses's method of dealing with the Sirens and my act of removing the cashews were both acts of rational precommitment. They both satisfy the two conditions that are necessary for precommitment to be rational: (1) a change of preferences is antici-
A common precommitment institution is the Christmas club. Christmas clubs have three distinguishing features: They pay little or no interest; they require weekly deposits at some inconvenience; and they do not allow the customer to withdraw any money before Thanksgiving. This institution clearly seems inefficient. But is it irrational? The decision tree in Figure III shows once again that C is a rational choice only if A is a mirage. But for individuals or families on a tight budget who would otherwise not save enough, a Christmas club could be rational. The fundamental point is that a rule (which is what a precommitment strategy is) must necessarily be crude and inflexible, and may also be inefficient. Nevertheless, these drawbacks, in and of themselves, should not lead us to the conclusion that a particular rule is undesirable. To evaluate a rule we must compare it with the alternatives.
rule specifying that the captain of the ship may not alter the ship’s course would be judged unacceptable. But for Ulysses, that rule was better than any other feasible alternative.

Public uses of precommitment

Rational precommitment is highly important in the domain of public policy. Take terrorism or airplane hijacking, for example: As all airline passengers know, we spend millions of dollars and countless hours of time screening airline passengers for bombs, guns, keys, lighters, and calculators. Film is ruined, people miss planes, and we all pay more for plane tickets. What do we gain from this? Since any security system can be beaten, planes are still occasionally hijacked. As an alternative to all the equipment I propose we adopt the following rule: “Never make concessions to hijackers.” Hijackers would be given a choice: Give up or be shot. One might say, “Won’t that be a dangerous rule? Won’t many

**Figure III:** Christmas Club Decision Tree.
innocent people be hurt or killed?" The answer is no. First, if no one ever gets anything from hijacking a plane, then the incidence will fall almost to zero. Second, there is no defense against a crazed terrorist. If someone wants to kill himself and a lot of other people he can do it, and we cannot stop him. Anyone can hijack a bus or blow up an office building at will.

A different criticism of this rule is that there might be situations in which society would want to make concessions. Suppose someone hijacks a caravan of school buses—would we not want to make concessions in this case? But such examples simply illustrate the value of the rule: If an exception is made for a school bus once, no school bus would ever be safe again. To enforce this rule we could decide now that anyone not personally at risk who grants a concession to a hijacker would be guilty of a felony. (A jail sentence would be mandatory, of course.)

Another example of rational precommitment is mandatory retirement. Mandatory retirement rules normally have two separate provisions. First, an organization will announce that it is under no obligation, moral or legal, to keep a worker past the age of 60 (or 65, or 70). One reason organizations adopt such a policy is that for most workers, though not all, productivity reaches its peak some time before retirement. Wages, on the other hand, usually rise throughout a worker's employment. These two factors together suggest that just before retirement most workers are earning more than they produce. Clearly a firm would not want to allow that state of affairs to go on indefinitely.5

The second provision, while not universal, frequently accompanies the first. It provides that no worker may remain employed after the normal retirement age; this might be called "mandatory mandatory retirement" (or MMR for short). Since the adoption of MMR eliminates some future options for an organization, it qualifies as precommitment. But is it rational? It is easy to criticize an MMR rule since it might force a university to lose a Nobel laureate who is still active. Nevertheless, I believe such rules make good sense because it is so difficult to tell anyone he is no longer productive. Thus the option to keep some people can, and will, become a practice of keeping almost anyone who wants to stay on. So for every Nobel laureate who is kept for an extra couple of years, the organization must retain several others who are no longer productive.

I am not advocating any particular age for mandatory retirement; clearly that should differ across jobs. What I do oppose is the recent federal law that declared mandatory retirement illegal for ages under 70. I believe this is an unnecessary and ill-advised intrusion into private organizations' affairs. In many cases these rules were arrived at through an explicit process of collective bargaining. The abolition of mandatory retirement is sometimes posed, improperly, as a civil rights issue. But old age is a state we all hope to attain. Young people benefit when mandatory retirement creates new openings, but those same young people will face those rules later. Mandatory retirement makes sense for some organizations, and they should be given the freedom to enforce their own rules.

**The federal budget as dinner check**

I would also encourage the federal government to impose some precommitment rules on itself, in particular fiscal caps such as Proposition 13 in California. Several proposed constitutional amendments would impose such rules on the federal government either by restricting future growth of spending to no more than the growth rate of real GNP, and/or by requiring a balanced federal budget. Such ideas are not new. In 1798 Thomas Jefferson wrote, "I wish it were possible to obtain a single amendment to our Constitution. I would be willing to depend on that alone for the reduction of the administration of our government to the genuine principles of its Constitution; I mean an additional article, taking from the government the power of borrowing."

Since these proposed amendments would greatly restrict the government's flexibility (though exceptions are made for declarations of war), it must be demonstrated that such precommitment would be rational. Though the growth in government's share of GNP in the last 55 years should be evidence enough, let me describe some of the mirages that led to this explosion.

