Department of Economics

Professor Sendhil Mullainathan on Scarcity: Why Having Too Little Means So Much

September 17, 2013

Harvard Professor **Sendhil Mullainathan**, one of the leading economists in the field of behavioral economics, has recently released a new book with Princeton cognitive psychologist Professor Eldar Shafir entitled ***Scarcity: Why Having Too Little Means So Much***.

Their book examines the psychology of scarcity and the scarcity mindset that narrows perspective and perpetuates lack through the limiting of one's options. This is an important new work that addresses the psychology around poverty and how people's minds work differently when they feel they lack something. The results of their research show empirically that the feeling of scarcity places very real limits on what people are able to see, and the authors offer strategic interventions as behavioral solutions to help break these cycles that lead to the scarcity mindset.

Book Reviews:

Being poor changes your thinking about everything, *The Washington Post*, September 13, 2013

Scarcity: Why Having Too Little Means So Much – review, *The Guardian*, September 7, 2013

Days late, dollars short: Those with too little have a lot on their mind, *The Economist*, August 31, 2013

It Captures Your Mind, *The New York Review of Books,* September 26, 2013

Why is saving money so hard? on CNN Money, December 17, 2013

The New York Times

The Opinion Pages
Fixes

Escaping the Cycle of Scarcity

By TINA ROSENBERG

September 25, 2013 10:00 am

Fixes looks at solutions to social problems and why they work.

"Scarcity" is a new book that does something that I didn't think possible: it says something new about why people are poor — and what to do about it.

Here's what's not new: Poor people have more self-destructive habits than middle-class people. The poor don't plan for the future as much. Compared to middle-class people, the poor have less self-control and are quicker to turn to instant gratification. These habits perpetuate a cycle of poverty.

This is proven. The controversy is why it is the case. For conservatives, roughly speaking, these behaviors cause poverty. For liberals, also roughly speaking, poverty in many ways causes these behaviors. It is easy to see how the stresses of poverty weigh in. With eating habits, for example: fruit and vegetables cost more that many unhealthier foods, and might not be available in a poor neighborhood.

But there are behaviors the liberal view struggles to explain. Even when healthy foods are available and made cheap, for example, poor people take advantage of them far less.

Now Sendhil Mullainathan, a Harvard economist, and Eldar Shafir, a psychologist at Princeton, propose a way to explain why the poor are less future-oriented than those with more money. According to these authors, one explanation for bad decisions is scarcity — not of money, but of what the authors call bandwidth: the portion of our mental capacity that we can employ to make

decisions.

Worrying about money when it is tight captures our brains. It reduces our cognitive capacity — especially our abstract intelligence, which we use for problem-solving. It also reduces our executive control, which governs planning, impulses and willpower. The bad decisions of the poor, say the authors, are not a product of bad character or low native intelligence. They are a product of poverty itself. Your natural capability doesn't decrease when you experience scarcity. But less of that capacity is available for use. If you put a middle-class person into a situation of scarcity, she will behave like a poor person.

The authors and two colleagues had a team of researchers approach shoppers at a mall in New Jersey. People were asked about their income and then classified (without their knowledge) as either poor or rich. Then they were asked a question: your car needs a repair that will cost you $150. You can take a loan, pay in full, or postpone service. How do you go about making this decision? After they answered, the subjects took tests that measured fluid intelligence and cognitive control.

Poor and rich people did equally well on the test.

But then the researchers changed one thing: instead of needing $150 for the repair, they would need $1,500. The rich subjects did as well on the intelligence and willpower tests as they had before. The poor group did not.

Their scores dropped the equivalent of losing 13 or 14 IQ points — larger than the drop experienced by people who had just stayed up all night. Thinking about how to come up with $150 didn't affect them. But thinking about coming up with $1,500 eroded their intelligence more than if they had been seriously sleep-deprived.

This result isn't particular to New Jersey. The same team studied sugar cane farmers in India, testing their intelligence just after the harvest, when they were flush with cash, and before it, when they were poor. The same farmers got 25 percent more questions right on the intelligence test when they were rich, and made 15 percent more errors on the executive control test when they were poor.

Isn't this just stress? We know how harmful stress can be. But Mullainathan and Shafir argue that the effects of scarcity go further. Its capture of our brains leads people into a tunnel; your only focus is solving the emergency of the moment. If the rent is due, you use money that would have gone to the car payment. The fact that this will end in getting your car repossessed, and therefore losing your job, doesn't really register. You take very little notice of what's outside the tunnel.

In this way, scarcity creates a vicious circle. Tunneling leads people to borrow to deal with the emergency expense. For the poor, borrowing is very costly. They take high-interest payday loans, buy on installment, pay large credit-card fees and interest. They "borrow" by paying bills late, which means they pay a substantial portion of their income in late fees and reconnection fees. These consequences, however, lie outside the tunnel — until paying those bills becomes the new emergency.

The authors designed complicated games to simulate conditions of scarcity. One was a version of the TV game show "Family Feud," played by Princeton students assigned at random to either have a lot of time to answer questions or just a little. When researchers allowed players to borrow time from their future rounds at high rates of interest, the time-poor players borrowed profligately, and their scores plummeted. When the loans could be rolled over — simulating real-world debt traps — the time-poor did even worse.

Mullainathan and Shafir write that the same mentality of scarcity that applies to the cash-poor also applies to people who are overly busy and those who are dieting.
People short of time also tunnel, borrowing time by postponing projects that are tomorrow's emergency but not today's. And being hungry captures the mind in a way similar to being poor. People who are on strict diets spend a lot of their bandwidth thinking about food.

The scarcity phenomenon is good news because to a certain extent, we can design our way around it. Awareness of the psychology of scarcity and the behavioral challenges it yields "can go some way toward improving the modest returns of anti-poverty interventions," Mullainathan and Shafir write.

Here are some examples:

Automate good decisions. Since we can't be counted on to make good choices when we're in the tunnel, we can make them automatic. One decision to automate your choices will eliminate all those future opportunities to screw up. One way is to switch the default. For example, instead of making enrolling in a 401(k) savings plan voluntary, make not enrolling voluntary. This simple change has produced spectacular increases in usage of 401(k)s, organ donation and AIDS testing. It can be used for many outside-the-tunnel decisions, like building savings: sign up to have part of your paycheck automatically deposited into a savings account. You can still get at it, but you have to take steps to do so.

Provide better options for borrowing. Employers of minimum wage workers often complain that these workers are unprepared for their jobs, unfriendly to customers and distracted. Part of the reason may be that they are devoting little bandwidth to their jobs because they are worrying about how to live on their wages.

The theories in "Scarcity" support the idea that paying them a living wage would increase productivity. But since some employers may balk at this, the book proposes a smaller step: remove some of the penalties that come with borrowing.

Since poor people often have an urgent need for small sums, they take a lot of payday loans. These loans, some of which have interest rates of more than 300 percent, cost workers hundreds of dollars in fees. They are a scam designed to trap people in cycles of debt — 85 percent of payday loans go to people who take seven or more loans each year. (See this report (pdf) for a thorough explanation of their horrors, and this column by Tom Edsall.)

One solution is to spread credit unions. Another is to expand workplace-based financial counseling and services, like Neighborhood Trust's innovative Employer Solution.

Employers can help by paying weekly instead of bi-weekly, and by offering loans themselves with reasonable interest rates. Better yet, a portion of the repayment could go automatically into a savings account for each worker, so they

could eventually borrow from themselves.

Internationally, we now know that microcredit loans are often used to cover personal emergencies, not to start businesses. They are not well-suited to this, as they are usually too large and take too much time to get. (This is why even people with access to microcredit continue to go to pawn brokers and loan sharks.) Dhanei KGFS, a financial services provider in Orissa, India, pioneered a successful new product: small, low-interest emergency loans that clients of their bank had pre-qualified for and could get at any time of day or night, nearly instantly.

Design services for the poor to take up less bandwidth. We know the poor are short of cash; we design for that (most of the time). But we don't think about their scarcity of bandwidth, and that should influence services as well. One good model is Single Stop, which operates more than 90 sites around the country where low-income people can apply for benefits, do their taxes and get legal and financial advice.

Structure incentives to put them inside the tunnel. Since scarcity forces us to tunnel, and concentrate only on what's inside that tunnel, incentives and penalties will work best when they can be inside, too. This means very short deadlines and quick rewards — perhaps in several installments.

Telling people they can be on welfare for only five years isn't effective. That deadline might not become part of the tunnel until they hit four years and 11 months — too late to start looking for a job. Mullainathan and Shafir call this the worst of both worlds: "it penalizes but fails to motivate," they write.

The same phenomenon explains why the death penalty, the three-strikes law and other harsh punishments fail to deter criminals. No matter how harsh they are, they are far enough away to lie outside the tunnel.

These design shifts — the authors and others propose more of them on the behavioral economics site www.ideas42.org — are a small solution to a very big problem. But the theory is a new one. It needs more study — but part of that exploration will be trying out different models of antipoverty services that take bandwidth scarcity into account. It is far from the only reason people are poor, of

course, but what's particularly useful about the idea of scarcity is that it is overarching; ease that burden, and people will be better able to deal with all the rest.

Join Fixes on Facebook and follow updates on twitter.com/nytimesfixes. To receive e-mail alerts for Fixes columns, sign up at here.

Tina Rosenberg won a Pulitzer Prize for her book "The Haunted Land: Facing Europe's Ghosts After Communism." She is a former editorial writer for The Times and the author, most recently, of "Join the Club: How Peer Pressure Can Transform the World" and the World War II spy story e-book "D for Deception."

It Captures Your Mind

Cass R. Sunstein

SEPTEMBER 26, 2013 ISSUE

Scarcity: Why Having Too Little Means So Much
by Sendhil Mullainathan and Eldar Shafir
Times Books, 288 pp., $28.00

There is a great deal of unlovely jargon within the federal government. The product of an activity is called "the deliverable." A task that follows a meeting is called a "do-out." A request for action is described as "the ask." If someone needs to continue a discussion with a colleague, he will promise to "circle back." If a project must be abandoned or put on hold because of competing demands on people's time and attention, the problem is one of "bandwidth." Of course such terms can be found in many other places, including in businesses, but they are used with particular regularity in Washington, D.C.

Museum of Modern Art, New York City/Bill Brandt Archive Ltd.

Bill Brandt: Northumbrian Miner at His Evening Meal*, 1937; from 'Bill Brandt: Shadow and Light,' a recent exhibition of his photographs at MoMA. The catalog, by Sarah Hermanson Meister, is published by MoMA and distributed by DAP. For more on Brandt's work, see the NYRgallery.*

Of the various unlovely terms, "bandwidth" is the most useful and the most interesting. The central idea is that public officials have the capacity to focus on, and to promote and implement, only a subset of the universe of good ideas. Bandwidth is limited partly for political reasons. In any particular period, members of Congress, executive branch officials, and the public itself may be unwilling to support more than a small set of proposals. But much of the problem involves the limits of time and attention. A proposed reform might seem excellent, and it might even be able to attract considerable political support, but the minds of the people who might pursue it are occupied, and they do not have the time to learn about it and to explore its merits. Within government, some good ideas fail to go anywhere, not because anyone opposes them, but because the system lacks the bandwidth to investigate them.

Economists focus on the problem of scarcity—on how people allocate their resources (including both time and money) in the face of many competing demands. In their

extraordinarily illuminating book, the behavioral economist Sendhil Mullainathan and the cognitive psychologist Eldar Shafir explore something quite different, which is the *feeling* of scarcity, and the psychological and behavioral consequences of that feeling. They know that the feeling of scarcity differs across various kinds of experiences and that people can feel "poor" with respect to money, time, or relationships with others.

But their striking claim, based on careful empirical research, is that across all of those categories, the feeling of scarcity has quite similar effects. It puts people in a kind of cognitive tunnel, limiting what they are able to see. It depletes their self-control. It makes them more impulsive and sometimes a bit dumb. What we often consider a part of people's basic character—an inability to learn, a propensity to anger or impatience—may well be a product of their feeling of scarcity. If any of us were similarly situated, we might end up with a character a lot like theirs. An insidious problem is that scarcity produces more scarcity. It creates its own trap.

Because they lack money, poor people must focus intensely on the economic consequences of expenditures that wealthy people consider trivial and not worth worrying over. Those without a lot of time have to hoard their minutes, and they may have trouble planning for the long term. The cash-poor and the time-poor have much in common with lonely people, for whom relationships with others are scarce. When people struggle with scarcity, their minds are intensely occupied, even taken over, by what they lack.

Mullainathan and Shafir offer a somewhat macabre illustration. Toward the end of World War II, the Allies knew that they would find a lot of Europeans on the edge of starvation, and they wanted to learn exactly how they should start to feed those whom they were liberating. Are full meals a good idea? Should they begin with small quantities? To answer these questions, researchers at the University of Minnesota engaged in an experiment with healthy male volunteers whose calories were reduced to the point right above the level where they would be permanently harmed. The most surprising finding was psychological. The men became not merely hungry but completely focused on food:

> Obsessions developed around cookbooks and menus from local restaurants. Some men could spend hours comparing the prices of fruits and vegetables from one newspaper to the next. Some planned now to go into agriculture. They dreamed of new careers as restaurant owners…. When they went to the movies, only the scenes with food held their interest.

A participant in the study recalled the experience as horrific, not so much "because of the physical discomfort, but because it made food the most important thing in one's life…food became the one central and only thing really in one's life." For Mullainathan and Shafir, the central point is that "scarcity captures the mind."

Here's a less grisly illustration. Researchers asked people to view a screen with words flashing across it very quickly (1/30 of second), and to say whether they could identify those words. The words included RAKE, TAKE, and CAKE. Participants were invited to come to the lab three or four hours before the experiment began; some of them were asked to go out and get lunch during that time, while others ate nothing. In general, the hungry participants did about as well on the test as those who had eaten. But they did a lot better on food-related words. When the word CAKE was onscreen, they saw it, even when it escaped the attention of those who had had lunch. Importantly, they saw it subconsciously, not deliberately; the flash was far too fast to allow any kind of conscious control. (For people who are thirsty, the same test works with words like WATER.)

Something similar happens for scarcity of all kinds. Lonely people do not do better than others in remembering what they have read, but they stand out in their ability to recall parts of a narrative that involve interactions with others. Remarkably, poor children systematically overestimate the size of bigger coins (quarters and half-dollars), evidently because they loom large to them. At restaurants and airports, people who are going through divorce are especially alert to the presence of couples and families.

Mullainathan and Shafir emphasize that scarcity can have distinctive benefits, simply because it focuses the mind. If you face scarcity, you may end up in a kind of psychological tunnel, and your focus may well have a beneficial effect. People often work best in the face of an imminent deadline—not only more rapidly, but also more creatively. In his book on Winston Churchill, Max Hastings quoted the diplomat Lord D'Abernon: "An Englishman's mind works best when it is almost too late." Studies of meetings establish that it is only as time gets short that people start to make progress. (A lesson for institutions of all kinds: consider cutting the length of all meetings in half.) After a trip to the supermarket, most people do not remember how much they spent on particular items, but poor people do.

Psychologists and behavioral economists have found that with respect to money, many people make what economists regard as a series of cognitive mistakes. For example, most of us value a ticket to a sports event as the amount that we paid for it, rather than as the amount we could get for it if we sold it on the open market (the right measure from the economic point of view). Intensely focused on their economic situation, poor people are far less likely to make that particular mistake.

The downside is that by occupying the mind, scarcity can prevent people from attending to other matters. If the mind is full, it will have a hard time absorbing new material. When sixth-graders take classes near a noisy railroad line, they learn a lot less, ending up a full year behind their counterparts. Social scientists have done a lot of experiments involving "cognitive load." In such experiments, they ask people to solve complex problems and then test whether the effort affects their behavior in other respects, for example by leading them to choose chocolate cake over fruit. The standard finding is that their self-control is diminished;

they are more likely to go for the cake. Mullainathan and Shafir think that scarcity works in the same way. It imposes a kind of “bandwidth tax” that impairs people’s ability to perform well.

In one experiment, they asked a group of people to imagine that their car needed to be fixed, that the repair would cost $300, and that they were making a choice between getting it fixed immediately or waiting (and hoping that the car might work for a while longer). Then the authors asked: How would you make this decision? Would it be an easy or hard decision to make? After receiving people’s answers, the authors asked them a series of questions of the sort that appear on conventional intelligence tests. Well-off people and poor people did not show any difference in intelligence.

In a second version of the experiment, the authors posed exactly the same problem, but with a single difference: the cost of the repair was $3,000 rather than $300. Here is the remarkable finding: After encountering the second version of the problem, poor people did significantly worse than well-off people on the same intelligence test. What explains the difference? The answer is not more challenging arithmetic. When the authors posed nonfinancial problems, the use of small or large numbers produced no difference between poor people and rich people. Nor did the problem involve a lack of motivation. When the authors paid people for correct answers (and thus gave poor people an especially strong incentive to do well), the $3,000 version continued to create a large difference between poor people and well-off people on general intelligence questions.

Mullainathan and Shafir attribute the result to the fact that for people without a lot of money, it is extremely challenging to try to figure out a way to come up with $3,000. To meet that challenge, they have to think extremely hard, which is depleting, and which makes it harder to do well on subsequent tasks. After people are depleted in that way, they do worse on intelligence tests. (Recall the sixth-graders who learned less because of background noise, and the food-obsessed participants in the University of Minnesota study; it is a fair bet that they would not have done so well on intelligence tests.) Mullainathan and Shafir replicated their general result with sugar cane farmers in India, finding that they do far worse on intelligence tests before a harvest, when they have little money and are preoccupied with how to make ends meet, than after a harvest, when cash is plentiful. Stunningly, the effect of plentiful cash was equivalent to a nine-to-ten-point boost in IQ.

A depletion of bandwidth also reduces people’s capacity for self-control. After being asked to try to remember eight-digit numbers, people are more likely to be rude in difficult social situations. The general lesson is that when people’s attention is absorbed by other matters, they are more likely to yield to their impulses. With this lesson in mind, Mullainathan and Shafir insist that certain characteristics that we attribute to individual personality (lack of motivation, inability to focus) may actually be a problem of limited bandwidth. The problem is scarcity, not the person. Compare a computer that is working slowly because a lot of other programs are operating in the background. Nothing is wrong with the computer; you just need

to turn off the other programs.

Drawing by Edward Gorey

In this light, it should be easy to see why Mullainathan and Shafir think that scarcity tends to produce more of the same. For example, most of us are susceptible to "the planning fallacy," which means that we are unrealistically optimistic about how long it will take to complete a project. But busy people are especially vulnerable, since they are attending to their past and current projects and so are "more distracted and overwhelmed—a surefire way to misplan." Poor people are unlikely to take the time required to understand the small print on low-cost mortgage forms, even if they contain information that they need to understand. They are also more likely to resort to payday loans, which have high fees, and which can create a kind of trap, in which people end up taking out payday loans to pay back their payday loans. The underlying problem is that when people "tunnel," they focus on their immediate problem; "knowing you will be hungry next month does not capture your attention the same way that being hungry today does." A behavioral consequence of scarcity is "juggling," which prevents long-term planning.

Those who live in circumstances of abundance have a kind of cushion, which allows them to avoid depletion. If wealthy people are confronted with a serious economic "shock," requiring

them to spend a great deal of cash on an emergency, their lives are not turned upside-down. With respect to money itself, this point is self-evident, but Mullainathan and Shafir want to draw attention to its psychological and behavioral consequences. When bad surprises occur, those who live under circumstances of abundance (with respect to money or time) do not have to devote a lot of mental energy to them.

Short of creating widespread abundance, can anything be done to reduce the harmful effects of scarcity? Mullainathan and Shafir organize their answer around an arresting story. During World War II, the United States military was faced with a series of "wheels-up" crashes, which occurred when pilots, upon landing, retracted the wheels rather than the flaps. The occurrence of these crashes was a puzzle. Did the pilots suffer from poor training, carelessness, or fatigue? It turned out that the problem was limited to bomber pilots, flying B-17s and B-25s. In those particular planes, the wheel controls and the flap controls looked almost identical, and they were side by side. Pilot errors turned out to be cockpit design errors. A small change in the controls was sufficient to eliminate the problem.

Mullainathan and Shafir think that a lot of problems in life stem from something like cockpit design errors. They want institutions and individuals to make the social environment "scarcity-proof." To understand their perspective, it is useful to consider the words of the economist Esther Duflo, one of the world's leading experts on poverty:

> We tend to be patronizing about the poor in a very specific sense, which is that we tend to think, "Why don't they take more responsibility for their lives?" And what we are forgetting is that the richer you are the less responsibility you need to take for your own life because everything is taken care [of] for you. And the poorer you are the more you have to be responsible for everything about your life…. Stop berating people for not being responsible and start to think of ways instead of providing the poor with the luxury that we all have, which is that a lot of decisions are taken for us. If we do nothing, we are on the right track. For most of the poor, if they do nothing, they are on the wrong track.*

Mullainathan and Shafir seek to identify ways to help people to end up on the right track if they do nothing, or at least much less. One possibility is to make certain outcomes automatic, so that people do not have to think about them at all. For example, many workers are busy, and they do not take the time to sign up for pension plans. In the United States, numerous employers have recently adopted automatic enrollment plans, signing workers up themselves (while allowing them to opt out). There is evidence that in bringing about an increase in savings, automatic enrollment can have an even bigger effect than significant tax incentives. With respect to health insurance, Obamacare requires large employers (those with more than two hundred employees) to enroll employees automatically. For economic planning in general, Mullainathan and Shafir urge that people would greatly benefit from small steps that make certain actions unnecessary (such as, for example, automatic bill payment).

Another approach involves simple reminders. Many people fail to pay bills on time (and thus end up paying late fees). Others forget to make an appointment with a doctor or dentist (and thus risk serious health problems). Still others fail to pay attention when their driver's license is expiring (and thus risk criminal penalties). Evidence suggests that if people are sent reminders, perhaps by text messages, such problems are significantly reduced. In the same vein, reductions in the burdens of paperwork can substantially increase participation in private and public programs, including those designed to give people financial aid for college and to promote job training. Mullainathan and Shafir think that if they focus on the corrosive psychological consequences of scarcity, individuals and institutions will be able to identify a host of promising reforms.

In providing a unified treatment of those consequences, Mullainathan and Shafir have made an important, novel, and immensely creative contribution. But there is an immediate question, which is whether their real topic is stress rather than scarcity. We might well think that stress is scarcity's most important psychological consequence, and that it accounts for many and perhaps most of their findings. The point might be right, but stress can occur in the absence of scarcity, and scarcity can occupy people's minds even if they are not particularly stressed. You might feel stress because people are treating you badly at work, and even if you are happy and stress-free, you might neglect some important matters once you are focused and working contentedly in your "tunnel." (Some professional athletes do not feel a lot of stress during pressure situations, but they are certainly attending to the task at hand.) It would have been illuminating for Mullainathan and Shafir to offer a detailed discussion of the effects of stress as such, and of the relationship between those effects and their findings, but they are right to say that their topic is a different one.

