# Behavioral Economics

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# "Behavioral Economics" Fall 2021

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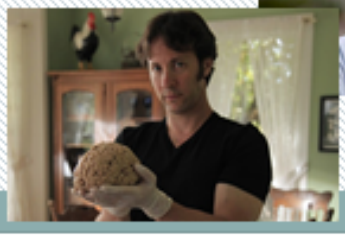

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- "How Change Happens," Cass Sunstein, 2019
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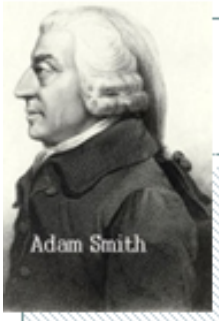
# The Origin of Behavioral Economics


# Behavioral Economics

- **Behavioral economics**, studies the effects of psychological, social, cognitive, and emotional factors on the economic decisions of individuals and institutions.
- The study of behavioral economics includes how market decisions are made and the mechanisms that drive public choice.
- There are several prevalent themes in behavioral economics and finance including:
  - Heuristics: Humans make most of their decisions using mental shortcuts or rules of thumb. These rules work well under most circumstances, but they can lead to systematic deviations from logic, probability or rational choice theory.
  - Framing: The collection of anecdotes and stereotypes that make up the mental emotional filters individuals rely on to understand and respond to events.
  - Market inefficiencies: These include mispricing and non-rational decision making.



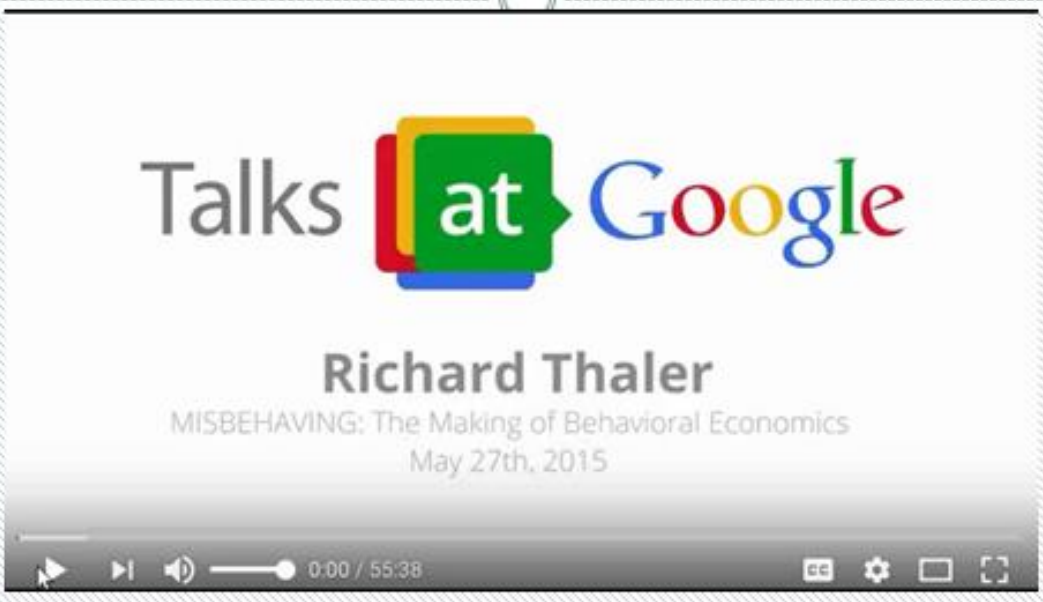

## The Economic Man

- Economics is largely built around three key assumptions:
  - "Economic man" is informed of all alternatives the market offers
  - He makes wholly rational decisions
  - He is motivated by self interest
- The concept of equilibrium, in which competing forces balance each other out appears in Adam Smith's notion of an "invisible hand" steering selfish individuals towards socially beneficial results.
- Economics has evolved and gotten more complex in recent years but most classical economic theories still clings to the basic assumptions.
- Today we will challenge the first two key assumptions.

## Richard Thaler

- Is an American economist and the Charles R. Walgreen Distinguished Service Professor of Behavioral Science and Economics at the University of Chicago Booth School of Business.
- In 2017, he was awarded the Nobel Prize in Economics. The Royal Swedish Academy of Sciences said that his "contributions have built a bridge between the economic and psychological analyses of individual decision-making. His empirical findings and theoretical insights have been instrumental in creating the new and rapidly expanding field of behavioral economics."
- Thaler has written a number of books on behavioral economics, including *Quasi-rational Economics* and *The Winner's Curse*. He is coauthor, with Cass Sunstein, of *Nudge: Improving Decisions About Health, Wealth, and Happiness* (Yale University Press, 2008). *Nudge* discusses how public and private organizations can help people make better choices in their daily lives. In 2015 Thaler wrote *Misbehaving: The Making of Behavioral Economics*, a history of the development of behavioral economics.

## Richard Thaler Interview




## Free Tickets


- Suppose you are given two tickets to a major home team sports event. This is a playoff game, tickets are in high demand, there is a black market for the tickets and the market price is $1000. Do you go to the game?
- If you decide to go to the event how much does it cost you? (Econ. 101 answer: $1000) Either way the cost is the same!
- If you are not well off and you were not given the tickets would probably not go to the game. But if you were given the tickets you probably would.
- That's the endowment effect.

## Stanley

- Stanley mows his lawn every weekend and it gives him terrible hay fever.
- I ask Stan why he doesn't hire a neighbor kid to mow his lawn. Stan says he doesn't want to pay the $10.
- I ask Stan whether he would mow his neighbor's lawn for $20.
- Stan says, "no, of course not."
- Stanly is violating the economic precept that buying and selling prices should be about the same.

## Linnea's Shopping Trips

- Linnea is shopping for a clock radio. She finds a model she likes at what she has found to be a good price $42.
- The store clerk mentions that the same radio is on sale for $32 at a new branch of the store, ten minutes away, that is holding a grand opening sale. Does she drive to the other store to make the purchase?
- On a separate shopping trip Linnea is shopping for a television set and finds one she likes for $495.
- Again the clerk informs her that the same model is on sale at another store ten minutes away for $485. Same question… but likely a different answer.

## Lee's New Sweater

- Lee's wife gives him an expensive cashmere sweater for Christmas.
- He had seen the sweater in the store and decided that it was too big of an indulgence to feel good about buying it.
- He was nevertheless delighted with the gift.
- Lee and his wife pool all their financial assets and neither has a separate source of income. But Lee feels better about spending family resources on and expensive sweater if his wife makes the decision.

## Value Theory

- **Value theory** is a range of approaches to understanding how, why, and to what degree persons value things.
- Economic analysis emphasizes goods in a market and tends to use the consumer's choices as evidence that various products are of economic value. The value is what consumers will pay for the goods.
- The initial ideas behind this value theory go back to Daniel Bernoulli in 1738 who invented the idea of risk aversion. He postulated that people's happiness – or utility – increases as they get wealthier but at a decreasing rate.
- Thus to a peasant, a windfall of $100,000 would be life changing. To Bill Gates it would go undetected. True value must be measured in context.

# The Value Function


- Kahneman and Traversky recognized that we need to change our focus from levels of wealth to changes in wealth.
- Notice that the loss function is steeper than the gain function.
- Roughly speaking, losses hurt about twice as much as gains make you feel good.
- The fact that a loss hurts more than an equivalent gain gives pleasure is called "**loss aversion.**"

# Dan Ariely: Predictably Irratioal

## Learning

- The style of experiment Kahneman and Tversky ran was often faulted as a "one shot." game. In the real world people have opportunities to learn.
- The problem with the learning theory is that it assumes we all live in a world like the Bill Murry movie *Groundhog Day*.
- But psychologists tell us that in order to learn from experience, two ingredients are necessary: frequent practice and immediate feedback. Many of life's problems don't offer these opportunities.

cafeteria lunch | sweaters | cars | homes | career choices | spouses

- Notice the trend. There is some validity to the argument, Thaler admits, particularly for the small stuff. But when it comes to choosing a home we don't get much practice. Saving for retirement we do just once. Because of learning we are more likely to get the little things right. (again countering the "incentives" argument!)

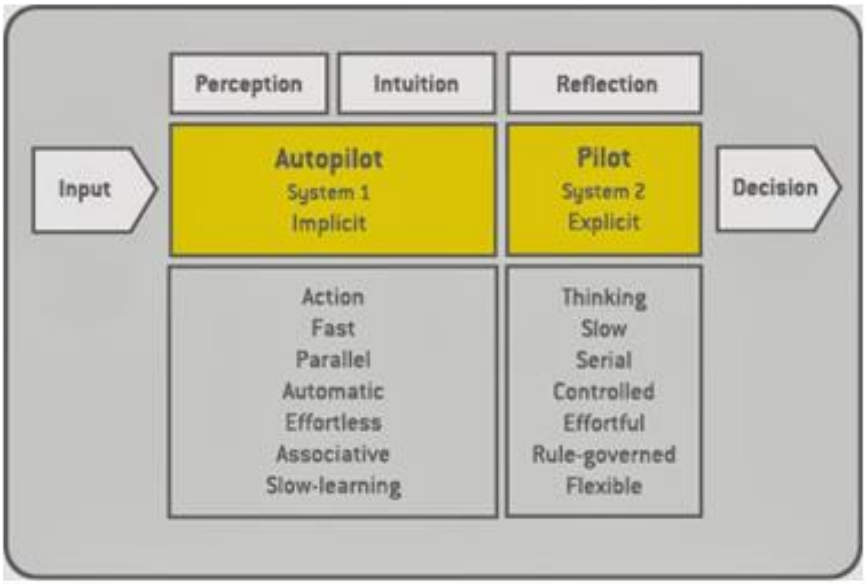
# Behavioral Economics


**Class 2: Thinking Fast and Slow**

## Daniel Kahneman

- An Israeli-American psychologist notable for his work on the psychology of judgment, decision-making, and behavioral economics.
- He was awarded the 2002 Nobel Memorial Prize in Economic Sciences (shared with Vernon L. Smith).
- His best selling book *Thinking, Fast and Slow*, which summarizes much of his research, was published in 2011.
- He is professor emeritus of psychology and public affairs at Princeton University's Woodrow Wilson School.
- In 2015 *The Economist* listed him as the seventh most influential economist in the world.

## System 1 and 2



## Kahneman/Brooks Interview


## Kahneman Key Points

- Prior to his work psychologists believed that errors of judgement arrive from our emotions. Errors are products of the normal function of thinking.
- System 1: thoughts that come to mind automatically. It includes our skills but also included our intuition.
- System 2: thoughts that require attention or mental work like computation involving large numbers or dealing with an unusual situation.
- We are not as rational as we think. Loss aversion is one example of a bias in our thinking. Anchoring is another. Confirmation bias is a third.
- Rational thinking was a key assumption of economics. Economists have started to take psychologists seriously and question this assumption.
- Intuition works well in a world where there is a large degree of structure and regularities.
- Rationality is the ability to question yourself.
- People become afraid without a clear understanding of what they are afraid of.
- Most people including "experts" are overconfident in their abilities.
- It is difficult to teach facts (e.g. statistics) that cause a change in peoples perception of the world. People are not good about inferring the particular from the general.

# WYSIATI

- Daniel Kahneman believes that jumping to conclusion on the basis of limited evidence is important to our understanding of intuitive thinking.*
- Consider the following: "Will Mindik be a good leader? She is intelligent and strong…"
- The answer that usually comes to mind is "yes."
- But what if the next two adjectives are "corrupt and cruel?"
- In forming your opinion you did not start by asking, "what do I need to know about this person before I form an opinion."
- The acronym at the top stands for, "what you see is all there is."
- "System 1" is radically insensitive to the amount and quality of the data on which a story or idea is based.
- The confidence that individuals have in their beliefs depends mostly on the quality of the story they can tell about what they see, even if they see little.

* *Thinking Fast and Slow* by Daniel Kahneman, P86

# Anchoring

- Kahneman once recruited students to participate in an experiment.
  - First he rigged a wheel of fortune to stop at only 10 or 65. He had them write down the result.
  - Next he asked: Is the percentage of African nations among U.N. members larger or smaller than the number you wrote?
  - He then asked: what is the percentage of African nations in the U.N.?
- The average estimates was 25% for those that saw 10 and 45% for those that saw 65.
- What happens is one of the most reliable results of experimental psychology. It is called the anchoring effect. It happens when people consider a particular value before estimating an unknown quantity.

# Availability and Risk

- Howard Kunreuther first studied the "availability" effects on the insurance industry. Victims and near victims are very concerned after a disaster. Californians become very interested in buying insurance after each significant earthquake.
- Causes of death provide good examples:
  - Strokes cause almost twice as many deaths as accidents but 80% of respondents judged accidental death to be more likely.
  - Tornadoes were seen as more frequent killers than asthma but the later causes 20 times more deaths.
  - Death by accidents was judged to be more than 300 times more likely than death by diabetes, but the true ratio is 1:4.
- The lesson is clear: estimates of causes of death are warped by media coverage.
- Cass Sunstein invented a name for the mechanism through which such biases flow into public policy: the *availability cascade*.
- In today's world terrorists are the most significant practitioners of the art of inducing availability cascades. Even after 9/11, the number of casualties from terror attacks is very small relative to other causes.

# Regression to the Mean

- Daniel Kahneman was once an instructor for the Israeli Air Force. While teaching flight instructors he told them about a principle of skill training: rewards for performance work better than punishment for mistakes. He cited evidence from research done on animals.
- One of the more seasoned flight instructors rebuked him saying, "it might work on birds but on many occasions I have praised cadets but on the next attempt they did worse. On the other hand I have often screamed at cadets for bad execution and in general he does better on the next try."
- His observation was astute and correct but did not disprove the original hypothesis! This observation was a demonstration of "regression to the mean."
- Regression to the mean can be expressed by the following equation: success = talent + luck
- One conclusion that can be drawn is that a competitor who does much better than average on one day (e.g. golf) is likely to have a worse score the next day (regardless of any feedback he may get).

## Understanding Regression

- The phenomenon of regression is strange to the human mind.
- Regression to the mean was discovered in the late nineteenth century by Sir Francis Galton.
- Regression effects can be found wherever we look.
- One of the hurdles Galton faced was measuring variables that are measured on different scales.
- For two variables that are related on different scales the correlation can be measured by a "correlation coefficient."
- Correlation coefficients between two measures usually varies between 0 and 1 and is a measure of the relative weight of the factors they share.
- We share half of our genes with each parent. The correlation between parents and children for factors which have little environmental influence is not far from .5

## The Illusion of Pundits and Political Experts

- Our tendency to construct and believe coherent narratives makes it difficult for us to accept the limits of our forecasting ability.
- The idea that large historical events are determined in large part by luck is profoundly shocking.
- PhilipTetlock interviewed 284 people who made their living "commenting or offering advice on political and economic trends. He gathered more than 80,000 predictions.
- The results were devastating. The experts performed worse than they would have if they assigned equal probabilities to each of three potential outcomes.
- Even in the region they knew best, experts were not significantly better than non-specialists.
- Two lessons:
  - Errors of prediction are inevitable because the world is unpredictable.
  - High confidence is not to be trusted as an indicator of accuracy

## Experts vs. Algorithms

- Paul Meehl in his book[1], analyzed the claim that mechanical (algorithmic) methods of data combination outperformed clinical (e.g., subjective, "in the head") methods.
- He found that a formula was more accurate than most counselors when predicting the academic achievement of students.
- Similar results were achieved across a variety of other outcomes including violations of parole, pilot training and criminal recidivism.
- In over 200 studies since the original, about 60% have shown better accuracy for the algorithms.
- Experienced radiologists who evaluate chest x-rays as "normal" or "abnormal" contradict themselves 20% of the time when they see the same picture on separate occasions.
- We know from studies of priming that unnoticed stimuli have a substantial influence on our thoughts.

*1. Clinical vs. Statistical Prediction: A Theoretical Analysis and a Review of the Evidence, 1954*

## Ability to Infer the Specific from the General

- Kahneman cited his experience in writing a new curriculum for the Israeli Ministry of Education. The group was asked to estimate how long the task would take. The average estimate was two years.
- The head of the School of Education was initially unable to apply his knowledge of past similar efforts to formulate his estimate. He was asked to give an "outside view" based on his knowledge of past similar projects. This estimate was 7 to 10 years and 40% failed to complete their project.
- When the team was exposed to the "outside view" they promptly ignored it.
- The book was eventually completed eight years later.
- Examples of similar optimistic forecasts are found everywhere.
- Kahneman and Tversky coined the term "planning fallacy" to describe this problem. People are often reluctant to go to "System 2" and invoke deductive reasoning skills to formulate the particular from the general.

## Entrepreneurial Delusions

- The chances that a small business will survive for five years in the U.S. are about 35%. But the individuals who open such businesses do not believe that the statistics apply to them.
- The idea of seeking or adopting the "outside view" doesn't occur to the average entrepreneur.
- The observation that "90% of drivers believe they are better than average" is a well established psychological finding.
- The outcome of a start-up depends as much on the achievements of its competitors and on changes in the market as on its efforts.
- Several scholars at Duke collected 11,600 forecasts on corporate returns from CFOs. The correlation between their estimates and the true value was slightly less than zero!
- In medicine, clinicians who were completely certain of the diagnosis antemortem were wrong 40% of the time. Confidence is valued over certainty and there is a prevailing censure against disclosing uncertainty to patients.
- Overconfidence is a direct consequence of features of system 1 that can be tamed but not vanquished.

## Rare Events

- **You read that a vaccine that protects children from a fatal disease carries a .001% risk of permanent disability. Now consider another description: 1 of 100,000 vaccinated children will be permanently disabled.**
- **The second statement does something to your mind that the first does not: it calls up the image of an individual child who is permanently disabled.**
- **This is called "denominator neglect." Low probability events are much more heavily weighted when described in terms of relative frequencies (how many) than when stated in more abstract terms of "risk" or probability."**
- **"System 1" is better at dealing with individuals than categories, particularly for rare events.**

# Framing

- Logically equivalent statements often evoke different reactions as our "system 1" reacts to them differently. *
- Losses vs. gains is an example of where logically equivalent statements evoke different reactions. (See loss aversion)
- An article published in 2003 noted that organ donation was close to 100% in Austria but only 12% in Germany, 86% in Sweden but only 4% in Denmark.
- The high donation countries have an opt –out form where individuals who wish not to donate must check an appropriate box. Low contributing countries have an opt-in form: you must check a box to become a donor.
- Medical training is no defense against framing. In a study half the doctors read statistics about short term outcomes of surgery in terms of survival rates, the others received the same information in terms of mortality rates.
- Surgery was much more popular among the physicians who were given survival rates.

* *Thinking Fast and Slow*, Kahneman, Ch. 34

# Thaler: Framing and Politics

## "Econs" and "Humans"

- Kahneman attempts to divide up the world into two groups: "Humans" and "Econs."
- Humans are highly susceptible to loss aversion, WYSIATI, narrow framing, and the other biases we have discussed.
- Econs are those who think rationally: they test the consistency of their conclusions with pre-defined models and are able to avoid the problems that humans are so susceptible to.
- But the only test for rationality is not whether a person's beliefs and preferences are reasonable, but whether they are internally consistent. Thus, Econs too are prone to error.
- A rational person can believe in ghosts so long as all her other beliefs are consistent. Rationality is logical coherence, reasonable or not.
- Kahneman believes that Humans are not irrational but they often need help to make more accurate judgements and better decisions. In some cases policies and institutions can provide that help.
- In a nation of Econs, government should keep out of the way, allowing people to act as they choose. But Humans need protection from others who deliberately exploit their weaknesses.
- The government has the ability to *Nudge* people in the right direction concerning many issues such as fuel consumption, automatic enrollment in health insurance, and dietary guidance.

* *Thinking Fast and Slow*, Kahneman, Conclusions

THE NEW YORKER

# The Two Friends Who Changed How We Think About How We Think

By Cass R. Sunstein and Richard Thaler
December 7, 2016

In 2003, we reviewed "Moneyball," Michael Lewis's book about Billy Beane and the Oakland A's. The book, we noted, had become a sensation, despite focussing on what would seem to be the least exciting aspect of professional sports: upper management. Beane was a failed Major League Baseball player who went into the personnel side of the business and, by applying superior "metrics," had remarkable success with a financial underdog. We loved the book—and pointed out that, unbeknownst to the author, it was really about behavioral economics, the combination of economics and psychology in which we shared a common interest, and which we had explored together with respect to public policy and law.

Why isn't the market for baseball players "efficient"? What is the source of the biases that Beane was able to exploit? Some of the answers to these questions, we suggested, might be found by applying the insights of the Israeli psychologists Daniel Kahneman and Amos Tversky, on whose work behavioral economics greatly relies. Lewis read the review, began to take an interest in the whole topic of human rationality, and, improbably, decided to write a book about Kahneman and Tversky. He kindly even gave us credit for setting him down this path.

Though we were pleased that Lewis was taking an interest in our field, we admit to being skeptical when we heard about his book plan. Granted, Lewis has shown many times before—not only with "Moneyball" but also with "The Big Short," his book about the real-estate market, and "Flash Boys," which is about high-speed trading—that he can write a riveting book about an arcane subject. And we did not doubt the appeal of the book's main characters: one of us had written several papers with Kahneman, and the other had known Kahneman and Tversky since 1977 and had collaborated with both men. (Tversky died in 1996, at the age of fifty-nine. Kahneman, now eighty-two, is blessedly still very much with us.) Both of us had been deeply influenced by their joint work on the psychology of judgment and decision-making. Still, how was Lewis going to turn a story about their *lives* into the kind of page-turner that he's known for? Kahneman and Tversky were brilliant, but they did most of their work together more than thirty years ago, and they worked primarily by talking to each other, switching between English and Hebrew. Where's the book?

Our skepticism was misplaced. The book, titled "The Undoing Project: A Friendship That Changed Our Minds," captivated both of us, even though we thought we knew most of the

story—and even though the book is just what Lewis had said it would be, a book about Amos and Danny, two men who changed how people think about how people think. Lewis accomplishes this in his usual way, by telling fascinating stories about intriguing people, and leaving readers to make their own judgments about what lessons should be learned. He provides a basic primer on the research of Kahneman and Tversky, but almost in passing; what is of interest here is the collaboration between two scientists. Having written several articles and one book together, we have firsthand experience in both the joys and struggles of getting two minds to speak with one voice, and the conflicts that can arise when one author is a fast writer and the other likes to linger over each word. And while one gleans a good deal about teamwork from the book, Lewis doesn't spell the lessons out. Instead, the reader learns through observation, getting as close as anyone could to being in those closed rooms where the two men worked.

In 1968, Tversky and Kahneman were both rising stars in the psychology department at the Hebrew University of Jerusalem. They had little else in common. Tversky was born in Israel and had been a military hero. He had a bit of a quiet swagger (along with, incongruously, a slight lisp). He was an optimist, not only because it suited his personality but also because, as he put it, "when you are a pessimist and the bad thing happens, you live it twice. Once when you worry about it, and the second time when it happens." A night owl, he would often schedule meetings with his graduate students at midnight, over tea, with no one around to bother them.

Tversky was a font of memorable one-liners, and he found much of life funny. He could also be sharp with critics. After a nasty academic battle with some evolutionary psychologists, he proclaimed, "Listen to evolutionary psychologists long enough, and you'll stop believing in evolution." When asked about artificial intelligence, Tversky replied, "We study natural stupidity." (He did not really think that people were stupid, but the line was too good to pass up.) He also tossed off such wisdom as "The secret to doing good research is always to be a little underemployed. You waste years by not being able to waste hours." Managers who spend most of their lives in meetings should post that thought on their office walls.

Early in his career, Tversky was a "mathematical psychologist," which meant that he used formal models to characterize human behavior. He didn't care for metaphors: "They replace genuine uncertainty about the world with semantic ambiguity. A metaphor is a cover-up." He was organized and highly disciplined. His office was spotless; there was nothing on his desk except a pad, a mechanical pencil, and an eraser. (Even Tversky made mistakes.)

If there were a pad and pencil in Daniel Kahneman's office, on the other hand, Kahneman would struggle to find them. Born in Tel Aviv when his mother was visiting family, he spent his childhood in Paris, speaking French as his first language. His father was a chemist in a cosmetics company. In 1940, the German occupation put the family at risk. Hiding in the South of France, they managed to survive (with the exception of his father, who died in 1944, from untreated diabetes). After the war, the rest of the family immigrated to Palestine.

A constant worrier, Kahneman is an early riser who often wakes up alarmed about something. He is prone to pessimism—claiming that, by expecting the worst, he is never disappointed. This

pessimism extends to the expectations he has for his own research, which he likes to question: "I get a sense of movement and discovery whenever I find a flaw in my thinking." In our own collaborations with Kahneman, we saw this close up, as he would proclaim, at what seemed to be the final stages of some joint work, that he had just discovered a fatal problem with our whole approach and that we would have to give up or start all over again. He was usually wrong about that—but sometimes he was right, and the constant worry made the work much better.

Tversky liked to say, "People are not so complicated. *Relationships* between people are complicated." But then he would pause and add, "Except for Danny." So, yes, they were different, but those who saw them together, spending endless hours just talking, knew that something special happened when they applied their two very different minds to a problem. Lewis both captures and sharpens the contrast between them, showing us why their collaboration was impossibly incongruous and yet perfectly complementary.

The names Kahneman and Tversky are now well known among social scientists, but even experts in the field will not know the story of how their collaboration began. At the beginning of their careers, they worked in different branches of psychology: Kahneman studied vision, while Tversky studied decision-making. Like much of psychology, these topics can be studied only indirectly; one can't directly monitor what people see or think (yet). In those days, mathematical psychologists like Tversky conceived of thinking in much the same way as economists: choices were thought to be made more or less "correctly," as people incorporate new information and make good choices for themselves. By contrast, those studying vision made much use of common mistakes such as visual illusions. (What does the fact that we see what seems to be water on a desert highway tell us about the vision system?) As Kahneman put it, "How do you understand memory? You don't study memory. You study forgetting."

In the spring of 1969, Kahneman invited Tversky to speak at his seminar. Tversky chose to outline some cutting-edge experiments about how people learn from new information. The experiments seemed to demonstrate that ordinary people were close to being rational; they thought like "intuitive statisticians." Though the presentation was impressive, Kahneman thought that the experiments were, as Lewis writes, "just incredibly stupid," and that they demonstrated no such thing. Insisting that judgments are more like sensory perceptions (and similarly prone to error), he went after Tversky hard, as people do in the best academic environments. Tversky almost never lost an argument, but he lost this one.

Very much in character, Tversky reacted to this loss by coming back for more. His friend Avishai Margalit, the distinguished Israeli philosopher, calls the session "Kahneman and Tversky's Big Bang." He recalls meeting an agitated Tversky, who "started by dragging me into a room. He said, 'You won't believe what happened to me.' He tells me that he had given this talk and Danny had said, 'Brilliant talk, but I don't believe a word of it.' "

Before long, Kahneman and Tversky were in constant conversation. They worked intensely in a small seminar room or a coffee shop, or while taking a long walk. The sessions were private; no one else was invited to join. As they began to produce work together, each sentence would be written, rewritten, and rewritten again, with Kahneman manning the typewriter. (Tversky never

did master the art of the keyboard.) On a good day, they would write a paragraph or two. Everything was produced jointly; they did not really know where one's thought ended and the other's began. Graduate students "now wondered how two so radically different personalities could find common ground, much less become soul mates," Lewis writes. One reason was that "Danny was always sure he was wrong. Amos was always sure he was right."