Suppose we consider the behavior of a hypothetical group of 500 people going to an expensive restaurant for drinks and dinner. Compare their expected behavior under two different rules: Each person pays his own bill; or, the total bill is divided evenly. Under which rule will people spend more? The latter of course. If I order a shrimp cocktail for $5.00 and it is split 500 ways, I pay only one cent. I am more likely to order a shrimp cocktail at one cent than at $5.00. This "check-splitting effect" is what leads to so-called
pork barrel legislation. The amount a district will pay toward a particular local project can be very small indeed, so it is in the interest of every Representative to get as many projects into his district—just as it is my interest to order dessert if everyone else is chipping in.

Suppose the larger dinner party comes up with a clever idea: The check will still be divided evenly, but to save time, the ordering will be done by committee. There will be separate committees for drinks, appetizers, entrees, salads, and desserts. Each person can serve on the committee of his choice. How will people allocate themselves to committees? You guessed it—the lushes will be on the drinks committee, the vegetarians on salad committee, the sweet-tooths on the dessert committee, etc. (After all, we do want the people with expertise on the relevant committees.) Of course such an arrangement will exacerbate the tendency toward over-ordering. The lushes will have a bottle of wine with each course, the sweet-tooths two rounds of dessert, and if by chance a lush finds himself on the dessert committee we can be sure that rum cake will be served. Unfortunately, this metaphor closely resembles the structure of the U.S. Congress, where the committee process reinforces the tendency toward excessive spending.

Suppose further that each of our diners can put his bill on a credit card—a special credit card that does not have to be paid if the diner loses his job or retires. This rounds out the story nicely. To a representative more concerned with getting re-elected than with posterity, "buy now, pay later (maybe)" is a very appealing process.

How can we control the budget? I advocate random committee assignments, but that is probably politically infeasible. Failing that, we need both a limit on the rate at which government spending can grow, and an enforced balanced budget.

Such rules have been criticized on numerous grounds: They are rightly described as crude and inflexible, and the definition of a balanced budget is far from obvious. Nonetheless, the spirit of such amendments is worth supporting, and the criticisms are not persuasive. The issue is not whether such rules are perfect, but rather whether they are an improvement over the current situation. As Richard Wagner and Robert Tollison recently wrote:

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Annual budget balance is a good idea because it places useful and meaningful constraints on political choice. This is not to say that it is a perfect rule for the conduct of government, for there are no perfect rules for the conduct of something as massive as our government. The problem is to search for feasible, workable rules that encourage political decision makers to act as if they had good common sense. A rule of annual budget balance and careful up-front monitoring of the viability of long-term government projects seems to be the wisest course of action.8

No thyself

By definition, precommitment must be done in advance, before we actually face temptation. We always resolve to go on a diet—next week. "Lord give me strength—but not now." So we should not be surprised to find that we, or our organizations, want to break rules that were established earlier, even if the rules are desirable. Indexation of the federal income tax is a good illustration of this principle.

Because we have a progressive income tax with marginal rates that increase with income, inflation automatically produces real tax increases. In 1981, Congress passed a law that instituted indexing of the personal income tax beginning in 1985. The way the law works, the personal exemption (now $1,000), the zero-tax bracket (now $3,400), and all other bracket levels would automatically rise with inflation. This would be particularly helpful to lower income families, since the brackets are much closer together at lower levels. Not surprisingly, some in Congress now want the law repealed. As Martin Feldstein, chairman of the President's Council of Economic Advisors, argues in a recent Wall Street Journal:

If tax revenue must be raised, the repeal of indexing isn't a satisfactory substitute for an explicit tax increase. Because the repeal of indexing is a hidden way of increasing taxes, it removes the pressure to choose between spending cuts and more taxes. And unlike voting an explicit tax increase, repealing indexing doesn't provide a fixed amount of additional tax revenues but starts a money machine that will squeeze more and more money from taxpayers in years ahead. The repeal of indexing is politically tempting to many in Congress because it increases revenue without explicitly increasing taxes. But it is the very opposite of responsible budgeting [emphasis added].

Feldstein's choice of language is quite apt. First, he describes

the tax increases in the absence of indexation as hidden. This is right on target. To keep government spending under control we should want tax increases to be visible, not hidden. Second, he says the repeal of indexation would be tempting to Congress. Congress recognized its addiction to hidden tax increases and resolved to break the addiction—starting in four years. It is important that this resolution be kept. Indexation is particularly important in the absence of spending restrictions or a balanced budget amendment, since it will help keep government from growing.

My proposal can perhaps best be summarized in the dictum Thomas Schelling set down in these pages several years ago: "No Thyself." This is good advice for individuals, organizations, and governments. If we make rules to enforce the "no," we must remember that all rules are imperfect, and that they must not be lightly abandoned. Not even Ulysses could count on self-restraint.