Mullainathan and Shafir are concerned with those forms of scarcity that produce a kind of intense focus (and in extreme cases, obsessiveness) that makes it difficult or even impossible to attend to other matters. In their account, scarcity leads to particular psychological states, which have behavioral consequences. There is a lot of truth in this account, but I think that it might benefit from greater nuance. Scarcity, as such, is not necessary for those psychological states to occur, and in some cases, it is not sufficient.

Our minds are often occupied by problems that are not naturally seen as ones of scarcity. Perhaps we can say that if John is desperately trying to get time and attention from his romantic partner Jane, John is "Jane-poor." Perhaps we can say that someone who is struggling with cancer, and can think of little else, is "health-poor." But it might not be so illuminating to apply the term "scarcity" to a pilot struggling with a poorly engineered cockpit, or a mother who is feeling overwhelmed because her child is failing in school, or a novelist who is entirely absorbed in the task of completing her book, or a political activist who cannot stop thinking about a terrible tragedy in some part of the world. Minds can be occupied in the absence of scarcity.

Is scarcity sufficient to produce a form of tunneling? In cases of real desperation, as with extreme thirst or hunger, it almost certainly is. But some forms of scarcity do not have that effect. The psychological consequences that concern Mullainathan and Shafir need not occur merely because people are poor or busy, or because they have few friends. Unless they are at the very edge of subsistence, people without much money are able to think about a wide range of things; their minds need not be occupied by their economic status. So too, people who are single, or who have few friends, need not be preoccupied by that fact. Some people are doing fine on their own. The association between scarcity, taken as a matter of fact, and "tunneling" varies greatly across people and situations.

Nonetheless, Mullainathan and Shafir are correct to say that in its many forms, scarcity tends to have a series of unfortunate psychological consequences, and that those consequences can seriously disrupt not only people's performance, but also the very quality of their lives. They are also right to say that some of the most harmful effects of scarcity can be greatly reduced by reforms that simplify tasks and make greater use of automatic solutions. In Washington, D.C., policymakers think a lot about the limits of "bandwidth" when they decide whether to take on new projects. It is not too much to ask them to do the same thing in deciding what kinds of projects to impose on the rest of us.

---

* Susan Parker, "Esther Duflo Explains Why She Believes Randomized Controlled Trials Are So Vital," Center for Effective Philanthropy Blog, June 23, 2011. ↩

theguardian | TheObserver

Scarcity: Why Having Too Little Means So Much by Sendhil Mullainathan and Eldar Shafir – review

A study showing how poverty impairs judgment has far-reaching implications

Tim Adams
The Observer, Saturday 7 September 2013 10.00 EDT

People crouch to collect leftover vegetables in Athens: ‘scarcity of all kinds remodels patterns of thinking’. Photograph: Bloomberg/Getty Images

In a world increasingly polarised by wealth, the efforts to find a metaphor that unifies rich and poor, a shared humanity, if you like, has become both a lucrative and a slightly desperate publishing enterprise. Most of the academic traffic is concentrated at the busy crossroads between economics and psychology, where a nudge is as good as a blink. The idea that we are defined by and subject to market forces is taken as a given in this work; the interest lies in the gap between the economist's faith in rational decision-making and the psychologist's stacked-up evidence of our less than rational behaviours: in the exposure of our almost comical inability to understand risk and reward and to do what is best for us.

Scarcity: Why having too little means so much
by Sendhil Mullainathan, Eldar Sharif

Buy the book

Tell us what you think: Star-rate and review this book

This gap was first comprehensively explored in the pioneering work of Daniel Kahneman and the late Amos Tversky, through their Nobel-prize winning analysis of how man (and woman, but mainly man) is anything but a creature of logic in market places of all kinds. Kahneman's recent bestselling precis of his life's work, *Thinking, Fast and Slow*, was a catalogue of examples of people using the wrong kind of analysis when confronting pivotal problems: relying on instinct when precise weighing of probabilities would be crucial, and vice versa. The seductive tone of Kahneman's writing comes in part from his understanding that no one is exempt from these failings. When I interviewed him about his ideas, he observed that the most useful subject for his study of internal biases and wonky reasoning had always been himself. Though he spent a lifetime proving the fundamental weakness of human beings in predicting the outcomes of any relatively complex choice, it happily didn't stop him making all sorts of errors of judgment in his own life.

Scarcity, the latest of the post-Kahneman adventures into this behaviourist world, comes with a quoted tribute from the master: "the finest combination of heart and head that I have seen in our field". Some of that dichotomy is a result of this book being a collaboration between another distinguished double act: a Harvard economist and a Princeton psychologist. The duetting professors present their adventures in metaphor as a kind of quest, though it is not always clear who is Quixote and who Sancho Panza. Their journey begins with the sort of revelation common to all such quests, a leap from the personal to the universal. The hypothesis to be tested is this: do the patterns of behaviour they themselves show when under deadline pressure in busy academic lives bear relation to those displayed by those billions of people in the world struggling to survive on minimal resources? In other words, do the stressed-out time-poor of the west have common cause with the actual dollar-a-day poor of the developing world? If they do, it is Mullainathan and Shafir's contention that the link between these two states is "scarcity".

If that link sounds tendentious, or even arrogant, then the American professors have no end of smart studies to back it up. It is, to begin with, their provable belief that "scarcity captures the mind", and it doesn't matter whether the absent resource is time or food or money. Some of this understanding is not new: a 1946 study of hunger (prompted by a need to understand and feed Europe's starving after the war) among American volunteers revealed not only the obvious – that, faced with starvation, food of any kind would be eaten and plates licked clean – but also that the brain was hijacked entirely by

this need. The subjects of the study who watched movies were interested only in the scenes in which food was mentioned; when they talked they made plans to open restaurants or become farmers when the study was ended; they hoarded cookbooks.

Further studies show this preoccupation to occur in far less extreme circumstances. In one experiment, a group is divided into those who'd had lunch, and those who hadn't eaten since breakfast. Both sets watched words flashed very quickly – at one-thirtieth of a second – on a screen. The hungry cohort identified as many of the words as the others except in one instance – they were far more likely to identify the word "cake" than their fully fed peers. From such findings the authors begin to count the ways in which scarcity of all kinds – sleep, security, time, food, money – remodels patterns of thinking. Sometimes the results are counterintuitive. Thus, the lonely and isolated are far more alive to the nuances of facial gesture than the popular and sociable. Sometimes the "tunnelling" of vision is more creative: as any artist or writer will confirm, an unmissable deadline will focus the mind like nothing else. But always, the authors observe, such narrowing comes at a price.

The cost is an undue focus on the necessity at hand, which leads to a lack of curiosity about wider issues, and an inability to imagine longer-term consequences. The effect of this scarcity-generated "loss of bandwidth" has catastrophic results in particular in relation to money. While the poor have a much sharper idea of value and cost, an obsessive concentration on where the next dollar is coming from leads not only to poor judgment, a lessened ability to make rational choices or see a bigger picture, but also to a diminishing of intelligence (even "feeling poor" lowers IQ by the same amount as a night without sleep), as well as a lowering of resistance to self-destructive temptation.

This "scarcity trap" provides an explanation for unpalatable truths, the authors argue. It shows why the "poor are more likely to be obese... Less likely to send their children to school... [why] the poorest in a village are the ones least likely to wash their hands or treat their water before drinking it." And the explanation is this: "the poor are not just short of cash. They are short on bandwidth." When an individual – any individual – is primed to think about his money troubles, his ability to perform tests and tasks is measurably reduced. Reminded that they are poor, individuals "showed less flexible intelligence, less executive control. With scarcity on his mind, he simply had less mind for everything else."

The implications of such findings, that poverty of all kinds literally reduces imagination and the ability to shape one's own life, are presented as somewhat revolutionary. As antidotes the authors suggest a series of nudge-like interventions to "create bandwidth" – for the time-poor these can be as simple as setting up direct debits, for the cash-poor it might involve providing some kind of insurance against "small shocks", (a puncture, a

sick cow, a rent rise) that can lead to moneylenders and loan sharks, or providing regular working days rather than the debilitating stress of zero-hours contracts. Such solutions are hardly news. Neither, you imagine, will the fact that pressing need limits long-term perspective and self-control come as a shock to anyone but the idle rich (and the government). Though the book lacks the killer anecdotal "stickiness" of a Malcolm Gladwell or a Kahneman, *Scarcity* does give scientific rigour to our instinctive understanding of the effect of privation (and austerity) on the brain – which alone should make it essential reading for policy-makers everywhere.

The Economist

The psychology of scarcity

Days late, dollars short

Those with too little have a lot on their mind

Aug 31st 2013 | From the print edition

Scarcity: Why Having Too Little Means So Much. By Sendhil Mullainathan and Eldar Shafir. *Times Books; 288 pages; $28. Allen Lane; £20.* Buy from Amazon.com (http://www.amazon.com/exec/obidos/ASIN/0805092641/theeconomists-20) , Amazon.co.uk (http://www.amazon.co.uk/exec/obidos/ASIN/1846143454/economistshop-21)

THE authors of this book both study people for a living—often people who lack money. They may be vegetable sellers in Chennai, India, who borrow money at dawn and repay with exorbitant interest at dusk. Or they may be ill-paid office managers, like Shawn from Cleveland, Ohio, who lives from pay cheque to pay cheque, always finding that there is “more month than money”.

Surprisingly the authors see a lot of themselves in their subjects. As successful academics, neither lacks money (Sendhil Mullainathan, an economist at Harvard, won a $500,000 “genius” grant from the MacArthur Foundation before he turned 30). But they do lack time. The way Mr Mullainathan feels about his professional obligations mirrors the way Shawn felt about his financial liabilities. He has been known to miss deadlines, just as Shawn missed bill payments. Mr Mullainathan has double-booked meetings, promising time he has already committed; Shawn similarly bounced checks. Both were too busy putting out fires to prevent them from flaring up, and both fell prey to fresh temptations. Shawn was seduced by a leather jacket at an unbeatable price; Mr Mullainathan accepted an unmissable invitation to write about people like Shawn.

There is a distinctive psychology of scarcity, argues Mr Mullainathan and Eldar Shafir, a psychologist at Princeton University. People’s minds work differently when they feel they lack something. And it does not greatly matter what that something is. Anyone who feels strapped for money, friends, time or calories is likely to succumb to a similar “scarcity mindset”.

This mindset brings two benefits. It concentrates the mind on pressing needs. It also gives people

a keener sense of the value of a dollar, minute, calorie or smile. The lonely, it turns out, are better at deciphering expressions of emotion. Likewise, the poor have a better grasp of costs.

This scarcity mindset can also be debilitating. It shortens a person's horizons and narrows his perspective, creating a dangerous tunnel vision. Anxiety also saps brainpower and willpower, reducing mental "bandwidth", as the authors call it. Indian sugarcane farmers score worse on intelligence tests before the harvest (when they are short of cash) than after. Feeling poor lowers a person's IQ by as much as a night without sleep. Anxieties about friendlessness have a similar effect. In one experiment a random group of people were told that their results on a personality test suggested a life of loneliness. This random subset subsequently performed worse on intelligence tests and found it harder to resist the chocolate-chip cookies provided for them.

By making people slower witted and weaker willed, scarcity creates a mindset that perpetuates scarcity, the authors argue. In developing countries too many of the poor neglect to weed their crops, vaccinate their children, wash their hands, treat their water, take their pills or eat properly when pregnant. Ingenious schemes to better the lot of the poor fail because the poor themselves often fail to stick to them. The authors describe these shortcomings as the "elephant in the room"—which poverty researchers ignore because it is disrespectful to the people they are trying to help. But if these so-called character flaws are a consequence of poverty, and not just a cause of it, then perhaps they can be faced and redressed.

The authors discuss a range of solutions to the psychological pratfalls of scarcity. These include pill bottles that glow when they have been neglected, and savings cards displayed near supermarket tills, like lottery tickets, but which transfer the money impulsively "spent" on them into the person's savings account.

Some of these practical antidotes are not new. But the book's unified theory of the scarcity mentality is novel in its scope and ambition. This theory has a lot of moving parts, perhaps too many. (The scarcity mindset yields a "focus dividend", which is offset by a tunnel-vision "tax" and a "bandwidth tax"; this can be relieved by "slack", but although slack relieves scarcity, "abundance" creates a dangerous complacency). It is, however, easy to enjoy the book's many vignettes and insights, leaving it to others with more bandwidth to fit it all together.

From the print edition: Books and arts

TIME

EVERYDAY MONEY PSYCHOLOGY OF MONEY

Why is Saving Money So Hard?

Dec. 17, 2013

SHARE

Sendhil Mullainathan, a professor of economics at Harvard University and a recipient of a MacArthur Foundation "genius" grant, answers the big question of why setting aside money for the future is so difficult.

Harvard economics professor Sendhil Mullainathan says people's failure to save shouldn't be blamed on a lack of self-control.

Photo: Joe Pugliese

Why is saving so hard?

There's a popular image of people who don't save for the future as lacking in self-control. But the reason saving is so hard has less to do with self-control and more to do with a scarcity of attention.

If you have urgent current expenses to cover, then future priorities like college and retirement fall off your radar because they are simply less pressing.

Scarcity of attention prevents us from seeing what's really important. The psychology of scarcity engrosses us in only our present needs.

That's a theme of Scarcity: Why Having Too Little Means So Much, your new book with Princeton professor Eldar Shafir. When saving is so hard, how can you get better at it?

People think saving is difficult because they think it requires a heroic tightening of your budget. In reality, you can make a big dent with automation and by capitalizing on a few opportunities requiring self-control.

For example, I have a healthy savings rate. But I don't consciously save anything. I just have a chunk of every paycheck go straight to a savings account. With the money I get, I actually spend willy-nilly.

I overcame my scarcity of foresight by setting up this system. It's like jumping into a pool: You just have to steel yourself and do it once, and you get benefits going forward. The

ability to save automatically is among the most powerful tools available to us.

How do you know it's so strong?

One piece of evidence is a study of investors in TIAA-CREF a few years back. After having chosen their 401(k) mix, the median number of times people changed their asset mix in any way over their working life was zero.

The best use of automation is something like the "Save More Tomorrow" program [developed by behavioral economists Richard Thaler and Shlomo Benartzi]. It sets up a regular deduction that doesn't kick in right away. This is how companies sell you things: They start out cheap, then you're automatically moved to a paid subscription later. You should do the same with your savings.

What if you don't have a steady paycheck? How do you save?

In that case, you can't just automatically put aside money. The question is what you do at times of abundance — say, if you get a tax refund. You have a magical opportunity to escape scarcity. But studies show that if I give you an abundance shock of $10,000, you don't just spend that $10,000. You end up spending $20,000, because you're thinking, "I have all this extra money."

You forget how you felt under the conditions of scarcity. You need to think, "Instead of using this windfall to buy something nice, I should put it in a savings account."

Are there any good tools for getting yourself to do this?

There's a cool website I've used, FutureMe.org. It lets you write an email to yourself to be delivered later. Say you are struggling to make a credit card payment. You send yourself an email to arrive in December, when you're going to get your Christmas bonus, saying, "Remember last March when making that payment was a pain? I don't want to be back there. As attractive as shopping is right now, let's put some of our bonus toward paying down the credit card."

In addition to making it hard to save for the future, how does financial scarcity affect us?

Our thoughts constantly go back to making ends meet, even if we are trying to focus on something else. The starkest implication of this, which we have evidence for, is that the same person has significantly less mental capacity to address a problem when he is poor than when he is well-off.

It is safe to say that when people are short on cash they might be less productive at work, be worse parents, and have less self-control.

What's the effect of scarcity on a societal level? Over the past 12 years, the mood in the U.S. has gone from a sense of plenty to one of anxiety.

A reasonable hypothesis is that as the U.S. has gotten into a recession and more people have making ends meet on their mind, we are actually becoming less productive, less intelligent, with lower self-control. How would we treat austerity and recessions if we knew they were hurting our mental capacity?

Along with your work on scarcity, you've studied financial advice a lot.

People often worry whether they can trust their adviser. Can they?

You can trust some of them some of the time. But a lot of advisers have financial incentives to sell specific products, which gets them to push funds that invest heavily in a particular stock or sector.

In a study I co-authored, we hired actors who pretended to seek financial advice. When some of them told advisers they already had their money in a good low-cost index fund, a significant majority of advisers tried to convince them to switch to some undiversified high-load fund. That was especially depressing.

So how can people avoid that trap?

For many people, target life-cycle funds can do a lot of work: They adjust the riskiness of your portfolio over time. All you need to do is to pick your retirement age.

You can also go to advisers that charge you by the hour and don't make money by selling you products. But you need to be self-aware too: We all have this urge to be told what we already want to hear.

In a study that Antoinette Schoar of MIT just finished, she found this striking problem in the demand for advice: If one adviser says, "Look, you can't beat the market; the best thing you can do is be in a low-cost diversified fund," and another adviser says, "I think that the tech sector is ready to rebound, and I've got a fund that would be good for that," people find the second adviser more knowledgeable and trustworthy.

It's like going to two doctors and preferring the doctor who offers you snake oil — and giving him an incentive to dispense snake oil. So you should make clear to your adviser that you are okay with being contradicted — that you are comfortable hearing perspectives at odds with your own.

Poverty Impedes Cognitive Function

Anandi Mani,[1] Sendhil Mullainathan,[2]* Eldar Shafir,[3]* Jiaying Zhao[4]

The poor often behave in less capable ways, which can further perpetuate poverty. We hypothesize that poverty directly impedes cognitive function and present two studies that test this hypothesis. First, we experimentally induced thoughts about finances and found that this reduces cognitive performance among poor but not in well-off participants. Second, we examined the cognitive function of farmers over the planting cycle. We found that the same farmer shows diminished cognitive performance before harvest, when poor, as compared with after harvest, when rich. This cannot be explained by differences in time available, nutrition, or work effort. Nor can it be explained with stress: Although farmers do show more stress before harvest, that does not account for diminished cognitive performance. Instead, it appears that poverty itself reduces cognitive capacity. We suggest that this is because poverty-related concerns consume mental resources, leaving less for other tasks. These data provide a previously unexamined perspective and help explain a spectrum of behaviors among the poor. We discuss some implications for poverty policy.

A variety of studies point to a correlation between poverty and counterproductive behavior. The poor use less preventive health care (*1*), fail to adhere to drug regimens (*2*), are tardier and less likely to keep appointments (*3*, *4*), are less productive workers (*5*), less attentive parents (*6*), and worse managers of their finances (*7*–*9*). These behaviors are troubling in their own right, but they are particularly troubling because they can further deepen poverty. Some explanations of this correlation focus on the environmental conditions of poverty. Predatory lenders in poor areas, for example, may create high-interest-rate borrowing, and unreliable transportation can cause tardiness and absenteeism. More generally, poverty may leave less room for error so that the "same" mistake can lead to worse outcomes (*10*, *11*). Other explanations focus on the characteristics of the poor themselves. Lower levels of formal education, for example, may create misunderstandings about contract terms, and less parental attention may influence the next generation's parenting style.

We propose a different kind of explanation, which focuses on the mental processes required by poverty. The poor must manage sporadic income, juggle expenses, and make difficult tradeoffs. Even when not actually making a financial decision, these preoccupations can be present and distracting. The human cognitive system has limited capacity (*12*–*15*). Preoccupations with pressing budgetary concerns leave fewer cognitive resources available to guide choice and action. Just as an air traffic controller focusing on a potential collision course is prone to neglect other planes in the air, the poor, when attending to monetary concerns, lose their capacity to give other problems their full consideration.

This suggests a causal, not merely correlational, relationship between poverty and mental function. We tested this using two very different but complementary designs (*16*, *17*). The first is a laboratory study: We induced richer and poorer participants to think about everyday financial demands. We hypothesized that for the rich, these run-of-the-mill financial snags are of little consequence. For the poor, however, these demands can trigger persistent and distracting concerns (*18*, *19*). The laboratory study is designed to show that similarly sized financial challenges can have different cognitive impacts on the poor and the rich. But, the study cannot fully capture our hypothesis that in the world, the poor face more challenging demands. In principle, the cognitive impact in situ may be different given that the scale of the problems can vary between the rich and the poor. Perhaps the rich in the world face larger monetary problems that also cause greater load. Perhaps the poor manage to restructure their lives so that they do not face as many cognitively challenging problems. Put simply, the laboratory study, although illustrating the mechanism, does not show its relevance in natural settings.

Our second study takes a different approach and allows us to assess what happens when income varies naturally. We conducted a field study that used quasi-experimental variation in actual wealth. Indian sugarcane farmers receive income annually at harvest time and find it hard to smooth their consumption (*20*). As a result, they experience cycles of poverty—poor before harvest and richer after. This allows us to compare cognitive capacity for the same farmer when poor (pre-harvest) versus richer (post-harvest). Because harvest dates are distributed arbitrarily across farmers, we can further control for calendar effects. In this study, we did not experimentally induce financial concerns; we relied on whatever concerns occurred naturally. We were careful to control for other possible changes, such as nutrition and work effort. Additionally, we accounted for the impact of stress. Any effect on cognitive performance then observed would thus illustrate a causal relationship between actual income and cognitive function in situ. As such, the two studies are highly complementary. The laboratory study has a great deal of internal validity and illustrates our proposed mechanism, whereas the field study boosts the external validity of the laboratory study.

We note two observations about these studies. First, they sidestep the discussion on whether poverty is best defined in absolute or relative terms (*21*). Because our hypothesis is about how monetary concerns tax the cognitive system, we define poverty broadly as the gap between one's needs and the resources available to fulfill them. Because this is based on subjective needs, it encompasses low-income individuals both in the developing and the developed world as well as those experiencing sharp transitory income shocks, such

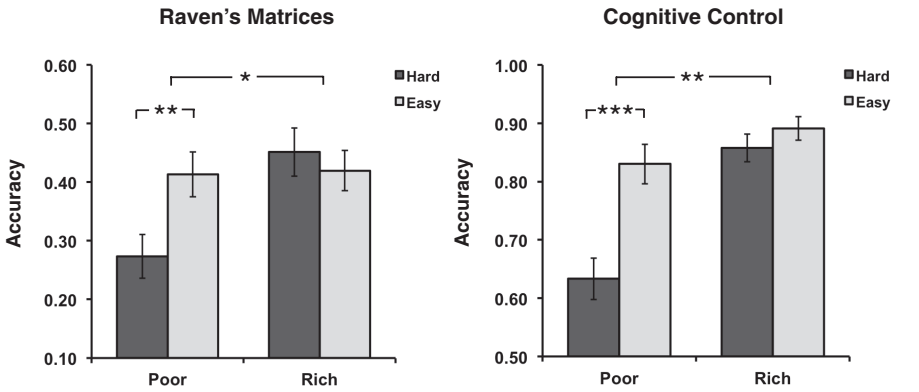


Fig. 1. Accuracy on the Raven's matrices and the cognitive control tasks in the hard and easy conditions, for the poor and the rich participants in experiment 1. (Left) Performance on the Raven's Matrices task. **(Right)** Performance on the cognitive control task. Error bars reflect ±1 SEM. Top horizontal bars show two-way interaction (poor versus rich × hard versus easy). *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$

[1]Department of Economics, University of Warwick, Coventry CV4 7AL, UK. [2]Department of Economics, Harvard University, Cambridge, MA 02138, USA. [3]Department of Psychology and Woodrow Wilson School of Public and International Affairs, Princeton University, Princeton, NJ 08540, USA. [4]Department of Psychology and Institute for Resources, Environment and Sustainability, University of British Columbia, Vancouver, British Columbia V6T 1Z4, Canada.