That actually did help. While Tversky was "the most terrifying mind most people had ever encountered," he was uncharacteristically receptive to Kahneman's ideas. Kahneman, for his part, found Tversky's arrogance surprisingly liberating: "It was extremely rewarding to feel like Amos, smarter than almost everyone." And they laughed together—a lot. As Kahneman said, "Amos was always very funny, and in his presence I became funny as well, so we spent hours of solid work in continuous amusement."

What followed was a period of extraordinary creativity—the best and most original work that either of them had done, or would do, at any stage in his career. In the period between 1971 and 1979, they published the work that would eventually win Kahneman the Nobel Prize in Economics. (The prize would certainly have been shared with Tversky had he still been alive. Nobel Prizes are not awarded posthumously.) There were two distinct themes: judgment and decision-making. Judgment is about estimating (or guessing) magnitudes and probabilities. *How likely is it that a billionaire businessman from New York with no experience in government gets elected President?* Decision-making is about how we choose, especially when there is uncertainty (meaning almost all the time). *What should we do now?*

Kahneman and Tversky showed that, in both of these domains, human beings hardly behave as if they were trained or intuitive statisticians. Rather, their judgments and decisions deviate in identifiable ways from idealized economic models. Most of the importance of Kahneman and Tversky's work lies in the claim that departures from perfect rationality can be anticipated and specified. In other words, errors are not only common but also predictable.

For instance: ask people what they think is the ratio of gun homicides to gun suicides in the United States. Most of them will guess that gun homicides are much more common, but the truth is that gun suicides happen about twice as often. The explanation that Kahneman and Tversky offered for this type of judgment error is based on the concept of "availability." That is, the easier it is for us to recall instances in which something has happened, the more likely we will assume it is. This rule of thumb works pretty well most of the time, but it can lead to big mistakes when frequency and ease of recall diverge. Since gun homicides get more media coverage than gun suicides, people wrongly think they are more likely. The availability heuristic, as Kahneman and Tversky called it, leads people to both excessive fear and unjustified complacency—and it can lead governments astray as well.

The influence of their work has been immense—not only in psychology and economics, where it has become part of the normal conversation, but in every other field of social science, as well as medicine, law, and, increasingly, business and public policy. And this legacy is based on what by current standards would be considered a very small number of papers—eight, to be precise.

(They went on to write more papers together in the years that followed, but the foundation was laid with those few from the nineteen-seventies.)

The low rate of output was one of their strengths, and is a direct result of their joint personality traits. Kahneman's constant worry about how they might be wrong combined perfectly with Tversky's mantra: "Let's get it right." And it takes a long time to write a paper when both authors have to agree on every word, one by one.

The Kahneman and Tversky partnership was extraordinary in terms of its scientific impact—they are the Lennon and McCartney of social science—and even now, when joint work is increasingly common in academia, enduring teams like theirs are extremely rare. In Lewis's account, the relationship between Kahneman and Tversky was as intense as a marriage. As anyone who has been married knows, marriages can be fraught, and they sometimes dissolve entirely, rarely amicably. Tversky and Kahneman never got divorced, but they did start dating other people, and their relationship became strained.

After the two decided to leave Israel, in 1978, Tversky quickly received offers from Harvard and Stanford (where he ended up). Kahneman, who was looking for jobs jointly with his equally distinguished wife, Anne Treisman, was hired at the University of British Columbia, in Vancouver—a fine university, but lower in status than those that pursued his friend. At a relatively young age, Tversky received honorary degrees from Yale and the University of Chicago.

Although their work had been a true collaboration of equals, Tversky had unofficially been declared the star of the team, which didn't sit well with Kahneman. Tensions were aggravated in 1984, when Tversky was given a MacArthur "genius" grant, and Kahneman wasn't. Kahneman was not actually eligible for the award, which is given only to American citizens or residents, but not many people realized this—and, what's more, when Kahneman moved to Berkeley, two years later, thus becoming eligible, the MacArthur Foundation still did not give him a fellowship. The incident illustrates another one of Kahneman and Tversky's most famous concepts: loss aversion. When the MacArthur grants are awarded every year, only the most egomaniacal of us read the list and say, "Damn, I lost." Unless, that is, your best friend wins the prize for work you did entirely together.

The two did not stop being friends, or stop talking nearly every day, or stop working on occasional projects. But once they were separated by distance, and began working with students and other co-authors, their relationship lost its ease. The way Kahneman saw it, "Amos changed. When I gave him an idea he would look for what was good in it. For what was right with it. . . . He stopped doing that." He noted, "Something happens when you are with a woman you love. You know something happened. You know it's not good. But you go on." Tellingly, he added, "I wanted something from *him*, not from the world." After one particularly difficult interaction, Kahneman decided, and told Tversky, that they were no longer even friends. "I sort of divorced him." This is the kind of outburst that Kahneman typically takes back within a few days, as he did at least a dozen times when he declared that he was abandoning

for good his book project, which would eventually become the mega-best-seller "Thinking, Fast and Slow."

In the case of his breakup with Tversky, fate intervened to hasten the inevitable reversal. Only three days later, Tversky called to say that he had just been diagnosed with a malignant melanoma and that he had, at most, six months to live. As Kahneman recalled, "He was saying, 'We're friends, whatever you think we are.' "

In the remaining six months, Kahneman and Tversky worked on the introduction to an edited collection of papers related to their work, an introduction Kahneman had to finish after Tversky died. Kahneman had (of course) worried about completing this introduction alone, and Tversky had (of course) assured him that he should just trust the mental model that, by now, he surely had of Tversky's mind. But no one has that model, alas. That is why collaborations are so special: one partner cannot simply replace the mind of the other, even after twenty-five years.

Tversky once said, "It is sometimes easier to make the world a better place than to prove you have made the world a better place." But it is not hard to prove that Amos and Danny did so—you only have to read those papers that they published in the seventies. Or, for that matter, Lewis's book.


- *Cass R. Sunstein is the Robert Walmsley University Professor at Harvard and the author of numerous books, including, most recently, "Impeachment: A Citizen's Guide."*
- *Richard Thaler is a professor at the Booth School of Business, at the University of Chicago, and the author of "Misbehaving: The Making of Behavioral Economics."*

# Daniel Kahneman changed the way we think about thinking. But what do other thinkers think of him?

Thinking, Fast and Slow was a global bestseller, and had a profound impact on psychology and economics, as these tributes from other leading figures show

## 'He revolutionized large parts of psychology'

Steven Pinker. Photograph: Graeme Robertson

**Steven Pinker is a psychology professor at Harvard University. He is frequently named one of the world's top intellectuals and has twice been a finalist for the Pulitzer prize.**

I've called Daniel Kahneman the world's most influential living psychologist and I believe that is true. He pretty much created the field of behavioural economics and has revolutionised large parts of cognitive psychology and social psychology. His central message could not be more important, namely, that human reason left to its own devices is apt to engage in a number of fallacies and systematic errors, so if we want to make better decisions in our personal lives and as a society, we ought to be aware of these biases and seek workarounds. That's a powerful and important discovery.

His work has had a great impact on my own. I've taught his research for more than 30 years and it's one of my favourite lectures when I teach psychology. My most recent book, *The Better Angels of Our Nature*, is about the historic decline of violence, a fact that I argue is underappreciated precisely because the human mind works the way Kahneman says it works, namely, that our sense of risk and danger is influenced by salient events that are available from memory. Our minds do not

naturally process statistics on incidents of violence, and so Kahneman helps explain why my claim is news or why it's hard for people to believe.

In person, Daniel is very stimulating. When I first presented the material that became my book *The Blank Slate*, he gave me a comment that really sat with me: he noted that the idea of human nature with inherent flaws was consistent with a tragic view of the human condition and it's a part of being human that we have to live with that tragedy. It was a profound philosophical observation and it influenced my writing of that book.

We have our differences. I think he is a pessimist, whereas I am an optimist. I do think he's right that human nature saddles us with some unfortunate limitations, but I also think – and actually he himself shows in the "slow thinking" part of his book – that we have the means to overcome some of our limitations, through education, through institutions, through enlightenment. It will always be a flaw, human nature will always push back, but gradually, bit by bit, with two steps forward, one step back, I think that our better angels can push back against our limitations and flaws.

*Thinking, Fast and Slow* is an interesting capstone to his career, but his accomplishments were solidified well in advance of writing it and they'd be just as significant without the book. His work really is monumental in the history of thought.

## 'Danny is warm and moderate but also highly volatile'

Richard Thaler . . . cute technocratic solutions to mainly minor problems.

Photograph: Rex



**Richard Thaler is a behavioural economist and expert in the psychology of decision-making. A professor at the University of Chicago Booth School of Business, he is also the co-author of the bestseller *Nudge*, which explores how individuals and governments can influence people to make choices.**

Although Daniel Kahneman and Amos Tversky [the cognitive psychologist who collaborated with Kahneman; he died in 1996] were not economists, they made behavioural economics possible. When I was a second-year assistant professor, I heard that they were going to be visiting the US from Israel and I made it my business to go to Stanford [University, where Kahneman used to work] that year to hang out with them. It changed my life. This was early in my career – I was 32 –

and following the work of two psychologists was not a strategy that anyone thought was brilliant.

I spent enormous amounts of time with them at Stanford. There was a whole clan: Amos and his wife, Barbara, Danny and his now-wife, Anne Treisman, and Anne's soon-to-be-ex-husband – they all came to the Bay Area that year. My office was near Danny's and we spent countless hours wandering the hills, brainstorming about what the intersection of our two fields might be. They knew nothing about economics and I knew nothing about psychology, so it was one walk at a time, but we had a lot of fun.

Danny is warm and moderate but also, inside himself, highly volatile. He quit writing this book at least a dozen times. And I had to convince him not to quit, n+1 times. He genuinely didn't think anybody would buy it. It was a biased forecast – he prides himself on being a pessimist. He was shocked that it did so well and he's still in shock. He didn't think it would sell more than a million copies worldwide.

On every project we worked on together, there were several times when he would call me up, at 9.30 on a Saturday morning, to tell me that he'd figured out that what we were doing was crap – he'd found the fatal flaw. Amos, who was very even, used to provide a counterbalance. So after 1996, when Amos died, I took over the role of the one who would reassure him. I'd say: going on base rates, most of what you've done so far is not crap, therefore the probability that this is crap is low. I tried to speak his language, and, not knowing Hebrew, I thought I'd better go with the jargon.

Certainly his work has to be viewed as one of the most important accomplishments of 20th century science. It's hard to think of any psychologist whose work has influenced so many different fields.

## 'He made happiness respectable as a goal for society'

Economist Richard Layard, author of the book Happiness: Lessons from a New Science. Photograph: Linda Nylind/Guardian

**Professor Richard Layard is a British economist. After years researching inequality and unemployment, he became one of the first economists to study happiness, chairing the World Economic Forum's global agenda council on**

**health and wellbeing at Davos in 2011 and co-editing a world happiness report in 2012 and 2013.**

Danny Kahneman changed my life. He persuaded me that happiness is a real experience which can be measured and therefore studied and understood. I had always believed that the best society is one where there is the most happiness and (above all) the least misery. But the new science of happiness, which Danny was inspiring, made this ideal a hundred times more practicable.

So I started writing a book on happiness, with Danny as my tutor. He invited me to Princeton. He introduced me to Richie Davidson, the great neuropsychologist who located areas of the brain where happiness and misery are experienced, and many other outstanding American psychologists. And, despite a dodgy back, he flew across the Atlantic four times to conferences we held, one of them on the draft of my book.

Danny is not only brilliant but exceptionally charming, which is how he became the focal point for people working on happiness. As Danny himself says, it is not often that you make close friends when you are beyond a certain age. I'm so lucky that it happened.

By chance I was visiting Princeton when, in 2002, Danny won the Nobel prize. That prize, more than anything, has made happiness respectable – not only as a subject of study but as a goal for society. In Britain, the government now measures happiness, the OECD promotes the standard international measurement of happiness and the UN holds a huge conference on happiness. And millions of people in their lives feel authorised to pursue meaningful objectives going way beyond material success.

And that is only part of the story. A huge part of Danny's work is on how we think – and how profoundly irrational we can be. That, too, is transforming business, however slowly, and explains the million copies he has sold of his new book. But, in the great sweep of history, I suspect he will be most remembered as the man who made happiness respectable.

## 'I learned one can force people to have a healthy outlook'

Nassim Nicholas Taleb author of The Black Swan Photograph: Murdo Macleod

**Risk engineering professor Nassim Nicholas Taleb is author of the bestselling book *The Black Swan*, about the problems created by rare events.**

I met Daniel Kahneman in 2003, at a conference in Rome, soon after he got the Nobel Memorial prize. I was standing with a bunch of French researchers and this French-sounding fellow told me that he was puzzled by my idea that humans were not good at understanding rare events. It did not hit me that it was Kahneman, who it turned out, spoke French with no accent – not well-known since he avoids using it professionally and even socially.

I gave my talk to a crowd who took my lecture (on *The Black Swan*) with an icy cold – it was before the publication of the book and I was then totally unknown. I had informed the audience (financiers) about their cluelessness concerning rare events (black swans) and I could discern their annoyance – a few bankers looked a bit insulted. The chairman announced that there was going to be no Q&A. I feared that they would disinvite me from the rest of the conference, and perhaps even throw me out of the building, and if they could, the country. Kahneman was the next speaker. He unexpectedly saved my life when his opening sentence was that he "fully agreed with the previous speaker".

We became friends (in English). There have been memorable episodes, particularly a five-hour drive to rural Delaware, in which – among other problems – we were tailgated by a huge angry fellow, as, forgetting that Danny was in the car, I gave the man the finger.

People talk about his ideas in vague terms but I have been able to get from his work at least a dozen simple practical solutions.

When I met Danny, it was at a low point in my professional life, as I was starting to manage money for other people and, while I learned to administer my own psychology, thanks to trial and error and a dose of Stoic philosophy (Seneca), I proved incompetent at managing the clients' emotions. The clients had invested in a strategy expected to take steady, small losses for long periods against occasional large gains. They were convinced of its merits but they had difficulties with the emotional aspect of it – they rapidly forgot the properties of the strategy and became impatient. The mistake, it turned out, is that I presented the premium as a

"loss", rather than an expense. There was no economic difference but, because of irrationality, there was a large behavioural one.

The first idea Danny gave me in Rome is that people do not perceive stand-alone objects, rather differences away from an anchor point. He said that it was not cultural: even the vision of babies was based on identifying variations. It was simply more economical for the brain to do so. Investors are more affected by changes in wealth than by wealth itself and they are very sensitive to the way information is presented to them; they are more unhappy if one tells them they have lost $10,000 (the variation) than if one informs them that their wealth is now $480,000 (the total). They just take a benchmark and react to variations from it. So one could make them react more rationally by modifying the anchor.

That small point was miraculous: upon my return to New York I forced the clients to write off the amount they were willing to lose during the year (like an insurance premium expensed at the beginning of the period). I then posted performance reports showing how much they "recovered", ie, money not lost. It was a wonder pill: clients became excited as they treated the money not lost as if it were a profit.

The second – equally potent – point I learned is that people do not aggregate information properly. When the portfolio is composed of many trades, and the net performance is positive, though some trades were up while a few were down, the clients got excited when they only saw the net total, but not when they saw the details. A small loss in a trade more than compensated by gains elsewhere would turn them off, and cause them to interrupt my lunch for an urgent conversation.

I also learned that one can change people's anchor to force them to have a realistic outlook on things. I am Lebanese and people keep bemoaning the relatively small tension in the wake of the Syrian civil war. But when I tell my mother to think of the turmoil that did not happen, her mood changes instantly.

## 'Ultimately he demonstrates that we are not rational'

Salley Vickers photographed at her home in London
Photograph: Antonio Olmos/Antonio Olmos

**Salley Vickers is a former psychotherapist and bestselling British author whose novels include *Miss Garnet's Angel* and *Dancing Backwards*.**

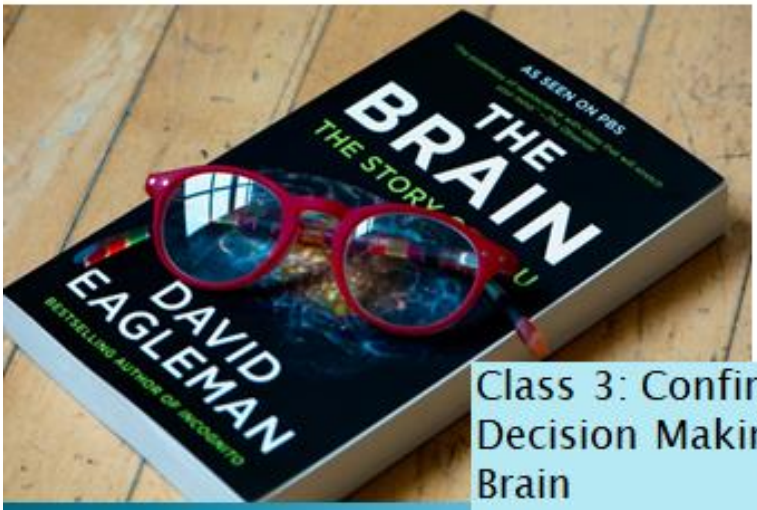
*Thinking, Fast and Slow* confirmed for me that economics is not a science but deeply connected to our psyche. I know several grand economists and have been dismayed by their lofty disregard for how the human animal actually functions. Daniel Kahneman's lucid and witty accounts (backed by thorough research) of our apparently innate tendency to risk-aversion reveals the crucial link between economics and psychology.

It also underlines our problem with rationality. We are no less keen, it seems, on abandoning hopeless endeavours than we are at taking risks. Ultimately, Kahneman demonstrates, we are not rational creatures but instinctive ones and any attempt to make us act rationally must take that inbuilt bias into account or fail. As a psychoanalyst turned novelist, this was not news to me, but it is wonderful to have Kahneman's intellectual support for what I have always felt in my bones.

His other great gift to me is his insight that financial success has more to do with random chance than planning. The rise and fall of businesses has little to do with who runs them and much to do with a natural statistic – failure of any kind is usually, that is to say statistically, followed by success. On a more personal note, his dismissal of financial advisers and insurance policies, confirming my ignorant but it turns out accurate prejudice, made me rejoice that I never buy into these.

In short, Kahneman is a breath of fresh air and *Thinking, Fast and Slow* is a book I treasure.

# Behavioral Economics




Class 3: Confirmation Bias, Decision Making and the Brain

# Confirmation Bias

## Confirmation Bias Research

- In 1960 Peter Wason published a report on the "2-4-6 problem." He showed subjects a series of three numbers and asked them to guess the rule that was followed. When told they had not guessed correctly people had no trouble generating new hypothesis. They were allowed to offer new triplets to test their new hypothesis but they hardly ever offered triplets that did not conform to the hypothesis.
- For example proposing 2-4-5 (yes) and 2-4-3 (no) would have helped people zero in on the actual rule: any series of ascending numbers.
- Wason called this phenomenon the "**confirmation bias**," the tendency to seek out and interpret new evidence in ways that confirm what you already think.
- Deanna Kuhn found further evidence for confirmation bias. People given evidence for a food that made a group of people sick rather quickly locked into a hypothesis. Even when given evidence that showed stronger indication for another source of the sickness, people stuck with their first hypothesis.

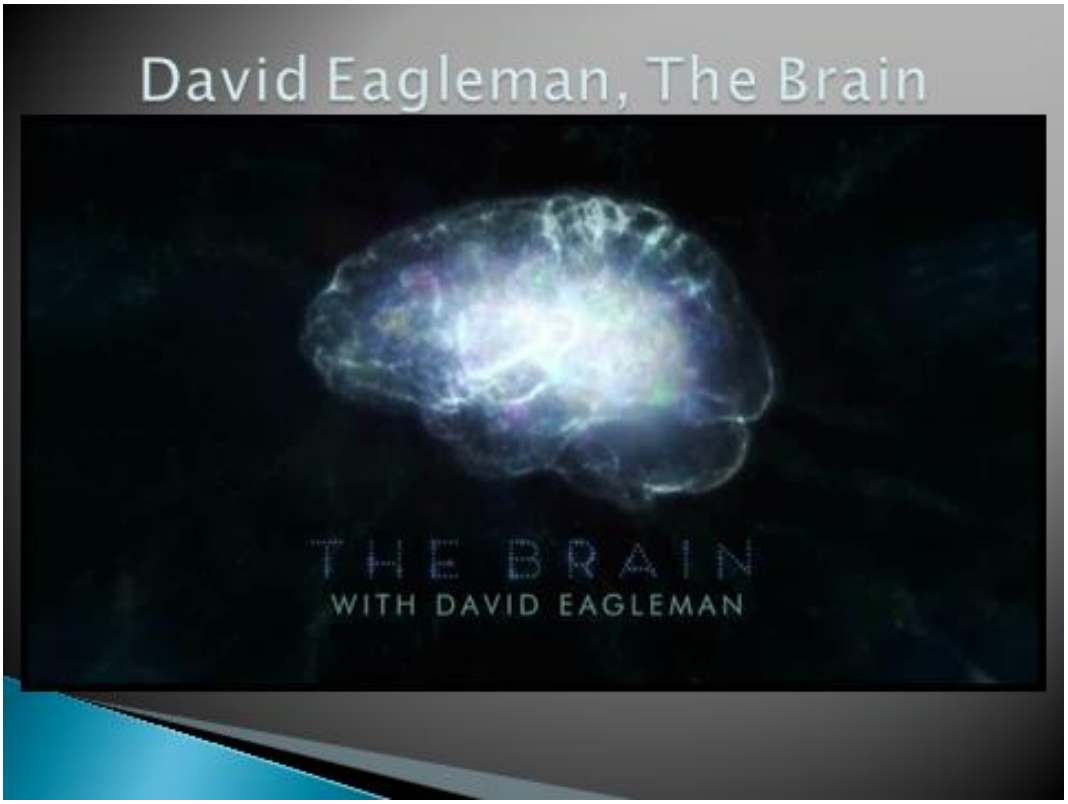
## Confirmation Bias Defined

- **Confirmation bias** is the tendency to search for, interpret, favor, and recall information in a way that confirms one's preexisting beliefs or hypotheses.
- People also tend to interpret ambiguous evidence as supporting their existing position.
- Confirmation bias is of particular current interest because of the increasing polarization between left-wing and right-wing political viewpoints, and the gullible acceptance of the current rapid spread of fake news.
- Confirmation biases contribute to overconfidence in personal beliefs and can maintain or strengthen beliefs in the face of contrary evidence.
- Some psychologists restrict the term *confirmation bias* to selective collection of evidence that supports what one already believes while ignoring or rejecting evidence that supports a different conclusion. Others apply the term more broadly to the tendency to preserve one's existing beliefs when searching for evidence, interpreting it, or recalling it from memory

# Confirmation Bias


## David Eagleman

- **Eagleman** is an American neuroscientist, author, and science communicator.
- He teaches at Stanford University after directing a neuroscience research laboratory for 10 years at Baylor College of Medicine.
- He is CEO of *NeoSensory*, a company that develops devices for sensory substitution.
- He also directs the non-profit *Center for Science and Law*, which seeks to align the legal system with modern neuroscience.
- He is a Guggenheim Fellow and a *New York Times* bestselling author.




# The Brain, Key Points


- Reason and emotion form two big decision systems in the brain.
- The trolley dilemma: people's emotional responses are key to decisions
- War is Easier to wage at a distance
- Brain damage that destroys the functioning of the emotional systems can greatly effect decision making capability
- But we tend to distrust decisions that are based on "feelings"
- Parole boards are more lenient after lunch
- Lap dancers earn more when they are ovulating
- The dopamine systems helps us put values on things but this can get out of control in cases of addiction.
- Will power can control impulses.
- Making agreements with others can strengthen our will-power. Eagleman arranged to meet his friend at the gymn.
- Seven out of ten people in jail are there because of drugs.

## Antonio Damasio

- **Damasio** is an neuroscientist at USC and the Salk Institute. He heads the Brain and Creativity Institute, and has authored several books.
- In his book *Descartes' Error,* written in 1994, Damasio discusses the case of Phineas P. Cage, a famous case where a man lived for several years after a large metal spike was driven through his head. "After the accident, he no longer showed respect for social convention; ethics in the broad sense of the term, were violated; the decisions he made did not take into account his best interest, and he was given to invent tales 'without any foundation except in his fancy.'"
- He uses this and other cases with damage to regions of the frontal lobes involved in emotional decision making to argue that rationality stems from emotion.
- According to his theory emotions and their biological underpinnings are directly involved in decision-making (both positively and negatively, and often unconsciously).

## Dopamine

- Various pleasurable stimuli activate the release of dopamine. The "mesolimbic dopamine pathway" projects to the PFC.
- Sex stimulates the release of dopamine in all species. In humans, just the thought of sex suffices.
- Chronic stress or pain depletes dopamine producing the defining symptoms of depression, the inability to feel pleasure.
- Food evokes dopamine release in hungry individuals of all species.
- Winning a lottery, other monetary rewards and winning a bid in an action activate the release of dopamine.
- Dopamine pathways activate in <u>anticipation</u> of a reward. The reward itself is nearly an afterthought.
- In one study subjects were shown an item to purchase. When they were told the price; if it was less than what they were willing to spend, there was activation of the emotional vmPFC; more expensive and there would be activation of the disgust related insular cortex.
- Given all the neuroimaging data you could predict whether the person would buy the item.

# Dopamine Continued

- We constantly habituate to our various stimulations. After repeatedly experiencing a given stimulation our reward decreases: when we consume more we desire less. What was an unexpected pleasure yesterday is what we feel entitled to today and won't be enough tomorrow.
- Dopamine is about invidious, rapidly habituating reward.
- If a reward is unpredictable even greater levels of dopamine are released. Anticipatory dopamine release peaks with the greatest uncertainty as to whether the reward will occur.
- Those who run Las Vegas count on this effect. Manipulations to make you feel that this is your lucky day cause dopamine to pour out.
- The propensity for addictive gambling was seen in a study of "near misses" when two or three reels line up in a slot machine. In control subjects there was minimal dopaminergic activation after misses of any sort. Among pathological gamblers a near miss activated the dopamine system like crazy.

*Behave* by Robert M. Sapolsky, Chapter Six

# Adolescence; or, Dude, Where's My Frontal Cortex?

We've established our rhythm: a behavior has just occurred; what events in the prior seconds, minutes, hours, and so on helped bring it about? The next chapter extends this into the developmental domain—what happened during that individual's childhood and fetal life that contributed to the behavior?

The present chapter breaks this rhythm in focusing on adolescence. Does the biology introduced in the preceding chapters work differently in an adolescent than in an adult, producing different behaviors? Yes.

One fact dominates this chapter. Chapter 5 did in the dogma that adult brains are set in stone. Another dogma was that brains are pretty much wired up early in childhood—after all, by age two, brains are already about 85 percent of adult volume. But the developmental trajectory is much slower than that. This chapter's key fact is that the final brain region to fully mature (in terms of synapse number, myelination, and metabolism) is the frontal cortex, not going fully online until the mid-twenties.