*Corresponding author. E-mail: mullain@fas.harvard.edu (S.M.); shafir@princeton.edu (E.S.)

as the unemployed. Second, existing theory and data suggest a possibly cumulative long-term impact of poverty on cognition (*22*, *23*): Childhood poverty may hinder brain development and eventually reduce adult cognitive capacity (*24*). Our hypothesis and tests focus on an immediate impact of poverty on cognition: Budgetary preoccupations can in real time impede cognitive function. Our proposed mechanism does not operate through brain development at early childhood but through an immediate cognitive load caused by financial concerns. Whether this mechanism also contributes to the long-term impacts is an open question.

The Laboratory Studies

The first study consisted of four experiments, with shoppers at a New Jersey mall who participated for pay (details are available in the supplementary materials). This sample encompasses a diverse income range, with the median household income at roughly $70,000 and a lower bound of roughly $20,000. This, broadly speaking, provides a cross-section of the United States, with the poor in our sample roughly corresponding to those in the lower quartile or third of the U.S. income distribution. We computed effective income by dividing household income by the square root of household size (*25*) and defined "rich" and "poor" through a median split on this variable (*26*).

In experiment 1, participants (n = 101) were presented with four hypothetical scenarios a few minutes apart. Each scenario described a financial problem the participants might experience. For example: "Your car is having some trouble and requires $X to be fixed. You can pay in full, take a loan, or take a chance and forego the service at the moment... How would you go about making this decision?" These scenarios, by touching on monetary issues, are meant to trigger thoughts of the participant's own finances. They are intended to bring to the forefront any nascent, easy to activate, financial concerns.

After viewing each scenario, and while thinking about how they might go about solving the problem, participants performed two computer-based tasks used to measure cognitive function: Raven's Progressive Matrices and a spatial compatibility task. The Raven's test involves a sequence of shapes with one shape missing (*27*). Participants must choose which of several alternatives best fits in the missing space. Raven's test is a common component in IQ tests and is used to measure "fluid intelligence," the capacity to think logically and solve problems in novel situations, independent of acquired knowledge (*28*, *29*). The spatial incompatibility task requires participants to respond quickly and often contrary to their initial impulse. Presented with figures on the screen, they must press the same side in response to some stimuli but press the opposite side in response to others. The speed and accuracy of response measures cognitive control (*30*), the ability to guide thought and action in accordance with internal goals (*31*). Both are nonverbal tasks, intended to minimize the potential impact of literacy skills. Upon completion of these tasks, participants responded to the original scenario by typing their answers on the computer or speaking to a tape recorder and then moved on to the next scenario (an analysis of participants' responses to the scenarios is available in table S1). We also collected participants' income information at the end of the experiment.

Participants were randomly assigned either to a "hard" condition, in which the scenarios involved costs that were relatively high (for example, the car would require $1500 to fix); or to an "easy" condition, where costs were lower (for example, the car would require $150 to fix). Because the sums in the easy condition are small, we expected this condition to evoke few of one's own monetary concerns, for either poor or rich participants. In contrast, the large sums in the hard condition, we hypothesized, would evoke monetary concerns in the poor but not in the rich participants.

Cognitive performance in experiment 1 is plotted in Fig. 1. For the financially "easy" scenarios, designed to generate relatively trivial concerns, the poor and rich performed similarly [Raven's: $t(50) = 0.13$, $P = 0.90$; cognitive control: $t(50) = 1.55$, $P = 0.13$]. In contrast, in the context of the financially "hard" condition, the poor performed significantly worse than did the rich on both Raven's [$t(47) = 3.21$, $P < 0.01$] and on cognitive control [$t(47) = 5.22$, $P < 0.001$]. A two-way analysis of variance revealed a robust interaction between income and condition [Raven's: $F(1,97) = 5.12$, $P = 0.03$; cognitive control: $F(1,97) = 7.86$, $P < 0.01$]. In both tasks, the rich were uninfluenced by condition [Raven's: $t(48) = 0.56$, $P = .58$; cognitive control: $t(48) = 1.04$, $P = 0.30$], whereas the poor performed significantly worse in the hard condition [Raven's: $t(49) = 2.63$, $P = 0.01$; cognitive control: $t(49) = 3.98$, $P < 0.001$]. As a result, the poor performed reliably worse than the rich performed overall [Raven's: $F(1,97) = 5.61$, $P = 0.02$; cognitive control: $F(1,97) = 23.24$, $p < 0.001$]. The magnitudes of the effect here are substantial, with Cohen's d in this and ensuing replications ranging between 0.88 and 0.94.

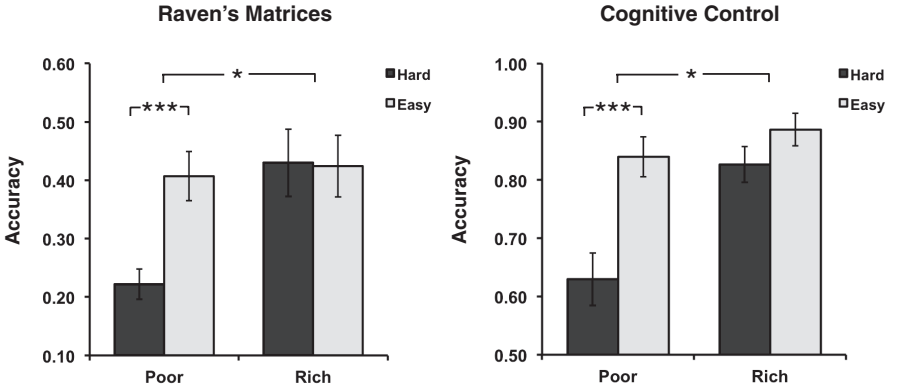


Fig. 2. Accuracy on the Raven's matrices and the cognitive control tasks in the hard and easy conditions, for the poor and the rich participants, when incentives were provided in experiment 3. (**Left**) Performance on Raven's Matrices task. (**Right**) Performance on cognitive control task. Error bars reflect ±1 SEM. Top horizontal bars show two-way interaction (poor versus rich × hard versus easy). *P < 0.05, ***P < 0.001.

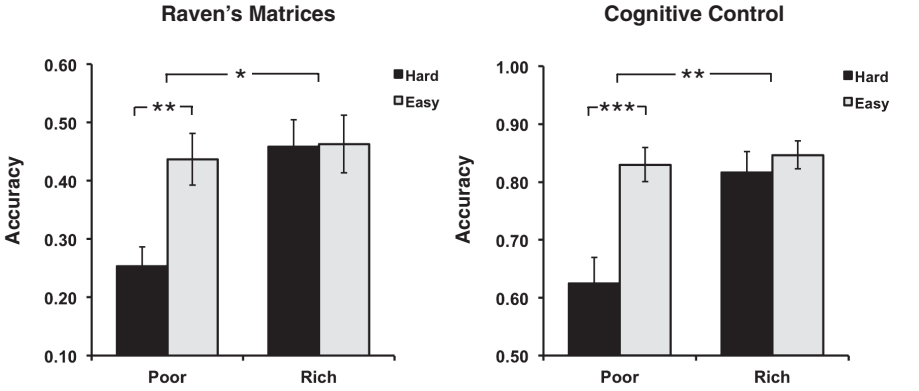


Fig. 3. Accuracy on the Raven's matrices and the cognitive control tasks in the hard and easy conditions, for the poor and the rich participants in experiment 4. (**Left**) Performance on Raven's Matrices task. (**Right**) Performance on cognitive control task. Error bars reflect ±1 SEM. Top horizontal bars show two-way interaction (poor versus rich × hard versus easy). *P < 0.05, **P < 0.01, ***P < 0.001.

To rule out the effect of "math anxiety," experiment 2 used the same set of numbers as in experiment 1 but with nonfinancial scenarios. This recreates a mathematical problem but without evoking financial concerns. There was no interaction between the difficulty of the scenario and participants' income (further details are available in supplementary materials, experiment 2). Thus, the reduced cognitive performance in the poor participants in experiment 1 was not due to anxiety with large numbers.

Experiment 3 added incentives to experiment 1: In addition to the standard participation fee, participants earned \$0.25 for every correct response on both tasks. Performance in experiment 3 (n = 100 participants) is summarized in Fig. 2. As before, the poor performed similarly to the rich in the easy condition [Raven's: $t(46) = 0.26$, $P = 0.79$; cognitive control: $t(46) = 1.02$, $P = 0.31$] and worse in the hard condition [Ravens: $t(50) = 3.34$, $P < 0.01$; cognitive control: $t(50) = 3.54$, $P < 0.001$]. The rich performed equally well in the easy and hard conditions [Raven's: $t(45) = 0.07$, $P = 0.94$; cognitive control: $t(45) = 1.42$, $P = 0.16$], whereas the poor performed significantly worse in the hard condition [Raven's: $t(51) = 3.75$, $P < 0.001$; cognitive control: $t(51) = 3.67$, $P < 0.001$], yielding a robust interaction between income and scenario [Raven's: $F(1,96) = 4.34$, $P = 0.04$; cognitive control: $F(1,96) = 4.31$, $P = 0.04$]. Despite the incentives, and the fact that they presumably needed the money more, the poor performed worse overall [Raven's: $F(1,96) = 6.55$, $P = 0.01$; cognitive control: $F(1,96) = 11.88$, $P < 0.001$] and earned 18% (\$0.71) less than the rich earned.

The hypothetical scenarios are intended to trigger participants' financial concerns. Yet in experiments 1 to 3, the cognitive tests themselves may have created additional load because they were performed while the participant was contemplating the scenarios. To rule this out, experiment 4 (n = 96 participants) replicated experiment 1, except that participants finished responding to each scenario before proceeding to the Raven's and cognitive control tasks. That is, participants viewed each scenario as in experiment 1, responded to the scenario, and only then completed the Raven's and cognitive control tasks. Because there were no intervening tasks between scenario presentation and response, we added a few scenario-relevant questions in order to equate the time spent with that of experiment 1. Performance is summarized in Fig. 3.

The results match those in experiments 1 and 3. As before, there was a robust interaction between income and condition [Raven's: $F(1,92) = 4.04$, $P = 0.04$; cognitive control: $F(1,92) = 6.66$, $P = 0.01$]; the rich and poor performed similarly in the easy condition [Raven's: $t(48) = 0.41$, $P = 0.69$; cognitive control: $t(48) = 0.43$, $P = 0.67$], and the poor performed significantly worse than the rich performed in the hard condition [Ravens: $t(44) = 3.55$, $P < 0.001$; cognitive control: $t(44) = 3.34$, $p = .002$]. Condition was insignificant for the rich [Raven's: $t(47) = 0.08$, $P = 0.93$; cognitive control: $t(47) = 0.72$, $P = 0.47$], but significant for the poor [Raven's: $t(45) = 3.26$, $P = 0.002$; cognitive control: $t(59) = 3.94$, $P < 0.001$]. Again, the poor performed worse than the rich performed overall [Raven's: $F(1,92) = 6.42$, $P = 0.01$; cognitive control: $F(1,92) = 8.74$, $P = 0.004$].

Although remarkably consistent, these findings have limitations. The causal attribution made possible by laboratory studies comes at the expense of some external validity. For example, in experiment 4 the hypothetical scenarios themselves—even after answers were given—may still have weighed on people's minds. More generally, in all the experiments we explicitly primed monetary concerns. Such explicit priming may not mirror naturally occurring circumstances. It is possible that environments in which one is richer bring to mind other concerns (such as bigger purchases), creating load comparable with that experienced by the poor. It is also possible—though less plausible—that the poor structure their lives to avoid these

Table 1. Changes in financial situation and cognitive capacity around harvest. This table presents changes in farmers' financial situation (panel A) and their cognitive capacity (panel B) before and after harvest. Each coefficient reported here is the result of an ordinary least-squares regression for the dependent variable in the row heading. For instance, row 1 in column 1 shows that on average, a farmer is 56.6% less likely to have pawned his belongings in the 15-day interval before the post-harvest survey than in the same time interval before the pre-harvest survey. These coefficients also account for any differences that may be attributed to the specific months in which tests were taken. Column 1 reports results for the entire sample; column 2 reports results for farmers who had already completed the harvesting process, but had not yet been paid for the harvest, at the time of the first-round survey. Each cell is the coefficient γ from a separate regression of the type $y_{it} = \alpha_i + \beta_t + \gamma PostHarvest_{it}$, where the dependent variable varies in each row. Here, i denotes individuals, t denotes time, y denotes various outcome variables, and PostHarvest is a dummy for whether the observation occurs after harvest. The variables α and β reflect a set of individual and time fixed effects, respectively, controlling for all fixed differences between time periods (months) and individuals. Robust standard errors are in square brackets. *Significant at 10%; **significant at 5%; ***significant at 1%. Main independent variable = 1 for the post-harvest period and 0 pre-harvest.

Dependent variable	Full sample: Household + time fixed effects	Subsample: Farmers who completed harvest, but had not received payment
Panel A		
	Column 1	Column 2
Belongings pawned	−0.566***	−0.598
(last 15 days: 0 = no, 1 = yes)	[0.058]	[0.058]
Observations	924	630
Mean: 0.41 (0.78 pre-harvest, 0.04 post-harvest)		
Loans outstanding	−0.885***	−0.899
(0 = no, 1 = yes)	[0.033]	[0.032]
Observations	922	626
Mean: 0.56 (0.99 pre-harvest, 0.13 post-harvest)		
Number of loans outstanding	−1.979***	−2.033***
	[0.105]	[0.106]
Observations	920	626
Mean: 1.22 (2.28 pre-harvest, 0.15 post-harvest)		
Ability to cope with ordinary bills in the past 15 days	0.111***	0.109***
(1 = low; 3 = high)	[0.049]	[0.050]
Observations	924	630
Mean: 1.69 (1.62 pre-harvest, 1.76 post-harvest)		
Panel B		
	Column 1	Column 2
Raven's accuracy	1.367***	1.321***
(Min = 0; max = 10)	[0.256]	[0.274]
Observations	920	624
Mean: 4.9 (4.35 pre-harvest, 5.45 post-harvest)		
Stroop-time taken	−30.582***	−32.319***
(In seconds)	[5.923]	[6.208]
Observations	904	618
Mean: 138.94 (146.05 pre, 131.83 post-harvest)		
Stroop-number of errors	−1.818***	−1.937***
	[0.566]	[0.588]
Observations	906	620
Mean: 5.55 (5.93 pre, 5.16 post-harvest)		

concerns. To address these issues, we conducted the field study.

The Field Studies

Our second study examined 464 sugarcane farmers living in 54 villages in the sugarcane-growing areas around the districts of Villupuram and Tiruvannamalai in Tamil Nadu, India. These were a random sample of small farmers (with land plots of between 1.5 and 3 acres) who earned at least 60% of their income from sugarcane and were interviewed twice—before and after harvest—over a 4-month period in 2010. There were occasional nonresponses, but all of our pre-post comparisons include only farmers we surveyed twice.

A challenge with pre-post comparisons is calendar effects: Differences between months (such as a festival or the weather) can create a spurious correlation. We overcame this through a particular feature of this context: Farmers' harvest (and planting) dates are staggered over a 3- to 5-month period being set by sugar mills with processing capacity constraints. One farmer may harvest, for example, in June, whereas another harvests in August. The same month then is pre-harvest for some farmers and post-harvest for others. This feature allows us to control for calendar effects.

Our data show that farmers indeed faced greater financial pressures pre- as compared with post-harvest: They pawned items at a higher rate (78 versus 4%, $P < 0.001$, $n = 462$ participants) and were more likely to have loans (99 versus 13%, $P < 0.001$, $n = 461$ participants). On average, farmers had 1.97 more loans before harvest than they did after it. They were also more likely to answer "Yes" to the question, "Did you have trouble coping with ordinary bills in the last fifteen days?" before harvest than after (1.62 and 1.76, respectively, on a 3-point scale, where 1 corresponded to low ability and 3 to high ability to cope; $P < 0.001$, $n = 462$ participants). (Regressions adjusted to take out farmer and month fixed effects are shown in Table 1, panel A.)

We again used Raven's to gauge fluid intelligence. For cognitive control, we could not administer the spatial incompatibility task in the field. Instead, we used a numeric version of the traditional Stroop task, which is appropriate for participants with low literacy rates. In a typical trial, participants would see "5 5 5" and have to quickly respond "3," which is the number of 5s in the sequence, rather than "5" that comes to mind most naturally. Both response speed and error rates were recorded. Each participant performed 75 trials on the numerical Stroop.

Pre- and post-harvest differences on both tests were pronounced and are illustrated in Fig. 4. On Raven's, the farmers scored an average of 5.45 items correct post-harvest but only 4.35 items correct pre-harvest ($P < 0.001$, $n = 460$ participants). On Stroop, they took an average of 131 s to respond to all items post-harvest, as compared with 146 s pre-harvest ($P < .001$, $n = 452$). In addition, the average number of errors the farmers committed was higher before harvest than after (5.93 versus 5.16 errors; $P < .001$, $n = 453$).

We also report results of regressions that control for farmer and month fixed effects (Table 1, panel B). Each cell in Table 1 is a distinct regression. Table 1, column 1 shows that even after regression adjustment, strong pre-post harvest differences remain for both Raven's and Stroop performance. In addition to these pre-post differences, we found that farmers' perceived intensity of how financially constrained they are—as captured by how they rate their ability to cope with ordinary bills in the preceding 15-day period—correlates negatively with performance on Raven's and time taken on Stroop tests (table S2).

Other factors besides income that vary pre- and post-harvest could drive these effects. One major candidate is physical exertion; preparing the land for harvest might involve increased physical labor. Another candidate is anxiety over crop yield; farmers might be preoccupied not with making ends meet but with how much they will earn. In practice, neither is likely to be true in the case of sugarcane farming. Farmers typically use external labor on their lands, and sugarcane crop size can be readily estimated months before harvest. Still, to address this further we observe that there is a several-week delay between physical harvest and the actual receipt of payment. Financial burdens are only relieved at the time of payment, but labor and anxiety over crop size are fully resolved at the time of harvest. For 316 farmers in our sample, the "pre-harvest" survey was actually post–physical harvest but pre-payment. We reestimated our equation on this subsample as shown in Table 1, column 2, and found highly similar results, which suggests that neither physical exertion nor anxiety pre-harvest drives our results.

Training effects present another potential confound; post-harvest farmers may do better simply because they are taking the test a second time. To address this, we held back 100 randomly selected farmers at the time of initial sampling. These farmers were surveyed for the first time post-harvest, and their scores were compared with the post-harvest scores of the original sample. If our results were due to learning, we would expect these novice farmers to do worse. Instead, we found that they performed similarly on Raven's accuracy and Stroop reaction time (table S3), suggesting no training effect. There is some evidence for training effects on Stroop error rates (table S3), but the overall pattern cannot be attributed to simple test familiarity. Taken together, the two sets of studies—in the New Jersey mall and the Indian fields—illustrate how challenging financial conditions, which are endemic to poverty, can result in diminished cognitive capacity.

We have argued that the attentional demands created by poverty are a plausible mechanism (*29*). But there could be other mediating factors. Nutrition is one candidate—in the harvest findings, if not in the mall study; farmers may eat less when poor. In 2009, we ran a pilot study with the same design in the districts of Thanjavur, Thiruvarur, Perambalur, and Pudokottai in Tamil Nadu, in which we surveyed 188 farmers and also asked about food consumption. We found similar effects on Stroop (1.47 errors post-harvest versus 2.12 errors pre-harvest; $P = 0.006$ via t test, $n = 111$ participants). Pre-harvest farmers were not eating less; they spent 2663 rupees a month on food pre-harvest and 2592 rupees post-harvest (roughly \$53 and \$52, respectively, not accounting for purchasing power parity). Additionally, the Stroop results persist even in regressions in which food consumption is included as a control variable.

A potential explanation of these findings is stress. Financial concerns could reasonably induce stress in pre-harvest farmers. Indeed, we examined biological stress. In the 2009 study, we collected two biomarkers of stress: heart rate and blood pressure. Both measures showed that the farmers were more stressed before the harvest; heart rate was higher pre-harvest than post-harvest (78.42 versus 76.38; $P = 0.088$ via t test, $n = 188$ participants), and so were diastolic blood pressure (78.70 versus 74.26, $P < 0.001$ via t test, $n = 188$) and systolic blood pressure (128.64 versus 121.56, $P < 0.001$ via t test, $n = 188$).

However, these differences in stress do not explain our findings. When we reestimated the impact of harvest on Stroop performance, controlling

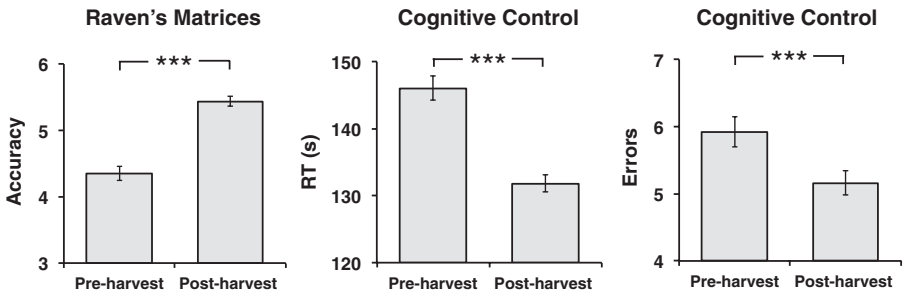


Fig. 4. Accuracy on the Raven's matrices and the cognitive control tasks for pre-harvest and post-harvest farmers in the field study. (**Left**) Performance on Raven's matrices task. (**Middle** and **Right**) Stroop task (measuring cognitive control) response times (RT) and error rates, respectively; error bars reflect ±1 SEM. Top horizontal bars show test for main effect of pre- versus post-harvest (***$P < 0.001$).

for all three stress measures, the findings remained significant. In fact, the coefficient on post-harvest did not change [for Stroop, we continued to find a coefficient of –1.46 (0.52) on the post-harvest dummy, with a t of –2.80 and $P < 0.006$; $n = 222$ participants]. This suggests that although the pre-harvest farmers did experience stress, stress cannot fully explain the impairment in cognitive function. Our suggested mechanism—that poverty captures attention, triggers intrusive thoughts, and reduces cognitive resources—could itself be described colloquially as "stress": persistent mental engagement induced by some trigger. The 2009 data, however, suggest that the biological view of stress—as proxied by these biomarkers of stress—is not sufficient to account for our findings. This is consistent with the existing literature on the effects of stress on cognitive function, in which both facilitation and impairment have been found (*32*). For example, there is evidence that stress can increase working memory capacity (*33*).