This has two screamingly important implications. First, no part of the adult brain is more shaped by adolescence than the frontal cortex. Second, nothing about adolescence can be understood outside the context of delayed frontocortical maturation. If by adolescence limbic, autonomic, and endocrine systems are going full blast while the frontal cortex is still working out the assembly instructions, we've just explained why adolescents are so frustrating, great, asinine, impulsive, inspiring, destructive, self-destructive, selfless, selfish, impossible, and world changing. Think about this—adolescence and early adulthood are the times when someone is most likely to kill, be killed, leave home forever, invent an art form, help overthrow a dictator, ethnically cleanse a village, devote themselves to the needy, become addicted, marry outside their group, transform physics, have hideous fashion taste, break their neck recreationally, commit their life to God, mug an old lady, or be convinced that all of history has converged to make this moment the most consequential, the most fraught with peril and promise, the most demanding that they get involved and make a difference. In other words, it's the time of life of maximal risk taking, novelty seeking, and affiliation with peers. All because of that immature frontal cortex.

## THE REALITY OF ADOLESCENCE

Is adolescence real? Is there something qualitatively different distinguishing it from before and after, rather than being part of a smooth progression from childhood to adulthood? Maybe

"adolescence" is just a cultural construct—in the West, as better nutrition and health resulted in earlier puberty onset, and the educational and economic forces of modernity pushed for childbearing at later ages, a developmental gap emerged between the two. Voila! The invention of adolescence.

As we'll see, neurobiology suggests that adolescence is for real, that the adolescent brain is not merely a half-cooked adult brain or a child's brain left unrefrigerated for too long. Moreover, most traditional cultures do recognize adolescence as distinct, i.e., it brings some but not all of the rights and responsibilities of adulthood. Nonetheless, what the West invented is the longest period of adolescence.

What does seem a construct of individualistic cultures is adolescence as a period of intergenerational conflict; youth of collectivist cultures seem less prone toward eye rolling at the dorkiness of adults, starting with parents. Moreover, even within individualistic cultures adolescence is not universally a time of acne of the psyche, of Sturm and Drang. Most of us get through it just fine.

## THE NUTS AND BOLTS OF FRONTAL CORTICAL MATURATION

The delayed maturation of the frontal cortex suggests an obvious scenario, namely that early in adolescence the frontal cortex has fewer neurons, dendritic branches, and synapses than in adulthood, and that levels increase into the mid-twenties. Instead, levels decrease.

This occurs because of a truly clever thing evolved by mammalian brains. Remarkably, the fetal brain generates far more neurons than are found in the adult. Why? During late fetal development, there is a dramatic competition in much of the brain, with winning neurons being the ones that migrate to the correct location and maximize synaptic connections to other neurons. And neurons that don't make the grade? They undergo "programmed cell death"—genes are activated that cause them to shrivel and die, their materials then recycled. Neuronal overproduction followed by competitive pruning (which has been termed "neural Darwinism") allowed the evolution of more optimized neural circuitry, a case of less being more.

The same occurs in the adolescent frontal cortex. By the start of adolescence, there's a greater volume of gray matter (an indirect measure of the total number of neurons and dendritic branches) and more synapses than in adults; over the next decade, gray-matter thickness declines as less optimal dendritic processes and connections are pruned away. Within the frontal cortex, the evolutionarily oldest subregions mature first; the spanking-new (cognitive) dorsolateral PFC doesn't even start losing gray-matter volume until late adolescence. The importance of this developmental pattern was shown in a landmark study in which children were neuroimaged and IQ tested repeatedly into adulthood. The longer the period of packing on gray-matter cortical thickness in early adolescence before the pruning started, the higher the adult IQ.

Thus, frontal cortical maturation during adolescence is about a more efficient brain, not more brain. This is shown in easily misinterpreted neuroimaging studies comparing adolescents and

adults. A frequent theme is how adults have more executive control over behavior during some tasks than do adolescents and show more frontal cortical activation the time. Now find a task where, atypically, adolescents manage a level of executive control equal to that of adults. In those situations adolescents show *more* frontal activation than adults—equivalent regulation takes less effort in a well-pruned adult frontal cortex.

That the adolescent frontal cortex is not yet lean and mean is demonstrable in additional ways. For example, adolescents are not at adult levels of competence at detecting irony and, when trying to do so, activate the dmPFC more than do adults. In contrast, adults show more activation in the fusiform face region. In other words, detecting irony isn't much of a frontal task for an adult; one look at the face is enough.

What about white matter in the frontal cortex (that indirect measure of myelination of axons)? Here things differ from the overproduce-then-prune approach to gray matter; instead, axons are myelinated throughout adolescence. This allows neurons to communicate in a more rapid, coordinated manner—as adolescence progresses, activity in different parts of the frontal cortex becomes more correlated as the region operates as more of a functional unit.

This is important. When learning neuroscience, it's easy to focus on individual brain regions as functionally distinct (and this tendency worsens if you then spend a career studying just one of them). As a measure of this, there are two high-quality biomedical journals out there, one called Cortex, the other Hippocampus, each publishing papers about its favorite brain region. At neuroscience meetings attended by tens of thousands, there'll be social functions for all the people studying the same obscure brain region, a place where they can gossip and bond and court. But in reality the brain is about circuits, about the patterns of functional connectivity among regions. The growing myelination of the adolescent brain shows the importance of increased connectivity.

Interestingly, other parts of the adolescent brain seem to help out the underdeveloped frontal cortex, taking on some roles that it's not yet ready for. For example, in adolescents but not adults, the ventral striatum helps regulate emotions; we will return to this.

Something else keeps that tyro frontal cortex off-kilter, namely estrogen and progesterone in females and testosterone in males. These hormones alter brain structure and function, including in the frontal cortex, where gonadal hormones change rates of myelination and levels of receptors for various neurotransmitters. Logically. landmarks of adolescent maturation in brain and behavior are less related to chronological age than to the time since puberty onset.

Moreover, puberty is not just about the onslaught of gonadal hormones. It's about how they come online. The defining feature of ovarian endocrine function is the cyclicity of hormone release—"It's that time of the month." In adolescent females puberty does not arrive full flower, so to speak, with one's first period. Instead, for the first few years only about half of cycles actually involve ovulation and surges of estrogen and progesterone. Thus, not only are young adolescents experiencing these first ovulatory cycles, but there are also higher-order fluctuations in ether the ovulatory fluctuation occurs. Meanwhile, while adolescent males don't

have equivalent hormonal gyrations, it can't help that their frontal cortex keeps getting hypoxic from the priapic blood flow to the crotch.

Thus, as adolescence dawns, frontal cortical efficiency is diluted with extraneous synapses failing to make the grade, sluggish communication thanks to under-myelination, and a jumble of uncoordinated sub-regions working at cross-purposes; moreover, while the striatum is trying to help, a pinch hitter for the frontal cortex gets you only so far. Finally, the frontal cortex is being pickled in that ebb and flow of gonadal hormones. No wonder they act adolescent.

## *Frontal Cortical Changes in Cognition in Adolescence*

To appreciate what frontal cortical maturation has to do with our best and worst behaviors, it's helpful to first see how such maturation plays out cognitive realms.

During adolescence there's steady improvement in working memory, flexible rule use, executive organization, and frontal inhibitory regulation (e.g., task shifting). In general, these improvements are accompanied by increasing activity in frontal regions during tasks, with the extent of the increase predicting accuracy.

Adolescents also improve at mentalization tasks (understanding someone else's perspective). By this I don't mean emotional perspective (stay tuned) but purer cognitive challenges, like understanding what objects look like from someone else's perspective. The improvement in detecting irony reflects improvement in abstract cognitive perspective taking.

## *Frontal Cortical Changes in Emotional Regulation*

Older teenagers experience emotions more intensely than do children or adults, something obvious to anyone who ever spent time as a teenager. For example, they are more reactive to faces expressing strong emotions. In adults, looking at an "affective facial display" activates the amygdala, followed by activation of the emotion-regulating vmPFC as they habituate to the emotional content. In adolescence, though, the vmPFC response is less; thus the amygdaloid response keeps growing.

Chapter 2 introduced "reappraisal," in which responses to strong emotional stimuli are regulated by thinking about them differently. Get a bad grade on an exam, and there's an emotional pull toward "I'm stupid"; reappraisal might lead you instead to focus on your not having studied or having had a cold, to decide that the outcome was situational, rather than a function of your unchangeable constitution.

Reappraisal strategies get better during adolescence, with logical neurobiological underpinnings. Recall how in early adolescence, the ventral striatum, trying to be helpful, takes on some frontal tasks (fairly ineffectively, as it's working above its pay grade). At that age reappraisal engages the ventral striatum; more activation predicts less amygdaloid activation and better emotional regulation. As the adolescent matures, the prefrontal cortex takes over the task, and emotions get steadier.

Bringing the striatum into the picture brings up dopamine and reward, thus bringing up the predilection of adolescents for bungee jumping.

## ADOLESCENT RISK TAKING

In the foothills of the Sierras are California Caverns, a cave system that leads, after an initial narrow, twisting 30-foot descent down a hole, to an abrupt 180-foot drop (now navigable by rappelling). The Park Service has found skeletons at the bottom dating back centuries, explorers who took one step too far in the gloom. And the skeletons are always those of adolescents.

As shown experimentally, during risky decision making, adolescents activate the prefrontal cortex less than do adults; the less activity, the poorer the risk assessment. This poor assessment takes a particular form, as shown by Sarah-Jayne Blakemore of University College London. Have subjects estimate the likelihood of some event occurring (winning the lottery, dying in a plane crash); then tell them the actual likelihood. Such feedback can constitute good news (i.e., something good is actually more likely than the person estimated, or something bad is less likely). Conversely, the feedback can constitute bad news. Ask subjects to estimate the likelihood of the same events again. Adults incorporate the feedback into the new estimates. Adolescents update their estimates as adults do for good news, but feedback about bad news barely makes a dent. (Researcher: "How likely are you to have a car accident if you're driving while drunk?" Adolescent: "One chance in a gazillion." Researcher: "Actually, the risk is about 50 percent; what do you think your own chances are now?" Adolescent: "Hey, we're talking about me; one chance in a gazillion.") We've just explained why adolescents have two to four times the rate of pathological gambling as do adults.

So adolescents take more risks and stink at risk assessment. But it's not just that teenagers are more willing to take risks. After all, adolescents and adults don't equally desire to do something risky and the adults simply don't do it because of their frontal cortical maturity. There is an age difference in the sensations sought—adolescents are tempted to bungee jump; adults are tempted to cheat on their low-salt diet. Adolescence is characterized not only by more risking but by more novelty seeking as well.

Novelty craving permeates adolescence; it is when we usually develop our stable tastes in music, food, and fashion, with openness to novelty declining thereafter. And it's not just a human phenomenon. Across the rodent life span, it's adolescents who are most willing to eat a new food. Adolescent novelty seeking is particularly strong in other primates. Among many social mammals, adolescents of one sex leave their natal group, emigrating in another population, a classic means to avoid inbreeding. Among impalas there are groups of related females and offspring with one breeding male; the other males knock around disconsolately in "bachelor herds," each scheming to usurp the breeding male. When a young male hits puberty, he is driven from the group by the breeding male (and to avoid some Oedipus nonsense this is unlikely to be his father, who reigned many breeding males ago).

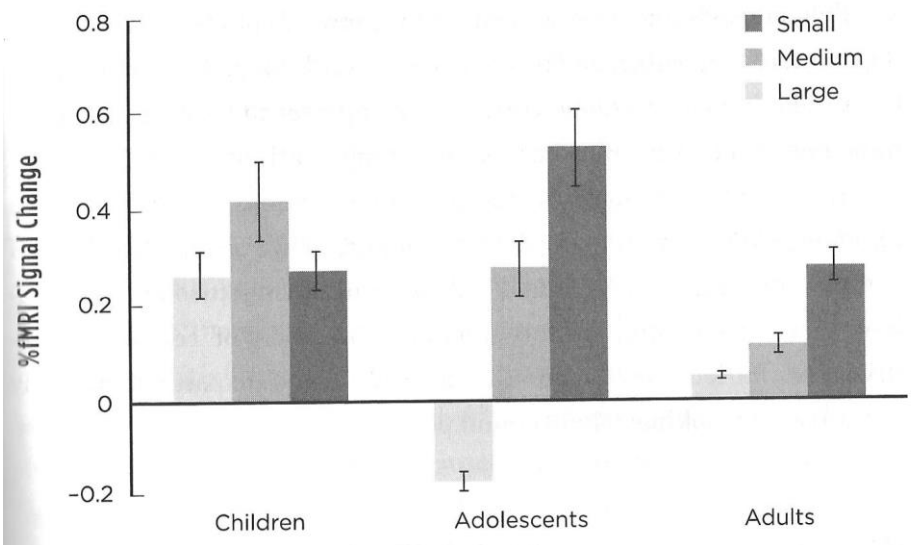
But not among primates. Take baboons. Suppose two troops encounter - each other at some

natural boundary—say, a stream. The males threaten each other for a while, eventually get bored, and resume whatever they were doing. Except there's an adolescent, standing at the stream's edge riveted. New baboons, a whole bunch of 'em! He runs five steps toward them, runs back four, nervous, agitated. He gingerly crosses and sits on the other bank, scampering back should any new baboon glance at him.

So begins the slow process of transferring, spending more time each day with the new troop until he breaks the umbilical cord and spends the night. He wasn't pushed out. Instead, if he has to spend one more day with the same monotonous baboons he's known his whole life, he'll scream. Among adolescent chimps it's females who can't get off the farm fast enough. We primates aren't driven out at adolescence. Instead we desperately crave novelty.

Thus, adolescence is about risk taking and novelty seeking. Where does the dopamine reward system fit in?

The ventral tegmentum is the source of the mesolimbic dopamine projection to the nucleus accumbens, and of the mesocortical dopamine projection to the frontal cortex. During adolescence, dopamine projection density and signaling steadily increase in both pathways (although novelty seeking itself peaks at mid-adolescence, probably reflecting the emerging frontal regulation after that).




*Changes in the amount of dopaminergic activity in the "reward center" of the brain following different magnitudes of reward. For the adolescents, the highs are higher, the lows lower.*

It's unclear how much dopamine is released in anticipation of reward. Some studies show more anticipatory activation of reward pathways in adolescents than in adults, while others show the opposite, with the least dopaminergic responsiveness in adolescents who are most risk taking.

Age differences in absolute levels of dopamine are less interesting than differences in patterns of release. In a great study, children, adolescents, and adults in brain scanners did some task where correct responses produced monetary rewards of varying sizes (see figure above)." During this, prefrontal activation in both children and adolescents was diffuse and unfocused. However, activation in the nucleus accumbens in adolescents was distinctive. In children, a correct answer produced roughly the same increase in activity regardless of size of reward. In adults, small, medium, and large rewards caused small, medium,

and large increases in accumbens activity. And adolescents? After a medium reward things looked the same in kids and adults. A large reward produced a humongous increase, much bigger than in adults. And the small reward? Accumbens activity declined. In other words, adolescents experience bigger-than-expected rewards more positively than do adults and smaller-than-expected rewards as aversive. A gyrating top, nearly skittering out of control.

This suggests that in adolescents strong rewards produce exaggerated dopaminergic signaling, and nice sensible rewards for prudent actions feel lousy. The immature frontal cortex hasn't a prayer to counteract a dopamine system like this. But there is something puzzling.

Amid their crazy, unrestrained dopamine neurons, adolescents have reasoning skills that, in many domains of perceiving risk, match those of adults. Yet despite that, logic and reasoning are often jettisoned, and adolescents act adolescent. Work by Laurence Steinberg of Temple University has identified a key juncture where adolescents are particularly like to leap before looking: when around peers.

## PEERS, SOCIAL ACCEPTANCE, AND SOCIAL EXCLUSION

Adolescent vulnerability to peer pressure from friends, especially peers they want to accept them as friends, is storied. It can also be demonstrated experimentally. In one Steinberg study adolescents and adults took risks at the same rate in a video driving game. Adding two peers to egg them on had no effect on adults but tripled risk taking in adolescents. Moreover, in neuroimaging studies, peers egging subjects on (by intercom) lessens vmPFC activity and enhances ventral striatal activity in adolescents but not adults.

Why do adolescents' peers have such social power? For starters, adolescents are more social and more complexly social than children or adults. For example, a 2013 study showed that teens average more than four hundred Facebook friends, far more than do adults. Moreover, teen sociality is particularly about affect, and responsiveness to emotional signaling—recall the greater limbic and lesser frontal cortical response to emotional faces in adolescents. And teens don't rack up four hundred Facebook friends for data for their sociology doctorates. Instead there is the frantic need to belong.

This produces teen vulnerability to peer pressure and emotional contagion. Moreover, such pressure is typically "deviance training," increasing the odds of violence, substance abuse, crime, unsafe sex, and poor health habits (few teen gangs pressure kids to join them in tooth flossing followed by random acts of kindness). For example, in college dorms the excessive drinker is more likely to influence the teetotaling roommate than the reverse. The incidence of eating disorders in adolescents spreads among peers with a pattern resembling viral contagion. The same occurs with depression among female adolescents, reflecting their tendency to “co-ruminate" on problems, reinforcing one another's negative affect.

Neuroimaging studies show the dramatic sensitivity of adolescents to peers. Ask adults to think about what they imagine others think of them, then about what they think of themselves. Two different, partially overlapping networks of frontal and limbic structures activate for the two

tasks. But with adolescents the two profiles are the same. "What do you think about yourself?" is neurally answered with "Whatever everyone else thinks about me."

The frantic adolescent need to belong is shown beautifully in studies of the neurobiology of social exclusion. Naomi Eisenberger of UCLA developed the fiendishly clever "Cyberball" paradigm to make people feel snubbed. The subject lies in a brain scanner, believing she is playing an online game with two other people (naturally, they don't exist—it's a computer program). Each player occupies a spot on the screen, forming a triangle. The players toss a virtual ball among themselves; the subject is picking whom to throw to and believes the other two are doing the same. The ball is tossed for a while; then, unbeknownst to the subject, the experiment begins—the other two players stop throwing the ball to her. She's being excluded by those creeps. In adults there is activation of the periaqueductal gray, anterior cingulate, amygdala, and insular cortex. Perfect—these regions are central to pain perception, anger, and disgust.

And then, after a delay, the ventrolateral PFC activates; the more activation, the more the cingulate and insula are silenced and the less subjects report being upset afterward. What's this delayed vlPFC activation about? "Why am I getting upset? This is just a stupid game of catch." The frontal cortex comes to the rescue with perspective, rationalization, and emotion regulation.

Now do the study with teenagers. Some show the adult neuroimaging profiles; these are ones who rate themselves as least sensitive to rejection and who spend the most time with friends. But for most teenagers, when social exclusion occurs, the vlPFC barely activates; the other changes are bigger than in adults, and the subjects report feeling lousier—adolescents lack sufficient frontal forcefulness to effectively hand-wave about why it doesn't matter. Rejection hurts adolescents more, producing that stronger need to fit in.

One neuroimaging study examined a neural building block of conformity. Watch a hand moving, and neurons in premotor regions that contribute to moving your own hand become a bit active—your brain is on the edge of imitating the movement. In the study, ten-year-olds watched film clips of hand movements or facial expressions; those most vulnerable to peer influence (assessed on a scale developed by Steinberg) had the most premotor activation—but only for emotional facial expressions. In other words, kids who are more sensitive to peer pressure are more prepared to imitate someone else's emotionality. (Given the age of the subjects, the authors framed their findings as potentially predictive of later teen behavior.)

This atomistic level of explaining conformity might predict something about which teens are likely to join in a riot. But it doesn't tell much about who chooses not to invite someone to a party because the cool kids think she's a loser.

Another study showed neurobiological correlates of more abstract peer conformity. Recall how the adolescent ventral striatum helps the frontal cortex reappraise social exclusion. In this study, young adolescents most resistant to peer influence had the strongest such ventral striatal responses. And where might a stronger ventral striatum come from? You know the

answer by now.

## EMPATHY, SYMPATHY, AND MORAL REASONING

By adolescence, people are typically pretty good at perspective taking, seeing the world as someone else would. That's usually when you'll first hear the likes of "Well, I still disagree, but I can see how he feels that way, given his experience."

Nonetheless, adolescents are not yet adults. Unlike adults, they are still better at first- than third-person perspective taking ("How would you feel in her situation?" versus "How does she feel in her situation?"). Adolescent moral judgments, while growing in sophistication, are still not at adult levels. Adolescents have left behind children's egalitarian tendency to split resources evenly. Instead, adolescents mostly make meritocratic decisions (with a smattering of utilitarian and libertarian viewpoints thrown in); meritocratic thinking is more sophisticated than egalitarian, since the latter is solely about outcomes, while the former incorporates thinking about causes. Nonetheless, adolescents' meritocratic thinking is less complex than adults'—for example, adolescents are as adept as adults at understanding how individual circumstances impact behavior, but not at understanding systemic circumstances.

As adolescents mature, they increasingly distinguish between intentional and accidental harm, viewing the former as worse. When contemplating the latter, there is now less activation of three brain regions related to pain processing, namely the amygdala, the insula, and the pre-motor areas (the last reflecting the tendency to cringe when hearing about pain being inflicted). Meanwhile, there is increasing dlPFC and vmPFC activation when contemplating intentional harm. In other words, it is a frontal task to appreciate the painfulness of someone's being harmed intentionally.

As adolescents mature, they also increasingly distinguish between harm to people and harm to objects (with the former viewed as worse); harm to people increasingly activates the amygdala, while the opposite occurs for harm to objects. Interestingly, as adolescents age, there is less differentiation between recommended punishment for intentional and unintentional damage to objects. In other words, the salient point about the damage becomes that, accidental or otherwise, the damn thing needs to be fixed—even if there is less crying over spilled milk, there is no less cleaning required.

What about one of the greatest things about adolescents, with respect to this book's concerns—their frenzied, agitated, incandescent ability to feel someone else's pain, to feel everyone's pain, to try to make everything right? A later chapter distinguishes between sympathy and empathy—between feeling for someone in pain and feeling as that someone. Adolescents are specialists at the latter, where the intensity of feeling as the other can border on being the other.

This intensity is no surprise, being at the intersection of many facets of adolescence. There are the abundant emotions and limbic gyrations. The highs are higher, the lows lower, empathic pain scalds, and the glow of doing the right thing makes it seem plausible that we are here for a

purpose. Another contributing factor is the openness to novelty. An open mind is a prerequisite for an open heart, and the adolescent hunger for new experiences makes possible walking miles in lots of other people's shoes. And there is the egoism of adolescence. During my late adolescence I hung out with Quakers, and they'd occasionally use the aphorism "All God has is thee." This is the God of limited means, not just needing the help of humans to right a wrong, but needing you, you only, to do so. The appeal to egoism is tailor-made for adolescents. Throw in inexhaustible adolescent energy plus a feeling of omnipotence, and it seems possible to make the world whole, so why not?

As will be seen, one instance where empathic responses don't necessarily lead to acts is when we think enough to rationalize ("It's overblown as a problem" or "Someone else will fix it"). But feeling too much has problems as well. Feeling someone else's pain is painful, and people who do so most strongly, with the most pronounced arousal and anxiety, are actually *less* likely to act prosocially. Instead the personal distress induces a self-focus that prompts avoidance—"This is too awful; I can't stay here any longer." As empathic pain increases, your own pain becomes your primary concern.

In contrast, the more individuals can regulate their adverse empathic emotions, the more likely they are to act prosocially. Related to that, if a distressing, empathy-evoking circumstance increases your heart rate, you're less likely to act prosocially than if it decreases it. Thus, one predictor of who actually acts is the ability to gain some detachment, to ride, rather than be submerged, by the wave of empathy.

Where do adolescents fit in, with their hearts on their sleeves, fully charged limbic systems, and frontal cortices straining to catch up? It's obvious. A tendency toward empathic hyperarousal that can disrupt acting effectively.

This adolescent empathy frenzy can seem a bit much for adults. But when I see my best students in that state, I have the same thought—it used to be so much easier to be like that. My adult frontal cortex may enable whatever detached good I do. The trouble, of course, is how that same detachment makes it easy to decide that something is not my problem.

## ADOLESCENT VIOLENCE

Obviously, the adolescent years are not just about organizing bake sales to fight global warming. Late adolescence and early adulthood are when violence peaks, whether premeditated or impulsive murder, Victorian fisticuffs or handguns, solitary or organized (in or out of a uniform), focused on a stranger or on an intimate partner. And then rates plummet. As has been said, the greatest crime-fighting tool is a thirtieth birthday.

On a certain level the biology underlying the teenaged mugger is similar to that of the teen who joins the Ecology Club and donates his allowance to help save the mountain gorillas. It's the usual—heightened emotional intensity, craving for peer approval, novelty seeking, and, oh, that frontal cortex. But that's where similarities end.

What underlies the adolescent peak in violence? Neuroimaging shows nothing particularly distinct about it versus adult violence. Adolescent and adult psychopaths both have less sensitivity of the PFC and the dopamine system to negative feedback, less pain sensitivity, and less amygdaloid/frontal cortical coupling during tasks of moral reasoning or empathy.

Moreover, the adolescent peak of violence isn't caused by the surge in testosterone; harking back to chapter 4, testosterone no more causes violence in adolescents than it does in adult males. Moreover, testosterone levels peak during early adolescence, but violence peaks later.

The important point is that an average adolescent doesn't have the self-regulation or judgment of an average adult. This can prompt us to view teenage offenders as having less responsibility than adults for criminal acts. An alternative view is that even amid poorer judgment and self-regulation, there is still enough to merit equivalent sentencing. The former view has held in two landmark Supreme Court decisions.

In the first, 2005's *Roper v. Simmons,* the Court ruled 5-4 that executing someone for crimes committed before age eighteen is unconstitutional, violating the Eighth Amendment ban on cruel and unusual punishment. Then in 2012's *Miller v. Alabama*, in another 5-4 split, the Court banned mandatory life sentences without the chance of parole for juvenile offenders, on similar grounds.

The Court's reasoning was straight out of this chapter. Writing for the majority in *Roper v. Simmons*, Justice Anthony Kennedy said:

> First, [as everyone knows, a] lack of maturity and an underdeveloped sense of responsibility are found in youth more often than in adults and are more understandable among the young. These qualities often result in impetuous and ill-considered actions and decisions.

I fully agree with these rulings. But, to show my hand early, I think this is just window dressing. I think the science encapsulated in this book should transform every nook and cranny of the criminal justice system.

## A FINAL THOUGHT: WHY CAN'T THE FRONTAL CORTEX JUST ACT ITS AGE?

As promised, this chapter's dominant fact has been the delayed maturation of the frontal cortex. Why should the delay occur? Is it because the frontal cortex is the brain's most complicated construction project?

Probably not. The frontal cortex uses the same neurotransmitter systems as the rest of the brain and uses the same basic neurons. Neuronal density and complexity of interconnections are similar to the rest of the (fancy) cortex. It isn't markedly harder to build frontal cortex than any other cortical region.

Thus, it is not likely that if the brain "could" grow a frontal cortex as fast as the rest of the

cortex, it "would." Instead I think there was evolutionary selection for delayed frontal cortex maturation.

If the frontal cortex matured as fast as the rest of the brain, there'd be none of the adolescent turbulence, none of the antsy, itchy exploration and creativity, none of the long line of pimply adolescent geniuses who dropped out of school and worked away in their garages to invent fire, cave painting, and the wheel.

Maybe. But this just-so story must accommodate behavior evolving to pass on copies of the genes of individuals, not for the good of the species. And for every individual who scored big time reproductively thanks to adolescent inventiveness, there've been far more who instead broke their necks from adolescent imprudence. I don't think delayed frontal cortical maturation evolved so that adolescents could act over the top.

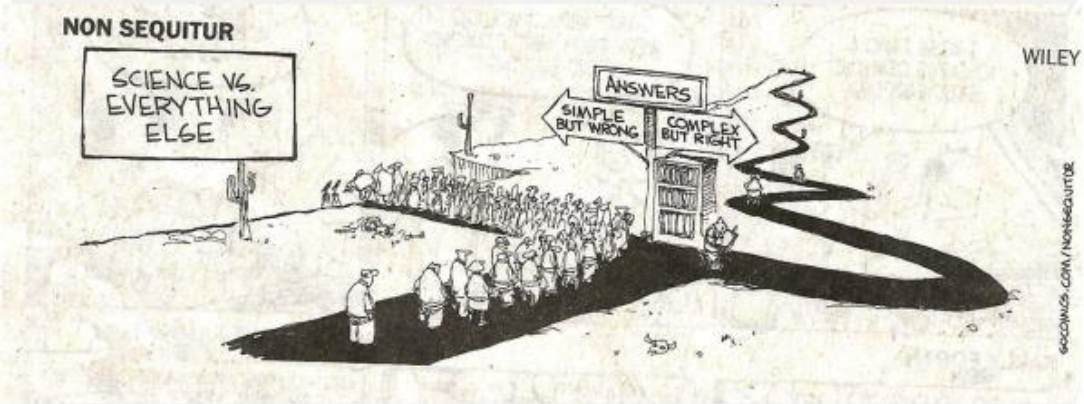
Instead, I think it is delayed so that the brain gets it right. Well, duh; the brain needs to "get it right" with all its parts. But in a distinctive way in the frontal cortex. The point of the previous chapter was the brain's plasticity—new synapses form, new neurons are born, circuits rewire, brain regions expand or contract—we learn, change, adapt. This is nowhere more important than in the frontal cortex.

An oft-repeated fact about adolescents is how "emotional intelligence" and "social intelligence" predict adult success and happiness better than do IQ or SAT scores. It's all about social memory, emotional perspective taking, impulse control, empathy, ability to work with others, self-regulation. There is a parallel in other primates, with their big, slowly maturing frontal cortices. For example, what makes for a "successful" male baboon in his dominance hierarchy? *Attaining* high rank is about muscle, sharp canines, well-timed aggression. But once high status is achieved, maintaining it is all about social smarts—knowing which coalitions to form, how to intimidate a rival, having sufficient impulse control to ignore most provocations and to keep displacement aggression to a reasonable level. Similarly, among male rhesus monkeys a large prefrontal cortex goes hand in hand with social dominance.

Adult life is filled with consequential forks in the road where the right thing is definitely harder. Navigating these successfully is the portfolio of the frontal cortex, and developing the ability to do this right in each context requires profound shaping by experience.

This may be the answer. The brain is heavily influenced by genes. But from birth through young adulthood, the part of the human brain that most defines us is less a product of the genes with which you started life than of what life has thrown at you. Because it is the last to mature, by definition the frontal cortex is the brain region least constrained by genes and most sculpted by experience. This must be so, to be the supremely complex social species that we are. Ironically, it seems that the genetic program of human brain development has evolved to, as much as possible, free the frontal cortex from genes.

# BEHAVIORAL ECONOMICS




## CLASS 4: SCIENCE AND MATH

## POPULAR UNDERSTANDING OF MAJOR SCIENTIFIC CONCEPTS

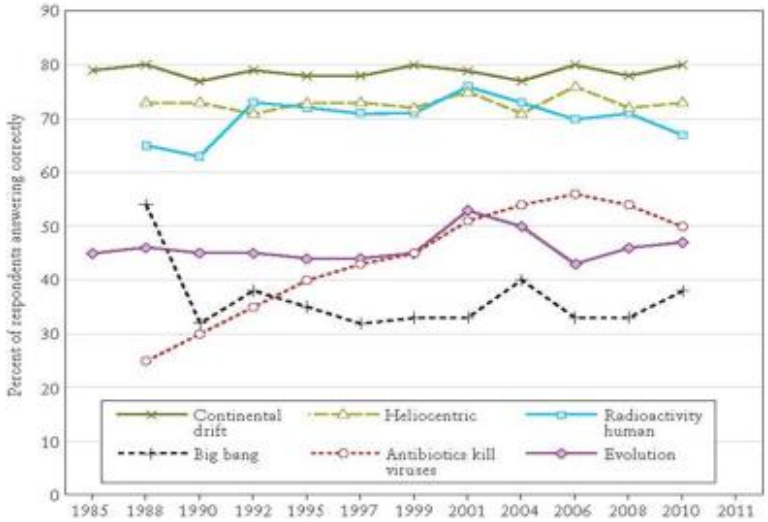



*Figure 41.* Popular understanding of major scientific concepts. People generally accept continental drift and the heliocentric view, while the big bang theory of the origin of the universe and evolutionary theories are correctly understood by less than half of Americans.

From "Climate Casino"

# SURVEYS RESULTS AND CURVE FIT: "DO YOU THINK THE EARTH IS WARMING?"

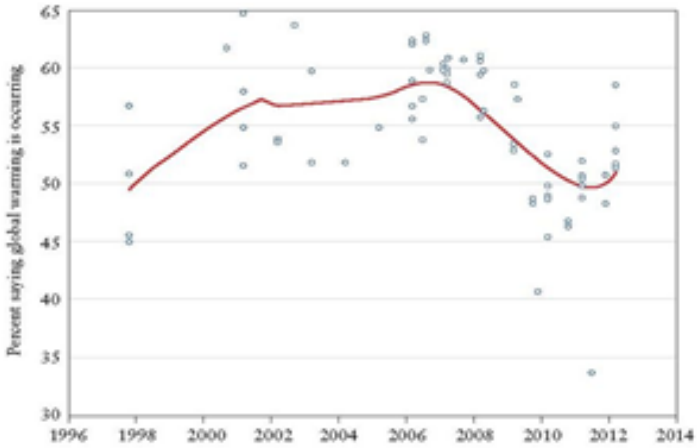



*Figure 42:* Fraction of population saying that global warming is real. This figure synthesizes data on public views in the United States on global warming. While the questions differ, they typically are "Do you think the earth is warming?" The dots are the individual surveys, while the solid line is a statistical fit.

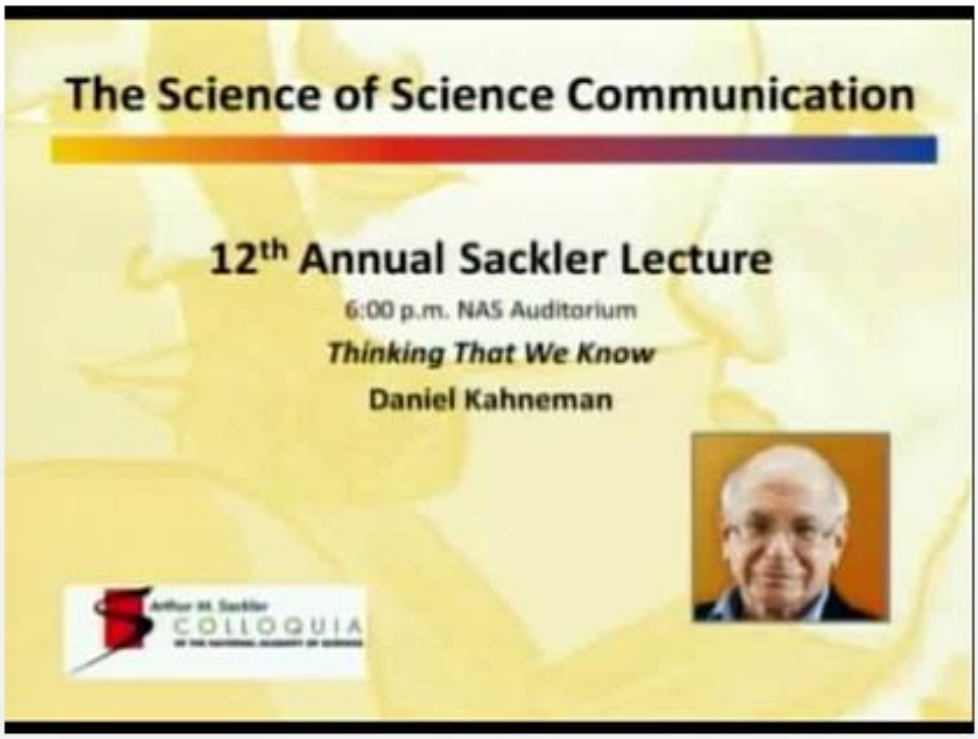


# SAVING THE PLANET

- Those that pollute do not pay the full costs that are imposed on the environment. Economist call these "externalities."
- Abandoning wasteful and ineffient uses of energy is an underutilized strategy for addressing pollution and global warming.
- Many hotels in Europe require that the room key be inserted in a slot in order to turn on the lights. When the key is removed the lights and air conditioning go off.
- The government can address this issue by increasing taxes on the offending product or "cap and trade" systems. In 1990 amendments to the clean air act were passed by Congress that relied on an emission trading system to control "acid rain."
- In recent years our government has chosen to ignore the problems.
- Thaler and Sunstein suggest* that the government should create a Greenhouse Gas Inventory (GGI) that would permit people to readily see the various sources of greenhouse gasses and track changes over time. Such a "Nudge" would not be costly and would allow consumers to take actions that consistent with their concerns.

* *Nudge*, Thaler and Sunstein, 2009, Chapter 12

# DANIEL KAHNEMAN




# WHAT DISTINGUISHES SCIENCE FROM OTHER SYSTEMS OF BELIEF? THE SCIENTIFIC METHOD:

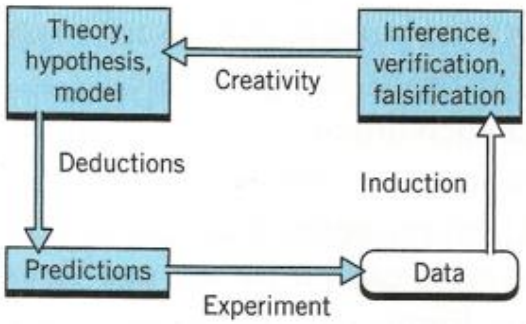



**Figure 2-7** Aspects of science fit together in a never-ending cycle of hypothesis, prediction, data gathering, and verification.

## WHY IS IT SO HARD TO MAKE HEALTHY DECISIONS?

## NUDGE: QUIT SMOKING WITHOUT A PATCH

- Despite its serious health effects, smoking is extremely commonplace in the Philippines. In 2009, 28.3 percent of Filipinos aged 15 years or older were current smokers.
- CARES (Committed Action to Reduce and End Smoking) runs a program to help people stop.
- A smoker opens an account with a minimum balance of $1.
- For six monts she deposits the amount of money she would otherwise spend on cigarettes into the account.
- After 6 months the client takes a urine test to confirm that she has not smoked recently.
- If she passes the test she gets the money back. If she fails the account is closed and the money is donated to charity.
- Individuals who were *offered* a CARES contract were 3.3 to 5.8 % more likely to pass a urine test after six months than those in the comparison group. This represents an over-35 % increase in the likelihood of smoking cessation compared to baseline.

## NUDGE: GAMBLING SELF-BANS

- It would be nice if we could ban state governments from exploiting a monopoly on gambling. Particularly lotteries that pay off roughly fifty cents on the dollar.
- Compulsive gambling affects 2%-3% of Americans. Gambling addicts need real help.
- With the publication of *DSM-5,* The American Psychiatric Association (APA) officially classified pathological gambling as an addiction.
- Several states including Illinois, Indiana, and Missouri have enacted laws enabling gamblers to put themselves on a list that bans than from entering casinos.

## DESTINY HEALTH PLANS

- Destiny Health Plans gives people an inventive to make healthy choices.
- A participant earns "Vitality Bucks" if he works out in a health club, has a child join a soccer league or completes a blood pressure check with normal results.
- It is a clever effort to combine heath insurance with nudges designed to get people to live heathier lives.
- "We use behavioral economics and actuarial science to create effective engagement strategies and compelling incentives that drive long-term behavior change and real business results… Destiny Health member data shows that engaged members experience a 15 percent drop in claims over a three-year period," according to their web site.

# LOWERING YOUR ENERGY BILL


# STATISTICS AND BASE RATE

- Tom is a graduate student at a large university. Please rank the following five fields of graduate specialization in order of likelihood that Tom is a student in each of these fields:
  - business administration
  - computer science
  - engineering
  - medicine
  - library science
- You know immediately that the relative size of enrollment in the different fields is the key to a solution.
- To decide which is more likely you need to know how many students are enrolled in each field. This is called **base rate.**
- When this experiment was first conducted by Kahneman and Tversky, the average answer was:
  - computer science
  - engineering
  - business administration
  - library science
  - medicine
- Now what if people are also given a personality sketch of Tom? (e.g. intelligent but lacking in creativity, has a need for order, his writing is rather dull)
- If asked again to estimate the likelihood that Tom is a student in each of the fields, they tend to ignore the base rate information and center their choices around intuitive stereotypes associated with each field *

* *Thinking Fast and Slow*, Kahneman, Ch. 14

# CAUSES TRUMP STATISTICS

- Consider the following scenario:
  - A cab was involved in a hit and run accident
  - Two cab companies, the Green and the Blue operate in the city of which 85% are Green and 15% are Blue.
  - A witness identified the cab as blue. When tested under the circumstances that existed that night, the witness identified the correct color of the cab 80% of the time.
- What is the probability that the cab involved in the accident was Blue?

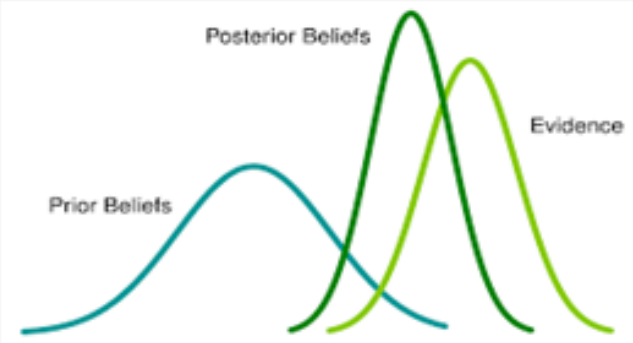
- This is a standard problem in Bayesian inference. The correct answer is 41%. However most people ignore the base rate and go with the witness. The most common answer is 80%.
- Results having a causal interpretation have a stronger effect on our thinking than non-causal information. But even compelling causal statistics will not change long held beliefs or beliefs rooted in personal experience.

Bayes' theorem mathematically describes the probability of an event, based on prior conditions that are related.

Solution to the previous problem can be calculated using Bays theorem to combine the prior probabilities with the posterior probabilities:

$$\frac{.80 \times .15}{.80 \times .15 + .20 \times .85} = .41$$

Thomas Bayes, 1701-1761




See Wikipedia, *Bayes' theorem* for a complete description.

# TAMING INTUITIVE PREDICTIONS

- Question: Julie is currently a senior in a state university. She read fluently when she was four years old. What is her GPA?
- In judging this question your system 1 goes to work and WYSIATI applies. Since there is logically some correlation between precocity and later GPA you usually estimate a rather high GPA. But how much are they correlated?
- Kahneman's recommended steps:
  1. Start with an estimate of average GPA.
  2. Determine the GPA that matches your impression of the evidence.
  3. Estimate the correlation between reading precocity and GPA.
  4. If the correlation is .30 move 30% of the distance from the average to the matching GPA.
- A good place to start is to ask yourself: how would an average performer perform? Then you need to add in any evidence with a weighting factor representing the correlation between the evidence and the specific question you are trying to evaluate.

# *Nudge* by Thaler and Sunstein
# Chapter 10, Prescription Drugs: Part D for Daunting

Prescription drug coverage was a hot topic during the 2000 presidential campaign. As a solution, Democrat Al Gore proposed a classic government mandate. Gore wanted to add prescription drug coverage to Medicare in a single plan, assemble a panel of medical experts to work out the specifics, and offer the package to all seniors. Republican George W. Bush, in contrast, offered what might be considered a good example of the theme of his campaign: compassionate conservatism. Indeed, Bush tried to combine compassionate conservatism with a major role for free markets and the private sector. He offered seniors an expensive new entitlement program—but one that featured a wide variety of drug plans devised by private health care companies and that let consumers choose whether to join and which plan to pick.

Three years later, President Bush's version passed on a narrow vote in Congress. The largest overhaul in Medicare's history, Bush's plan created a half-trillion-dollar federal subsidy for prescription drug coverage called Part D. "The reason why we felt it was necessary to provide choices is because we want the system to meet the needs of the consumer," President Bush told a clubhouse of Florida seniors in 2006, with the plan's rollout under way. "The more choices you have, the more likely it is you'll be able to find a program that suits your specific needs. In other words, one-size-fits-all is not a consumer-friendly program. And I believe in consumers, I believe in trusting people."

President Bush's trust in American seniors left them with a great deal of decision-making responsibility. But this was no laissez-faire system. The national government imposed a lot of structure. Before consumer even begin to choose, the government set minimum coverage requirements and approved all private plans. This system of constrained choice might seem like a nice example of libertarian paternalism in action. And in fact, we think that on some dimensions Bush was on the track. As a health care delivery system, Part D met its planner's expectations reasonably well. As a piece of choice architecture, however, it suffered from a cumbersome design that impeded good decision making. It offered a menu with lots of choices, which is fine, but it had four major defects:

- It gave participants little guidance to help them make the best selections from that menu.
- Its default option for most seniors was non-enrollment.
- It chose a default at random (!) for six million people who were a automatically enrolled, and it actively resisted efforts to match people plans based on their prescription drug histories.
- It failed to serve the most vulnerable population, specifically the poor and the poorly educated.

Do not misunderstand. Part D has done a lot of good. Contrary to charges of the critics, it has not been an unmitigated disaster. But there is plenty of room for better choice architecture.

Our discussion in this chapter will be fairly detailed; it is difficult to understand the program, and what is wrong with it, without a sense of key choices and where they went sour. But if the four defects are kept in mind, the forest will not be lost for the trees.

## Design of Medicare Part D

Before Part D, about half of all American seniors—approximate twenty-one million—had some form of prescription drug coverage through private plans or a government source such as the Department Veterans Affairs. Government officials had high hopes of covering the rest through Part D. The working principle was to provide seniors with as many federally approved choices as possible. The result was a policy with six key features.

1. For most people, Part D is a voluntary plan; you benefit only if you enroll in it. An exception applies to 6.2 million low-income seniors and disabled people who were previously covered by Medicaid (the government medical insurance program for the poor). These two groups are supposed to choose from a subset of the private plans, namely the cheapest and most basic plans meeting certain benchmarks (in 2007 states had between five and twenty basic plans). Anyone who does not make an active choice is enrolled randomly into one of these plans.
2. The initial enrollment period ran from November 2005 to May 2006, with open enrollment periods at the end of every subsequent year. Seniors who do not enroll when they become eligible, and who lack a comparable private plan, face a penalty on their premiums for every month they delay.
3. Seniors can enroll in a stand-alone prescription drug plan or a joint Medicare–Prescription Drug plan.*
4. Plans differ across states, from 45 stand-alone plans in Alaska to 66 in West Virginia and Pennsylvania. Most states offer between 50 and 6o stand-alone plans and between 15 and 142 joint plans. The total number available plans has increased since the law was enacted.
5. During the initial enrollment period, the government, with help from such groups as AARP (formerly known as the American Association for Retired People, in 1999 the organization shortened its name to remove the "R" word from its title), sponsored a $400 million public awareness campaign encouraging people to choose a plan. Medicare officials, including the secretary of health and human services, traveled the country in a giant blue bus to promote the program. Companies also sent out their own advertisements. Currently, seniors are advised to "rely on advice from people you know or trust," "choose a plan you are already familiar with," or use a customized guide called the Medicare Prescription Drug Plan Finder on the Medicare Web site.
6. Coverage starts with the first prescription a patient needs, but then stops for a while after the patient has spent a certain amount of money, only to start up again when another spending plateau is reached. In the popular press, this coverage gap is usually described as the "doughnut hole." Because we know well that discussion of the details of Plan D can cause dangerous headaches even without any mention of the doughnut hole, we will consign any further discussion of this issue to the endnotes. Let's just say that no economist would ever recommend an insurance policy with this feature.

*stand-alone plans are commonly purchased by individuals who already have separate health insurance coverage through traditional Medicare, a pension plan, or a private employer. Joint plans are for those enrolled in Medicare Advantage, a special series of privately operated plans (health-maintenance organizations [HMOs], preferred provider organizations [PPOs], and private fee-for-service plans) that tend to provide more benefits than the traditional Medicare program but limit doctor choice.

If the people eligible for these plans were Econs, none of these design features would be a problem. "If consumers are up to this task, then their choices will ensure that the plans, and insurers, that succeed in the market are ones that meet their needs," writes the Nobel Prize winner Daniel McFadden, a University of California–Berkeley economist who has studied Part D extensively. "However, if many are confused or confounded, the market will not get the signals it needs to work satisfactorily." With so many complex plans to choose from, it should not be a huge surprise that seniors have had a difficult time sending the right signals.

## Confusion Awaiting Clarity

As the six-month window for enrolling in Part D was closing, people were struggling to sign up. Consider the experience of seniors in McAllen, Texas. Known as the City of Palms, McAllen is a town of one hundred thousand people, located in the Rio Grande valley near the Mexican border. A manufacturing hub for multinational corporations, McAllen is the kind of poor town—about one-fifth of residents sixty-five and older live in poverty—that was intended to benefit hugely from Part D.

To obtain those benefits, however, eligible residents first needed to wade through forty-seven prescription drug plans. "Intellectually, the program is a good idea," said Dr. E. Linda Villarreal, a former president of the Hidalgo-Starr County Medical Society. "But there's been total chaos and confusion among most of my patients, who do not understand the system and how to work it." Ramiro Barrera, a co-owner of Richard's Pharmacy in Mission, said: "The new Medicare program is a full-time job. We are swamped with requests for help from beneficiaries."

The experience in McAllen was hardly unique. Seniors everywhere were confused. So were their doctors and pharmacists. Together they overwhelmed Medicare hot lines set up to help people figure out the best plan for them. Critiquing Medicare Part D's complexity became so common that Saturday Night Live spoofed the maze of detail in a phony public service commercial. The commercial promised a simple and easy plan to tech-savvy seniors who had succeeded in completely mastering their computers, iPods, and satellite televisions.

President Bush sympathized with the frustration but said that the program would ultimately be worth the pain. "I knew that when we . . . laid out the idea of giving seniors choices, it would create a little confusion for some," he told the Florida seniors. "I mean, after all, up to now there hadn't been . . . many choices in the system, and all of a sudden, [for] a senior who feels pretty good about things [here comes] old George W. . . and all of a sudden forty-six choices pop up."

How were seniors expected to handle all those choices? President Bush urged them to have patience and to turn to private institutions for assistance. "We encouraged all kinds of people to help," he said. "AARP is helping; NAACP is helping; sons and daughters are helping; faith-based programs are helping people sort through the programs to design a program that meets their needs. I readily concede some seniors have said, there are so many choices, I don't think I want to participate. My advice is there is plenty of help for you."

The impulse here was commendable, but you have now read enough to know that offering people forty-six choices and telling them to ask for help is likely to be about as good as no help

at all. And in Medicare Part D's case, many of the groups meant to assist seniors were confused themselves. The confusion spread to medical professionals, who agreed with their patients that the number of plans in the current program bewildered everyone. Others, such as AARP, decided to go into the business of offering insurance plans as well as giving advice about which plan to select, a pretty obvious conflict of interest.

In the end, getting seniors into a plan turned out not to be the biggest problem. Organizations were ultimately successful at signing up large numbers of beneficiaries. As of January 2007 fewer than 10 percent of all Medicare beneficiaries—about four million—had no drug coverage, either through Part D or an equivalent private plan. One-quarter of those in a plan were probably healthy enough that they did not need to enroll immediately. Their participation, however, was crucial to Part D's survival, because they helped to subsidize sick seniors. To federal health officials, the high enrollment was a sign of undeniable success. To this extent, freedom of choice has worked—a nice point for those who reject, as we do, the idea that one size fits all.

Overall, seniors seem happy about the program (as they should be, because it provides them with an enormous government subsidy!). Since the passage of the new Medicare law, disapproval of the program has steadily fallen while approval has risen, in an apparent tribute to rapid learning over time. In November 2005, just as seniors were getting their first taste of forty-plus plans, half of eighteen hundred seniors surveyed had an unfavorable view of the program, compared with 28 percent who viewed it favorably. By November 2006 the unfavorable rating had fallen to 34 percent, while the favorable rating had risen to 42 percent. When asked about their own personal experiences, three out of four held a "very" or "somewhat" positive view of Part D.

Seeing these patterns, a vigorous defender of Part D could claim that, as with any new program, participants underwent a sometimes painful educational process, but, on the whole, were ultimately satisfied with the plan they chose. Overwhelming majorities thought they had made good choices, though for reasons to be developed shortly, we doubt that many had much basis for that evaluation.

Of course it is true that because of learning, once-complicated choices become easier. But we think that there has been a lot less learning about Part D than a casual look suggests. For starters, the high enrollment rates were achieved in part because approximately two-thirds of seniors were easily or automatically enrolled through one of a variety of routes: employer or union plans; Medicaid, Veterans Affairs, or federal employee coverage; or the special, more comprehensive Medicare program known as Medicare Advantage. Advertising campaigns and media coverage certainly boosted awareness, but no one should read the statistics and conclude that thirty-eight million seniors filled out a Part D application because the government asked them to do so.

In addition, many people are still not enrolled in the program, even though it is clear that they should be. Four million uncovered Americans is a large number, and studies suggest that this group is probably dominated by poorly educated people living just above the poverty line (and thus not eligible for Medicaid). In addition, one-quarter of the 13.2 million seniors eligible for a low-income subsidy—again, most of them poorly educated and living alone—did not take advantage of it. Because coverage for this last group is practically free when the subsidy is added in, 25 percent non-enrollment is disturbingly high.

Even when people do elect to enroll, an abundance of choice can overwhelm them. Since the

new Medicare law passed, seniors have consistently told interviewers that they find Part D dumbfounding. After a year of experience in the program, only about one in ten said it was working well and needed "no real changes." In November 2006, once again with a year of experience and knowledge, 73 percent of seniors said Part D was "too complicated," and 60 percent agreed with a statement that an unnamed party, most likely the government, should "select a handful of plans . . . so seniors have an easier time choosing." The consensus of the medical community was even stronger. More than 90 percent of both doctors and pharmacists, who had been bombarded with patient questions throughout the enrollment period, agreed that the program was too complicated.

These responses suggest that overall consumer satisfaction could be a lot higher with a better design. Complexity is the most glaring problem. But it is not the only one. In fact, two other pieces of Part D's choice architecture are just as puzzling.

## Random Default Plans for the Most Vulnerable

In the Introduction, we discussed the options faced by cafeteria supervisor Carolyn; one of those options was to display food items at random. We said that this option could be considered fair-minded and principled, but that it would lead to unhealthy diets at some schools. The option didn't strike us as desirable because it unfairly penalized some students by inducing them to consume a diet consisting entirely of pizza, egg rolls, and ice cream.

Still, this is the option the government adopted for six million of its poorest and sickest citizens. It automatically assigned each person who did not pick a plan on her own to a randomly chosen default plan with premiums at or below certain benchmarks for her specific region. As a result of plan restructuring, another 1.1 million people were eligible for random assignment in 2007. One state, Maine, shrewdly resisted this system in favor of an "intelligent assignment" process for forty-five thousand people. We will return to shrewd Maine shortly; for now, we focus on the other forty nine states.