We find attentional capture to be the most compelling explanatory mechanism. It matches findings on the effects of scarcity on borrowing (*34*) and is consistent with demand and distraction observed in domains of scarcity other than poverty—from insufficient time to limited calorie budgets (*35*). But surely, other mechanisms might be operating. For example, poverty might influence cognitive load by changing people's affective state (*36*, *37*). We hope future work will test other mechanisms for explaining these findings.

New Perspectives on Policy

The data reported here suggest a different perspective on poverty: Being poor means coping not just with a shortfall of money, but also with a concurrent shortfall of cognitive resources. The poor, in this view, are less capable not because of inherent traits, but because the very context of poverty imposes load and impedes cognitive capacity. The findings, in other words, are not about poor people, but about any people who find themselves poor.

How large are these effects? Sleep researchers have examined the cognitive impact (on Raven's) of losing a full night of sleep through experimental manipulations (*38*). In standard deviation terms, the laboratory study findings are of the same size, and the field findings are three quarters that size. Put simply, evoking financial concerns has a cognitive impact comparable with losing a full night of sleep. In addition, similar effect sizes have been observed in the performance on Raven's matrices of chronic alcoholics versus normal adults (*39*) and of 60- versus 45-year-olds (*40*). By way of calibration, according to a common approximation used by intelligence researchers, with a mean of 100 and a standard deviation of 15 the effects we observed correspond to ~13 IQ points. These sizable magnitudes suggest the cognitive impact of poverty could have large real consequences.

This perspective has important policy implications. First, policy-makers should beware of imposing cognitive taxes on the poor just as they avoid monetary taxes on the poor. Filling out long forms, preparing for a lengthy interview, deciphering new rules, or responding to complex incentives all consume cognitive resources. Policy-makers rarely recognize these cognitive taxes; yet, our results suggest that they should focus on reducing them (*11*). Simple interventions (*41*) such as smart defaults (*42*), help filling forms out (*43*), planning prompts (*44*), or even reminders (*45*) may be particularly helpful to the poor. Policy-makers should further recognize and respond to natural variation in the same person's cognitive capacity. Many programs that impose cognitive demand on farmers, for example, from HIV education to agricultural extension services (which provide farmers with information about new seeds, pesticides, and agricultural practices) should be carefully timed. At the very least, as our results suggest, they should be synchronized with the harvest cycle, with greater cognitive capacity available post-harvest. One recent study illustrated this with fertilizer. Farmers made higher-return investments when the decision was made right after harvest as compared with later in the season (*46*). The data suggest a rarely considered benefit to policies that reduce economic volatility: They are not merely contributing to economic stability—they are actually enabling greater cognitive resources.

References and Notes

1. S. J. Katz, T. P. Hofer, *JAMA* **272**, 530–534 (1994).
2. M. R. DiMatteo, P. J. Giordani, H. S. Lepper, T. W. Croghan, *Med. Care* **40**, 794–811 (2002).
3. A. J. Karter *et al.*, *Med. Care* **42**, 110–115 (2004).
4. R. D. Neal *et al.*, *Br. J. Gen. Pract.* **51**, 830–832 (2001).
5. J. Kim, B. Sorhaindo, E. T. Garman, *J. Fam. Econ. Issues* **27**, 458–478 (2006).
6. V. C. McLoyd, *Am. Psychol.* **53**, 185–204 (1998).
7. M. S. Barr, *No Slack: The Financial Lives of Low-Income Americans* (Brookings Institution Press, Washington, DC, 2012).
8. R. M. Blank, M. S. Barr, *Insufficient Funds: Savings, Assets, Credit, and Banking Among Low-Income Households* (Russell Sage Foundation Publications, New York, 2009).
9. K. Edin, L. Lein, *Making Ends Meet: How Single Mothers Survive Welfare and Low-Wage Work* (Russell Sage Foundation Publications, New York, 1997).
10. M. Bertrand, S. Mullainathan, E. Shafir, *Am. Econ. Rev.* **94**, 419–423 (2004).
11. M. Bertrand, S. Mullainathan, E. Shafir, *J. Public Policy Mark.* **25**, 8–23 (2006).
12. A. Baddeley, G. Hitch, in *The Psychology of Learning and Motivation*, G. Bower, Ed. (Academic Press, New York, 1974), pp. 47–89.
13. S. J. Luck, E. K. Vogel, *Nature* **390**, 279–281 (1997).
14. G. A. Miller, *Psychol. Rev.* **63**, 81–97 (1956).
15. U. Neisser, *Cognition and Reality: Principles and Implications of Cognitive Psychology* (Freeman, San Francisco, 1976).
16. P. Butterworth, N. Cherbuin, P. Sachdev, K. J. Anstey, *Soc. Cogn. Affect. Neurosci.* **7**, 548–556 (2012).
17. S. J. Lupie, S. King, M. J. Meaney, B. S. McEwen, *Dev. Psychopathol.* **13**, 653–676 (2001).
18. This design resembles "stereotype threat" studies, in which identity-relevant primes diminish cognitive performance (*19*).
19. C. M. Steele, J. Aronson, *J. Pers. Soc. Psychol.* **69**, 797–811 (1995).
20. D. Laibson, *Q. J. Econ.* **112**, 443–478 (1997).
21. A. Deaton, "Measuring poverty" (Working Paper, Princeton Research Program in Development Studies, 2004); available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=564001.
22. C. H. Karelis, *The Persistence of Poverty: Why the Economics of the Well-Off Can't Help the Poor* (Yale Univ. Press, New Haven, CT, 2007).
23. J. P. Shonkoff, P. Deborah, *From Neurons to Neighborhoods: The Science of Early Childhood Development* (National Academies Press, Washington, DC, 2000).
24. G. W. Evans, M. A. Schamberg, *Proc. Natl. Acad. Sci. U.S.A.* **106**, 6545–6549 (2009).
25. B. Buhmann, L. Rainwater, G. Schmaus, T. M. Smeeding, *Rev. Income Wealth* **34**, 115–142 (1988).
26. Alternative measures, such as dividing household income by number of people in the household, yield similar findings.
27. J. Raven, *Cognit. Psychol.* **41**, 1–48 (2000).
28. R. W. Engle, S. W. Tuholski, J. E. Laughlin, A. R. Conway, *J. Exp. Psychol. Gen.* **128**, 309–331 (1999).
29. E. Hunt, *Human Intelligence* (Cambridge Univ. Press, New York, 2010).
30. M. C. Davidson, D. Amso, L. C. Anderson, A. Diamond, *Neuropsychologia* **44**, 2037–2078 (2006).
31. M. I. Posner, G. J. DiGirolamo, in *The Attentive Brain*, R. Parasuraman, Ed. (MIT Press, Cambridge, MA, 1998), pp. 401–423.
32. M. Joëls, Z. Pu, O. Wiegert, M. S. Oitzl, H. J. Krugers, *Trends Cogn. Sci.* **10**, 152–158 (2006).
33. E. Y. Yuen *et al.*, *Proc. Natl. Acad. Sci. U.S.A.* **106**, 14075–14079 (2009).
34. A. K. Shah, S. Mullainathan, E. Shafir, *Science* **338**, 682–685 (2012).
35. S. Mullainathan, E. Shafir, *Scarcity: Why Having Too Little Means So Much* (Henry Holt, New York, 2013).
36. B. Hermalin, A. Isen, (USC CLEO Research Paper C01-5, 2000); available at http://ideas.repec.org/p/wpa/wuwpmh/9912001.html.
37. A. Oswald, E. Proto, D. Sgroi, (Working Paper, Univ. of Warwick, 2012); available at www.sire.ac.uk/funded-events/relativity/invited/24MarchOsProSgroiPaper2009.pdf.
38. L. Linde, M. Bergström, *Psychol. Res.* **54**, 127–136 (1992).
39. B. Jones, O. A. Parsons, *Arch. Gen. Psychiatry* **24**, 71–75 (1971).
40. M. O. Pontón *et al.*, *J. Int. Neuropsychol. Soc.* **2**, 96–104 (1996).
41. R. H. Thaler, C. R. Sunstein, *Nudge: Improving Decisions About Health, Wealth, and Happiness* (Yale Univ. Press, New Haven, CT, 2008).
42. C. N. Smith, D. Goldstein, E. J. Johnson, (Working Paper, INSEAD, 2009); available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1116650.
43. E. P. Bettinger, B. T. Long, P. Oreopoulos, L. Sanbonmatsu, (Working Papers, NBER, 2012); available at www.nber.org/papers/w15361.
44. K. L. Milkman, J. Beshears, J. J. Choi, D. Laibson, B. C. Madrian, *Proc. Natl. Acad. Sci. U.S.A.* **108**, 10415–10420 (2011).
45. N. Ashraf, D. Karlan, W. Yin, *Q. J. Econ.* **121**, 635–672 (2006).
46. E. Duflo, M. Kremer, J. Robinson, *Am. Econ. Rev.* **101**, 2350–2390 (2011).

Acknowledgments: Authors' names are listed alphabetically; the authors contributed equally to this work. The authors gratefully acknowledge support from the National Science Foundation (award SES-0933497), the John Simon Guggenheim Memorial Foundation, the International Finance Corporation, and the Institute for Financial Management and Research Trust. S. Krishnan, D. Mackenzie, and especially D. Bulla provided able research assistance. The authors declare no conflict of interest.

Supplementary Materials

www.sciencemag.org/cgi/content/full/341/6149/976/DC1
Materials and Methods
Figs. S1 and S2
Tables S1 to S3
References and Notes

19 March 2013; accepted 23 July 2013
10.1126/science.1238041

showed a similar pattern to H3 after the first GSC division (fig. S3).

The consistent asymmetric cell divisions of GSCs could be lost under certain conditions, such as ectopic activation of the key JAK-STAT signaling pathway in the niche (*23*–*25*). It has been shown that overexpression of the JAK-STAT ligand *unpaired* (OE-*upd*) induces overpopulation of GSCs (*23*, *24*). Consistent with the loss of asymmetry in expanded GSCs, the asymmetric distribution pattern of the histone H3 was not observed in OE-*upd* testes 16 to 20 hours after heat shock (Fig. 4). These results demonstrate that the asymmetric histone distribution pattern is dependent on GSC asymmetric divisions. We propose a two-step process as our favored explanation (fig. S4A; an alternative explanation is discussed in fig. S4B): Old and newly synthesized histones are incorporated to different sister chromatids during S phase; then, during mitosis, the sister chromatid preloaded with old histones is preferentially segregated to GSC.

These data reveal that stem cells preserve preexisting histones through asymmetric cell divisions. The JAK-STAT signaling pathway required for the asymmetric GSC divisions contributes to the asymmetric histone distribution pattern. This work provides a critical first step toward identifying the detailed molecular mechanisms underlying old histone retention during GSC asymmetric division. These findings in the well-characterized GSC model system will facilitate understanding of how epigenetic information could be maintained by stem cells or reset in their sibling cells that undergo cellular differentiation.

References and Notes

1. L. Ringrose, R. Paro, *Annu. Rev. Genet.* **38**, 413 (2004).
2. J. J. Jacobs, M. van Lohuizen, *Biochim. Biophys. Acta* **1602**, 151 (2002).
3. B. M. Turner, *Cell* **111**, 285 (2002).
4. J. A. Knoblich, *Cell* **132**, 583 (2008).
5. S. H. Eun, Q. Gan, X. Chen, *Curr. Opin. Cell Biol.* **22**, 737 (2010).
6. R. Jaenisch, R. Young, *Cell* **132**, 567 (2008).
7. M. Buszczak, A. C. Spradling, *Cell* **125**, 233 (2006).
8. M. T. Fuller, A. C. Spradling, *Science* **316**, 402 (2007).
9. V. P. Losick, L. X. Morris, D. T. Fox, A. Spradling, *Dev. Cell* **21**, 159 (2011).
10. T. Kouzarides, *Cell* **128**, 693 (2007).
11. M. Xu *et al.*, *Science* **328**, 94 (2010).
12. V. Jackson, R. Chalkley, *J. Biol. Chem.* **256**, 5095 (1981).
13. V. Jackson, R. Chalkley, *Cell* **23**, 121 (1981).
14. G. Russev, R. Hancock, *Nucleic Acids Res.* **9**, 4129 (1981).
15. A. T. Annunziato, R. K. Schindler, M. G. Riggs, R. L. Seale, *J. Biol. Chem.* **257**, 8507 (1982).
16. H. Tagami, D. Ray-Gallet, G. Almouzni, Y. Nakatani, *Cell* **116**, 51 (2004).
17. K. Ahmad, S. Henikoff, *Mol. Cell* **9**, 1191 (2002).
18. J. Cheng *et al.*, *Nature* **456**, 599 (2008).
19. X. R. Sheng, E. Matunis, *Development* **138**, 3367 (2011).
20. Y. M. Yamashita, D. L. Jones, M. T. Fuller, *Science* **301**, 1547 (2003).
21. S. Yadlapalli, J. Cheng, Y. M. Yamashita, *J. Cell Sci.* **124**, 933 (2011).
22. Y. M. Yamashita, A. P. Mahowald, J. R. Perlin, M. T. Fuller, *Science* **315**, 518 (2007).
23. A. A. Kiger, D. L. Jones, C. Schulz, M. B. Rogers, M. T. Fuller, *Science* **294**, 2542 (2001).
24. N. Tulina, E. Matunis, *Science* **294**, 2546 (2001).
25. J. L. Leatherman, S. Dinardo, *Cell Stem Cell* **3**, 44 (2008).

Acknowledgments: We thank J. Prado for discussions to develop a controlled gene expression system and the *FRT-MCS-SV40 Poly A-FRT* plasmid; A. Talaga, A. Chin, A. Kim, and B. Weber for experimental assistance; K. Ahmad for plasmids containing *H3*, *H2B*, and *H3.3* sequences; A. Nakamura for the *UAS-mKO-vasa* strain; S. DiNardo for the *UAS-upd* strain; Y. Yamashita for GSC cell cycle information and insightful suggestions; and R. Kuruvilla, K. Zhao, Y. Zheng, H. Zhao, M. Van Doren, D. Drummond-Barbosa, A. Hoyt, and Chen lab members for critical reading. Supported by NICHD/NIH grants R21HD065089 and R01HD065816, the David & Lucile Packard Foundation, American Federation of Aging Research, and JHU start-up (X.C.).

Supplementary Materials

www.sciencemag.org/cgi/content/full/338/6107/679/DC1
Materials and Methods
Figs. S1 to S4
Tables S1 to S4
References (*26*–*31*)

13 June 2012; accepted 4 September 2012
10.1126/science.1226028

Some Consequences of Having Too Little

Anuj K. Shah,[1]* Sendhil Mullainathan,[2] Eldar Shafir[3]

Poor individuals often engage in behaviors, such as excessive borrowing, that reinforce the conditions of poverty. Some explanations for these behaviors focus on personality traits of the poor. Others emphasize environmental factors such as housing or financial access. We instead consider how certain behaviors stem simply from having less. We suggest that scarcity changes how people allocate attention: It leads them to engage more deeply in some problems while neglecting others. Across several experiments, we show that scarcity leads to attentional shifts that can help to explain behaviors such as overborrowing. We discuss how this mechanism might also explain other puzzles of poverty.

The poor often behave in ways that reinforce poverty. For instance, low-income individuals often play lotteries (*1*, *2*), fail to enroll in assistance programs (*3*), save too little (*4*), and borrow too much (*5*). Currently there are two ways to explain this behavior. The first focuses on the circumstances of poverty, such as education (*6*), health (*7*), living conditions (*8*), political representation (*9*), and numerous demographic and geographic variables (*10*, *11*). Put simply, the poor live in environments (for sociological, political, economic, or other reasons) that promote these behaviors. The second view focuses on personality traits of the poor (*12*–*14*). But we suggest a more general view: Resource scarcity creates its own mindset, changing how people look at problems and make decisions.

To understand this hypothesis, consider how people manage expenses. When money is abundant, basic expenses (e.g., groceries, rent) are handled easily as they arise. These expenses come and go, rarely requiring attention and hardly lingering on the mind. But when money is scarce, expenses are not easily met. Instead of appearing mundane, they feel urgent. The very lack of available resources makes each expense more insistent and more pressing. A trip to the grocery store looms larger, and this month's rent constantly seizes our attention. Because these problems feel bigger and capture our attention, we engage more deeply in solving them. This is our theory's core mechanism: Having less elicits greater focus.

This view is not bound to the specific circumstances of poverty, nor does it make assumptions about the dispositions of the poor. This mindset stems from the most fundamental feature of poverty: having less. And this hypothesis is about scarcity more generally, not just poverty. Indeed, just as expenses capture the attention of the poor, researchers have found that people who are hungry and thirsty focus more on food- and drink-related cues (*15*, *16*). Likewise, the busy (facing time scarcity) respond to deadlines with greater focus on the task at hand (*17*). Across many contexts, we see a similar psychology. People focus on problems where scarcity is most salient.

The second part of our theory follows readily from the first. Because scarcity elicits greater engagement in some problems, it leads to neglect of others. While focusing on the groceries from week to week, we might neglect next month's rent. While consumed with meeting tomorrow's

[1]Booth School of Business, University of Chicago, Chicago, IL 60637, USA. [2]Department of Economics, Harvard University, Cambridge, MA 02138, USA. [3]Department of Psychology and Woodrow Wilson School of Public and International Affairs, Princeton University, Princeton, NJ 08544, USA.

*To whom correspondence should be addressed. E-mail: anuj.shah@chicagobooth.edu

manuscript deadline, we might fail to prepare next week's lecture. Attentional neglect appears in many domains. Low-income homeowners often do not attend to regular home maintenance while they focus on more pressing expenses (*18*). Neglected, these small repairs become major projects. Similarly, in areas where water-borne illness is common, families might focus on pressing daily expenses while failing to procure periodic water treatments (*19*).

Attentional neglect can explain another particularly striking behavior: why low-income individuals take short-term, high-interest loans, with interest rates that can approach 800% (*20–22*). These loans make it easier to meet today's needs, but the loans' deferred costs make it difficult to meet future expenses. If scarcity creates a focus on pressing expenses today, then attention will go to a loan's benefits but not its costs. This suggests a clear prediction: Scarcity, of any kind, will create a tendency to borrow, with insufficient attention to whether the benefits outweigh the costs.

Consistent with this prediction, the busy also borrow. Facing tight budgets (i.e., deadlines), they borrow time by taking extensions. Like the poor, the busy often take extensions because they focus on urgent tasks, but neglect important tasks that seem less pressing (*23*). We suggest that both forms of borrowing stem from how scarcity shifts attention.

We test this theory with the use of an approach that psychologists have employed to study other social problems, such as obedience to authority (*24*), helping behavior (*25*), and conformity (*26*). Simple experiments can distill a problem's primary features in the lab, abstracting from the complexities of the world and highlighting how selected features guide behavior. Here, we distill scarcity and test its influence on how people borrow. Experiments 1 and 2 show that scarcity creates increased focus. Experiments 2 to 5 demonstrate how (and why) scarcity leads people to borrow.

In all experiments, participants were randomly assigned budgets; "poor" participants had smaller budgets than "rich" participants [see (*27*) for a full description]. These budgets were distributed in "paychecks" across multiple rounds of a game. Poor participants had proportionally smaller paychecks than rich participants. On each round, participants used the resources to earn rewards. If participants moved on from a round without exhausting their paycheck, unspent units were saved for future use. Participants were also assigned to different borrowing conditions. Some could not borrow—when a paycheck was exhausted, they moved to the next round. Other participants could borrow at a cost R: Borrowing an additional resource unit for the current round subtracted R units from their overall budget.

In experiment 1, 60 participants played a version of *Wheel of Fortune* (*WoF*). Scarcity was manipulated by budgeting participants' chances to guess letters in word puzzles. Poor participants had 84 total guesses (6 per round); rich participants had 280 guesses (20 per round). Previous work suggests that greater engagement in *WoF* will cause cognitive fatigue and worse performance on subsequent cognitive tasks (*28*). As a measure of cognitive fatigue, after *WoF*, participants completed a version of the Dots-Mixed task, which assesses executive functions such as attention and cognitive control (*29*). Participants responded to visual stimuli presented to the left or right of a fixation cross. On congruent trials, participants had to press a key on the same side as the stimulus; on incongruent trials, they had to press a key on the opposite side. Congruent and incongruent trials (40 each) were randomly presented. Although *WoF* included a scarcity manipulation, the Dots-Mixed task was identical for all participants.

A simple model of effort might suggest that the rich should be more fatigued because they spent more time and made more guesses playing *WoF*. In our model, however, the poor would engage more deeply and could be more fatigued despite spending less time.

We measured the total number of correct responses in the attention task. Four participants were removed from the analyses for having zero correct responses. Poor participants performed worse (mean ± SD, 45.12 ± 15.87) than did rich participants (52.93 ± 12.79) [$F(1, 54) = 4.16$, $P < 0.05$, effect size $\eta_p^2 = 0.07$; see table S1 for performance based on trial type]. Scarcity seems to have created greater engagement: Even with less time played (and fewer guesses made), the poor were more depleted.

Experiment 2 offers a more precise look at how scarcity changes engagement. Sixty-eight participants played a video game similar to Angry Birds. They fired shots from a slingshot, earning points for clearing targets. The poor had budgets of 30 shots (3 per level); the rich had 150 shots (15 per level). Some participants could not borrow shots, whereas others could borrow with $R = 2$ (essentially, 100% interest). Participants played until exhausting their budget.

To analyze how scarcity affected focus, we measured how long participants spent aiming each shot (i.e., how careful they were with their resources). Poor participants spent more time aiming the first shot of each level (log-transformed milliseconds, 8.08 ± 0.42) than did rich participants (7.73 ± 0.39) [$F(1, 64) = 12.96$, $P < 0.001$, $\eta_p^2 = 0.17$]. These results held for subsequent shots as well. Because the rich could always earn more points (and each additional point increased the chances of winning a prize), they had an incentive to remain engaged and use their resources well. Yet they were less engaged than the poor. Still, one might argue that these differences are driven by rich participants losing interest later in the game. However, these differences emerged on the very first shot of the game (poor: 8.19 ± 0.52; rich: 7.86 ± 0.52) [$F(1, 64) = 6.58$, $P < 0.05$].

This engagement had some benefits for the poor. Among participants who could not borrow, the poor earned more points per shot (2.31 ± 0.60) than did the rich (1.67 ± 0.37) [$F(1, 31) = 11.92$, $P < 0.005$]. Rich participants had 5 times as many shots as the poor, but earned far fewer than 5 times as many points. If the rich had played as if they were poor, they would have performed better. It seems that to understand the psychology of scarcity, we must also appreciate the psychology of abundance. If scarcity can engage us too much, abundance might engage us too little.

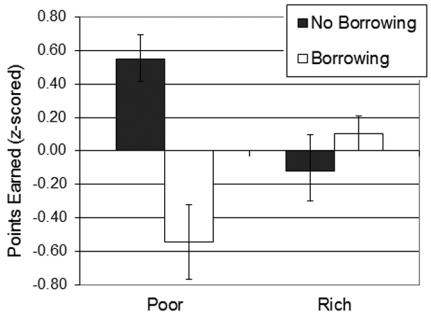
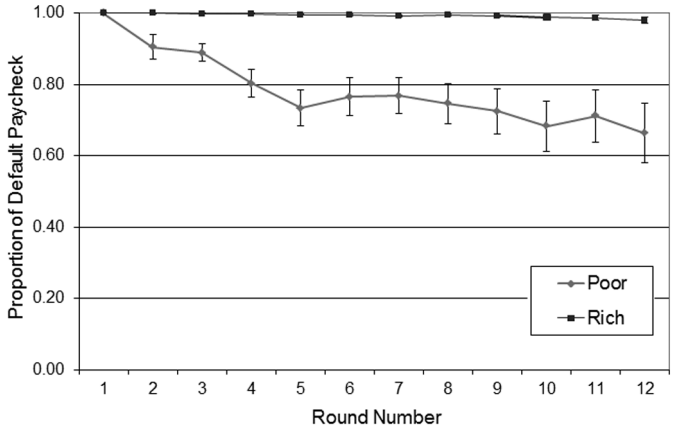


Fig. 1. Performance in experiment 1: Standardized points earned by the rich and poor. Error bars represent SE of the mean.

Fig. 2. The accumulation of debt in experiment 4. The paycheck for each round is shown as a proportion of the default paycheck allocated. Errors bars represent SE of the mean. Data are shown for the median number of rounds completed by all participants.



These results illustrate scarcity's focusing effect. Field data also show scarcity-induced focus. For instance, instead of offering bulk discounts, some retailers raise the per-unit cost of an item as purchase quantity increases. Most people overlook these occasional "quantity surcharges," but low-income consumers are more likely to notice these surcharges (*30*). Low-income consumers are also more sensitive to "hidden" taxes—those not included in the posted price (*31*).

Our experiments also suggest that scarcity leads people to neglect future rounds and borrow away from them. In experiment 2, each shot used beyond a round's paycheck counted as a shot borrowed. Borrowed shots were summed across a participant's game. As a fraction of their budget, poor participants borrowed more shots (0.24 ± 0.15) than the rich (0.02 ± 0.05) [$F(1, 33) = 27.53$, $P < 0.001$].

Performance data suggest that this borrowing was counterproductive. We measured performance in *z*-scores, standardizing points earned separately for the poor and the rich (Fig. 1; see table S2 for unstandardized data). Rich participants performed similarly whether they could not borrow (–0.12 ± 0.77) or could (0.10 ± 1.18), whereas poor participants fared better when they could not borrow (0.55 ± 0.65) than when they could (–0.55 ± 1.00) [scarcity × borrowing interaction, $F(1, 64) = 8.47$, $P < 0.005$, $\eta_p^2 = 0.12$]. This suggests that the poor overborrowed.

The amount of borrowing by the poor was significantly correlated with measures of engagement. On rounds where poor participants borrowed, the average amount of time spent aiming each shot in their paycheck correlated positively with how many shots they subsequently borrowed [$r(38) = 0.34$, $P < 0.05$]. The more focused the poor were on the current round, the more they neglected (and borrowed away from) future rounds.

To ensure that this was not an artifact of a particular context, we considered a different form of scarcity: having too little time. In experiment 3, 143 participants were given budgets of time with which to play *Family Feud*, a trivia game where each question allows multiple answers. Each round consisted of a new question and participants earned points for each correct answer. Poor participants had budgets of 300 s (15 per round); rich participants had 1000 s (50 per round). Participants played until exhausting their budget. There were three borrowing conditions: no borrowing, borrowing with $R = 1$ (i.e., "without interest"), and borrowing with $R = 2$ ("with interest").

Regardless of interest rate, poor participants borrowed a greater proportion of their budget (0.22 ± 0.15) than did rich participants (0.08 ± 0.15) [$F(1, 102) = 22.39$, $P < 0.001$]. Once again, the poor overborrowed [interaction $F(1, 137) = 6.54$, $P = 0.002$, $\eta_p^2 = 0.09$; see table S3 for unstandardized data]. Rich participants performed similarly whether they had no option to borrow (0.06 ± 1.10), borrowed without interest (–0.31 ± 0.88), or borrowed with interest (0.25 ± 0.98) [$F(1, 137) = 2.14$, $P = 0.15$]. The poor performed best when they could not borrow (0.60 ± 1.14), less well when they borrowed without interest (0.08 ± 0.67), and worst when they borrowed with interest (–0.48 ± 0.94) [$F(1, 137) = 7.49$, $P < 0.001$].

The effects of scarcity appear to be quite general. But one concern with these studies might be that the consequences of borrowing, which were not felt until the end, were not sufficiently salient. In experiment 4, we therefore modified the game so that borrowing would create "debt" in subsequent rounds. That is, the size of each paycheck varied depending on how people borrowed or saved. Initial paychecks were the same as in experiment 3, but on subsequent rounds, paychecks equaled the total time remaining divided by the number of remaining rounds. Participants played until they exhausted their budget or completed 20 rounds, whichever came first. Excessive borrowing on one round would therefore lead to a smaller paycheck on the next round. Some participants could not borrow, whereas others could borrow with $R = 2$.

Poor participants borrowed a greater proportion of their budget (0.27 ± 0.14) than did rich participants (0.03 ± 0.04) [$F(1, 56) = 70.50$, $P < 0.001$] and consequently saw their paychecks shrink during the game (Fig. 2). For this analysis, each round's paycheck was converted to a proportion of the default paycheck (i.e., dividing by 15 for the poor and by 50 for the rich). We regressed these proportions on the round numbers and analyzed the slopes for each participant. The poor accumulated debt at a higher rate (mean of slope ± SD, –0.13 ± 0.18) than did the rich (–0.01 ± 0.01) [Mann-Whitney test, $z = 5.46$, $P < 0.001$]. Furthermore, the poor did not adjust their borrowing as they accumulated debt. Instead, as their budgets shrunk, they gradually increased their borrowing relative to their remaining budget (*27*). As a result, rich participants performed similarly when they could not borrow (–0.09 ± 0.81) and when they could (0.11 ± 1.20). The poor performed better when they could not borrow (0.54 ± 0.77) than when they could (–0.49 ± 0.94) [interaction $F(1, 114) = 12.81$, $P < 0.001$, $\eta_p^2 = 0.10$; see table S4 for unstandardized data].

As in these experiments, neglect also creates many forms of borrowing (beyond conventional loans) among the poor in the world. For example, the poor often focus on certain expenses while neglecting utility payments, thereby incurring reconnection fees that are like interest payments—"borrowing" by paying the bill late (*32*).

Experiment 5 offers more direct support for the notion that scarcity creates attentional neglect. One hundred thirty-seven participants played *Family Feud.* Some participants could see previews of the subsequent round's question at the bottom of the screen; others could not. We expected that poor participants would be too focused on the demands of the current round to consider what comes next, whereas rich participants would be able to consider future rounds and whether moving on was beneficial. All participants could borrow with $R = 3$. As predicted, poor participants performed similarly with previews (–0.02 ± 0.87) and without (0.02 ± 1.11), while rich participants performed better with previews (0.32 ± 0.98) than without (–0.35 ± 0.92) [scarcity × borrowing interaction, $F(1, 133) = 4.29$, $P < 0.05$, $\eta_p^2 = 0.03$; for unstandardized scores, see table S5]. One concern might be that the poor did not have enough time to consider the previews. But the experiments above found that the poor were using too much; they were overborrowing. Their performance in the no-preview condition left substantial room for improvement. Even if poor participants had used some of the borrowed time to consider the previews and move on sooner, they could have improved. That is, the previews benefited the rich by helping them save more; they could have benefited the poor by helping them borrow less. But it appears they were too focused on the current round to benefit.

Taken together, these studies provide compelling support for the notion that scarcity elicits greater engagement and that a focus on some problems leads to neglect of others (manifesting in behaviors such as overborrowing). An alternative account might be that the poor and rich approached these tasks with the same mindset—playing each round until they were satisfied with their progress before moving on. By this account, the poor borrowed only because they were facing more severe constraints. But evidence from experiments 1 and 2 suggests that the poor and rich did not approach the tasks in the same way. The poor were more engaged.

Another explanation might be that scarcity creates cognitive load, thereby diminishing performance. Cognitive load might prevent people from figuring out the optimal borrowing rates, or it might lead people to use their resources less efficiently or make riskier financial decisions. Although we agree that scarcity creates load, our theory is more specific about the origins of that load and its effects. We suggest that cognitive load arises because people are more engaged with problems where scarcity is salient. This consumes attentional resources and leaves less for elsewhere.

Once we appreciate where attention is drawn under scarcity, we see how this mechanism can explain behaviors other than overborrowing. Scarcity-induced focus is not myopia, nor does it necessarily imply steeper discount rates. The poor often save for the future. However, their savings are not set aside in a generic account, but rather are geared toward specific expenses. That is, the poor often save for the same reason they borrow. This has clear policy implications. Interventions that draw people's attention to specific future needs should be particularly effective at increasing savings (*33*). This mechanism also

explains why the poor in many countries have a patchwork of financial instruments, with high turnover across accounts. A scarcity mindset leads people to choose the most locally convenient response to pressing demands, leading to constant financial juggling (*34*).

Questions surrounding poverty are large. Poverty has long occupied philosophers, social scientists, and policy-makers. No experiment can fully explain how poverty, and scarcity more generally, guides behavior. But the hypotheses, methods, and results above offer an approach to unpacking this problem. This paradigm can shed light on the cognitive consequences of poverty. Future research might also suggest ways to alleviate the taxing cognitive consequences of having too little. Finally, this approach can help us to understand circumstances even broader than poverty, because scarcity underlies problems as dire as hunger and as mundane as busyness. These problems have traditionally been studied within their own limited domains. A more general study of scarcity can inform our understanding of many specific contexts at once. This may be the key to a deeper appreciation of the vast psychology that stems from having too little.

References and Notes

1. C. Clotfelter, P. Cook, *Selling Hope: State Lotteries in America* (Harvard Univ. Press, Cambridge, MA, 1991).
2. E. Haisley, R. Mostafa, G. Loewenstein, *J. Risk Uncertain.* **37**, 57 (2008).
3. M. Bertrand, S. Mullainathan, E. Shafir, *Am. Econ. Rev.* **94**, 419 (2004).
4. D. S. Shurtleff, Improving savings incentives for the poor (National Center for Policy Analysis Brief Analysis No. 672, 2009); www.ncpa.org/pub/ba672.
5. D. Mendel, *Advocasey* **7**, 4 (2005); www.aecf.org/upload/publicationfiles/advocasey-%20winter%202005.pdf.
6. B. D. Bernheim, D. M. Garrett, D. Maki, *J. Public Econ.* **80**, 435 (2001).
7. R. W. Johnson, G. B. T. Mermin, D. Murphy, The impact of late-career health and employment shocks on Social Security and other wealth (Urban Institute Discussion Paper 07-07, 2007); www.urban.org/UploadedPDF/411591_impact_social_security.pdf.
8. J. Ludwig, G. J. Duncan, P. Hirschfield, *Q. J. Econ.* **116**, 655 (2001).
9. F. Cleaver, *World Dev.* **33**, 893 (2005).
10. S. W. Allard, *Access to Social Services: The Changing Urban Geography of Poverty and Service Provision* (Brookings Foundation, Washington, DC, 2004).
11. S. Spilerman, D. Elesh, *Soc. Probl.* **18**, 358 (1971).
12. O. Lewis, in *On Understanding Poverty: Perspectives from the Social Sciences*, D. P. Moynihan, Ed. (Basic Books, New York, 1969), pp. 187–200.
13. M. Salling, M. E. Harvey, *Environ. Behav.* **13**, 131 (1981).
14. T. J. Kane, *Soc. Serv. Rev.* **61**, 405 (1987).
15. R. Radel, C. Clément-Guillotin, *Psychol. Sci.* **23**, 232 (2012).
16. H. Aarts, A. Dijksterhuis, P. De Vries, *Br. J. Psychol.* **92**, 631 (2001).
17. S. J. Karau, J. R. Kelly, *J. Exp. Soc. Psychol.* **28**, 542 (1992).
18. L. Acquaye, *Comm. Dev.* **42**, 16 (2011).
19. A. Banerjee, E. Duflo, *Poor Economics* (Public Affairs, New York, 2011).
20. S. Bair, *Low-Cost Payday Loans: Opportunities and Obstacles* (Annie E. Casey Foundation, Baltimore, 2005); www.aecf.org/upload/publicationfiles/fes3622h334.pdf.
21. *The High Cost of Being Poor: What It Takes for Low-Income Families to Get By and Get Ahead in Rural America* (Annie E. Casey Foundation, Baltimore, 2004); www.aecf.org/upload/publicationfiles/rf2022k560.pdf.
22. P. Chen, *Univ. Ill. Law Rev.* **2004**, 723 (2004).
23. L. A. Perlow, *Admin. Sci. Q.* **44**, 57 (1999).
24. S. Milgram, *J. Abnorm. Soc. Psychol.* **67**, 371 (1963).
25. J. M. Darley, C. D. Batson, *J. Pers. Soc. Psychol.* **27**, 100 (1973).
26. S. E. Asch, *Psychol. Monogr.* **70**, 1 (1956).
27. See supplementary materials on *Science* Online.
28. B. J. Schmeichel, K. D. Vohs, R. F. Baumeister, *J. Pers. Soc. Psychol.* **85**, 33 (2003).
29. M. C. Davidson, D. Amso, L. C. Anderson, A. Diamond, *Neuropsychologia* **44**, 2037 (2006).
30. J. K. Binkley, J. Bejnarowicz, *J. Retailing* **79**, 27 (2003).
31. J. Goldin, T. Homonoff, "Smoke Gets in Your Eyes: Cigarette Tax Salience and Regressivity," http://scholar.princeton.edu/jgoldin/files/goldin_homonoff.pdf.
32. M. S. Barr, *No Slack* (Brookings, Washington, DC, 2012).
33. D. Karlan, M. McConnell, S. Mullainathan, J. Zinman, Getting to the top of mind: How reminders increase saving (NBER Working Paper No. 16205, 2010); www.nber.org/papers/w16205.
34. D. Collins, J. Morduch, in *Insufficient Funds*, R. M. Blank, M. S. Barr, Eds. (Russell Sage Foundation, New York, 2009), chap. 4.

Acknowledgments: Supported by NSF award 0933497 and by the Canadian Institute for Advanced Research. Data are available at http://theslab.uchicago.edu/browse/scidata.

Supplementary Materials

www.sciencemag.org/cgi/content/full/338/6107/682/DC1
Materials and Methods
Tables S1 to S5

26 March 2012; accepted 13 September 2012
10.1126/science.1222426

Savings Policy and Decision-making in Low-Income Households

Sendhil Mullainathan & Eldar Shafir

In Michael Barr and Rebecca Blank (Eds.), Insufficient Funds: Savings, Assets, Credit and Banking Among Low-Income Households. Russell Sage Foundation Press (pp. 121-145). 2009.

Contributions to this research made by a member of The Financial Access Initiative and Innovations for Poverty Action.

Chapter 5

Savings Policy and Decisionmaking in Low-Income Households

Sendhil Mullainathan and Eldar Shafir

Theories about poverty, held both by social scientists and by regular folks, typically fall into one of two camps: those who regard the behaviors of the economically disadvantaged as calculated adaptations to prevailing circumstances, and those who view these behaviors as emanating from a unique "culture of poverty" that is rife with deviant values. The first view presumes that people are highly rational, hold coherent, well-informed, and justified beliefs, and pursue their goals effectively, with little systematic error and no need for help. The second view attributes to the poor a variety of psychological and attitudinal shortcomings, presumed to be endemic, that render the views of the poor misguided and ill informed, their behaviors impulsive and lacking, and their choices fallible, and that leave them in need of paternalistic guidance.

Both camps are likely to capture some important elements some of the time. There are, no doubt, important circumstances in which people—the poor included—are methodical and calculating, and other circumstances in which they are fallible or misguided. But both camps fail to explain important phenomena. We propose an alternative perspective, one largely informed by recent behavioral research. According to this perspective, the behavioral patterns of the poor may be neither perfectly calculating nor especially deviant. Rather, the poor may exhibit fundamental attitudes and natural proclivities, including weaknesses and biases, that are similar to those of people from other walks of life. One important difference, however, is that in poverty the margins for error are narrow, so that behaviors shared by all often manifest themselves in the poor in more pronounced ways and can lead to worse outcomes (see Bertrand, Mullainathan, and Shafir 2004, 2006).

Whereas the "rational" view assumes that the poor are doing as well as they can and ought to be left to their own devices, the "culture of poverty" perspective is motivated by the impulse to change how the poor function. In contrast, the central gist of the "behavioral" perspective is that much of the time the poor are not functioning optimally, nor are they any more in need of behavioral change than everyone else. Instead, it is the interaction of fundamental behavioral proclivities with the

context in which they function that produces the particularly destructive circumstances in which the poor often find themselves. According to this behavioral view, people who live in poverty are susceptible to many of the same impulses and idiosyncrasies as those who live in comfort, but whereas people who are better off function in the midst of a system—composed of consultants, reminders, cooperative employers, "no-fee" options, incentive awards, and automatic deposit—that is increasingly designed to facilitate their decisions and improve their outcomes, people who are less well off typically find themselves without easy recourse to such "aids" and often are confronted by obstacles—institutional, social, and psychological—that render their economic choices all the more overwhelming and their economic conduct all the more fallible.

In what follows, we explore some insights provided by a behaviorally more realistic analysis of the economic conditions of the poor. Our perspective draws on empirical research on judgment and decisionmaking and is supplemented by lessons from social and cognitive psychology. We first review the psychological insights and then consider their implications for a variety of financial products and services that feature prominently in the financial context of the American poor. Of course, insights generated by experimental research and empirical observation need to be carefully tested and evaluated before they can be relied on to shape policy. Even when an intervention succeeds in shaping some intended outcomes, there is always the possibility that other, unforeseen patterns will emerge. Bearing that in mind, we propose some guidelines for thinking about the future design and regulation of financial services.

THE BEHAVIORAL PERSPECTIVE

The Importance of Context

Human behavior proves to be heavily context-dependent, that is, a function of both the person and the situation. One of the major lessons of modern psychological research is that situation exerts impressive power; we have a persistent tendency to underestimate that power relative to the presumed influence of personality traits. Various studies have documented the stunning capacity of situational factors to influence behaviors that are typically seen as reflective of deep personal dispositions. In his now-classic obedience studies, for example, Stanley Milgram (1974) showed how decidedly mild situational pressures sufficed to generate persistent willingness on the part of regular people to administer what they believed to be grave levels of electric shock to innocent subjects. Along similar lines, John Darley and Daniel Batson (1973) recruited seminary students to deliver a practice sermon on the parable of the Good Samaritan. While half the seminarians were told that they were ahead of schedule, others were led to believe that they were running late. On their way to give the talk, all participants passed an ostensibly injured man slumped in a doorway, coughing and groaning. Whereas the majority of those with time to spare stopped to help, a mere 10 percent of those who were running late

stopped; the remaining 90 percent stepped over the victim and rushed along. In contrast with these participants' ethical training and biblical scholarship, the contextual nuance of a minor time constraint proved decisive in the decision to stop and help a suffering man.

The Role of Construal

A simple but fundamental tension between classical economic analyses and modern psychological research is captured by the role of "construal." Agents in classical economic analyses are presumed to choose between options in the world, objectively represented. People do not respond directly, however, to objective circumstances; rather, stimuli are mentally construed, interpreted, understood (or misunderstood), and then acted upon. Behavior is directed not toward actual states of the world but toward our mental representation of those states; moreover, mental representations do not bear a one-to-one relationship to the thing they represent, nor do they necessarily constitute faithful renditions of actual circumstances. As a result, many well-intentioned interventions can fail because of the way in which they are construed by the targeted group—for example, "as an insulting and stigmatizing exercise in co-option and paternalism" (Ross and Nisbett 1991) or as an indication of what the desired or expected behavior might be, or of what it might be worth. Thus, people who are rewarded for a behavior they find interesting and enjoyable can come to attribute their interest in the behavior to the reward and consequently to view the behavior as less attractive (Lepper, Greene, and Nisbett 1973). In one classic study, for example, children who were offered a "good player award" to play with magic markers, which they had previously done with great relish in the absence of extrinsic rewards, subsequently showed little interest in the markers when these were introduced as an unawarded classroom activity—in contrast with children who had not received an award and showed no decrease in interest.

Mental Accounting and Finances

One domain that is of great relevance to our present topic and where construal can prove of great consequence is that of mental accounting. Mental accounting research documents the variety of ways in which the assumption of the fungibility of money fails, leading people to view cash, credit, and debit differently depending on the "mental account" in which the money is perceived to be. People's representation of money systematically departs from what is commonly assumed in economics. According to the fungibility assumption, which plays a central role in theories of consumption and savings, "money has no labels"; all components of a person's wealth can be collapsed into a single sum. Contrary to this assumption, people appear to compartmentalize wealth and spending into distinct budget categories, such as savings, rent, and entertainment, and into separate mental accounts,

such as current income, assets, and future income (Thaler 1985, 1992). These mental accounting schemes lead to differential marginal propensities to consume (MPC) from one's current income (where MPC is high), current assets (where MPC is intermediate), and future income (where MPC is low). Consumption functions thus end up being overly dependent on current income, and people find themselves willing to save and borrow (at a higher interest rate) at the same time (Ausubel 1991).

A variety of other experimental findings are relevant to a better understanding of financial behaviors, but a full summary of those findings is beyond the purview of the present brief exposition. To list just a few, people are loss-averse—the loss of utility associated with giving up a good is greater than the utility associated with obtaining it (Tversky and Kahneman 1991)—and loss aversion yields "endowment effects," wherein the mere possession of a good can lead to higher valuation of it than if it were not in one's possession (Kahneman, Knetsch, and Thaler 1990). This, in turn, leads to a general reluctance to depart from the status quo, because the disadvantages of departing from it tend to loom larger than the advantages of the alternatives (Knetsch 1989; Samuelson and Zeckhauser 1988). People often also fail to ignore sunk costs (Arkes and Blumer 1985), fail appropriately to consider opportunity costs (Camerer et al. 1997), and show money illusion, wherein the nominal worth of money interferes with a representation of its real worth (Shafir, Diamond, and Tversky 1997). Furthermore, people often prove weak at predicting their future tastes or at learning from past experience (Kahneman 1994), and their intertemporal choices exhibit poor planning (Buehler, Griffin, and Ross 1994) and high discount rates for future as opposed to present outcomes, yielding dynamically inconsistent preferences (Loewenstein and Prelec 1992; Loewenstein and Thaler 1989).

An understanding of such proclivities may be further harnessed to help make sense of behaviors that might otherwise appear perplexing, and this understanding may also help produce more desirable behaviors and outcomes. For example, numerous studies of middle-class savings show that, as a consequence of faulty planning and procrastination, saving works best as a default. Thus, participation in 401(k) plans is significantly higher when employers offer automatic enrollment (Madrian and Shea 2001), and because participants tend to retain the default contribution rates, savings can be increased as a result of agreeing to increased default deductions from future raises (Benartzi and Thaler 2004). As we discuss later, the poor tend to have little recourse to just this kind of default savings and saving programs, but the general notion that context can be designed so as to ameliorate outcomes is a central and important one.