The poorest and sickest enrollees are those people eligible for both Medicare and Medicaid (and so are called the "dual eligibles"). These people are disproportionately African-American, Latino, and female. Dual eligibles are more likely to have diabetes and strokes than other Medicare beneficiaries, and they use, on average, ten or more prescription drugs. They include the most severely disabled Americans, physically and cognitively handicapped men and women of all ages, and elderly patients suffering from dementia and requiring full-time care. The government has not said exactly how many dual eligibles actively chose a plan, but the evidence we have suggests that very few did. Dual eligibles are able to switch plans at any time—but if few are actively choosing plans, we suspect that few are taking advantage of the flexible switching option.

Random assignment can cause random harm to unlucky people placed in plans that don't fit their needs. For the drugs that dual eligibles take most often, and that are in categories covered by the law, plans varied considerably in their coverage, from as low as 76 percent to as high as 100 percent. This means that some dual eligibles were defaulted into a plan that did not cover the drugs they use most. They could switch, of course, but being Human, most stayed with the plan that had been lovingly picked at random for them. And given the patchy drug access, it is not

surprising that random plan defaults impaired people's health. In a recent survey of dual eligibles, To percent reported improved medication access, while more than 22 percent said they had stopped taking medications temporarily or permanently because of problems in managing the new plan.

The government's official reason for rejecting intelligent assignment in favor of random assignment is that people's prescription needs change. Someone's past use is no guarantee of her future use. In the health care community, there has been a lot of head scratching about this argument. Especially for the elderly, who are often on several long-term medications, last year's drug use is often an excellent predictor of next year's, and certainly it is a better predictor than picking a plan out of a hat.

It seems somewhere between callous and irresponsible to assign plans without even looking at people's specific needs. Random assignment is also inconsistent with the market-based philosophy of the plan. In markets, better products get a higher share, and most free-market economists consider this a good feature. We do not think that every automobile manufacturer should get the same market share any more than we think that families should pick their cars at random. Why should we want randomness for insurance plans?

How costly were the mistakes and misallocations caused by this random assignment? One way to examine this issue is to see how many people chose to switch plans after the first year. (Every November there is an open enrollment period when participants, can switch plans.) Unfortunately, we don't know as much as we'd like to about plan switching because the government has not been very forthcoming about releasing the data. It did announce that during the open enrollment period for 2007, about 2.4 million—10 percent of Part D enrollees—changed plans. But of those who changed, 1.1 million were low-income beneficiaries, most of whom were moved unilaterally by the government so that they would not have to pay increased premiums. That means that excluding dual eligibles, only 6 percent actively changed plans. (We suspect that the percentage of active switchers is even lower if we include the entire population of enrollees.)

There are two possible interpretations of these low switching rates. One interpretation, favored by defenders of the plan, and the one that would be correct if we were studying a population of Econs, is that all is going well—the wide variety of plans is handling diverse health conditions, and seniors have chosen the best plan for their needs. The second interpretation, more plausible if the participants are Humans, is that inertia and the status quo bias are keeping people from switching. How can we tell which interpretation is right? One way is by comparing the participants who actively chose their own plan with those who had a plan picked at random for them. For the latter group there can be no presumption that the plan they started with is the best one. And the fact that we find low switching rates for both groups suggests that the second interpretation is right. Most participants seem to find that the burden of switching—the time and energy it takes to decide on the best plan—is just not worth the effort.

Is it worth that effort? The answer depends on how varied the plans are and how costs differ depending on the set of drugs people use. Consider a comparative study of the prices of drugs covered by basic plans (the kind poor beneficiaries would be defaulted into) in three regions of the country. The study reported savings between $5 and $50 per drug per month when individuals are assigned to the lowest-cost, best-fitting basic drug plan. More data comparing entire plans, as opposed to individual drugs, should be available soon, and we think they will

confirm results that other academic teams are beginning to find. Kling's team has estimated almost a $700 annual difference between a randomly chosen plan and the lowest-cost plan. Choosing the right plan, rather than a random plan, has the potential to save both seniors and the government a lot of money. If hundreds of dollars are at stake for every person, many seniors would find it worthwhile to spend at least an hour or two sorting out the best plan (much as they would in choosing a new washing machine or putter).

## Not User-Friendly

Unfortunately, spending an hour or two is not going to get the job done. The chief tool people have to help choose a plan is the Medicare Web site. "This will help people make competent decisions," said the head of federal Medicare offices. "They'll have an unprecedented array of tools that will help them find a drug plan." But there is an obvious problem with relying heavily on a Web site. Most seniors do not yet use the Internet, let alone the Medicare Web site, and those who do are rarely Web-savvy (though this will change over time). Most seniors get their information about Part D passively from mailings by insurers, the government, and groups like AARP. Those mailings are highly unlikely to contain personalized information. So the Web site is the best source for help. To whom does the job of navigating the site fall? To seniors' adult children, of course.

An economist friend of ours, Katie Merrell, is one adult who does research on health coverage and took it upon herself to choose plans for both her elderly parents. She found that the task took hours, even for an expert like herself. Katie allowed us to see how painful choosing a plan would be by kindly providing a list of the drugs her mother takes. Thaler logged onto the Medicare Part D Web site and tried his luck. What a nightmare! Just to give one example, the site does not have a spell checker. If you type "Zanax" instead of "Xanax," you don't get any help (unlike at Google, for example). This is a problem because drug names resemble strings of random letters, so typing errors are to be expected. Getting all the dosages right is also tricky. You need to know both the size of the pill (for example, 25 mg) and how frequently it is taken. The Web site assumes you take a generic drug, if it is available, and gives you the option of keeping the premium brand drug. Many people, however, take generics while calling them by their brand name, which requires paying close attention to every drug selection. Once a user manages to get all the data entered, the Web site offers three plan suggestions, with annual cost estimates. (Technophobic seniors can call I-800-MEDICARE and have a customer service representative give them the three plan suggestions and prices, but no explanation is offered for how these plans have been chosen.)

Eventually (with help from Katie that bordered on psychotherapy), Thaler managed to get some answers, though not the same ones that Katie got. Still, because Thaler is nearing Medicare age himself, he thought perhaps someone younger would have an easier time of it. So we asked one of our graduate student research assistants to give it a try. Being younger and more patient helped, but he got yet another set of answers. We then pulled out all the stops and put the youngest and smartest member of our team on the job, our student intern (and Teen Jeopardy whiz), who was headed for a top college that fall. Even she, who normally finds everything easy, was befuddled at times in this process. And no two of us, though armed with the same data, ended up with the same cost estimates or the same recommended plans.

At first, we were stumped. But it turns out that even four Econs couldn't have mimicked each other perfectly. We all got different estimates because prescription drug plans are constantly updating their drug prices. There is no guarantee that the cheapest plan for your mother today would be the cheapest plan for your mother tomorrow. In fact, Consumers Union has tracked price differences in five large states and found continuous monthly changes. Sometimes these fluctuations are only a few dollars; sometimes more. Nearly 40 percent of the 225 plans underwent changes of more than 5 percent, which can add up to several hundred dollars per year. Frequent price changes are one more hurdle for Humans to jump, and in light of our experience, they can be a rude awakening to those who don't know about them.

## Did Choosers Make Good Choices? Not Always

What is it like to pick a prescription drug plan? How hard is it to choose the right one? The short answer is: really hard. For the sake of argument, ignore decisions about whether to enroll in Medicare Part D, or whether to enroll in a stand-alone drug plan or a Medicare Advantage plan. Assume that you, like most enrollees, are picking a stand-alone plan. You'll need to compare plans along fifteen major dimensions. (If you doubt that this is confusing, read the endnote, which offers some details, but we suggest taking two aspirin before you start reading.)

True, the Medicare Web site tries to help seniors sort plans across some of these dimensions. But we have already pointed to the pain and suffering that accompany using this Web site, and even if you arrive at the concluding page and see the three cheapest plans available, you shouldn't breathe easy. You will not be able to tell from the Web site whether prior authorization will be hard to obtain in your situation, or what the quantity limit on a particular drug will be. This information is probably available only after you sign up for a plan and attempt to fill the particular prescription.

Figuring out whether seniors are making good choices would require information about their health characteristics and their plans. Given the obvious concerns about privacy, the government has not released these data. But it apparently believes, and even says, that seniors are making good choices. We are not so sure. A good choice is one that meets a person's specific needs. In an experiment, the economist Daniel McFadden and his team have attempted to evaluate how good (or bad) seniors' choices turn out to be.

McFadden's team members gave seniors a break. They tried to give them a reasonable chance of making a good choice. Seniors didn't have to worry about pharmacy networks and prior authorization. They were offered only four options. To make the choice even easier, a person's particular economic circumstances were also thrown out the window. The four plans offered were worth the same amount of money. They differed only in the level of protection provided as drug bills rose.

Even in this simplified environment, a high percentage of seniors made poor choices among the four available plans, because they failed to connect their choices to their actual health, prescription use, and attitude toward risk. In all, nearly two-thirds of enrollees failed to choose the plan that minimized their out-of-pocket costs.

## Possible Nudges

As libertarian paternalists, we applaud the Bush administration for insisting on freedom of choice in Part D. We leave it to others to debate the pros and cons of a single-payer plan. But like any plan with lots of options, better choice architecture can help a lot.

*Intelligent Assignment*

Random default plan assignment is a terrible idea. If a poor person is assigned to a bad plan and does not switch, her drug bills may rise, or she may decide to stop taking an expensive drug, as some already have. This may save the government money in the short run, but it will be costly in the long run, especially for diseases such as diabetes, for which a failure to keep on the drug regime can lead to numerous complications. The government also pays more if it assigns someone to one plan if a different plan covers all that person's drugs and costs 15 percent less.

The most obvious response is to end random assignment in favor of what has been dubbed intelligent assignment. As we have noted, Maine is the only state that uses an intelligent assignment system for placing its dual eligibles in a prescription drug plan. Random assignment "resulted in a poor fit for many dual eligible beneficiaries in Maine," according to a Government Accountability Office report. Under random assignment, only one-third of the beneficiaries were placed in plans that covered all of their recently used drugs, and one-quarter were in plans that covered fewer than 60 percent of those drugs.

In Maine, to match each eligible participant with a plan, the ten plans meeting state coverage benchmarks were evaluated according to three months of historical data on prescription use. Participants in plans covering fewer than 80 percent of their required drugs were switched automatically (with participants retaining the option to cancel the reassignment). Another set of participants received letters informing them that better matches existed, and were advised to contact state officials for more information. Intelligent assignment switched more than ten thousand people, 22 percent of all the dual eligibles—and produced dramatic results. Although incomplete data and technology malfunctions created some initial problems, Maine officials now say that every dual eligible is in a plan that covers 90 –100 percent of her required drugs.

Maine was not the only state interested in intelligent assignment. In 2005 two leading pharmaceutical groups, the National Association of Chain Drug Stores and the National Community Pharmacists Association, collaborated with a Tampa, Florida, health care information technology company, Informed Decisions, to develop software that matched people with plans. The consortium's presentations to federal government officials were met politely but coolly. (Perhaps its advocates should have called it "intelligent design.") As a result of skepticism from Washington and legal challenges from insurers, intelligent assignment is used to place dual eligibles only in Maine. Other states should clearly be encouraged, not discouraged, from experimenting with similar methods, and more important the law mandating random assignment should be revised.

## RECAP

Seniors could be helped a lot if our RECAP system were applied to Medicare. RECAP would also make using the Medicare Web site a snap (well, relatively speaking).

Here's how RECAP would work. Once a year, just before the enrollment period opens, companies would send seniors an, itemized list of all the drugs used over the previous year and all the fees incurred. Insurers would also have to provide a summary of their complete pricing schedule to anyone who wanted it. The information would be made available online, so it could be imported into both the Medicare Web site and comparison pricing programs that could now easily be offered by third parties. The purpose of the information would be to nudge seniors away from a status quo bias and encourage comparison shopping by making prescription drug costs as salient as possible. Because the costs of delay are high for large majorities of seniors, similar nudges could be used on non-enrollees. Price disclosures could be sent to those seniors who delayed enrollment, with a clear delineation of the premiums for a sample of popular plans. One goal would be to highlight for seniors how much money a delay costs them.

We believe that in this domain, as elsewhere, the requirement that providers offer a RECAP report would lead private sector firms to offer services allowing participants to input their data to help choose the best plan. In fact, a Massachusetts company called Experion Systems has already developed an online Prescription Drug Plan Assistant tool that is a more user-friendly version of the government Web site's form. An early version of the tool asks people questions that guide better decision making. Experion has also joined with the pharmacy chain CVS/pharmacy to make it possible to import usage information of the sort that would be found on a RECAP report. If a RECAP rule were in place, then Experion could import the relevant usage data no matter where people obtain their prescriptions.

The RECAP information could also be used to improve intelligent assignment programs. One research team has produced some preliminary evidence that a RECAP-style nudge has promise. In a study of Wisconsin beneficiaries, the team estimated that if people moved from their current plan to the lowest-cost plan that continued to meet their drug needs, they could save, on average, about five hundred dollars a year. To see whether people would take advantage of these savings with a slight nudge, the researchers mailed a personal letter to a random sample of study participants who had agreed to share their personal drug histories. The letter explained the costs in their current plan, the cheapest comparable plan, and the savings they could realize by switching plans. Another random sample of participants received generic Part D brochures instead. Both mailings contained the Internet address of the Medicare plan finder Web site and information about how to use it. The personal letters appear to have nudged more people to pick lower-cost plans. The overall switch rate among seniors receiving letters was 27 percent—10 percentage points higher than among those receiving brochures. More than three times as many letter receivers as brochure receivers picked the cheapest plan—the one mentioned in the letter (although the overall percentages were still in single digits). These results are consistent with other studies showing that people are making errors in their choices among plans, and that simple, clear information can reduce those errors.

The lesson of Part D is similar to that of the Swedish social security reform. In complex situations, the Just Maximize Choices mantra is not enough to create good policy. The more choices there are, and the more complex the situation, the more important it is to have enlightened choice architecture. To produce a user-friendly design, the architect needs to understand how to help Humans. Software and building engineers live by a time-honored slogan: keep it simple. And if a building has to be complicated to be functional, then it is best to offer plenty of signs to help people navigate. Choice architects need to incorporate these lessons.

# Behavioral Economics


Class 5: Are Markets Rational?

## Interview: Justin Fox

## *The Myth of the Rational Market,* Key Points

- The book traces the rise of "the efficient market hypothesis" (EMH) a theory that states that asset prices fully reflect all available information.
- A direct implication is that it is impossible to "beat the market" consistently on a risk-adjusted basis since market prices should only react to new information.
- The EMH was developed by Eugene Fama.
- Various researchers have disputed the EMH both empirically and theoretically. Behavioral economists attribute the imperfections in financial markets to a combination of cognitive biases such as overconfidence, overreaction, representative bias, information bias, and various other predictable human errors in reasoning and information processing. These have been researched by psychologists such as Daniel Kahneman, Amos Tversky, Richard Thaler, and Paul Slovic.
- Among the problems the critics sight is that the EMH doesn't explain the business cycles.

## Tulip Mania

- The tulip was introduced to Europe in the mid-16th century from the Ottoman Empire and became very popular in the Netherlands
- As the flowers grew in popularity, professional growers paid higher and higher prices for bulbs with a virus that caused the flowers to grow with spectacular colors, lines and flares on the petals
- During the Dutch Golden Age contract prices for bulbs reached extraordinarily high levels and then suddenly collapsed
- At the peak of tulip mania, in 1637, some single tulip bulbs sold for more than 10 times the annual income of a skilled craftsman
- It is generally considered the first recorded speculative bubble

# Business Cycles

- In 1833 the Manchester Statistical Society began to study the "business cycle" and in particular the sharp downturns in financial markets that accompanied it.
- In 1867 John Mills presented a paper to the Society which made the case that "the malady of commercial crisis is not, in essence, a matter of the purse but of the mind." It was, in particular, a matter of memory. After a decade or so of good times, most of the gloomy olsters who remember the last crash are gone and "healthy confidence… has degenerated into the disease of a too facile faith." The "Speculative Period" has begun.
- Standard neoclassical theories simply ignore the business cycle.
- In the 20th century Keynes and Fisher devised tools for combating depressions and tended to portray them as a fixable divergence from economic norm.

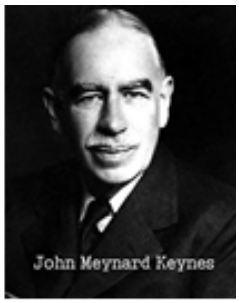
# Financial Bubbles

- Financial bubbles have been around for centuries and have confounded those who have tried to understand or predict them.
- Sir Isaac Newton, after witnessing a financial swing, remarked, "I can calculate the motion of heavenly bodies, but not the madness of people."
- Some notable US bubbles or panics include:

| Panic | Primary Cause | Other Causes |
|---|---|---|
| 1792 | Highly leveraged investors | Fluctuating money supply and currency values, Leveraged banks. |
| 1819 | Boom and bust in real estate and agricultural commodities. | Fluctuating money supply, Trade war. |
| 1837 | Boom and bust in real estate and cotton. | Leveraged banks, tight money supply |
| 1857 | Boom and bust in real estate and grain. | Railroads operating in effect as banks, selling mortgage backed securities. |
| 1873 | Undercapitalized railroads | Fluctuating money supply, interest rates and currency values, Leveraged banks. |
| 1893 | Fluctuating money supply | Boom and bust in real estate and grain, Undercapitalized and overbuilt railroads |
| 1907 | Leveraged investors | Leveraged banks subject to "runs" |
| 1929 | Highly Leveraged investors | Fluctuating money supply, Leveraged banks |

# John Maynard Keynes

1883- 1946




- British economist whose ideas have profoundly affected the theory and practice of modern macroeconomics.
- In the 1930s, Keynes spearheaded a revolution in economic thinking, overturning the older ideas of neoclassical economics that held that free markets would in the short to medium term automatically adjust to full employment.
- Keynes advocated use of "fiscal policy," direct spending by the government to offset lack of demand, stimulate the economy and bring back full employment until normal demand recovered.
- Keynesians cite the success of government spending during WWII in ending the great depression as proof that the theory works.
- During the 1950s and 60s, the success of Keynesian economics resulted in almost all capitalist governments adopting its policies.

# Paul Samuelson

- Samuelson joined the faculty at MIT in 1940
- In 1947 he wrote *Foundations of Economic Analysis* an equation filled work that became a core text of graduate economics education for years to come.
- In his undergraduate textbook *Economics: An Introductory Analysis* he theorized that an "ideal competitive market" that is characterized by "an equilibrium that is constantly being disturbed but is always in the process of re-forming itself – not unlike the surface of the ocean." A few sentences later he conceded that actual speculative markets often didn't look anything like that.
- In 1965 Samuelson published "Proof that Properly Anticipated Prices Fluctuate Randomly" which theorized that randomness was characteristic of a perfectly functioning financial market. Samuelson's paper is often cited as the origin of the "efficient market" hypothesis.
- Samuelson went on to become the first American to win the Nobel Memorial Prize in Economic Sciences in 1970.

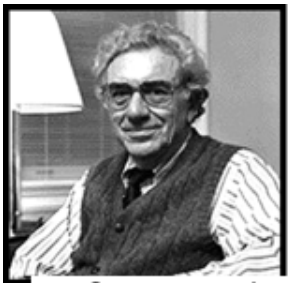
## Other Economists Weigh In on the Question of Efficient Markets

- In the 60's the Capital Asset Pricing Model (**CAPM**) was introduced by Jack Treynor, William Sharpe, John Lintner and Jan Mossin independently, building on the earlier work of Harry Markowitz on diversification and modern portfolio theory. Sharpe, Markowitz and Merton Miller jointly received the 1990 Nobel Memorial Prize in Economics for this contribution.
- In 1981 **Robert Shiller** found the hypothesis that stock prices represent the value of future dividend returns lacking as stock prices turned out to be vastly more volatile than dividends.
- In 1984, using advanced mathematics **Larry Summers** constructed a model of an alternative financial universe. The model had prices move randomly but in no direct relation to fundamental values. It was impossible to differentiate it statistically from a rational random market.

## Nova: Mind Over Money

## Mind Over Money Key Points

- People often behave irrationally (not in their own best interest)
  - People often demonstrate a "present bias" (are more influenced by taking gains in the short term than math models would predict)
  - People become "anchored" on a number that may have no relation to free market prices
  - Sadness may affect people's actions
- Money often activates the same brain regions as sex and drugs
- History reveals a pattern of economic booms and busts that may result from emotionally driven market speculation (e.g. 1929 stocks, housing prices in the 2000's)
- Many economists believe in the "efficient market hypothesis" and see no need for government regulation
- Vernon Smith (Nobel Prize winner in economics), has performed experiments which demonstrated how irrational trading by students in his lab results in a classic bubble



## Minsky School

Hyman Minsky
1919-1996

- Sometimes known as "Post-Keynesianism"
- Hypothesis: in periods of stable economic activity, people will gain confidence and begin borrowing more money. This will result in them spending more money, an even stronger economy, leading to more spending and more borrowing.
- The more that is consumed, the more that can be consumed – a paradox of gluttony. Thus it is impossible to remain in a stable equilibrium.
- A boom-bust dynamic will result.
- A "**Minsky moment**" is a sudden major collapse of asset values which is part of the business cycle.
- Where Minsky and the Austrians differ is that Minsky countercyclical government policies could be used to stabilize economic cycles.

The Economist

# Minsky's moment

## The second article in our series on seminal economic ideas looks at Hyman Minsky's hypothesis that booms sow the seeds of busts


Jul 30th 2016 | From the print edition

FROM the start of his academic career in the 1950s until 1996, when he died, Hyman Minsky labored in relative obscurity. His research about financial crises and their causes attracted a few devoted admirers but little mainstream attention: this newspaper cited him only once while he was alive, and it was but a brief mention. So it remained until 2007, when the subprime-mortgage crisis erupted in America. Suddenly, it seemed that everyone was turning to his writings as they tried to make sense of the mayhem. Brokers wrote notes to clients about the "Minsky moment" engulfing financial markets. Central bankers referred to his theories in their speeches. And he became a posthumous media star, with just about every major outlet giving column space and airtime to his ideas. *The Economist* has mentioned him in at least 30 articles since 2007.

If Minsky remained far from the limelight throughout his life, it is at least in part because his approach shunned academic conventions. He started his university education in mathematics but made little use of calculations when he shifted to economics, despite the discipline's growing emphasis on quantitative methods. Instead, he pieced his views together in his essays, lectures and books, including one about John Maynard Keynes, the economist who most influenced his thinking. He also gained hands-on experience, serving on the board of Mark Twain Bank in St Louis, Missouri, where he taught.

Having grown up during the Depression, Minsky was minded to dwell on disaster. Over the years he came back to the same fundamental problem again and again. He wanted to understand why financial crises occurred. It was an unpopular focus. The dominant belief in the latter half of the 20th century was that markets were efficient. The prospect

of a full-blown calamity in developed economies sounded far-fetched. There might be the occasional stockmarket bust or currency crash, but modern economies had, it seemed, vanquished their worst demons.

Against those certitudes, Minsky, an owlish man with a shock of grey hair, developed his “financial-instability hypothesis”. It is an examination of how long stretches of prosperity sow the seeds of the next crisis, an important lens for understanding the tumult of the past decade. But the history of the hypothesis itself is just as important. Its trajectory from the margins of academia to a subject of mainstream debate shows how the study of economics is adapting to a much-changed reality since the global financial crisis.

Minsky started with an explanation of investment. It is, in essence, an exchange of money today for money tomorrow. A firm pays now for the construction of a factory; profits from running the facility will, all going well, translate into money for it in coming years. Put crudely, money today can come from one of two sources: the firm’s own cash or that of others (for example, if the firm borrows from a bank). The balance between the two is the key question for the financial system.

Minsky distinguished between three kinds of financing. The first, which he called “hedge financing”, is the safest: firms rely on their future cash flow to repay all their borrowings. For this to work, they need to have very limited borrowings and healthy profits. The second, speculative financing, is a bit riskier: firms rely on their cash flow to repay the interest on their borrowings but must roll over their debt to repay the principal. This should be manageable as long as the economy functions smoothly, but a downturn could cause distress. The third, Ponzi financing, is the most dangerous. Cash flow covers neither principal nor interest; firms are betting only that the underlying asset will appreciate by enough to cover their liabilities. If that fails to happen, they will be left exposed.

Economies dominated by hedge financing—that is, those with strong cash flows and low debt levels—are the most stable. When speculative and, especially, Ponzi financing come to the fore, financial systems are more vulnerable. If asset values start to fall, either because of monetary tightening or some external shock, the most overstretched firms will be forced to sell their positions. This further undermines asset values, causing pain for even more firms. They could avoid this trouble by restricting themselves to hedge financing. But over time, particularly when the economy is in fine fettle, the temptation to take on debt is irresistible. When growth looks assured, why not borrow more? Banks add to the dynamic, lowering their credit standards the longer booms last. If defaults are minimal, why not lend more? Minsky’s conclusion was unsettling. Economic stability breeds instability. Periods of prosperity give way to financial fragility.

With overleveraged banks and no-money-down mortgages still fresh in the mind after the global financial crisis, Minsky’s insight might sound obvious. Of course, debt and finance matter. But for decades the study of economics paid little heed to the former and relegated the latter to a sub-discipline, not an essential element in broader theories. Minsky was a maverick. He challenged both the Keynesian backbone of macroeconomics and a prevailing belief in efficient markets.

It is perhaps odd to describe his ideas as a critique of Keynesian doctrine when Minsky himself idolized Keynes. But he believed that the doctrine had strayed too far from Keynes's own ideas. Economists had created models to put Keynes's words to work in explaining the economy. None is better known than the IS-LM model, largely developed by John Hicks and Alvin Hansen, which shows the relationship between investment and money. It remains a potent tool for teaching and for policy analysis. But Messrs Hicks and Hansen largely left the financial sector out of the picture, even though Keynes was keenly aware of the importance of markets. To Minsky, this was an "unfair and naive representation of Keynes's subtle and sophisticated views". Minsky's financial-instability hypothesis helped fill in the holes.

His challenge to the prophets of efficient markets was even more acute. Eugene Fama and Robert Lucas, among others, persuaded most of academia and policymaking circles that markets tended towards equilibrium as people digested all available information. The structure of the financial system was treated as almost irrelevant. In recent years, behavioral economists have attacked one plank of efficient-market theory: people, far from being rational actors who maximize their gains, are often clueless about what they want and make the wrong decisions. But years earlier Minsky had attacked another: deep-seated forces in financial systems propel them towards trouble, he argued, with stability only ever a fleeting illusion.

**Outside-in**

Yet as an outsider in the sometimes cloistered world of economics, Minsky's influence was, until recently, limited. Investors were faster than professors to latch onto his views. More than anyone else it was Paul McCulley of PIMCO, a fund-management group, who popularised his ideas. He coined the term "Minsky moment" to describe a situation when debt levels reach breaking-point and asset prices across the board start plunging. Mr McCulley initially used the term in explaining the Russian financial crisis of 1998. Since the global turmoil of 2008, it has become ubiquitous. For investment analysts and fund managers, a "Minsky moment" is now virtually synonymous with a financial crisis.

Minsky's writing about debt and the dangers in financial innovation had the great virtue of according with experience. But this virtue also points to what some might see as a shortcoming. In trying to paint a more nuanced picture of the economy, he relinquished some of the potency of elegant models. That was fine as far as he was concerned; he argued that generalizable theories were bunkum. He wanted to explain specific situations, not economics in general. He saw the financial-instability hypothesis as relevant to the case of advanced capitalist economies with deep, sophisticated markets. It was not meant to be relevant in all scenarios. These days, for example, it is fashionable to ask whether China is on the brink of a Minsky moment after its alarming debt growth of the past decade. Yet a country in transition from socialism to a market economy and with an immature financial system is not what Minsky had in mind.