Channel Factors

As it turns out, the pressures exerted by apparently trivial situational factors can create restraining forces that are hard to overcome, or they can promote inducing forces that can be harnessed to great effect. What is particularly impressive is the fluidity with which construal occurs and the sweeping picture it imposes.

Alongside the remarkably powerful impact of context is a profound underappreciation of the effects of construal. When interpreting others' behavior, we tend to exhibit the "fundamental attribution error": we overweight the influence of internal, personal attributes and underappreciate the influence of external, situational forces. As explained by Lee Ross and Richard Nisbett (1991), where standard intuition would hold that the primary cause of a problem, or the particular weakness of a group of individuals, is human frailty, the social psychologist would often look to situational barriers and to ways to overcome them.

The behavioral perspective, with its emphasis on context and construal, suggests that in opposition to major interventions that prove ineffectual, seemingly minor situational changes can have a large impact. Kurt Lewin, in the middle of the last century, coined the term "channel factors." Certain behaviors, Lewin (1952) suggested, can be facilitated by the opening up of a channel (such as an a priori commitment or a small, even if reluctant, first step), whereas other behaviors can be blocked by the closing of a channel (such as the inability to communicate easily or the failure to formulate a simple plan). A well-known example of a channel factor was documented by Howard Leventhal, Robert Singer, and Susan Jones (1965), whose subjects received persuasive communications about the risks of tetanus and the value of inoculation and were told where they could go for a tetanus shot. Follow-up surveys showed that the communication was effective in changing beliefs and attitudes. Nonetheless, only 3 percent actually took the step of getting themselves inoculated, compared with 28 percent of those who received the same communication but were then also given a map of the campus with the infirmary circled and urged to decide on a particular time and route to get there. Related findings have been reported in studies of the utilization of public health services: a variety of attitudinal and individual differences rarely predict who will show up at a clinic, whereas the mere distance of individuals from a clinic proves to be a strong predictor (Van Dort and Moos 1976.) Consistent with this interpretation, Derek Koehler and Connie Poon (2006) argue that people's predictions of their future behavior overweigh the strength of their current intentions relative to situational or contextual factors. As it turns out, seemingly inconsequential contextual features can have a profound influence on the likelihood that intentions will be translated into action. (It is worth noting the complicating implications of these and related findings for standard assumptions of revealed preference: Did the students in the study conducted by Leventhal and his colleagues "want" to get the inoculation? And which observed preference is the "right" one—the 3 percent observed in the control condition or the 30 percent observed when handed a map?)

Individual psyches can be understood as "tension systems" (Lewin 1951), composed of coexisting proclivities and impulses, in which incentives, if they run against substantial opposing forces, will have little influence, whereas other interventions, when the system is finely balanced, can have a profound impact. In other words, big interventions can sometimes have negligible effects, whereas apparently small manipulations can make a big difference.

The basic insights outlined here have important corollaries for our present concerns. For one, they suggest that the same tendencies and weaknesses express

themselves differentially in diverse circumstances. For example, the tendency to avoid action and resort to the status quo leads to inferior outcomes when context is structured so that the most beneficial outcomes require action, and this tendency leads to more desirable outcomes whenever the default is set naturally to produce them. Similarly, the same tendencies and weaknesses have different repercussions in different circumstances. A person who is well off but fails to formulate a farsighted plan may have a more modest though still comfortable nest egg upon retirement, whereas a poor person who exhibits similar failures may end up with too little cash to pay a phone bill, accrue large fines for reconnection, become increasingly unable to pay bills, and descend further into poverty.

In this chapter, we examine the specific implications of the behavioral perspective for the financial lives of the poor at three different levels. At the individual level, how does this perspective affect their choices about savings and borrowing? At the institutional level, what does this perspective say about how financial services ought to be designed? And at the regulatory level, what are the implications of this perspective for how financial services ought to be regulated?

Individual psychology is relevant at each of these levels. It directly affects the choices and actions that compound to generate a pattern of saving and borrowing. It affects how individuals respond to various features of a financial product, from its pricing to the transaction costs in acquiring it to its intertemporal consequences. It also gives us a different perspective on the channels by which financial services can affect behavior. All of these insights generate implications for design. Finally, since individual psychology generates deviations from the traditional economic model, it also provides different rationales and guidance for regulation, and not always in the direction of traditional consumer protection. Interestingly, by helping to elucidate specific psychological mechanisms, individual psychology undercuts some of the previous motivations for consumer protection.

INSTITUTIONAL FINANCIAL ACCESS FOR THE POOR

The Role of Financial Access

Financial services may provide an important pathway out of poverty. Such services facilitate savings to mitigate against shocks and promote asset development, and they facilitate borrowing to purchase durables or help weather tough times. In short, financial services allow individuals to smooth consumption and invest (for more on the financial instruments used by low-income Americans, see Barr 2004, this volume). Improvement of financial services, then, provides two key advantages. First, for individuals who already have access to these services, improvement would lower the costs they pay. For example, improved financial services may enable them to use a credit card rather than the more expensive payday lender. Second, individuals who have not had access to financial services would get the direct benefits of access, such as the ability to borrow to smooth shocks (such as health shocks).

Some Features of Financial Access

Our perspective highlights the importance of contextual nuance and consequently the emergence of circumstances in which benefits and costs emanate from the interaction between behavioral tendencies and contextual structure. We briefly consider some simple contextual features that are pertinent to financial access.

INSTITUTIONS SHAPE DEFAULTS It is well established that defaults can have a profound influence on the outcomes of individual choices. Data available on decisions ranging from retirement savings and portfolio choices to the decision to be a willing organ donor illustrate the substantial increase in market share of default options (Johnson and Goldstein 2003; Johnson et al. 1993). This is likely to prove of great importance for the design of financial services, which often shape default financial behaviors.

Consider, for example, two individuals with no access to credit cards: one has her paycheck directly deposited into a savings account, and the other does not. Whereas cash is not readily available to the first person, who needs to take active steps to withdraw it, cash is immediately available to the second, who must take active measures to save it. The greater tendency to spend cash in the wallet compared to funds deposited in the bank (Thaler 1999) suggests that the first, banked person will spend less on impulse and save more easily than the person who is unbanked. Holding risk- and savings-related propensities constant, the first person is likely to end up a more active and efficient saver than the second.

INSTITUTIONS SHAPE BEHAVIOR Many low-income families are in fact savers, whether or not they resort to banks (Berry 2004). Without the help of a financial institution, however, their savings are at greater risk (from theft, impulse spending, access by household members), will grow more slowly, and may not be readily available to support access to reasonably priced credit in times of need. Institutions provide safety and control. In this sense, institutional context may be even more critical for the poor than for the comfortable. In circumstances of dearth, temptation, distraction, and difficult management and control, those savers who are unbanked are likely to find it all the more difficult to succeed on the path to long-term prosperity.

In fact, a recent survey conducted by the American Payroll Association (2002) shows that "American employees are gaining confidence in direct deposit as a reliable method of payment that gives them greater control over their finances, and that employers are recognizing direct deposit as a low-cost employee benefit that can also save payroll processing time and money." The employers of the poor, in contrast, often neither require nor propose electronic salary payments. Instead, they prefer not to offer direct deposit to hourly or non-exempt employees, temporary or seasonal employees, part-timers, union employees, and employees in remote locations—categories which often correlate with being low-paid. The most frequently stated reasons for not offering direct deposit to these employees

include lack of processing time to meet standard industry ("Automatic Clearing House") requirements, high turnover, and union contract restrictions. All these factors create a clearly missed opportunity to offer favorable defaults to needy individuals whose de facto default procedure for pocketing the money they have earned is to take a check, often after hours, to a place, often inconvenient, where it can be cashed for a hefty fee.

INSTITUTIONS PROVIDE IMPLICIT PLANNING As it turns out, a variety of institutions provide implicit planning, often in ways that address potential behavioral weaknesses. Credit card companies send customers timely reminders of due payments, and clients can elect to have their utility bills automatically charged, allowing them to avoid late fees if occasionally they do not get around to paying in time. By contrast, the low-income buyer who has no credit card, no automatic billing, and no Web-based reminders risks missed payments, (high) late fees, disconnected utilities (accompanied by high reconnection charges), and so on.

Interestingly, context can also be detrimental by providing debt too easily. Temporal discounting in general and present bias in particular can be exploited to make cash more attractive in the present than the future costs appear menacing. Whenever this happens, the increased availability of debt could especially lower the well-being of the poor, since overspending by the poor may entail subsequent cutbacks in far more essential consumption than overspending by the rich.

One fundamental lesson of such a behavioral analysis is a new appreciation for the impact and responsibilities of financial institutions. These should not simply be viewed from a financial cost-saving point of view but instead should be understood to affect the lives of people by easing their planning, facilitating their desired actions, and enabling their resistance to temptation. Such effects, furthermore, may have substantially different implications for those who are wealthier, who get professional help, and who, at the same time, can afford to err or be tempted than they do for the poor, who resort to fewer professionals and may pay dearly even for infrequent temptations or minor mistakes.

These considerations form part of a more general view of why financial institutions can be so important in the lives of the poor. Access to financial institutions allows people to improve their planning by keeping money out of temptation's way. In some cases (such as direct deposit and automatic deductions), one may not even notice the moment the money "arrived" in the savings account or was invested in the long term. The recourse to financial institutions provides the opportunity to make infrequent, carefully considered financial accounting decisions that can prove resistant to intuitive error or to momentary mental accounting impulses. In this sense, improving financial institutions can have a disproportionate impact on the lives of the poor. Moving from a payday lender and check-casher to a bank with direct deposit and payroll deduction can have benefits that far exceed the transactional costs saved (for further discussion and more examples of savings instruments aligned with behavioral principles, see Tufano and Schneider, this volume).

SOME NON-INSTITUTIONAL ASPECTS OF THE FINANCIAL LIVES OF THE POOR

Aided by these insights, we aim to further understand the interactions of the poor with specific financial institutions. To begin, we discuss three stylized facts about the financial lives of the poor that are non-institutional but that we think are especially important to the behavioral perspective. These stylized facts are not necessarily psychological. (Two of them have very straightforward economic interpretations.) Rather, they are facts that may render the impact of the relevant psychology particularly interesting and consequential.

Lack of Financial Slack

Though it is hard to define precisely in an economic model, the notion of "economic slack" is central to the lives of the poor. We define slack as the ease with which one can cut back consumption to satisfy an unexpected need. Under this definition, the poor appear to have less economic slack than the rich. Whereas a rich person can often cut back on (by their own admission) more frivolous spending, a poor person faced with a financially demanding situation is forced to cut back on essential expenses. There are two ways to understand this mechanism. The first, more traditional vehicle is via diminishing returns: if a rich person and a poor person face equivalent shocks and cut back on consumption by the same amount, the rich person will be cutting back on lower marginal utility consumption. The second, more psychological vehicle concerns temptations: if the incidence of temptation spending is increasing in income, the rich will be cutting back on precisely those goods that are less valuable from the point of view of past or future selves.

This analysis abstracts from the role of savings. We could argue that the poor, exactly because they face a more volatile environment, would put aside enough buffer-stock savings to handle that excess volatility. This in turn would mean that the same size shock is less likely to result in a poor person running out of savings. While plausible, we ignore this factor in the following conceptualization because a large amount of data show that poorer families tend to have negligible liquid savings. The lack of buffer-stock savings is, we feel, one of the more interesting puzzles to understand in the financial lives of the poor; we return to this issue briefly later in the chapter.

A lack of financial slack is particularly consequential when we consider the type of expenditures the poor might be forced to cut back on. One common finding in the literature is that late payments, some resulting in phone and gas disconnections (and ensuing costly reconnections), are frequent in the lives of the poor. Kathryn Edin and Laura Lein (1997) estimate that 5 percent of annual income is spent on the costs of reconnection. Many financial services impose fees for late payments. This ranges from the expected (on credit card bills) to the unexpected (the penalty for a late payment imposed by rent-to-own stores of repossessing the

item, thereby forcing a loss of all previously made payments). Landlords can impose late fees, and all sorts of bills, from utility to medical bills, usually have steep fees for late payments. The key observation about fees is that they are usually disproportionate. For example, a 5 percent late fee for a monthly bill is effectively a 100 percent APR on a loan. In other words, if the poor cut back by skipping a bill payment, they are effectively borrowing at very high rates.

High-interest borrowing, however, may be the *least* costly consequence of late payments. In fact, what makes the lack of financial slack particularly onerous are the indirect but linked consequences. Consider a household that has had its phone disconnected. The members of this household now face several difficult consequences. First, they need to make a large lump-sum payment to get the phone reconnected. Acquiring this large lump sum poses extra difficulties to an already stretched budget. Second, and more importantly, the lack of a phone could have other consequences for their lives. For example, if they happen to be unemployed (not unlikely for a household that was unable to pay its phone bills), they are now far less effective job-searchers. Even if they are employed, the employer may not be able to reach the home in case shifts change and they are needed at work, making them a less valuable employee. In other words, one action—paying the phone bill late—can have dynamic consequences, amplifying the initial cost and further depressing income. Low-income households struggling with the chronic lack of slack that comes with being low-income are thus always at risk of becoming ever more destitute.

There are profound consequences to being on the edge of further destitution. The first is that any failures to plan well can have quite severe consequences. A rich person who fails to plan, or who plans poorly, may simply cut back on frivolous expenditures. A poorer individual may face a domino effect of consequences that can amplify an otherwise small misplanning step. The lack of slack makes the poor walk a planning tightrope: they must in effect be super-planners, in less conducive and less helpful surroundings, lest they slip deeper into poverty.

A second consequence is empirically easier to identify. The individual who is facing the prospect of having his phone shut off, paying a hefty late fee to have it turned on again, and dealing with the assorted difficulties that arise from a lack of phone service may well be willing to borrow at high rates to keep this sequence of events from happening—or to get the phone reconnected if it has already happened. In fact, not only are low-income individuals sometimes willing to borrow at very high rates, it may be rational for them to do so. The desire to borrow at high rates is interesting: it can easily be confused with myopia, but in some contexts it can constitute a perfectly rational, even if undesirable, response to financial difficulty. This is also relevant to payday loans, an issue we return to later in the chapter.

Small to Big Transformations

One of the fundamental services that financial institutions provide is to allow for the gradual transformation of small amounts of cash, which are easier to come by, into larger lump sums, which can be hard to attain. As Stuart Rutherford (1999)

explains, individuals often need to transform small cash amounts into "usably large" amounts. Such transformation is particularly needed by the poor because of the nature of their cash inflows and needs. The urban poor typically deal with cash inflows in relatively small amounts, receiving weekly or biweekly paychecks. Net of the "necessary" rent, utility, and other bills, they are typically left with only small amounts of cash on hand. Many of the durables they may wish to purchase—washing machines, cars, televisions—require more than what they have left at any point in time. Consequently, the poor need to transform small amounts into usably large sums.

According to traditional economic theory, such transformation is straightforward: individuals simply save the cash they come by until they have accumulated enough. Alternatively, if credit is available, individuals borrow against future income streams to finance the transformation. Whether debt or savings are used depends on the flow value of the durable to be purchased, relative to the interest rate on debt. Of course, because the poor often do not have access to credit, they would need to save their way up.

The psychology of planning and self-control suggests that such savings may be more difficult than traditional theory is prone to assume. An individual saving to buy a durable over a long period of time would have large amounts of cash continuously accessible. And accessible cash can be extremely tempting and thus easy to spend on things that are mostly valued at the moment of spending. As such, temporal inconsistency and self-control problems make savings a weak vehicle on which to rely for small-to-big cash transformations. These factors turn savings accounts into highly leaky budgets.

Many institutions that are popular among the poor and that may otherwise look like less than perfectly rational solutions can be understood as alternative methods for making small-to-big transformation more feasible in a world of imperfect planning and limited control. First, consider the purchase of lottery tickets, which, as many have noted, the poor are especially likely to engage in (Blalock, Just, and Simon 2007; Kearny 2005). What is particularly interesting is the type of lottery ticket the poor typically buy—tickets with maximum payoffs of $200 to $500. If the poor are "buying dreams" through lottery tickets, these are quite modest dreams. Such small maximum payoffs are more consistent with lottery tickets as a vehicle for small-to-big conversion. An individual who struggles to save up to buy a $400 item, for example, would find it easy to buy a lottery ticket periodically. The recurring ticket costs are the "deposits," which eventually lead to a win and the ability to buy the expensive item with the winnings. Notice the dominance of this method of "saving" over the typical savings account. There is no money accumulating and providing recurring temptation to dip into it to satisfy one's own needs or those of family and friends. The individual loses his outlay until he (effectively) wins the desired item, the lottery ticket essentially serving as a commitment device, albeit an expensive one.

Notice that this explanation is very similar to a self-control explanation for the prevalence of ROSCAs in developing countries (Basu 2008). In a typical ROSCA, each participant contributes a fixed amount each week or month, with one participant taking the entire pot. The winner is determined by lottery or by bidding,

with each participant eligible to win once throughout the ROSCA. This is much like a lottery ticket except that one is guaranteed to win once in a given number of times. Both these institutions reinforce the view that a bigger lump of money is worth more to the poor than many small amounts.

Perhaps most telling is the prevalence of layaway plans. In a typical layaway program, an individual picks a particular durable he would like—for example, a washing machine. He then opens a layaway account, to which he deposits money on a payment schedule that depends on the particular store. Once the client has accumulated enough, he is given the durable. This is quite similar to the SEED commitment savings product offered to clients of a Philippine bank (Ashraf, Karlan, and Yin 2006). Some stores offer a price lock-in feature so that prospective buyers are guaranteed the initial posted price, but many others do not. Individuals who do not save enough to buy the item often forfeit their cash. It appears that the primary benefit of the layaway account is its illiquidity.

The popularity of layaways emphasizes the difficulty that simple myopia models face in explaining the behavior of the poor. In resorting to such arrangements, the poor are showing remarkable farsightedness. They are opting to save, without interest, in order to purchase a durable good, which they do not even get to enjoy as they save up to buy it. As with other examples in this section, there is apparently a willingness among the poor to pay large costs to transform small amounts of cash into larger sums.

Of course, the need to make such transformations is not unique to the poor. And surely some of the phenomena we discuss here may also appear among the middle class. We conjecture, however, that in the United States they are much more common among the poor. With access to a variety of institutions intended to facilitate such transformations—from store credit for durable purchases to automatic savings deductions—the well-off are less likely to resort to more exotic, and costly, institutions.

No Buffer-Stock Savings Despite High Volatility

One of the fundamental observations of behavioral research is the exceedingly "local" nature of everyday decisions. More global perspectives and considerations about the long term are often discounted in favor of issues salient at the moment. Thus, even when long-term decisions are made, they tend to be influenced by minor contextual nuances at the moment of decision that often have little relevance for the long run. Furthermore, long-term forecasts and predictions often fail to take into account the relevance and impact of foreseeable future developments. Along with mental accounting, this tendency typically yields consumption patterns that are overly dependent on current income.

The narrow focusing that emerges has clear implications for planning. Great energy can be spent on decisions of the moment—where to go for dinner or what brand to buy—with relatively little attention allocated to arguably more important decisions that are less immediate, such as how to invest one's retirement savings,

or whether to save at all. And the failure to plan can be exacerbated when circumstances are highly uncertain and the future less clear, as is often the case in the lives of the poor. With this month's rent proving of great concern, saving for the children's education or for retirement is naturally left until some better point in the future that may arrive. The tendency to leave financial planning for a more appropriate moment is particularly common among low-income individuals, whose finances afford little slack with which to do much planning. An outcome of this highly volatile struggle with the moment is a lack of buffer-stock savings even, or especially, among these people who, in some ways, need it most.

FROM A BEHAVIORAL PERSPECTIVE

The Unbanked

A little over 10 percent of American households are unbanked and have to rely on alternative financial institutions, such as check-cashers, to cash or process their checks (see also Scholz and Sheshadri, this volume). These alternative financial institutions usually charge high fees, and the households that use them typically have no recourse to formal borrowing instruments. Instead, they may resort to high-interest loans, borrow from friends and relatives to make ends meet or to cover emergency spending, or, in the worst case, simply live without access to credit even during tough times.

This pricey nonparticipation in banking could be the result of a rational choice based on cost-benefit analysis. If households have little to save, then the benefits of being banked may simply be outweighed by the financial costs of maintaining an account, such as the minimum balance fees required by most banks. Alternatively, the decision to remain unbanked could be due to sheer hassle; for example, since few banks have branches in disadvantaged neighborhoods, too much travel time may be involved in using a bank account. Low participation rates may also reflect various cultural factors. Some have attributed to the poor a persistent culture of distrust of financial institutions, or they argue that the poor have not internalized a culture of savings and simply prefer living one day at a time, doing little planning for the future. What is common to these arguments is a tendency to explain a "big" problem (millions of unbanked households) through appeal to "big" factors, such as the dearth of attractive banking options or a deep mistrust combined with a culture of living from day to day.

In contrast, a behavioral perspective suggests that even in the context of big problems, small factors may sometimes play a decisive role. From a normative perspective, defaults are seen as largely irrelevant and easily alterable, but it turns out that, descriptively speaking, the status quo, bolstered by loss aversion, indecision, procrastination, or even a simple lack of attention, has a force of its own (Samuelson and Zeckhauser 1988). Thus, the mere perception that banks are mostly intended for people of greater wealth may reinforce the impression that

banking is not meant for, and ought not appeal to, those of lesser means. Indeed, decisions that involve being subjected to scrutiny, interviews, requests, and applications are all likely to have a nontrivial affective component. And those who are most vulnerable are likely to feel the weight of such sentiments even more than the rest. As a number of ethnographic studies suggest (DeParle 2004; LeBlanc 2004), the poor often are painfully aware of society's norms and of their own inability to abide by them. A single mother who, without access to child care, needs to present herself at a bank in the company of her small children may be aware of the fact that, ideally, children are not brought into a bank. Along with a severely limited understanding of financial instruments, a poor client may feel reluctance, even shame, and a general sense that she can never be a valued bank customer.

Of course, that perception may not be terribly distant from the truth. There is, after all, a built-in asymmetry in banks' incentives between credit and savings for the poor and the rich. Regarding poorer clients, banks have a greater incentive to promote debt (which can be lucrative, delayed, and compounded) rather than savings (which are bound to remain modest), as opposed to the treatment of the wealthy, whose debt is likely to be repaid with little penalty and whose savings promise to be large and valuable.

In fact, when it comes to bank accounts, the default option is often different for the poor than it is for those who are better off. Consider, for example, the simple option of direct deposit. As mentioned earlier, the employers of the poor often do not make electronic salary payments, giving their employees one less important reason to pursue the default option of maintaining a checking account. Given the well-established power of default options, even among the comfortable, it seems safe to assume that such defaults would have at least as substantial an impact on the poor, whose options are inherently inferior and who may be less informed about available alternatives.