Shunning the power of equations and models had its costs. It contributed to Minsky's isolation from mainstream theories. Economists did not entirely ignore debt, even if they studied it only sparingly. Some, such as Nobuhiro Kiyotaki and Ben Bernanke, who would later become chairman of the Federal Reserve, looked at how credit could

amplify business cycles. Minsky's work might have complemented theirs, but they did not refer to it. It was as if it barely existed.

Since Minsky's death, others have started to correct the oversight, grafting his theories onto general models. The Levy Economics Institute of Bard College in New York, where he finished his career (it still holds an annual conference in his honour), has published work that incorporates his ideas in calculations. One Levy paper, published in 2000, developed a Minsky-inspired model linking investment and cashflow. A 2005 paper for the Bank for International Settlements, a forum for central banks, drew on Minsky in building a model of how people assess their assets after making losses. In 2010 Paul Krugman, a Nobel prize-winning economist who is best known these days as a *New York Times* columnist, co-authored a paper that included the concept of a "Minsky moment" to model the impact of deleveraging on the economy. Some researchers are also starting to test just how accurate Minsky's insights really were: a 2014 discussion paper for the Bank of Finland looked at debt-to-cashflow ratios, finding them to be a useful indicator of systemic risk.

**Debtor's prism**

Still, it would be a stretch to expect the financial-instability hypothesis to become a new foundation for economic theory. Minsky's legacy has more to do with focusing on the right things than correctly structuring quantifiable models. It is enough to observe that debt and financial instability, his main preoccupations, have become some of the principal topics of inquiry for economists today. A new version of the "Handbook of Macroeconomics", an influential survey that was first published in 1999, is in the works. This time, it will make linkages between finance and economic activity a major component, with at least two articles citing Minsky. As Mr Krugman has quipped: "We are all Minskyites now."

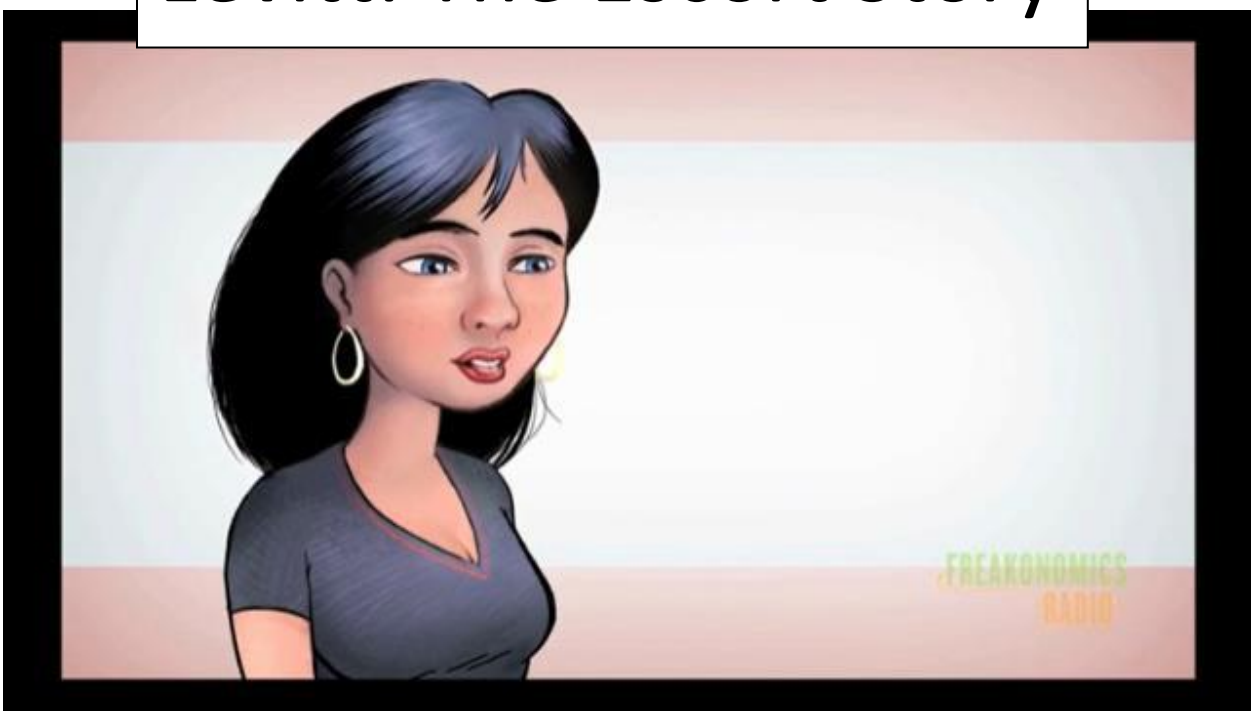
Central bankers seem to agree. In a speech in 2009, before she became head of the Federal Reserve, Janet Yellen said Minsky's work had "become required reading". In a 2013 speech, made while he was governor of the Bank of England, Mervyn King agreed with Minsky's view that stability in credit markets leads to exuberance and eventually to instability. Mark Carney, Lord King's successor, has referred to Minsky moments on at least two occasions.

Will the moment last? Minsky's own theory suggests it will eventually peter out. Economic growth is still shaky and the scars of the global financial crisis visible. In the Minskyan trajectory, this is when firms and banks are at their most cautious, wary of repeating past mistakes and determined to fortify their balance-sheets. But in time, memories of the 2008 turmoil will dim. Firms will again race to expand, banks to fund them and regulators to loosen constraints. The warnings of Minsky will fade away. The further we move on from the last crisis, the less we want to hear from those who see another one coming.

# Behavioral Economics


Class 6: Behavioral Finance

## Levitt: The Escort Story



# BEHAVIORAL FINANCE:

## THE USE OF PSYCHOLOGY-BASED THEORIES TO ANALYZE STOCK MARKET ANOMALIES AND INVESTING DECISIONS

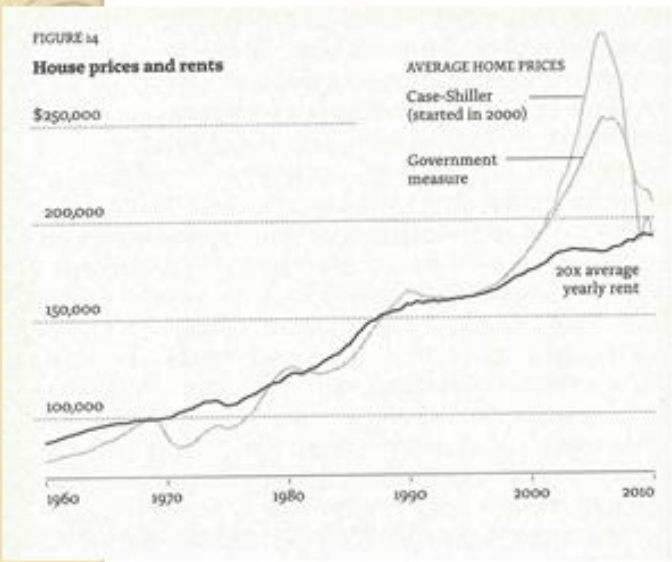
INVESTOPEDIA

## Robert Schiller

- Currently serves as a Sterling Professor of Economics at Yale University and is a fellow at the Yale School of Management's International Center for Finance.
- Shiller, together with Eugene Fama and Lars Peter Hansen received the 2013 Nobel Prize in Economics, "for their empirical analysis of asset prices"
- He received his masters degree from the Massachusetts Institute of Technology (MIT) in 1968, and his Ph.D. from MIT in 1972
- His book *Macro Markets* won TIAA-CREF's first annual Paul A. Samuelson Award.
- Shiller has written op-eds since at least 2007 for such publications as the New York Times, where he has appeared in print on at least two dozen occasions.

## Robert Shiller


## Housing: The Case-Shiller Index




- In a truly efficient market, bubbles should not exist.
- The Case-Shiller index was created to track the relative value of housing. Prices are adjusted for inflation.
- Up until 2000, housing prices tracked with 20x rent.
- Shiller used this index to warn of the impending housing bubble.

- But investors should be warned: it is much easier to detect that we are in a bubble than it is to say when the bubble will pop.

## Naïve Investing 1

- Employers have gradually evolved from offering defined benefit retirement plans to defined contribution plans.
- This moves the risk of investing to the employees but people are not well trained to handle this responsibility.
- The first question investors face is how much risk to take?
- Stocks generally earn higher rates of return than bonds or money market accounts but are more risky.
- In retirement accounts most investors do not invest in individual stocks but rather in mutual funds.
- Choosing the appropriate mix is called asset allocation.

## Naïve Investing 2

- How should you decide how much of your portfolio should be invested in stocks?
- Consider the 80 year period from 1925 to 2005:
  - US Treasury bills (short term, safe) would have turned $1 into $18. (3.7%/yr. compounded)
  - Longer term bonds would have turned $1 into $71.
  - Mutual funds with shares in the largest American companies would have turned $1 into $2658.
- But stocks are not safe. While average return has been 10% there have been years when they have fallen >30%.
- What would "econs" do? They would make a trade-off between risk and return. But recall from class 1 that humans are loss adverse. Particularly if you watch the daily ups and downs of the market you will hate stocks!

# Naïve investing 3

- Rip is a scion of the Van Winkle family. He has been feeling tired lately and goes to his doctor who tells him he is about to go to sleep for 20 years. The doctor tells him he should find a comfortable bed and should call his broker (an econ who will recommend investing in stocks) to make sure his asset allocation is where it should be.
- How will Rip feel about investing in stocks?
- Over a 20 year period stocks are almost certain to go up. Rip will take his broker's advice and sleep like a baby!*
- The lesson from the story is that attitudes towards risk depend on the frequency with which investors monitor their portfolios.

* Nudge, Thaler and Sunstein, P. 123

## Value Investing, the EMH and Regression to the Mean

- The work pioneered by Benjamin Graham (he taught at Columbia where one of his students was Warren Buffett) suggested that "value investing" was a superior investment strategy.
- Graham based his theory on an analysis of the Dow Jones Industrial Avg. over the period 1937 to 1969 where value stocks (low price/earnings ratio) did significantly better than growth stocks. Graham noted that during other periods this was not true.
- **While EMH theory said this strategy should not work** if did work for quite a long period of time. Graham was suggesting the tendency for people to extrapolate the recent past into the future.
- We have already talked about "regression to the mean." This is a phenomena where people underestimate the amount of luck involved and overestimate some indicators that may have little to do with outcomes.
- Dick Thaler set out to investigate the market to see if it demonstrated regression to the mean. In other words, "were investors likely to be over-reacting?"
- In one experiment he used 5 years of performance to form winner and looser portfolios and then calculated the return of each portfolio over the following 5 years.
- The losers outperformed the market by about 30% while the winners did worse than the market by about 10%.
- Thaler believes this is evidence that indeed investors often overreact.

## The Price Is Not Right: P/E


- The Price/Earnings Ratio is a key measure of a stock's investor confidence and perceived growth potential.
- It can also be used to measure the overall market. But can it be used to beat the market: buy when stocks are cheap (low P/E) and sell when they are relatively expensive?
- A plot of the S&P 500 stock Prices divided by 10 year average earning is shown.
- Notice that when the market diverges from its historical trends, eventually it reverts back to the mean. But the predictive power is not very precise.
- In 1996 Robert Shiller gave a briefing to the Federal Reserve Board warning that prices seemed dangerously high. Based on this Alan Greenspan gave a speech in which he questioned if investors had become "irrationally exuberant." Shiller later used this as his book title.
- But his warning came four years before the market peaked. He was wrong for a long time before he was right! Anyone who took Shiller's advice in 1996 and bet against the market would have gone broke before he had a chance to cash in.

## Saving for Tomorrow, Tomorrow

# Summary

- Many investment professionals, trained in our top business schools tell us not to worry… "You can't outsmart the market… Buy and hold, the market always works."
- Meanwhile many media talking heads worry about high prices, "speculative bubbles," and both high government and private debt.
- The debate goes on but an increasing number of economists believe that bubbles are a result of human psychology.
- The myth of the rational market has been taught in economics and business schools for years. This is starting to change.

# Robert Shiller on Behavioral Economics

By **Social Science Bites** | Published: August 1, 2012

In the past twenty years there has been a revolution in economics with the study not of how people would behave if they were perfectly rational, but of how they actually behave. At the vanguard of this movement is Robert Shiller of Yale University. He sits down with Nigel Warburton in this episode of the Social Science Bites podcast.

**David Edmonds:** *OK,you've got a choice, buy this plastic alarm clock right next to where you are standing for $28 or walk ten blocks and buy it in another shop for half price; $14. Now try this one, buy a laptop for $1995 in the shop next to you or walk ten blocks and get it for $1981. Well chances are you are more likely to walk to save money on the cheap clock then the expensive laptop, which is odd because in either case you could save exactly the same amount of money. In the past twenty years there has been a revolution in economics with the study not of how people would behave if they were perfectly rational, but of how they actually behave. At the vanguard of this movement is Robert Shiller of Yale University.*

**Nigel Warburton:** *Robert Shiller welcome to Social Science Bites.*

**Robert Shiller:** My pleasure.

**Nigel Warburton:** *The topic we are going to focus on is behavioral economics. Now we know roughly what economics is, but what's behavioral economics?*

**Robert Shiller:** Well the word 'behavioral' refers to the introduction of other social sciences into economics: psychology, sociology, and political science. It's a revolution in economics that has taken place over the past twenty years or so. I think it's bringing economics into a broader appreciation of reality. Economics was actually more behavioral fifty or a hundred years ago. At Yale University where I work, 1927 was the year where the department of economics, sociology and government was split into three separate departments and they moved us all apart.

**Nigel Warburton:** *Why would it matter if they just split the departments up, I mean there's an argument that specialization actually allows people to progress further in their field – rather then knowing a little bit about everything.*

**Robert Shiller:** Absolutely. There are both advantages and disadvantages of this structure. The advantage is that we develop mathematical economics and mathematical finance to a very advanced level – and it's useful: we have option pricing theory that is very subtle and allows complex calculations that have some relevance to understanding these markets. But it loses perspective on why we have these options anyway. It offers a justification typically that involves rational behavior. You can get into the swim of that, thinking 'I want to know why smart people use options' And it's instructive to go through the exercise of thinking 'is it really ever right to buy these investment products?' But that doesn't mean that you're answering the question why people *really* do buy options and why this market exists and why other markets that sound equally plausible don't exist.

**Nigel Warburton:** *So what you're saying is that traditional economics has focused on a kind of ideally rational individual: what would they do if they behaved in their own best interests based on the*

*information available? But behavioral economics brings in the fact that we don't always behave in our own best interests.*

**Robert Shiller:** That's right; well conventional economics misrepresents what our best interests are. A great example is the financial crisis that began in 2007. The way it began is home prices started falling rapidly. Many people had committed themselves to mortgages and now the debt was worth more then the house was worth,they can't come up with the money to payoff the mortgage and so it kind of lead to a world financial crisis. So why did that happen? Conventional economics theory can't seem to get at the answer, which I would say is, we had a speculative bubble driven by excessive optimism, driven by public inattention to risks of such an eventuality. And errors in managing the mortgage contracts that were made. There are no errors in conventional economics: it's all rational optimization.

**Nigel Warburton:** *Well let's take the optimism that you described: lots of people were incredibly optimistic about the never-ending increase in house prices. There's a sense that they are just ignoring past oscillations.Is that a basic trait in human beings that we are particularly optimistic: when we see things getting better we think they are always going to get better? Or is it something very specific to this case?*

**Robert Shiller:** It's always more specific to the case; it depends on framing how you think about the problem. Kahneman and Tversky, who were two psychologists, very important in behavioral economics, talked about the so-called 'representativeness heuristic'. We tend to look for patterns in the data that we think are representative of history. And we have salient images of things that happened- like home prices always going up, it's always gone up in our lifetime. You might look for some break because you also have another model in your mind, which is 1929, and the stock market crash. So you have people looking for these patterns; while home prices were going up and up it just seemed like anyone who raised the observation that they might fall just didn't seem intuitively plausible. Until they start falling! The other template that's in their mind suddenly becomes real and then that causes a self-reinforcing drop. The amazing thing is that in the economics profession of twenty years ago or so there were no bubbles. Now people freely say 'bubbles' but it was one of those words that was considered unprofessional by economists because markets are smarter then any of us and anything that happens in the market has a rational explanation.

**Nigel Warburton:** *So, if we bring psychology back into economics with the current crisis, what particular light would psychology shed on that? I mean you talked about people's optimism is it that there's a kind of herd mentality and the markets mirror that? Or is something else going on?*

**Robert Shiller:** There's a lot going on. It turns out that the human mind is very complicated. Economic theory likes to reduce human behavior to a canonical form, the structure has been, ever since Samuelson wrote this a half century ago, that people want to maximize their consumption. All they want to do is consume goods; they don't care about anyone else. There's neither benevolence nor malevolence. All they care about is eating or getting goods and they want to smooth it, they described it in terms of so-called utility functions through their lifetime and that's it. That is such an elegant simple model, but it's too simple and if you look at what psychology shows, the mind is the product of human evolution and it has lots of different patterns of behavior. The discoveries that psychologists make to economics are manifold.
**Nigel Warburton:** *One that I know you've discussed is this notion of fairness that might trump the economic rationality.*

**Robert Shiller:** A sense of fairness is a fundamental human universal. It's been found in some recent studies that it even goes beyond humans, that higher primates do have some vestigial or limited understanding of fairness and equity. In terms of how the market responds to crises, economists assume that everything is done purely out of self-interest. And yet non-economists when we ask them about how things work, they have a totally different view. In one of my questionnaire surveys we asked something like this: if the economy were to improve what would your employer do?
a) nothing – why should he help me just because the economy goes up?
b) well the economy improves means the market for my services improves so my employer would realize out of self-interest that he would have to raise my wage in order to keep me.

c) my employer is a nice person and he would recognize that he should share the benefits with his employees.
I gave this question to both economists and non-economists. The economists all picked B, or most of them picked B! They think that market forces dominate. Whereas very few of the non-economists did: they thought either their employer was a bad guy which is A, or their employer is a nice guy, that's C. So, there's a different worldview and I think that if people think that fairness is such an important thing in labor contracts then modelling the world as if it's of total insignificance is wrong.

**Nigel Warburton:** *So doesn't this just make everything much, much more complicated because you can't reduce individuals then to some kind of cipher where they are simply maximizing their self-interest in terms of economic benefits?*

**Robert Shiller:** That's why a lot of economists don't like this. Maybe with some justification they'll say that there's too many details in this theory, you can explain anything with it. But I'm un-persuaded by that criticism because, first of all, we can work on this and study people more and understand what psychological principle is relevant. And secondly, it doesn't help to have a theory based on wrong assumptions.

**Nigel Warburton:** *I can see this would work retrospectively because you've got much more of the data. But in terms of prediction it must be extremely difficult to know the features of psychology triggered by the particular situations that people find themselves in and how people are then going to react, not just individually, but on mass.*

**Robert Shiller:** This goes back to whether economics is a science or not. Alfred Marshall the great British economist of the turn of the last century said that economics can never be a science because it deals humans. For example predicting that crisis that started in 2007 most economists didn't see it coming at all. And it seems to me that the fault was that they didn't want to use their intuitive perceptions of how people are thinking; it seemed to me that something crazy was going on: we were in a housing bubble. But that term was proscribed in professional discussions, as that's what the taxi driver says, that's not professional, prove it! And I can't prove it. I mean I can refer to survey data, but that's not solid enough. Economists just sometimes don't see the obvious, they don't rely on mental faculties of human judgment that they have as well as not relying on a broader view of people that's informed by psychological or sociological research.

**Nigel Warburton:** *Is that because economists tend to see themselves as 'hard-scientists', as appose to the wishy-washy soft end of social science.*

**Robert Shiller:** I think that the economics profession suffers from physics-envy. I really do. We all wish we could be Einstein. It's too strong a model, we can't all develop the theory of relativity. The world of people isn't like that. When you look at what happens for example in a financial crisis, you've got to get immersed in a lot of detail. It doesn't become understandable by abstract economic reasoning. This means you have to look at an impression of what's driving people, what's on their minds, what they don't know, what the lawyers did with the contracts, what the people are assuming the government might do if such and such happens. It involves a lot of real world thinking which doesn't fit with the Einstein model.

**Nigel Warburton:** *If I take your example of Einstein, what's so amazing about Einstein was that he made a bold hypothesis that was then to some extent corroborated later. Couldn't economists do that? I mean can't you have a mathematically generated hypothesis and then it's either proved to be correct or not?*

**Robert Shiller** That's an interesting question and I've never been asked that before. I know Einstein wrote his special theory in 1905 and it wasn't until 1919 when they did an experiment involving a solar eclipse that Einstein was vindicated. So is there an example like that in economics? What springs to my mind is usually the opposite. Economists will see empirical regularities in the data and become famous for having named some empirical regularity and then shortly after that it stops happening. And so that's the reverse!

**Nigel Warburton:** *It's quite interesting because with Einstein the prediction couldn't possibly make the results happen. But in economics they could, conceivably.*

**Robert Shiller:** Yeah, because economics deals with people. One of the great concepts in economics came from the sociologist Robert K. Merton who in the 1940's wrote an article called 'Self-fulfilling Prophecy'; he coined that term in the 40s. And that's exactly what the great depression was, a time when people became pessimistic about the economy and they stopped spending, so it made it happen. It also refers to a reason why economists are loathe to predict depressions, because they feel that it's anti-social to set in mind a course in thinking. Especially central bankers feel reluctant to do that.

**Nigel Warburton:** *I can see that somebody could predict a depression and it happens. But that causes of it they can get completely wrong, they can be accurate about the outcome but the explanation of why it has occurred, because it is so complex with so many factors, there might be five different competing explanations all equally probable.*

**Robert Shiller** That's right. Well, first of all important recessions come rarely, so in your career as a social scientist it might come once or twice. So you won't prove anything from having said it. The other thing is that there will be many people numerically, you know, 20 people maybe that predicted it, all for different reasons and you can never figure out after the fact which one had the correct reason. It's a shortage of data. I'm talking about a particular problem in macroeconomics, especially when we have global recessions. Global recessions don't happen that often, and when they happen they are really big, and that's not something that any scientific method involving statistical analysis can handle.

**Nigel Warburton:** *So what is the value of this kind of behavioral economics then?*

**Robert Shiller:** We are learning amazing things about human behaviour, we could also add neuroscience. It seems to me that the profession advances by bringing in insights from other professions. And the place where 20 years ago I would least have expected it is the medical school. But you know people from the medical school are now coming into economic seminars because they go back to their lab and they can do an MRI or single-neuron study and see what's happening inside the brain. It used to be that we had no insight, we believed in what Samuelson called 'revealed preference'. We will look at people's functions of their mind by seeing what they do in their economic actions and there's no other way. But now we can look inside the brain and see something. One thing about behavioral economics incorporating neuro-economics is that it's going to be a very productive field in the next twenty years and it's going to change our thinking about the economy.

**Nigel Warburton:** *Well given all these different developments in the social sciences, in psychology, in neuroscience, does that make it more likely that economists are going to be good at predicting the next crash?*

**Robert Shiller:** Well, what it should do, economists' analysis should inform better public policy and reduce the frequency of crashes. We don't want to have these crashes in the first place. And so they will be unsung heroes who saw something coming and averted it. It's just like the guy who designed the traffic lights and he prevents accidents. You don't go to this person thankfully saying 'you prevented my accident', you don't even know that the person prevented it. So that's the kind of world where economists will fade into the background, just like the street planners in the city, and yet be doing good things.

**Nigel Warburton:** *Robert Shiller, thank you very much.*

**Robert Shiller:** It's a pleasure.

# Behavioral Economics

## Class 7: Myopic Preferences, Nudges and Public Policy

## Timothy Taylor

- Professor Taylor is Managing Editor of the Journal of Economic Perspectives, a journal is published by the American Economic Association which it is the most widely distributed journal of academic economics in the world.
- Professor Taylor graduated from Haverford College, where he majored in Economics and Political Science. He holds a master's degree in Economics from Stanford University
- Professor Taylor has published articles on globalization, the new economy, Medicare reform, and outsourcing. He has edited a wide range of books and reports, including books on school reform, airline deregulation, and pensions.
- At the University of Minnesota, he was named a Distinguished Lecturer by the Department of Economics.
- Taylor is also the author of *The Instant Economist: Everything You Need to Know About How the Economy Works* published in 2012. The fourth edition of Taylor's *Principles of Economics* textbook was published in 2017.

# Unexpected Economics: Myopic Preferences


## Key Points

- How much money would you need to receive in the future to make up for giving up $15 right now? What about 10 years in the future? Most people require a far higher return —expressed as an annual percentage rate —for giving up the money in the short term than in the longer term.
- Myopic preferences actually lead people to have preferences that change as an event draws closer in time. When people make plans in the future, they express one sort of preference, but when the future actually arrives, they act in the opposite way.
- Myopic preferences manifest themselves in many ways that have consequences for society, including saving and borrowing behavior, energy conservation, dealing with chronic disease, and completing high school.
- Overcoming the myopia that is often encountered in these areas may be a partial answer to America's problem of high and rising health -care costs.
- Public policy in response to myopic preferences can be viewed as helping people act in the way they wanted to act, but found themselves unable to act, in the short term. Some examples of policy that can be interpreted in this way include Social Security, cigarette taxes, and rules about energy efficiency.
- <u>Nudge</u> policies fall short of outright requirements but would give people a push toward overcoming their short- term biases.

# Privatizing Social Security

- In the 2000 U.S. presidential campaign George W. Bush called for privatizing Social Security. While this did not get much attention it resurfaced again in 2005.
- Meanwhile Sweden launched a privatized system similar to Bush's proposal. Participants were allowed to form their own portfolios by selecting up to 5 funds from an approved list.
- The Swedish system allowed any fund meeting fiduciary standards to enter giving the Swedes a maximum number of choices. There were initially 456 funds.
- One fund was chosen (with care) to be a default but it's selection was discouraged.
- One third of the participants ended up with the default fund.
- But maximizing the number of choices is not necessarily a good idea.
  - Investors have a tendency to buy stocks from their home country. Economists refer to this as home bias.
  - Only 4.1 % of funds in the selected portfolios were indexed. As a result the fees were much higher: .77% compared with .17% for the default fund.
- From late 2000 to July 2007 the default fund was up 21.5% while the average actively managed portfolio was up only 5.1%.*
- If the decision is difficult and unfamiliar, and if people do not get prompt feedback, then it's good to nudge a bit! The more choices you give people, the more help you need to provide.

* Nudge, Ch. 9, Thaler and Sunstein

# Improving School Choice

- After many years of debate school choice remains an intensely polarizing issue in American politics.
- With the introduction of charter schools and the competition it fosters, public schools produce higher achievement per dollar spent but test scores have only increased marginally (1 to 7%).
- One problem is that parents often do not have the information they need to make informed choices.
- A creative experiment in Charlotte showed that choices can be improved with better and simpler information. Parents given fact sheets selected schools that had, on average, 70% higher test scores.
- Sometimes a "nudge" is needed to encourage lower income high schoolers to go to college. In San Marcos Texas high schoolers were told they could not graduate from high school unless they completed an application to the local community college. The administrators also gave out financial aid information.
- Prior to this only 1/3 of the students experienced higher education. In one year students who went to Texas colleges rose to 45%.*

* *Nudge*, Thaler and Sunstein, 2009, Chapter 13

## Nudges: Charitable Giving

- Many People have strong charitable impulses but because of inertia give far less than they actually want to. Anna Breman has conducted a pilot experiment where people make small monthly donations at first but increase it after two months. In the second moth donations increased by 32%.
- A related nudge involved use of a charity debt card, a special card issued by banks and only accepted by charities. At the end of the year a printout of all charitable giving would be supplied for use in compiling the giver's tax return.