From a public-sector perspective, the government could play an important role by further encouraging the automatic transfer of tax (including the Earned Income Tax Credit) refunds to bank accounts. This would also provide a way to facilitate the opening of bank accounts. Some evidence from the First Account program in Chicago provides cautious optimism on this front. For many years, the Center for Economic Progress has been providing free tax preparation services for those eligible for EITC refund. Over the last couple of years, the center has been trying to combine this tax preparation service with the First Account program. Specifically, the center has been singling out individuals who are eligible for a refund but lack a bank account. These individuals are informed that they could get their refund much sooner if they were to open a bank account to which their refund would be directly deposited. Data obtained from the bank handling the First Account program suggest that those individuals who opened an account in this "quick refund carrot" context were not less likely to still be using their account compared with those individuals (more positively self-selected) who opened an account following a financial education workshop (further, related findings are reported later in the chapter).

In light of this discussion, it is clear that a behavioral view would predict positive effects on saving from the opening of bank accounts. Such accounts should generate a "good" savings default to replace the "bad" money-on-hand situation. In addition, the transfer of cash from, say, checking to savings could trigger a propensity to save more. In fact, bank accounts could be designed specifically to conform to people's mental accounting schemes (Thaler 1999). People might choose to label one account their housing account, another their education account, and yet another their car account. The labeling of accounts, while nonsensical from the perspective of standard fungibility assumptions, could provide a salient reminder and help with the allocation of specific funds. Such labeling is reminiscent of other, already existing schemes such as education funds, Christmas clubs, and even layaways, and indirect evidence suggests that it may have real consequences. For example, increased child allowance payments in Sweden were found to have disproportionate effects on how the recipients spent on children (discussed in Thaler 1990).

It is fair to note at this juncture that, despite preliminary empirical support, these proposals would need to be tentatively implemented and seriously evaluated before their full consequences could be fully understood. Behavioral outcomes, after all, tend to be multifaceted and complex. Thus, for example, although the appropriate default arrangements may indeed increase savings, it is possible that people with newly automated savings might only come to feel more empowered to take on greater debts, presumably to be covered by the new savings. The dynamic and malleable nature of behavior often necessitates a pilot testing and evaluation prior to full implementation before the construal and ultimate impact of new instruments can be fully understood.

To summarize thus far, being unbanked typically means that whatever little cash is available is readily available. The storage mechanisms that the poor have access to are highly fungible. Keeping money in cash rather than in the bank increases the ability and temptation to spend immediately, making it difficult to achieve any asset accumulation. Furthermore, even among the nonpoor, small amounts, as compared to large amounts, are more likely to be spent than saved, and since the poor typically deal with small amounts, savings is thereby further discouraged. In contrast with classical analyses, which impute substantial planning and control, numerous studies of middle-class savings suggest that saving works best as a default (Benartzi and Thaler 2004; Madrian and Shea 2001). Thus, 401(k)s seem to be effective because the cash is automatically deposited into savings. Yet the poor typically have little recourse to "good" savings defaults. And with good defaults less available to those without bank accounts, the poor have to revert to alternative and typically expensive commitment schemes to try to save toward big purchases. We can view participation in programs such as rent-to-own or layaway schemes as such alternative commitment devices, and some have argued that the purchase of actuarially unattractive lottery tickets may serve as a saving mechanism because they occasionally leave purchasers in possession of larger amounts than they would be able to save otherwise.

Payday Loans

Payday loans are a commonly used financial vehicle among lower- and middle-income households (for an analysis, see Skiba and Tobacman 2007; Stegman 2007). The typical payday loan involves receiving an advance on one's paycheck for a week or two, but this advance comes at a steep price, an effective interest rate that can be more than 7,000 percent APR. Such loans are highly contentious from a policy point of view and are often implicitly used to point out the myopia of the poor. We make two basic observations about this widespread institution.

First, as noted earlier, the highly credit-constrained sometimes find themselves at the edge of poverty. In these circumstances, there may be no myopia in taking out a payday loan. Instead, the local cost-benefit calculus, however painful, may be sound. Lack of cash at crucial times can result in disastrous and mounting consequences—such as having one's telephone service cut off. In these circumstances, even (especially!) the farsighted would take out a loan at high interest rates. The "error" happened earlier, through a sequence of actions that left the individual without a buffer stock to deal with shocks. In this view, therefore, there will be circumstances in which the question is not why the poor take out payday loans but why they find themselves in situations where they need them.

This perspective poses an interesting challenge to policymakers, who should want borrowers to have access to loans *at the time of borrowing*. Suppose payday loans are taken by people in severe need, and that the need they face is real, and that failure to meet it will have even more severe consequences. Put in this light, payday loans may be a lesser evil compared with policies that use interest-rate caps (or other vehicles) to drive out payday lenders, which could make the poor *worse off*.[1] Interestingly, unless interest-rate caps are accompanied by policies that solve the fundamental lack of a buffer stock among the poor, such principled arguments against payday loans are, once again, predicated, even if only implicitly, on the expectation that the poor ought to act more "rationally," and they could render the poor only more vulnerable to the various shocks they face. Note that a counter to this argument would be that perhaps the unavailability of payday loans would somehow make those who resort to them into better planners. While this is a priori possible, it seems unlikely, and it should certainly at least not be straightforwardly assumed. If, despite facing huge consequences, individuals still fail to plan, why would the addition of yet another cost have the desired effect?

To further understand the relative lack of reluctance to resort to such loans, we should ask: in what sense are payday loans so very costly? What we refer to here is not the question of whether such fees reflect marginal costs or monopoly profits. Instead, we are asking: what is the psychologically accurate way to view such costs? Do they really reflect an individual making a net present value calculation at such high (more than 7,000 percent APR) rates? Or is the behaviorally most compelling perspective one that suggests more bearable debts? As much research on mental accounting and related behavioral proclivities has shown, magnitudes are often evaluated in a narrow context. People may be willing to travel thirty minutes to save $10 on a $30 purchase, but not to save $20 on a $500 purchase. Just as we

should not impute a low value of time (less than $20 per hour) from the first behavior or a high value of time (more than $40 per hour) from the second, we should not necessarily impute discount rates to the intertemporal trade-offs implicit in specific payday loans.

Consider someone who is thinking about paying $20 to get a one-week advance on his $200 paycheck. Such a transaction could be psychologically coded in nominal levels: $20 for a one-week, highly beneficial advance. Viewed in these terms, it may not seem like such a bad transaction. (After all, when the wealthy individual pays $2 to withdraw $100 from an ATM machine out of town, she is really stating a willingness to pay $2, not a general proneness to pay 2 percent to withdraw her own cash.) Of course, when put into annual rates, this payday loan implies an APR of over 14,000 percent! The disjunction between the absolute amount and its APR is the result of compounding. But, of course, the individual is not actually making this decision over a year: he typically makes this decision a few times a year, and each for a short period, so the actual compounding is more of a technical than an experienced cost. In short, while the pricing of payday loans may raise economic as well as ethical questions about competition (supply-side issues), psychology can shed light on why individuals would be willing to pay such high rates, without necessarily suggesting immense if not stunning discount rates. Especially for short-horizon loans, computed APRs may not appropriately capture how individuals naturally frame the intertemporal trade-off.

Check-Cashing

Like many other services provided to the poor, check-cashing is a costly option that provides a service the well-to-do get for less. In a survey of households living in low- and moderate-income census tracts in Chicago, Los Angeles, and Washington, D.C., Christopher Berry (2004) found that people often have a fairly accurate understanding of the relative costs of products provided by banks and check-cashers. Nonetheless, for many individuals who would be unable to adhere to banks' minimum requirements, costly check-cashing arrangements may prove to be the lower-cost option.

The willingness to engage in costly arrangements may be further facilitated by some of the behavioral proclivities reviewed here. Loss aversion is likely to increase the attractiveness even of fairly costly ways to delay or altogether avoid permanent losses. And the high costs of financial services may be aggregated with the perceived gains to which they would contribute in the short run, thus leading to an accounting that at least locally may prove more attractive.

While alternatives to costly check-cashing often exist, they may be less familiar, less common, and less readily available, especially to low-income individuals. A behavioral analysis suggests that it is not that the mere existence of good alternatives makes the greatest difference, but that, in addition, what is often required is the design of effective channels, perhaps combined with directed marketing. For example, in a recent intervention intended to increase elderly

Americans' enrollment in Medicare Part D prescription drug coverage, Jeffrey Kling and his colleagues (2008) documented significantly higher enrollment rates, with an average of at least $230 savings, among participants who were mailed personalized information regarding their current plan and costs, as compared to a control group who were provided with information regarding the official website where comparable information could be obtained.

For another illustration, credit unions and check-cashers in New York have pioneered the use of the point-of-banking machine to facilitate deposits for credit union members at check-cashing stores, providing immediate liquidity of funds and greater convenience for consumers (Stuhldreher and Tescher 2005). Although such arrangements can prove highly beneficial, other partnerships between banks and nonbanks to facilitate payday loans have at times had negative consequences for consumers. Taking the implications of behavioral research seriously, regulators need to focus on promoting partnerships between banks and nonbanks that provide a more responsive and beneficial range of services to unbanked and underbanked consumers.

AN ILLUSTRATION OF A CHANNEL FACTOR

In the attempt to increase take-up of bank accounts among the poor, the behavioral discussion suggests that more attention should be devoted to making the task of "meeting with the bank" an easier and more appealing one and, if possible, perhaps one that does not feel like a "decision" at all. This suggests a variety of small, low-cost interventions that could have first-order effects on the take-up of bank accounts among the poor.

An illustration of the potential impact of small channel factors comes from a brief study of the First Account program implemented by the Center for Economic Progress in the Chicago area. As described earlier, the goal of this program was to entice an unbanked, lower-income population that was mostly dependent on check-cashers to open low-fee accounts at a local bank. To evaluate this program, we first conducted, in collaboration with Marianne Bertrand, a phone survey of a random sample of individuals who had participated in the financial education workshops organized by the Center for Economic Progress. In the workshops, participants took part in a lecture and discussion covering the mechanics of opening a bank account, basic banking products, personal budgeting, and goal-setting. They were also introduced to the First Account program and told that, if interested, they could obtain a referral letter to take to the bank to start the process of opening a First Account. In the survey, we hoped to glean a better understanding of why some participants decided to open First Accounts and others did not.

A promising illustration of small channel factors emerged from our analysis. First, while roughly 50 percent of respondents reported having opened a First Account following the workshop, close to 90 percent reported *thinking* they would do so. We asked those who had planned to open an account but had not done so why they had not. Among those who responded, a large fraction reported some form of time mismanage-

ment as the main cause (missing the deadline, too busy to complete the take-up process, and so on). Taken at face value, these responses suggest that take-up could have been higher had small hurdles to take-up been removed.

More direct evidence came from comparing take-up and usage of the First Accounts across two types of workshops. As mentioned, in the standard workshop participants interested in opening an account received a referral letter they could take to the bank to complete the take-up process. In an experimental subset of workshops, we gave participants interested in opening an account the opportunity to complete most of the paperwork at the workshop location with an available bank representative before heading to the bank to complete the process. From an economic perspective, the mere presence of a bank representative should have little effect on take-up, as it does not alter the cost-benefit analysis at the core of the First Account decision. From a behavioral perspective, however, this small change in implementation could have a large effect on take-up, as it would increase participants' perceived dedication to the program and reduces the likelihood that they would be derailed by procrastination or forget the initial intention.

In fact, we found a large positive effect on take-up associated with the presence of a bank representative on site. Of course, a higher take-up may not have the intended effects if people who open an account end up not using it (or rapidly closing it). As it turns out, we found that having the bank representative at the workshop was associated with a higher likelihood of having an account open at the time of the survey. In addition, a bank representative on site was positively correlated with usage of the complementary services offered by the bank, such as electronic fund transfer, direct deposits, and ATM cards. Contrary to the notion that the unbanked are plagued by "cultural norms" or a general distrust of banks, those who attended a workshop with a bank representative on site were more likely to open an account and to use it.

BEHAVIORALLY INFORMED REGULATION

The behavioral perspective has regulatory consequences, which must be handled with care for three reasons. First, the psychology underlying specific phenomena can be more involved than lay intuition allows. For example, suppose payday loans are in fact the result of individuals "overborrowing." If excess expenditures—spending "too much" on discretionary items (by the person's own admission)—occur throughout the week, then the payday loan is merely a symptom, not the source of the problem. In such circumstances, regulation of payday loans, if it has no impact on excess expenditures early in the week, could make the problem worse. When payday loans are used to deal with rent or phone bills, regulating them may generate problems of late fees or eviction.

Second, as we argue at greater length elsewhere (Barr, Mullainathan, and Shafir 2008a, 2008b), this thinking needs to be embedded in the logic of markets, through a framework that takes into account firm incentives and responses to behaviorally motivated regulation. Outcomes are an equilibrium interaction between individuals'

psychology and firms' responses to that psychology. Such interactions may or may not produce outcomes that are socially optimal, and they may even produce real harms. Depending on the bias and the context, the biases of individuals can either help or hurt the firms with which they interact. Hence, the interests of firms and of publicly minded regulators are sometimes aligned and other times are not. Consider, for example, a consumer who does not understand the profound effects of the compounding of interest and is thus led both to undersave and to overborrow. In one context—savings—investment firms have an incentive to correct the bias, since they can generate fees from the investment. In another context—borrowing—lenders have an incentive to exaggerate that bias, since they can generate revenues from the loan (we abstract here from fee structures and collection costs). A notable example of such positive interactions is the finding that firms are happy to help boost participation in 401(k) retirement plans. The Truth in Lending Act (TILA) of 1968, in contrast, attempts to force disclosure of hidden and complicated prices of credit in contexts where lenders have strong incentives to avoid such thorough disclosure.

Finally, regulation must recognize that firms "move last": they can respond to regulation by subtly altering the context (see Barr, Mullainathan, and Shafir 2008a, 2008b). For example, consider the power of defaults. In one context—401(k) choices—the setting of defaults appears to have large effects, compounded by the compliance of firms, if not their active participation. In other contexts—for example, car rentals—firms have greatly facilitated getting rid of mandated "defaults," to the point where placing one's initials in specially provided boxes on the form indicates the waiver of "defaults" and could be argued to have become the new default. This reinforces an earlier observation: When firms have incentives to take advantage of or even exacerbate a bias, they will explore ways to circumvent regulations intended to avoid the problem. And regulators, of course, do not have sole access to behavioral insight. In fact, the firm, often in a position to deal directly with customers and operating after regulations have been set, is well situated to circumvent regulatory intent.

CONCLUDING COMMENTS ON THE DESIGN AND REGULATION OF FINANCIAL SERVICES

Assuming a context where no further redistribution is about to take place, our perspective suggests some potential alterations to the way financial institutions for the poor are designed. These institutions could include for-profit banks attempting to gain footholds in a lucrative market, nonprofits providing financial and other services, and government service providers. We think several principles are relevant to the design of financial access. What is particularly important about these principles is that they often stand in contrast to classical economic assumptions, and to common intuition.

One such principle, underappreciated by program designers, is that information provided does not necessarily constitute knowledge attained. Individuals often do not fully process data put before them. Either they do not attend to it or they do not fully understand it. This, combined with the curse of knowledge—the tendency of

those who know something to overestimate the probability that others know it—can result in underinvestment in outreach programs that serve to educate individuals about financial services and costs.

Another principle concerns the relevance of people's construal processes. As discussed at the outset, individuals' internal representations of stimuli are, by necessity, interpretations of the "objective" reality. As a consequence, how information is framed systematically alters how it is construed. In an earlier paper (Bertrand, Mullainathan, and Shafir 2006), we focused on the role that marketing plays in the construal of contexts in which decisionmakers find themselves. On the one hand, marketing has been used profusely and effectively by for-profit firms and contributed, at least on occasion, to making the lives of the poor even poorer. Aggressive marketing campaigns have targeted the poor on products ranging from fast food, cigarettes, and alcohol to predatory mortgages, high-interest credit cards, payday loans, rent-to-own plans, and various other fringe-banking schemes (see, for example, Caskey 1996; Mendel 2005). On the other hand, significantly less has been done by marketing firms to promote more positive options aggressively, such as healthful diets, various not-for-profit services, union banks, prime-rate lenders, and so on.

Existence need not imply availability. Whereas most programs focus on the options that are available, a large behavioral literature emphasizes the importance of channel factors and small costs. Specifically, take-up of a program can be importantly influenced by the perceived nature of these small costs. Thus, an otherwise beneficial program with small "channel blockages" may de facto be a program that is not "available." Related to this principle is another touched on earlier: the existence of more options may not entail their availability. As options proliferate in what becomes a difficult choice, people may avail themselves of those options less rather than more.

This, in fact, is an area where recent trends have moved in a direction opposite to that suggested by behavioral analyses. In contrast with the economic truism that having more options is always good, behavioral research suggests that a greater number of alternatives can increase decisional conflict and overload decisionmakers, leading to deferral, procrastination, or inferior choices (see, for example, Bertrand, Mullainathan, and Shafir 2006; Kling et al. 2008 for further discussion). Consider, for example, the case of shopping for mortgages discussed earlier. To the extent that decisions are multi-attribute and complex and need to be simplified, the required monthly payment is probably the best attribute to rely on, since the affordability of payments is a good way to assess risk of foreclosure. If a client has to pick a simplifying heuristic in a sea of complicated alternatives, this would be it. Of course, apart from the ability to pay on a month-by-month basis, monthly payment conveys little information about the price of the loan. Consequently, shopping based on monthly payment might have worked adequately when home loans (say, thirty-year, fully amortizing) were roughly comparable products. But as the number and type of loans available quickly increases, sellers of loans can take advantage of this simplifying heuristic to extract substantially larger profits from borrowers (Willis 2006).

Related to the notion of channel factors is another important issue, that of the distinction between intention and action. In particular, problems of self-control, poor planning, forgetfulness, distraction, and habit can often intercede to produce observable actions that do not match underlying intentions. This tension may help produce a variety of "counterintuitive" venues intended to help people commit to their "better" intentions, such as a demand for financial services that provide illiquidity as a form of "commitment device." As in other contexts, such questionable venues, with their mixed benefits, are more likely to arise in the context of poverty, where superior institutional arrangements are often less immediately available. In addition, interventions that focus heavily on altering intentions, such as financial planning or education, may prove unsuccessful whenever context leads to actions that are in tension with these newly formed, even if genuine, intentions. Context-sensitive behavior, in other words, may run counter to people's true intentions. As a result, revealed preference fails.

A fundamental implication emanates from the present perspective that has direct consequences for issues of regulation and design: whereas the classical perspective assumes that people are rational and doing as well as should be expected, the "culture of poverty" perspective is motivated by the perception that people need to be changed. The central gist of the behavioral perspective is that the poor are neither irrational nor in need of change (not any more, that is, than the rest of humanity). Instead, it is the context in which people function—ranging from financial institutions, benefits programs, and the design of default structures to the availability of child care and transportation and the complexity of application forms—that merits careful attention and constructive work. Such a perspective is likely both to enrich and to complicate our views of the role of institutions and of regulation. As long as these are founded on a better understanding of decision-makers and generate novel policies intended to help them, it clearly seems worth trying.

We thank Michael Barr, Rebecca Blank, Christopher Carroll, and two anonymous reviewers for helpful comments. We thank the Russell Sage Foundation, the William and Flora Hewlett Foundation, and people at Ideas42 for financial, technical, and research support.

NOTE

1. Of course, if one believes that payday lenders are local monopolists, interest-rate caps could have other positive benefits. We are focusing here on the reduction in payday lending that would accompany caps in a competitive situation.

REFERENCES

American Payroll Association. 2002. "Survey Results: American Payroll Association 2003 Direct Deposit Survey." Available at: http://legacy.americanpayroll.org/pdfs/paycard/DDsurv_results0212.pdf (accessed January 28, 2009).

Arkes, Hal R., and Catherine Blumer. 1985. "The Psychology of Sunk Cost." *Organizational Behavior and Human Performance* 35(1): 129–40.

Ashraf, Nava, Dean Karlan, and Wesley Yin. 2006. "Tying Odysseus to the Mast: Evidence from a Commitment Savings Product in the Philippines." *Quarterly Journal of Economics* 121(2): 635–72.

Ausubel, Laurence M. 1991. "The Failure of Competition in the Credit Card Market." *American Economic Review* 81(1): 50–81.

Barr, Michael S. 2004. "Banking the Poor." *Yale Journal of Regulation* 21(1): 121–237.

Barr, Michael S., Sendhil Mullainathan, and Eldar Shafir. 2008a. "Behaviorally Informed Financial Services Regulation." White paper. Washington, D.C.: New America Foundation.

———. 2008b. "An Opt-Out Home Mortgage System." Hamilton Project discussion paper 2008-14. Washington, D.C.: Brookings Institution.

Basu, Karna. 2008. "Hyperbolic Discounting and the Sustainability of Rotational Savings Arrangements." Unpublished paper, University of Chicago (May 12). Available at: http://home.uchicago.edu/karna/karnabasu-rosca-may12.pdf (accessed January 28, 2009).

Benartzi, Shlomo, and Richard H. Thaler. 2004. "Save More Tomorrow: Using Behavioral Economics to Increase Employee Saving." *Journal of Political Economy* 112(1): 164–87.

Berry, Christopher. 2004. "To Bank or Not to Bank? A Survey of Low-Income Households." Working Paper Series. Cambridge, Mass.: Joint Center for Housing Studies.

Bertrand, Marianne, Sendhil Mullainathan, and Eldar Shafir. 2004. "A Behavioral Economics View of Poverty." *American Economic Review* 94(2): 419–23.

———. 2006. "Behavioral Economics and Marketing in Aid of Decisionmaking Among the Poor." *Journal of Public Policy and Marketing* 25(1): 8–23.

Blalock, Garrick, David R. Just, and Daniel H. Simon. 2007. "Hitting the Jackpot or Hitting the Skids: Entertainment, Poverty, and the Demand for State Lotteries." *American Journal of Economics and Sociology* 66(3): 545–70.

Buehler, Roger, Dale Griffin, and Michael Ross. 1994. "Exploring the 'Planning Fallacy': Why People Underestimate Their Task Completion Times." *Journal of Personality and Social Psychology* 67(September): 366–81.

Camerer, Colin, Linda Babcock, George Loewenstein, and Richard H. Thaler. 1997. "A Target Income Theory of Labor Supply: Evidence from Cab Drivers." *Quarterly Journal of Economics* 112(2): 407–441.

Caskey, John P. 1996. *Fringe Banking: Check-Cashing Outlets, Pawnshops, and the Poor.* New York: Russell Sage Foundation.

Darley, John M., and C. Daniel Batson. 1973. "From Jerusalem to Jericho: A Study of Situational and Dispositional Variables in Helping Behavior." *Journal of Personality and Social Psychology* 27(1): 100–108.

DeParle, Jason. 2004. *American Dream: Three Women, Ten Kids, and a Nation's Drive to End Welfare.* New York: Viking.