## More Nudges:
### Automatic Tax Return

- No sensible choice architect would design the current income tax system. People would benefit if it could become more automatic (an automatic tax return).
- Anyone who does not itemize deductions ($12,700 is the current standard deduction available available to married couples who do not itemize) and has no income (such as tips) that is not already reported to the IRS would receive a tax return already filled out. The taxpayer would only need to sign and return it.
- Automatic tax returns are already being used in other countries. Denmark has been using this system since the early 1980s. Today pre-filled systems of varying levels have been adopted in Australia, Norway, Sweden, Belgium, Chile, Portugal, Spain, France and the Netherlands.*

* As of 2009, Nudge, Chapter 16, Item 3

## More Nudges:
### Pregnancy and Carbon Footprint

- Teenage pregnancy can be a serious problem, particularly when the girl becomes pregnant again within a year or two. Several cities have experimented with a "dollar a day" program where teenagers receive a dollar a day in which they do not become pregnant for a second time. The results appear promising.
- Japan is planning to label consumer goods to show carbon footprints in a bit to raise awareness about global warming. Selected products including detergents and soft drinks will carry markings indicating how much gas responsible for global warming has been emitted through production and delivery. A bag of potato chips emits 75 grams of $CO_2$ in growing the potatoes, production, packaging and delivery.

## Nudges: Organ Donations

- Default options can create a powerful nudge that may be beneficial to society.
- Most countries adopt some version of an opt-in policy whereby donors have to take some positive step such as filling in a form in order to have their name added to the donor registry list.
- In countries with an opt-in policy less than half the population tends to opt-in.
- But Johnson and Goldstein found that in countries where the default is to be a donor, almost no one opted out.
- Thaler suggests a variant adopted in Illinois and several other states: when people renew their drivers license, they are asked whether they wish to be an organ donor. This makes it easy to sign up. In Alaska and Montana this approach has achieved donation rates exceeding 80%.*

* Thaler, *Misbehaving*, Ch. 32, Going Public, P.328.

## Default Options and Other Nudges May Fail

- Thoughts on nudges that sometimes fail:
  - Inertia and procrastination – particularly if people are very busy or the question is technical it is very tempting to stick with the status –quo.
  - Antecedent preferences – if people have strong existing preferences nudges will not be effective.
  - Counternudges – third parties with vested interests may employ active marketing techniques to counter the nudge.
  - Framing – words chosen by the policy architects are important. For instance President Obama's health care law had an important feature called a "mandate" which was well intentioned (preventing people from waiting until they were sick to buy insurance). This was considered by many voters to be an infringement on their rights or freedoms. There are other ways to achieve the same goal (if the insurance is not bought when initially offered, a waiting period to enroll is required).
- Thoughts on nudges that are successful:
  - Defaults are often thought to be the most effective nudge. *
  - When nudges are advocated by trusted sources, people are often inclined to accept them.
  - Loss aversion – people fear a loss more than they like corresponding gains. Nudges that help us avoid credible risks are often attractive.
  - Self control – we have more self control when it comes to the future than the present.
  - Making things easier – removing barriers and complications helps.

* Sunstein, *How Change Happens,* P. 111

## Cass Sunstein

- Is an American legal scholar, particularly in the fields of constitutional law, administrative law, environmental law and behavioral economics.
- Sunstein is the Robert Walmsley University Professor at Harvard Law School.
- During the Obama administration he headed the White House Office of Information and Regulatory Affairs.
- In 2008 he co-authored with Richard Thaler, *Nudge: Improving Decisions about Health, Wealth, and Happiness*. *Nudge* discusses how public and private organizations can help people make better choices in their daily lives.

## Cass Sunstein: Nudges and Public Policy


## Summary

- Richard Thaler's participation in the making of Behavioral Economics taught him some very basic lessons which can be adopted across circumstances:
  - **Observe**. Behavioral Economics started with simple observations: people eat too many nuts if the bowl is left out; people have mental accounts: they don't treat all cash the same. "The first step to overturning conventional wisdom, when conventional wisdom is wrong, is to look at the world around you."
  - **Collect Data**. People quite easily fall victim to confirmation bias and don't examine their past track record. "The only protection against overconfidence is to systematically collect data, especially data that can prove you wrong.
  - **Speak up**. Many organizational errors could have been prevented if someone had been willing to tell the boss that something was going wrong. Good leaders in which employees feel that making evidence-based decisions will be rewarded. The ideal organization encourages everyone to observe, collect data and speak up.

# Micromotives and Macrobehavior, by Thomas C. Schelling

*"A good part of social organization-of what we call society consists of institutional arrangements to overcome these divergences between perceived individual interest and some larger collective bargain."*

*"What we are dealing with is the frequent divergence between what people are individually motivated to do and what they might like to accomplish together"*

*"With people, we can get carried away with our image of goal-seeking and problem-solving. We can forget that people pursue misguided goals or don't know their goals, and that they enjoy or suffer subconscious processes that deceive them about their goals."*

Long before contemporary authors such as Malcom Gladwell, Stephen Levitt or Tim Harford created a new genre of "popular economics," picking up on the strange and interesting in the discipline for the fascination of the average reader, there was Thomas Schelling.

Schelling won a Nobel for Economics in 2005 (shared with Israeli-American mathematician Robert Aumann) "for having enhanced our understanding of conflict and co-operation through game-theoretic analysis." In books such as The Strategy of Conflict (1960) and Arms and Influence (1966) he delved into the calculus of influence and deterrence that was part of the Cold War nuclear era. Conversations Schelling had with director Stanley Kubrick and the novelist Peter George led to the film Dr Strangelove or: How I Learned to Stop Worrying and Love the Bomb (1964).

Micromotives and Macrobehavior (1978) was Schelling's application of game theory principles to everyday life. He defines game theory, pioneered by the mathematician John Nash, as "the study of how rational individuals make choices when the better choice among two possibilities, or the best choice among several possibilities, depends on the choices that others will make or are making." In other words, the fact that decisions are made in the light of the decisions of other people, who in turn make decisions in the light of what others do. His phrase "micromotives and macrobehavior" was simply the relationship between how individuals act and how "people" behave as an aggregate.

In the perfectly competitive markets theorized by economists, millions of individuals acting on their own have a good collective outcome, an equilibrium. If too many people drive polluting cars and they become too expensive, for instance, there is a shift to bus transport which benefits society at large. But in the real world, Schelling noted, the decisions one person makes may be good for them, but not so good for the community. Fishermen keep on fishing even as stocks are depleted, parents throw wet wipes down the toilet, bankers keep lending even in a house price bubble. In each case, an "equilibrium" may result (fish-free seas, clogged sewers, overpriced housing), but it is not one that is beneficial for the mass.

## Where shall I sit?

The book starts with a famous analysis of seating patterns, provoked by an experience Schelling had as a visiting speaker. As he was about to go on stage to deliver his talk, he was perplexed by the fact that, although the auditorium seemed mostly packed, the first dozen rows were empty. They were not reserved, so why wasn't anyone sitting in them?

Schelling looked into the many possible reasons for the empty rows at the front, including the desire to avoid embarrassment or exposure by having to sit in the very front row, wanting to sit near others, or simply a preference to be nearer the back to make a quick exit. It seemed that people like to sit near others, but not too near them (leaving at least one empty chair between them and the next stranger). What was clear to Schelling is that our seating preferences are not only to do with rational things like comfort or having a good view of the stage, but are formed by the psychology of the situation. No one sat in the first couple of rows out of fear of being isolated if the rows behind them did not fill up. Seating decisions, then, were based on where people thought other people would sit.

Schelling's point is that the goals or choices people make in their own interests do not necessarily lead to a positive outcome for the group, crowd or community. In the case of the auditorium, individual choices led to a poor distribution of seating: empty seats despite the crowd. "How well each does for himself in adapting to his social environment," Schelling writes, "is not the same thing as how satisfactory a social environment they collectively create for themselves."

Economists believe that phenomena, particularly markets, are self-balancing and lead to optimal results. But in Schelling's mind this equilibrium is simply the state of things when the dust has settled. "The body of a hanged man is in equilibrium when it finally stops swinging," he writes, "but nobody is going to insist that the man is all right." Economists' approval of equilibrium in national economies has often led to tragic outcomes, for that equilibrium could be a state of constant high inflation, or high unemployment, or sluggish growth. In the auditorium example, an economist would call it equilibrium if the people were so distributed that no one can be bothered to move seats. But that doesn't mean it is close to an ideal distribution. In an economy, my decision to stop spending may be very rational, given my circumstances, but if millions of others take the same course, a depression may result. No one ever wants unemployment or a stock market crash or a bank failure, and yet they frequently happen.

## Critical mass

A model fits the criterion of simplicity, Schelling says, if it not only shows how mechanical and physical systems work, but seems to describe social and human phenomena too. In nuclear energy production, there is a point when the process "goes critical," that is when the fission of the nuclear material becomes self-sustaining. This idea of achieving a "critical mass" is seen in the rise of social and political movements, the spread of clothing fashions and diseases, the naming of children and the adoption of new words. What matters is if something is perceived as "a thing" that has a momentum of its own, and that other people are enthused about.

Schelling saw examples of critical mass every day, from the traffic intersection where pedestrians were willing to go against the lights only if a whole crowd was doing so, to the exit of a professor on the last day of class: sometimes, a few claps leads to a round of applause; other

times, the early claps peter out and there is embarrassed silence. In short, people do something when they see that it is "what everybody else is doing." Schelling's paradoxical observation is that we cannot presume that an outcome is preferred, even if it is universally chosen. Daylight saving, imperial measurement, the QWERTY keyboard—these are examples of things we go along with because others go along with it, not necessarily because they are the "best."

## Segregation despite laws

Schelling became famous for his analysis of segregation, specifically his wish to find out what individual choices and incentives led to collective segregation.

He observed the phenomenon of "tipping," a subcategory of the critical mass phenomenon, in neighborhoods and public schools in terms of race. One or two minority families move into an area, which compels some members of the formerly homogenous (let's say white) population to leave. Their departure creates room for more minority families to move in, prompting more "majority" families to depart. The process snowballs until it is no longer a "white neighborhood." Schelling's point is not that all those who left were racist, but that people begin to leave simply because they fear that others' leaving will mean the value of their home will drop. People do not wait until some actual point of toleration is breached, but act in the expectation or fear that it will in the future. In the 1960s, the principle (later popularized by Malcolm Gladwell in The Tipping Point) was seen to operate in public schools, college fraternities, country clubs, and even beaches and parks. Informal segregation, Schelling noted, often continues long after legal segregation is outlawed, and indeed happens even if people are not consciously racist. There may be no policy of segregation, but it happens anyway as people tend to prefer living in sub-worlds that give them a feeling of familiarity.

People who can afford to live in the best area of a city generally do so, and if it is a society in which whites are generally richer than blacks, it will mean that the said area becomes mostly white without anyone designing it to be so. Yet Schelling also notes that people generally wish to avoid having minority status, so even if they have the money to live in the best area, members of a minority will not live there. In this way, without anyone really intending it, the segregation of a suburb can be compounded to the point where there is complete segregation. Alarmingly, such complete segregation becomes a "stable equilibrium" that proves resistant to change.

Schelling's point is that phenomena like racial segregation often just come about even though it serves no positive purpose. Indeed, segregation restricts choices and opportunities, and blights whole cities. It may seem to benefit some people, but does nothing to advance society as a whole, brings no "social efficiency."

## Final comments

Markets, Schelling notes, are generally good at taking individual people's self-serving decisions and integrating them into a greater whole that results in a pretty good allocation of resources, but thanks to human psychology and imperfect or asymmetric information (others have more information than we do, and use it to their advantage), there are plenty of market failures too. Schelling discusses George Akerlof's well-known 1970 article, "The Market for 'Lemons,'" which said that because used car buyers don't know which cars on the market are good ones and which are "lemons," the information deficit brings down the price of used cars generally. It is only warranties from dealers, and other certification, that keeps the used car market from

dwindling to nothing. There are plenty of other markets where there is unequal information. Because a lot of people may try to hide health issues to get life insurance, insurance companies have to charge higher premiums to cover the human equivalent of "lemons." As a result, healthier people who have long-life genes won't bother buying a policy, and so the life insurance market becomes increasingly useless for people who want to insure against unexpected death, which is its purpose in the first place.

When economists say people are "rational" and "self-seeking," they tend to mean it in a good way, yet it stands to reason that in any market or society in which there is plenty of dishonesty, suspicion, and willful obscuration, the decisions that individuals make can lead to a poor collective result. Thankfully, it also works the other way: societies are not simply big markets but rather structures for upholding moral values; if everyone strives to be a little bit better than they rationally need to be, society as a whole benefits.

*Thomas C Schelling*
*Shelling was born in 1921 and grew up in San Diego, California. He first studied economics at the University of California, Berkeley, and took his PhD from Harvard University in 1951. He worked on the Marshall Plan after World War Two, then as an adviser in the Truman administration. In 1958 he became a professor of economics at Harvard, and for two decades from 1969 taught at Harvard's Kennedy School of Government. He was subsequently professor emeritus at the School of Public Policy, University of Maryland. Schelling died in 2016.*

# How Change Happens by Cass R. Sunstein

## Chapter 4, Nudging: A Very Short Guide

Some policies take the form of mandates and bans. For example, criminal law forbids theft and assault. Other policies take the form of economic incentives (including disincentives), such as subsidies for renewable fuels, fees for engaging in certain activities, or taxes on gasoline and tobacco products. Still other policies take the form of nudges—liberty-preserving approaches that steer people in particular directions, but that also allow them to go their own way. In recent years, both private and public institutions have shown mounting interest in the use of nudges, because they generally cost little and have the potential to promote economic and other goals (including public health).

In daily life, a GPS device is an example of a nudge; so is an app that tells people how many calories they ate during the previous day; so is a text message that informs customers that a bill is due or that a doctor's appointment is scheduled for the next day; so is an alarm clock; so is automatic enrollment in a pension plan; so are the default settings on computers and cell phones; so is a system for automatic payment of credit card bills and mortgages. In government, nudges include graphic warnings for cigarettes; labels for energy efficiency or fuel economy; "nutrition facts" panels on food; MyPlate, which provides a simple guide for healthy eating (see choosemyplate.gov); default rules for public-assistance programs (as in "direct certification" of the eligibility of poor children for free school meals); a website like data.gov or data.gov.uk, which makes a large number of datasets available to the public; and even the design of government web-sites, which list certain items first and in large fonts.

**Freedom of Choice**

It is important to see that the goal of many nudges is to make life simpler, safer, or easier for people to navigate. Consider road signs, speed bumps, disclosure of health-related or finance-related information, educational campaigns, paperwork reduction, and public warnings. When officials reduce or eliminate paperwork requirements, and when they promote simplicity and transparency, they are reducing people's burdens. Some products (such as cell phones and tablets) are intuitive and straightforward to use. Similarly, many nudges are intended to ensure that people do not struggle when they seek to interact with government or to achieve their goals.

It is true that some nudges are properly described as a form of "soft paternalism," because they steer people in a certain direction. But even when this is so, nudges are specifically designed to preserve full freedom of choice. A GPS device steers people in a certain direction, but people are at liberty to select their own route instead. And it is important to emphasize that some kind of social environment (or "choice architecture"), influencing people's choices, is always in place. Nudges are as old as human history. New nudges typically replace preexisting ones; they do not introduce nudging where it did not exist before.

**Transparency and Effectiveness**

Any official nudging should be transparent and open rather than hidden and covert. Indeed, transparency should be built into the basic practice. Suppose that a government (or a private employer) adopts a program that automatically enrolls people in a pension program, or suppose that a large institution (say, a chain of private stores or a company that runs cafeterias in government buildings) decides to make healthy foods more visible and accessible. In either case, the relevant action should not be hidden in any way. Government decisions in particular should be subject to public scrutiny and review. A principal advantage of nudges, as opposed to mandates and bans, is that they avoid coercion. Even so, they should never take the form of manipulation or trickery. The public should be able to review and scrutinize nudges no less than government actions of any other kind.

All over the world, nations have become keenly interested in nudges. To take two of many examples, the United Kingdom has a Behavioral Insights Team (sometimes called the "Nudge Unit"), and the United States has had a White House Social and Behavioral Sciences Team, now called the Office of Evaluation. The growing interest in nudges is not a mystery. They usually impose low (or no) costs; they sometimes deliver prompt results (including significant economic savings); they maintain freedom; and they can be highly effective. In some cases, nudges have a larger impact than more expensive and more coercive tools. For example, default rules, simplification, and uses of social norms have sometimes been found to have even larger impacts than significant economic incentives.

In the context of retirement planning, automatic enrollment has proved exceedingly effective in promoting and increasing savings. In the context of consumer behavior, disclosure requirements and default rules, establishing what happens if people do nothing, have protected consumers against serious economic harm, saving many millions of dollars. Simplification of financial aid forms can have the same beneficial effect in increasing college attendance as thousands of dollars in additional aid (per student). Informing people about their electricity use and how it compares to that of their neighbors can produce the same increases in conservation as a significant spike in the cost of electricity. If properly devised, disclosure of information can save both money and lives. Openness in government, disclosing both data and performance, can combat inefficiency and even corruption.

**Testing**

For all policies, including nudges, it is exceedingly important to rely on evidence rather than intuitions, anecdotes, wishful thinking, or dogmas. The most effective nudges tend to draw on work in behavioral science (including behavioral economics) and hence reflect a realistic understanding of how people will respond to government initiatives. But some policies, including some nudges, seem promising in the abstract, but turn out to fail in practice. Empirical tests, including randomized controlled trials, are indispensable. Bad surprises certainly are possible, including unintended adverse consequences, and sensible policymakers must try to anticipate such surprises in advance (and to fix them if they arise). Sometimes empirical tests reveal that the planned reform will indeed work—but that some variation on it,

or some alternative, will work even better.

Experimentation, with careful controls, is a primary goal of the nudge enterprise. Fortunately, many nudge-type experiments can be run rapidly and at low cost and in a fashion that allows for continuous measurement and improvement. The reason is that such experiments sometimes involve small changes to existing programs, and those changes can be incorporated into current initiatives with relatively little expense or effort. If, for example, officials currently send out a letter to encourage people to pay delinquent taxes, they might send out variations on the current letter and test whether the variations are more effective.

**Ten Important Nudges**

Nudges span an exceedingly wide range, and their number and variety are constantly growing. Here is a catalog of ten important nudges—very possibly, the most important for purposes of policy—along with a few explanatory comments.

1. *default rules* (e.g., automatic enrollment in programs, including education, health, savings)
Default rules may well be the most effective nudges. If people are automatically enrolled in retirement plans, their savings can increase significantly. Automatic enrollment in health care plans or in programs designed to improve health can have significant effects. Default rules of various sorts (say, double-sided printing) can promote environmental protection. Note that unless active choosing (also a nudge) is involved, some kind of default rule is essentially inevitable, and hence it is a mistake to object to default rules as such. True, it might make sense to ask people to make an active choice, rather than relying on a default rule. But in many contexts, default rules are indispensable, because it is too burdensome and time-consuming to require people to choose.

2. *simplification* (in part to promote take-up of existing programs)
In both rich and poor countries, complexity is a serious problem, in part because it causes confusion (and potentially violations of the law), in part because it can increase expense (potentially reducing economic growth), and in part because it deters participation in important programs. Many programs fail, or succeed less than they might, because of undue complexity. As a general rule, programs should be easily navigable, even intuitive. In many nations, simplification of forms and regulations should be a high priority. The effects of simplification are easy to underestimate. In many nations, the benefits of important programs (involving education, health, finance, poverty, and employment) are greatly reduced because of undue complexity.

3. *uses of social norms* (emphasizing what most people do, e.g., "most people plan to vote" or "most people pay their taxes on time" or "nine out of ten hotel guests reuse their towels")
One of the most effective nudges is to inform people that most others are engaged in certain behavior. Such information often is most powerful when it is as local and specific as possible ("the overwhelming majority of people in your community pay their taxes on time"). Use of social norms can reduce criminal behavior and also behavior that is harmful whether or not it is criminal (such as alcohol abuse, smoking, and discrimination). It is true that sometimes most or

many people are engaging in undesirable behavior. In such cases, it can be helpful to highlight not what most people actually do, but instead what most people think people should do (as in, "90 percent of people in Ireland believe that people should pay their taxes on time").

4. *increases in ease and convenience* (e.g., making low-cost options or healthy foods visible)
People often make the easy choice, and hence a good slogan is this: make it easy. If the goal is to encourage certain behavior, reducing various barriers (including the time that it takes to understand what to do) often helps. Resistance to change is often a product not of disagreement or of skepticism, but of perceived difficulty—or of ambiguity. A supplemental point: If the easy choice is also fun, people are more likely to make it.

5. *disclosure* (e.g., the economic or environmental costs associated with energy use or the full cost of certain credit cards—or large amounts of data, as in the cases of data.gov and the Open Government Partnership; see opengovernmentpartnership.org)

The American Supreme Court Justice Louis Brandeis said that "sunlight is said to be the best of disinfectants," and disclosure can make both markets and governments much "cleaner."' For consumers, disclosure policies can be highly effective, at least if the information is both comprehensible and accessible. Simplicity is exceedingly important. (More detailed and fuller disclosure might be made available online for those who are interested in it.) In some settings, disclosure can operate as a check on private or public inattention, negligence, incompetence, wrongdoing, and corruption. The Open Government Partnership, now involving dozens of nations, reflects a worldwide effort to use openness as a tool for promoting substantive reform; nations must produce national action plans containing new policies to increase transparency.

6. *warnings, graphic or otherwise* (as for cigarettes)
If serious risks are involved, the best nudge might be a private or public warning. Large fonts, bold letters, and bright colors can be effective in triggering people's attention. A central point is that attention is a scarce resource, and warnings are attentive to that fact. One virtue of warnings is that they can counteract the natural human tendency toward unrealistic optimism and simultaneously increase the likelihood that people will pay attention to the long term. There is a risk, however, that people will respond to warnings by discounting them ("I will be fine"), in which case it would make sense to experiment with more positive messages (e.g., providing some kind of reward for the preferred behavior, even if the reward is nonmonetary, as in apps that offer simple counts and congratulations). Research also shows that people are far less likely to discount a warning when it is accompanied by a description of the concrete steps that people can take to reduce the relevant risk ("you can do X and Y to lower your risk").

7. *eliciting implementation intentions* ("do you plan to vote?")
People are more likely to engage in activity if someone elicits their implementation intentions. With respect to health-related behavior, a simple question about future conduct ("do you plan to vaccinate your child?") can have significant consequences. Emphasizing people's identity can also be effective ("you are a voter, as your past practices suggest").

8. *pre-commitment strategies* (by which people commit to a certain course of action)

Often people have certain goals (e.g., to stop drinking or smoking, to engage in productive activity, or to save money), but their behavior falls short of those goals. If people pre-commit to engaging in a certain action—such as a smoking cessation program—they are more likely to act in accordance with their goals. Notably, committing to a specific action at a precise future moment in time better motivates action and reduces procrastination.

9. *reminders* (e.g., by email or text message, as for overdue bills and coming obligations or appointments)
People tend to have a great deal on their minds, and when they do not engage in certain conduct (e.g., paying bills, taking medicines, or making a doctor's appointment), the reason might be some combination of inertia, procrastination, competing obligations, and simple forgetfulness. A reminder can have a significant impact. For reminders, timing greatly matters; making sure that people can act immediately on the information is critical (especially in light of the occasional tendency to forgetfulness). A closely related approach is prompted choice, by which people are not required to choose but asked whether they want to choose (e.g., clean energy or a new energy provider, a privacy setting on their computer, or to be organ donors).

10. *informing people of the nature and consequences of their own past choices* (smart disclosure in the United States and the midata project in the United Kingdom)
Private and public institutions often have a great deal of information about people's own past choices—for example, their expenditures on health care or on their electric bills. The problem is that individuals often lack that information. If people obtain it, their behavior can shift, often making markets work better and saving a lot of money. If, for example, people are given information about how much they have spent on electricity in the last year, they can take steps to reduce their spending in the future.

**Institutionalizing Nudges**

What is the best method for implementing nudges? It is certainly possible to rely entirely on existing institutions. We could imagine a system in which an understanding of nudges is used by current officials and institutions, including leaders at the highest levels. For example, the relevant research could be enlisted by those involved in promoting competitiveness, environmental protection, public safety, consumer protection, and economic growth—or in reducing private and public corruption and combating poverty, infectious diseases, and obesity. Focusing on concrete problems rather than abstract theories, officials with well-established positions might be expected to use that research, at least on occasion.

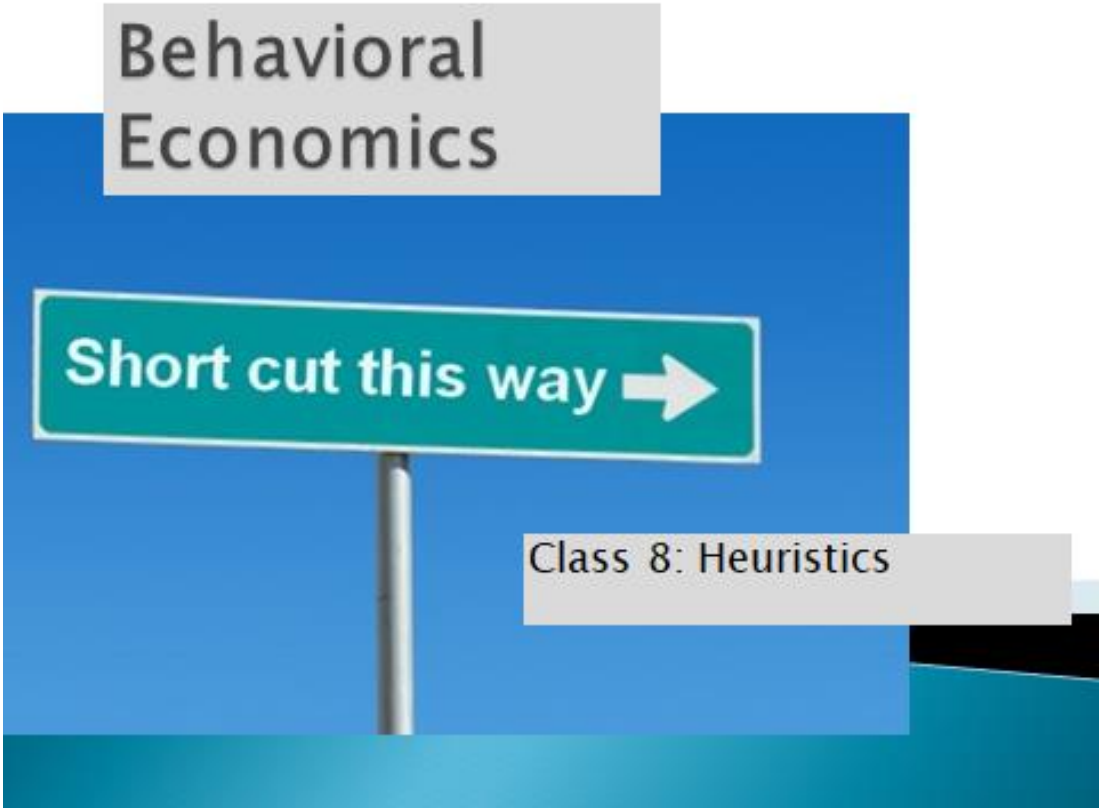
If the relevant officials have both knowledge and genuine authority, they might be able to produce significant reforms simply because they are not akin to a mere research arm or a think tank. (Even a single person, if given the appropriate authority and mission, could have a large impact.) In one model, the relevant officials would not engage in new research, or at least not in a great deal of it. They would build on what is already known (and perhaps have formal or informal partnerships with those in the private sector who work on these issues). In an important sense, this approach is the simplest because it does not require new offices or significant additional funding, but only attention to the relevant issues and tools, and a focus on

the right appointments. In the United States, this kind of approach has proved highly successful with the adoption of numerous nudges.

A quite different approach would be to create a new institution—such as a behavioral insights team or a nudge unit of some sort (as in the United Kingdom, the United States, Australia, the Netherlands, Ireland, Qatar, and increasingly many nations). Such an institution could be organized in different ways and could have many different forms and sizes. In a minimalist model, it would have a small group of knowledgeable people (say, five) bringing relevant findings to bear and perhaps engaging in, or spurring, research on their own. In a more ambitious model, the team could be larger (say, thirty or more), engaging in a wide range of relevant research. A behavioral insights team could be created as a formal part of government (the preferred model to ensure real impact) or could have a purely advisory role.

Whatever its precise form, the advantage of such an approach is that it would involve a dedicated and specialized team, highly informed and specifically devoted to the relevant work and with expertise in the design of experiments. If the team can work with others to conduct its own research, including randomized controlled trials, it might be able to produce important findings (as has in fact happened in the United Kingdom, Australia, Ireland, the Netherlands, and the United States, and similar efforts are occurring elsewhere). The risk is that such a team would be akin to an academic adjunct, a kind of outsider, without the ability to power or initiate real reform. Authority greatly matters. The United Kingdom has had the most experience with this kind of approach, and it has succeeded in part because it has enjoyed high-level support and access.

In this domain, one size does not fit all, but it is noteworthy that a growing number of nations have concluded that it is worthwhile to have a dedicated team. Of course, the two approaches might prove complementary.




# The Sunk Costs Fallacy

- A **sunk cost** is a cost that has already been incurred and cannot be recovered. Sunk costs are contrasted with *prospective costs*, which are future costs that may be avoided. In other words, a sunk cost is a sum paid in the past that is no longer relevant to decisions about the future.
- Even though economists argue that sunk costs are no longer relevant to future rational decision -making, people often take previous expenditures into their future decisions.
- There is nothing new about this concept. Long before Kahneman and Thaler started writing, it was often mentioned in basic economics textbooks.
- In the late 1960's and early 70's, many people in the United States argued that continuing the war in Vietnam was necessary because we invested too much to quit. Many more argued this was the wrong reason to continue.

## Sunk Costs, Continued

- The sunk cost fallacy has also been called the "Concorde fallacy": the UK and French governments took their past expenses on the costly supersonic jet as a rationale for continuing the project, as opposed to "cutting their losses".
- Managers of many utility companies in the U.S have been overly reluctant to terminate economically unviable nuclear plant projects. In the 1960s, the nuclear power industry promised “energy too cheap to meter.” But nuclear power later proved unsafe and uneconomical.

## Sunk Costs, Other Exmples

- Vacation time share developers use this fallacy to sell properties. Typically the prospective vacationer “invests” a sum of money which entitles her to spend a week at the property in perpetuity or at least until the company goes bankrupt. The original payment is an investment and the future vacations are “free.” Such investments should be seen as a way to disguise the cost of taking a vacation.
- A ticket-buyer who purchases a ticket in advance to an event they eventually turn out not to enjoy makes a semi-public commitment to watching it. To leave early is to make this lapse of judgment manifest to friends, strangers, as well as themselves. They have already paid, so they may feel that leaving would waste their expenditure.

# Kahneman on Heuristics

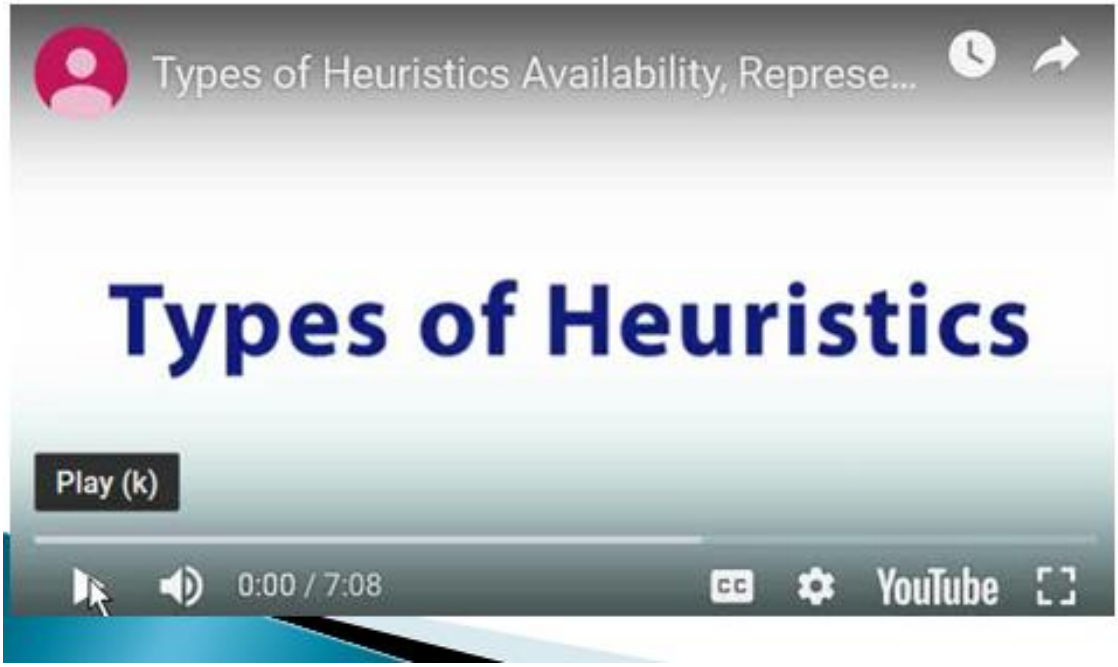
- The technical definition of a *heuristic* is a simple procedure that helps find adequate though often imperfect answers to difficult questions.
- Kahneman and Traversky asked themselves how people manage to make judgements of probability without knowing precisely what probability is.
- They concluded that people often substitute a "heuristic question" in place of the more difficult question. The mental shotgun makes it easier to generate answers to difficult questions without invoking your lazy system 2.

| Target Question | Heuristic Question |
|---|---|
| How much would you contribute to save an endangered species? | How much emotion do I feel when I think of dying dolphins? |
| How happy are you with your life these days? | What is my mood right now? |
| How should financial advisers who prey on the elderly be punished? | How much anger do I feel when I think of financial predators? |

# Thaler on Heuristics

- For several years economist Richard Thaler had been compiling a list of systemic errors that people often make.
- In the summer of 1976 Thaler read the paper published in *Science*: "Judgement Under Uncertainty: Heuristics and Biases." Thaler reports that, "As I read my heart started pounding the way it might during the final minutes of a close game. The paper took me thirty minutes to read from start to finish, but my life had changed forever."
- The thesis of the paper was simple and elegant. Humans have limited time and brainpower. As a result they use shortcuts, simple rules of thumb or "heuristics" to help make judgements.
- But using heuristics causes people to make **predictable** errors.
- Predictability is key to the argument. For years economists had assumed that rational people make random errors based on the inaccuracy of the data and the models they may be using. But Kahneman and Traversky were waiving a big red flag that said these errors were not always random.

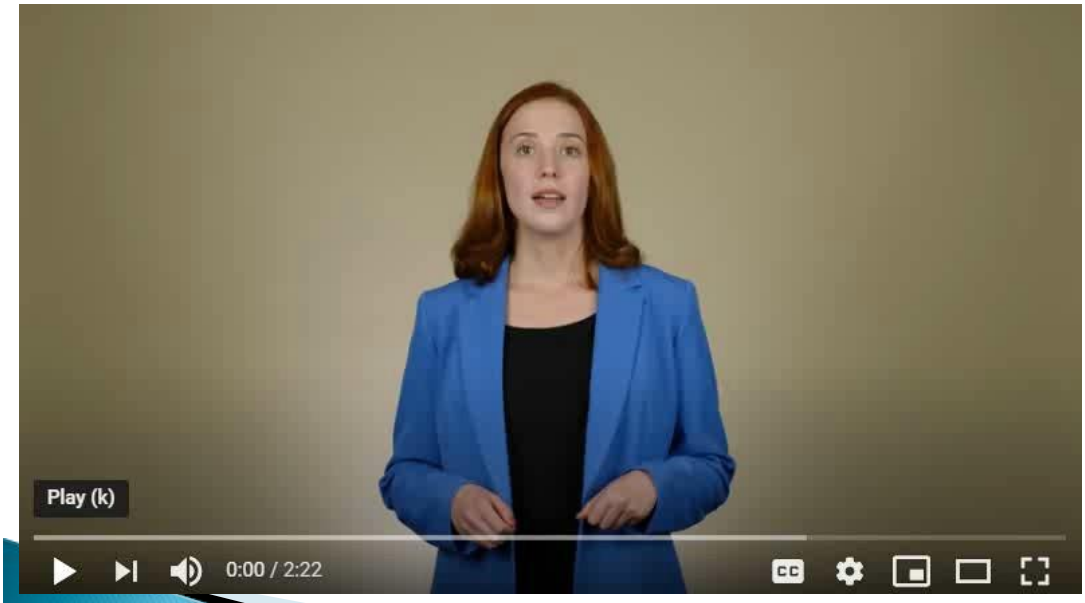

## Types of Heuristics



# The Availability Heuristic

- People assess the frequency of a class of probability of an event by the ease with which instances can be brought to mind.
- However availability is affected by factors other than frequency.
- For instance subjects hearing a list of well known personalities of both sexes were asked to judge whether the list contained more names of men than women. Different lists were given to different groups. In each of the lists, the subjects erroneously judged that the sex that had the more famous personalities was the more numerous.
- Recent occurrences are more likely to be relatively more available (and judged more likely) than earlier occurrences.
- Media coverage can help fuel a person's bias with widespread and extensive coverage of unusual events, such as terrorist events, mass shootings or airline accidents.

## Availability Heuristics in Advertising



# The Representativeness Heuristic

- The representativeness heuristic is seen when people use categories, for example when deciding whether or not a person is a criminal.
- It involves attending to the particular characteristics of the individual, ignoring how common those categories are in the general population.
- The representativeness heuristic is also an explanation of how people judge cause and effect. This can lead to a bias, incorrectly finding causal relationships between things that resemble one another when no cause and effect relation exists.
- Many superstitious people consider Friday the 13th to be unlucky. The superstition surrounding this day may have arisen in the Middle Ages, originating from the story of Jesus' last supper with 13 apostles and crucifixion on Friday.

# Base-Rate Heuristic

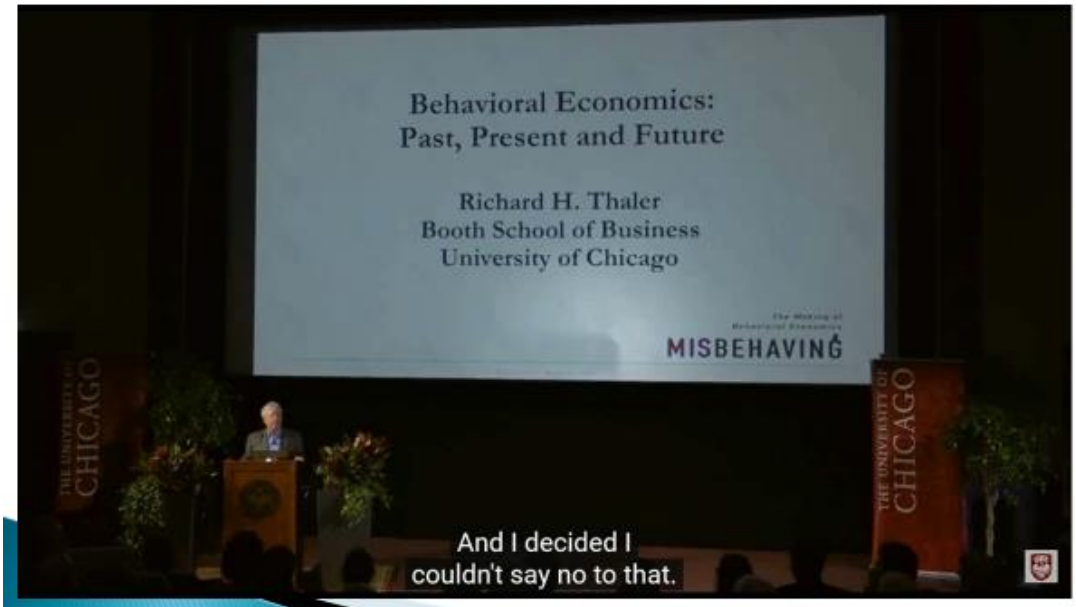
- Many people are biased <u>against</u> using base-rate information for making decisions.
- Disease in high incidence population, group *A*:
  - Imagine running an infectious disease test on 1000 persons, in which 40% are infected. The test has a false positive rate of 5% and no false negative rate.
  - $1000 \times 40/100 = 400$ people would receive a true positive Uninfected and test indicates disease.
  - $1000 \times 100 - 40/100 \times 0.05 = 30$ people would receive a false positive. The remaining 570 are correctly negative.
  - So a person receiving a positive test could be over 93% confident that it correctly indicates infection.
- Disease in low incidence population, group *B*:
  - Now imagine a population in which only 2% is infected.
  - $1000 \times 2/100 = 20$ people would receive a true positive
  - $1000 \times 100 - 2/100 \times 0.05 = 49$ people would receive a false positive.
  - Only 20 of the 69 total people with a positive test result are actually infected. So, the probability of actually being infected for those who tested positive is only 29% for a test that otherwise appears to be "95% accurate".
- A tester with experience of group *A* might find it a paradox that in group *B*, a result that had usually correctly indicated infection is now usually a false positive. The confusion is a natural error after receiving a health-threatening test result.

## The Outrage Heuristic *

- When people are thinking about how much to punish other people they decide how outrageous the underlying conduct was and base their decision on this.
- They do not think about deterrence.
- When asked to deliberate on punishment in a group, the outcome did not tend towards the median of the original group scores.
- Deliberations made the lower punishment ratings decrease when compared to pre-deliberation ratings. When the individual jurors favored little punishment, the group showed a leniency shift (symmetrically lower than the median).
- When the individual jurors favored strong punishment, the group as a whole produced a severity shift (symmetrically higher than the median).
- Once again the explanation can be explained as with group polarization: information, social comparison and corroboration or confidence.

* *How Change Happens*, Cass Sunstein, Chapter 2: The Law of Group Polarization

## Thaler: Behavioral Economics Past, Present and Futute



## Summary: Behavioral Economics is about Predictable Errors People Make

- Biases
  - Confirmation Bias
  - Present Bias
  - Anchoring
  - Endowment Effect
  - Loss Aversion
  - Sunk Cost
- Heuristics
  - Availability
  - Representativeness
  - Base Rate
  - Outrage
- Other Errors
  - Planning Fallacy (inability to inferring the particular from the general)
  - Framing

# Misbehaving: The Making of Behavioral Economics

## Chapter 48 from *50 Economics Classics,* compiled by Tom Butler-Bowdon

"There is, however, a problem: the premises on which economic theory rests are flawed. First, the optimization problems that ordinary people confront are often too hard for them to solve, or even come close to solving. Even a decent sized grocery store offers a shopper millions of combinations of items that are within the family's budget. Does the family really choose the best one? And, of course, we face many much harder problems than a trip to the store, such as choosing a career, mortgage, or spouse. Given the failure rates we observe in all of these domains, it would be hard to defend the view that all such choices are optimal."

## In a nutshell

**"Homo economicus," or rational man, is quite a different species to homo sapiens, which often seems to make decisions that seem to go against its own interests.**

When Richard Thaler was a young economics professor, he would give exams in the usual way, marked out of 100. The average grade would be 72 percent, which was a bit lower than the students were used to, and they complained vigorously that the exams were too hard. Wanting to keep his job and stop the complaining, Thaler had a brainwave: he made subsequent exams not out of 100, but out of 137. Why this odd number? It meant that the average mark would now be in the 90s. The change had a dramatic effect: complaints not only stopped, but most people were delighted with their grades, even though, when converted into a percentage out of 100, their grades were exactly the same as before.

The fact that you could make smart people a lot happier by changing the total marking score, even if it didn't change their A, B, C, or D grades, went against everything that orthodox economics taught about human beings being rational. It was not that people were stupid, Thaler says, but simply human. The economics discipline, and its models, was based on a fictional creature—homo economicus, or what Thaler calls the "Econ." Whereas Econs always act rationally, Humans "misbehave and this misbehavior, or departure from the models, has a major implication: economists' predictions would come out wrong. For instance, not only did hardly any economists foresee the 2007-08 financial crisis, but their models told them it couldn't happen. Unfortunately, in the making of public policy economists hold a very privileged position, their theories taken much more seriously than those of practitioners of other social sciences.

The economist Orley Ashenfelter called Thaler's research "wackonomics," because it seemed to be the economics of triviality. Yet just as the exposition of small anomalies can end up overturning whole paradigms of belief (see Thomas Kuhn in 50 Philosophy Classics), Thaler's observations of human foible and irrationality exposed the rigid "theory blindness" of economics. Misbehaving, with its frequently amusing character vignettes of the key players in

the making of behavioral economics, tells the story of that exposure. Thaler's Damascene moment was the discovery, in the 1970s, of an article by Daniel Kahneman and Amos Tversky, two Israeli psychologists investigating the limits of human rationality. At that time there wasn't much communication between the worlds of economics and psychology, but Thaler went to some lengths to befriend the pair and work with them.

While Kahneman went on to become "the greatest living psychologist" (see 50 Psychology Classics; Tversky died in 1996) Thaler's research, building on some of their insights, made him a seminal figure in behavioral economics. He prefaces the book with a 1906 quote from Vilfredo Pareto, the Italian economist:

*"The foundation of political economy and, in general, of every social science, is evidently psychology. A day may come when we shall be able to deduce the laws of social science from the principles of psychology."*

The world of academia being what it is, economics and psychology remain silos with their own preoccupations and outlooks, but economics has arguably gained the most from the cross-fertilization.

## Just human

Early in his career, Thaler started a list of situations (drawn from his own life and people he knew) in which people's actions contradicted what rational choice theory would suggest, such as:

- A man likes a cashmere sweater in a store, but doesn't buy it because he can't justify the expense to himself. But when, at Christmas, his wife gifts him the same sweater, he is delighted. He and his wife pool all their finances, and neither have any separate sources of money.
- I am willing to drive an extra ten minutes down the road to save $10 buying a $45 clock radio, but when the chance comes to save $10 when buying a $495 television set, I don't bother going to the other store. Why, when $10 is $10?
- Thaler was having a dinner party for some young economists, and noticed that a bowl of cashew nuts he had put out at the start was quickly being gobbled up. Fearing that the food to follow would be left uneaten, he promptly removed the bowl of cashews. The guests thanked him.

Conventional economics has it that people like as many options as possible, so why were the guests pleased when Thaler removed the cashew bowl? Economists don't see that humans have a problem with willpower. Because we are weak, we will purposely restrict our options. Adam Smith foreshadowed the self-control problem in *The Theory of Moral Sentiments*: "The pleasure which we are to enjoy ten years hence, interests us so little in omparison with that which we may enjoy today?'

The economist Franco Modigliani came up with the "life-cycle hypothesis?' according to which people work out how much money they are likely to earn over a lifetime, and working back from that how much they should spend in each period of their life. When Thaler explained the theory to an audience of psychologists, they laughed. How many people would do that in real life? The models of economists like Modigliani assume that people are very smart, very self-disciplined,

and look far into the future. Behavioral economists like Thaler assume people are myopic, that present enjoyment matters more than some delayed benefit, and that they don't think too much about decades ahead. Economics assumes there is one, unitary self, yet psychology has for a long time been open to there being many selves—or at least loci of control, from Freud's id and ego, to Kahneman's "fast" and "slow" thinking—within us, and that frequently these selves conflict each other.

## Weird ways we value

Thaler's life changed, he says, after reading Kahneman and Tversky's 1974 Science paper, "Judgment Under Certainty: Heuristics and Biases." The paper's basic argument was that because people have only limited brainpower, they use simple rules of thumb—"heuristics"—to help them make judgments and come to decisions. For instance, if someone asked an American if Dhruv was a common name, they would likely say "No," because they don't know anyone called Dhruv. But Dhruv happens to be a common name in India, and given the large population of India there are likely to be many more Dhruvs in the world than Grahams or Barrys. Because of the way humans think, we make predictable errors. This was a big idea for Thaler, because the economics discipline assumed that the errors in thinking people made were unique to them, but that in the main behavior and markets were rational.

"Economists get in trouble," Thaler writes, "when they make a highly specific prediction that depends explicitly on everyone being economically sophisticated:" For example, if scientists find that farmers would be better off using less fertilizer, economists assume that the best policy is to just make the information and research available, and farmers will—in their own interests—follow the advice. Yet this takes no account of the fact that many farmers will continue existing practices simply because that's the way they've always done things. Another example: if as a government you wanted to get people to invest more in their pension plans, all you should do is provide the information on how beneficial it is to them to save now to have a nest egg in the future. But this could in fact be an irresponsible approach, since people have a well-known bias in favor of the present over the future and unless they are "nudged" (by, for instance, making sizeable pension contributions the default option when starting a new job) or pushed, they won't save enough for their future.

Thaler was struck by another of Kahneman and Tversky's findings that what mattered to people was not so much the absolute level of wealth, but its relative utility, or more specifically, changes in wealth. People are not rational in that they hate losses more than they like gains. This aversion to loss sometimes makes us make bad decisions, such as unwillingness to sell a stock that has never performed well, when rationality would suggest cutting our losses and buying something more promising. Thaler coined the term "endowment effect" to explain the fact that people value what they already have (their endowment) more than they value what might become theirs in the future.

## Mental accounting

Thaler's research increasingly fell into an area he called "mental accounting," or the way we think about money and wealth that differs from what rationality would suggest.

When we have outstanding credit card bills, or loans, it makes sense for us to dip into our savings to pay off the loans, since the borrowings will be at a much higher interest rate than the

rate we get for savings. But people have very rigid mental categories like "rent," "bills," and "savings," and don't seem to remember that money is fungible (meaning money is money, and can be put to any use). This irrationality is highlighted by our gambling habits. The money we lose at the blackjack table is "our" money, while the money we win is the "house's money," and so is less valued. We are desperate to break even in order to preserve our money, but happy to gamble away whatever wins we have made on the night. But doesn't money won at the casino buy the same things as money earned through work?

According to economists, money we have already put into something that can't be recovered is a "sunk cost?' Whether we gain something or not from the payment or investment is irrelevant; it's now in the financial past. But this isn't how real people think Thaler gives the example of "Vince," who had paid $1000 for a season's membership of an indoor tennis club. After a couple of months into the membership he developed tennis elbow, but kept playing for another three months even though it was painful, because he didn't want to "waste" his membership. What economists call the "sunk cost fallacy" has more serious effects. Some believe the United States continued the war in Vietnam because it had invested so much money and people in it that it would be terrible for it all to be "for nothing?' Companies like Costco and Amazon exploit our vulnerability to the sunk cost fallacy by getting us to join up as a member. Paying $99 a year for "Prime" membership is likely to make us use Amazon even more, because we will feel like we "have to get our money's worth?'

Thaler also discusses his research into consumer psychology. Supermarket strategies of "everyday low prices" tend to fail, he notes, because we love to feel we are getting bargains through sale prices or the use of coupons, rather than the more boring saving of a few pennies on every item we buy. This is "transaction utility" in its essence. We need to feel a reward when we buy something to make us feel smart or lucky. Even retailers who have an everyday low prices strategy make sure they provide lots of transaction utility in other ways, such as offering rebates, low interest options, or refunds of money when goods bought were found to have been cheaper elsewhere. There is a reason even rich people shop at Walmart and Costco: because every human being "gets a kick from transactional utility" even if on a rational basis the gains can be misleading.

## Nudges towards optimality

Economics has been built on the idea that people, left free from government meddling, make the best choices about their lives and resources. But do people choose to be obese, for instance, or is obesity influenced by the environment around us, including fast food places on every street? Studies show a tendency for people to stick with the default option, from mobile phone settings to employer retirement plans. The power of inertia is great, but this has a flipside: policy makers can use inertia to bring about positive outcomes for both individual and society.

History is full of movements and governments that have wanted to exercise control over other people's choices "for their own good"—with awful consequences. Thaler is sensitive to such charges, and explains his thinking as "libertarian paternalism?' Governments already offer incentives to people in order to achieve certain policy aims, but incentives do not always work. A combination of incentives and apparently irrelevant "nudges," such as presenting to new employees a favored option (bigger, rather than smaller pension contributions) as first on the list of choices, can lessen the negative effects of our natural cognitive biases, such as overvaluing

pleasure today at the expense of happiness when we are older. Thaler is suggesting an approach which assumes that, if the same people had more information, they might choose otherwise.

Thaler's ideas caught the attention of policy wonks in Britain, where a Behavioral Insights Team, which was immediately dubbed the "Nudge Unit," was set up under the government of David Cameron in 2010. The unit had to justify its existence by helping departments introduce measures that would save the government ten times the cost of setting up the unit. One of its first trials involved telling people owing tax money that the "great majority" of other people had paid their taxes on time, and that "you are one of the very small minority" who has not. It led to a five percent increase in people paying up within a certain period, amounting to £9 million. Not bad for one line in a letter. In other instances, text messages to people owing court fines led to a dramatic increase in payment, and a new default setting on driver licensing forms has led to an increase in the supply of organs for life-saving transplants.

Having demonstrated its success, Britain's nudge unit was privatized and now sells its services to UK public bodies. There is an equivalent nudge unit within the New South Wales government, and a Social and Behavioral Sciences Team in the White House. Over 130 countries now apply some form of behavioral science to public policy.

## Final comments

Thaler devotes two chapters in the book to the impact of behavioral economics on finance, which is extensive. For several years he wrote a quarterly column, "Anomalies" in The Journal of Economic Perspectives, pointing out the research showing, for instance, the "calendar" effects in the stock market (stocks tend to go up on Fridays and down on Mondays, on the days before holidays, and in January). The column was read much more widely than most academic articles, and brought Thaler some renown. But after 14 columns it was discontinued, the new editor feeling that readers had had enough of anomalies.

As a keen reader of Thomas Kuhn's Structure of Scientific Revolutions, however, Thaler was inspired to keep pointing out anomalies. He didn't dream that bringing a psychological approach to economics could cause a Kuhnian revolution, but ultimately it has. Behavioral economics is no longer "wackonomics" but a serious sub-field of the discipline, forcing purely rational models onto the defensive. Yet when the time comes that all economists can incorporate behavioral aspects into their work, Thaler notes, "behavioral economics" as a field need no longer exist, since “all economics will be as behavioral as it needs to be.”