Edin, Kathryn, and Laura Lein. 1997. *Making Ends Meet: How Single Mothers Survive Welfare and Low-Wage Work*. New York: Russell Sage Foundation.

Johnson, Eric J., and Daniel Goldstein. 2003. "Do Defaults Save Lives?" *Science* (November 21): 1338–39.

Johnson, Eric J., John Hershey, Jacqueline Meszaros, and Howard Kunreuther. 1993. "Framing, Probability Distortions, and Insurance Decisions." *Journal of Risk and Uncertainty* 7(1): 35–51.

Kahneman, Daniel. 1994. "New Challenges to the Rationality Assumption." *Journal of Institutional and Theoretical Economics* 150(1): 18–36.

Kahneman, Daniel, Jack L. Knetsch, and Richard H. Thaler. 1990. "Experimental Tests of the Endowment Effect and the Coase Theorem." *Journal of Political Economy* 98(6): 1325–48.

Kearny, Melissa Schettini. 2005. "State Lotteries and Consumer Behavior." *Journal of Public Economics* 89(11–12): 2269–99.

Kling, Jeffrey R., Sendhil Mullainathan, Eldar Shafir, Lee Vermeulen, and Marian V. Wrobel. 2008. "Confusion in Choosing Medicare Drug Plans." Working paper. Cambridge, Mass.: Harvard University.

Knetsch, Jack L. 1989. "The Endowment Effect and Evidence of Nonreversible Indifference Curves." *American Economic Review* 79(5): 1277–84.

Koehler, Derek J., and Connie S. K. Poon. 2006. "Self-Predictions Overweight Strength of Current Intentions." *Journal of Experimental Social Psychology* 42(4): 517–24.

LeBlanc, Adrian N. 2004. *Random Family: Love, Drugs, Trouble, and Coming of Age in the Bronx*. New York: Scribner.

Lepper, Mark R., David Greene, and Richard E. Nisbett. 1973. "Undermining Children's Intrinsic Interest with Extrinsic Reward: A Test of the 'Overjustification' Hypothesis." *Journal of Personality and Social Psychology* 28(1): 129–37.

Leventhal, Howard, Robert Singer, and Susan Jones. 1965. "Effects of Fear and Specificity of Recommendation upon Attitudes and Behavior." *Journal of Personality and Social Psychology* 2(2): 20–29.

Lewin, Kurt. 1951. *Field Theory in Social Science*. New York: Harper & Row.

———. 1952. *Field Theory in Social Science: Selected Theoretical Papers*. London: Tavistock Publications.

Loewenstein, George, and Drazen Prelec. 1992. "Anomalies in Intertemporal Choice: Evidence and an Interpretation." *Quarterly Journal of Economics* 107(2): 573–97.

Loewenstein, George, and Richard H. Thaler. 1989. "Intertemporal Choice." *Journal of Economic Perspectives* 3(4): 181–93.

Madrian, Brigitte C., and Dennis F. Shea. 2001. "The Power of Suggestion: Inertia in 401(k) Participation and Savings Behavior." *Quarterly Journal of Economics* 116(4): 1149–87.

Mendel, Dick. 2005. *Double Jeopardy: Why the Poor Pay More*. Baltimore, Md.: Annie E. Casey Foundation.

Milgram, Stanley. 1974. *Obedience to Authority*. New York: Harper & Row.

Ross, Lee, and Richard E. Nisbett. 1991. *The Person and the Situation: Perspectives of Social Psychology*. New York: McGraw-Hill.

Rutherford, Stuart. 2001. *The Poor and Their Money*. New Delhi: Oxford University Press.

Samuelson, William, and Richard J. Zeckhauser. 1988. "Status Quo Bias in Decisionmaking." *Journal of Risk and Uncertainty* 1(1): 7–59.

Shafir, Eldar, Peter Diamond, and Amos Tversky. 1997. "Money Illusion." *Quarterly Journal of Economics* 112(2): 341–74.

Skiba, Paige M., and Jeremy Tobacman. 2007. "Measuring the Individual-Level Effects of Access to Credit: Evidence from Payday Loans." *Federal Reserve Bank of Chicago Proceedings* (May 2007): 280–301.

Stegman, Michael A. 2007. "Payday Lending." *Journal of Economic Perspectives* 21(1): 169–90.

Stuhldreher, Anne, and Jennifer Tescher. 2005. "Breaking the Savings Barrier: How the Federal Government Can Build an Inclusive Financial System." Washington, D.C.: New America Foundation and Center for Financial Services Innovation (February).

Thaler, Richard H. 1985. "Mental Accounting and Consumer Choice." *Marketing Science* 4(3): 199–214.

———. 1990. "Savings, Fungibility, and Mental Accounts." *Journal of Economic Perspectives* 4(1): 193–205.

———. 1992. *The Winner's Curse: Paradoxes and Anomalies of Economic Life.* New York: Free Press.

———. 1999. "Mental Accounting Matters." *Journal of Behavioral Decision Making* 12(3): 183–206.

Tversky, Amos, and Daniel Kahneman. 1991. "Loss Aversion in Riskless Choice: A Reference Dependent Model." *Quarterly Journal of Economics* 106(4): 1039–61.

Van Dort, Bernice E., and Rudolph H. Moos. 1976. "Distance and the Utilization of a Student Health Center." *Journal of American College Health Association* 24(3): 159–62.

Willis, Lauren E. 2006. "Decisionmaking and the Limits of Disclosure: The Problem of Predatory Lending: Price." Loyola Law School Los Angeles Legal Studies Paper 2006-27. Los Angeles: Loyola Law School.

On the Psychology of Scarcity

Eldar Shafir
Princeton University

Sendhil Mullainathan
Harvard University

Christopher Bryan
Crystal Hall
Anandi Mani
Anuj Shah

ideas42
asking the right questions

Columbia Business School and Robin Hood Foundation present
2012 Social Enterprise Leadership Forum:
The Economics and Psychology of Poverty

Two Dominant Views of Behavior under Poverty

Rational Choice view

- Consistency, Willpower, Well-defined preferences,..
- Behavior: calculated adaptation to prevailing circumstances

Pathology view

- Psychological pathologies specific to the poor
- Impatient, no planning, confused
- Behaviors endemic to "culture of poverty"

An alternative:

Us! Neither rational nor pathological; just plain human…

The psychology of scarcity…

Conditions of scarcity (in money, time…) produce their own psychology.

This psychology, in contexts of scarcity, produces characteristic behaviors.

The Packing Problem: A Suitcase metaphor

Larger suitcase:

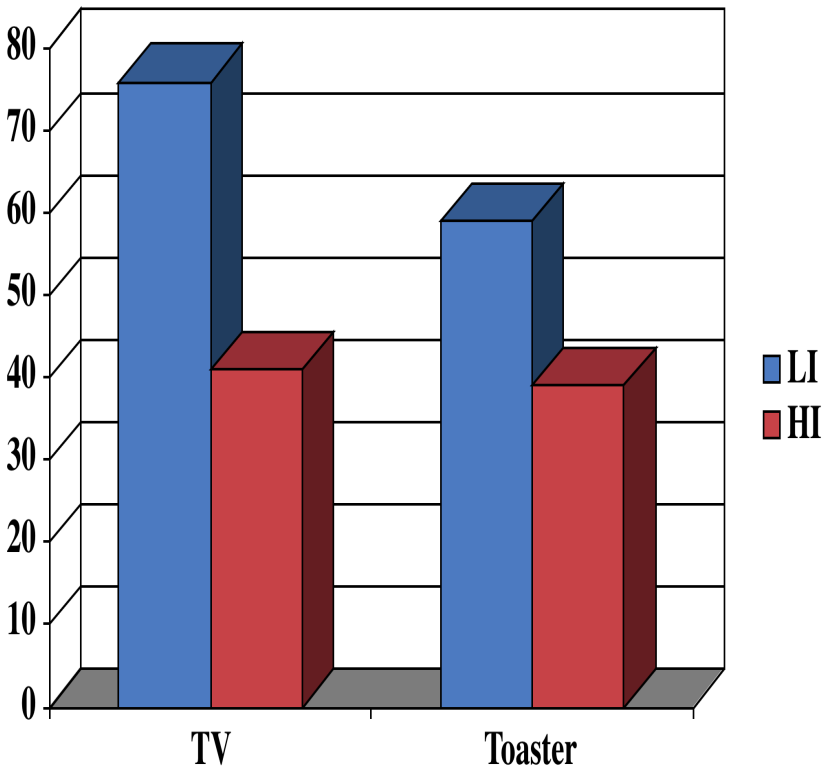
- pack everything important w. room to spare
- easy to leave slack, in case something comes up

Smaller suitcase:

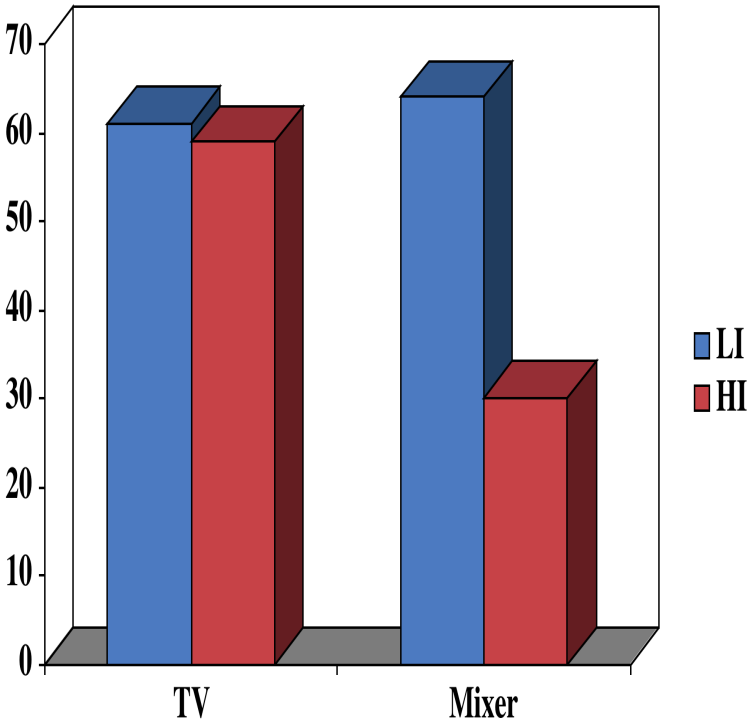
- pack the very essentials
- need to choose among important items that don't fit
- hard to maintain any slack

- Slack makes it easier to pack; Complexity higher when suitcase tight
  - Slack reduces cognitive cost: requires less focus, less vigilance
- Bigger suitcase means slack is "cheaper"
  - What you give up to maintain slack is (marginally) cheaper

Tradeoffs:
% who think about what they would not buy instead…

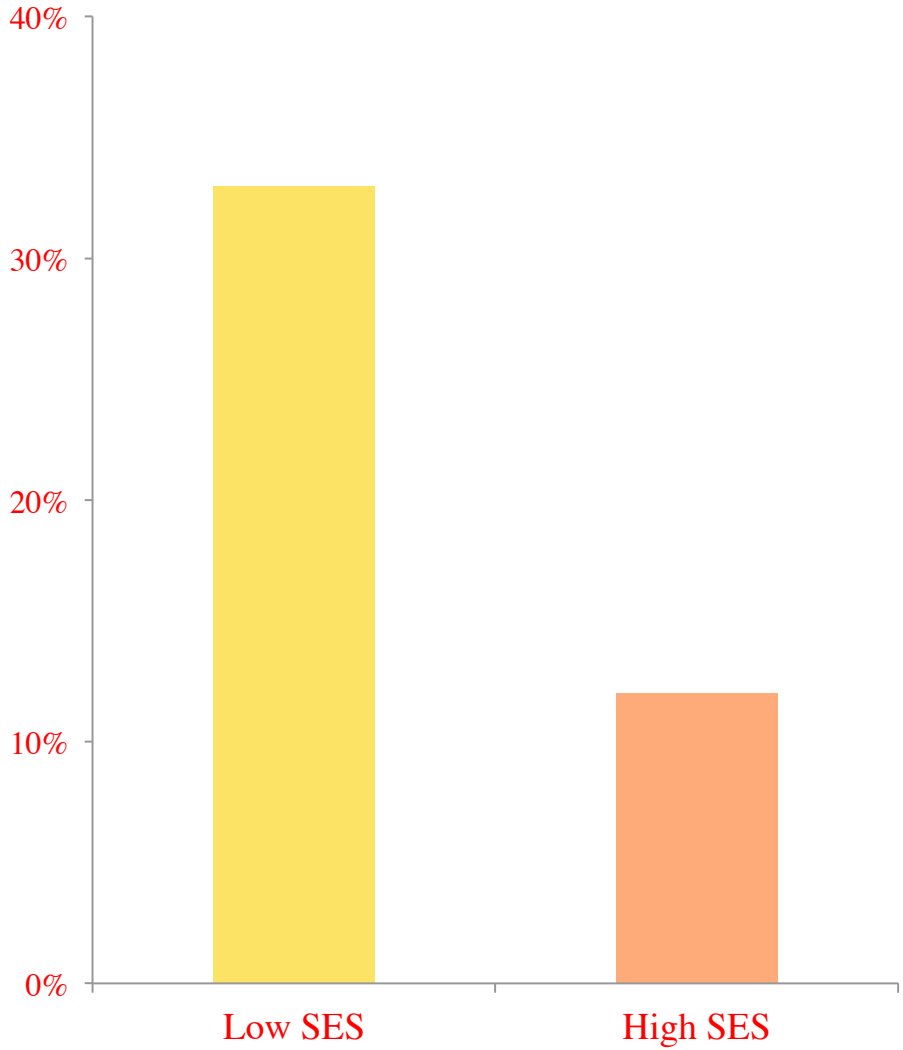


(US)



(India)

Taxi fare when you first get in?… (South Station)



Poor in Money or Time… an empathy bridge

Tradeoffs:	If I buy this, what do I *not* buy instead?	If I do this, what do I not do instead?
Temptations:	Basic goods turn into "luxuries"	Basic activities turn into "luxuries"
Indulgences:	Given what you owe, what are you doing spending?!	Given what you owe, what are you doing here schmoozing?!..

More consequential: When there's lack of slack, bad tradeoffs, giving into temptation / indulging - all more consequential!...

Psychology of Scarcity

- Persistent tradeoff thinking
- More complicated / demanding packing…
- Greater vigilance (attentiveness, knowledge...)
- Focus (often highly effective...)

➔

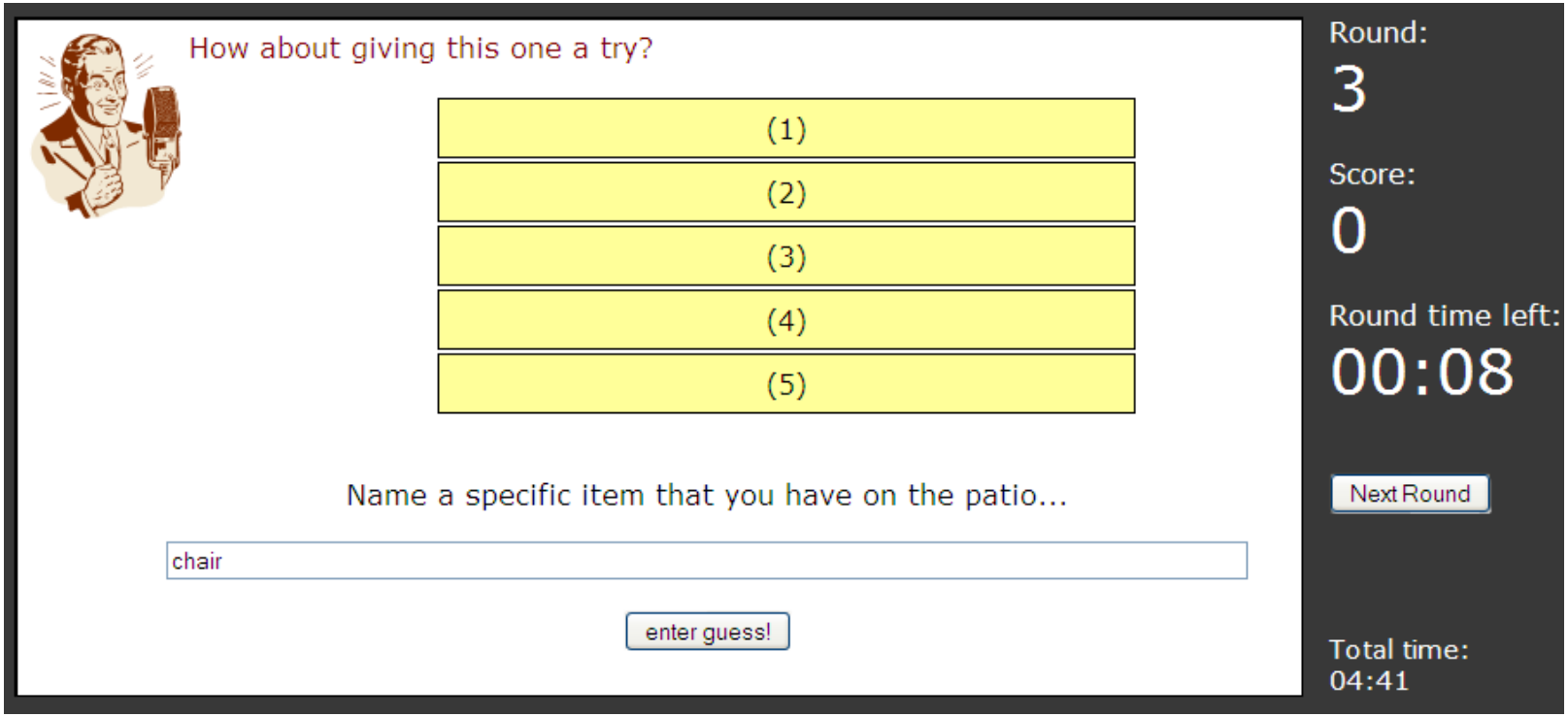
- Tunneling
  - Horizon shortening (“myopia..”)
- Borrowing
  - Insensitivity to horizon & its costs…
- Distraction
  - Depletion, Error…

20 rounds

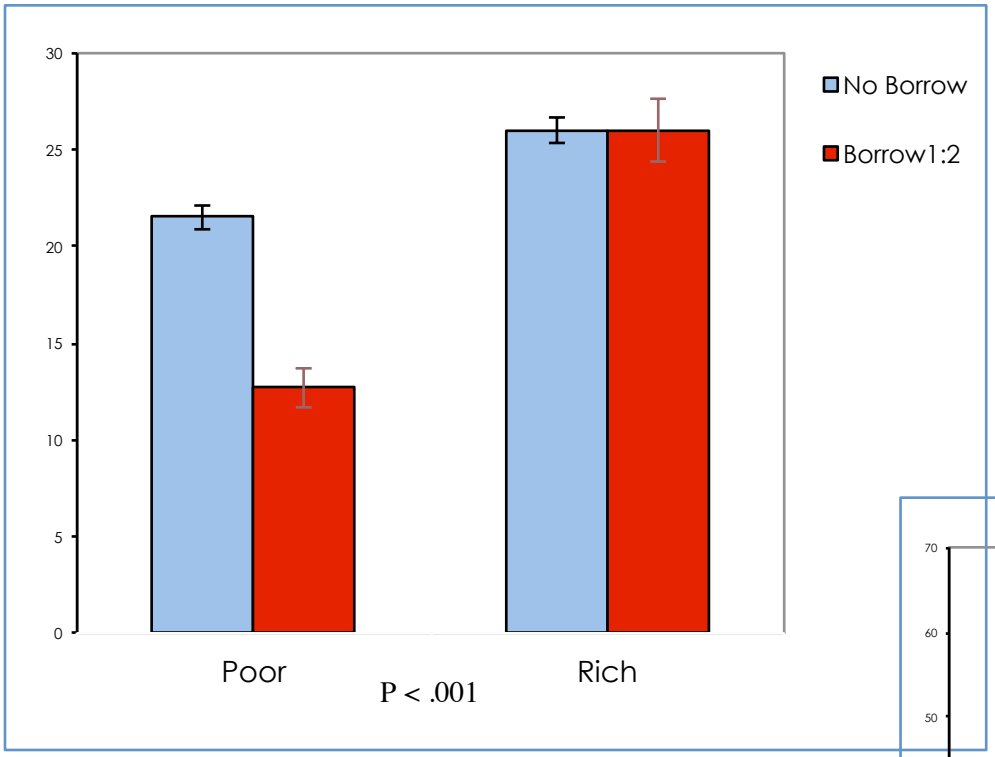
"Rich": 50 sec / rnd (1000 sec total)

"Poor":15 sec / rnd (300 sec total)

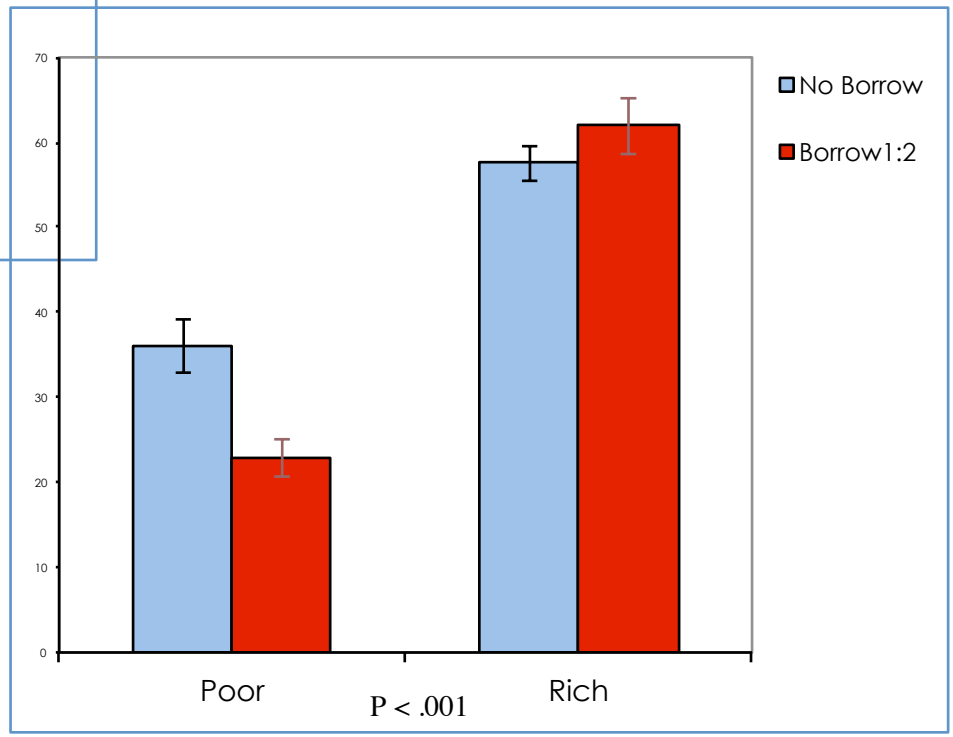
No borrowing vs. High Interest Borrowing



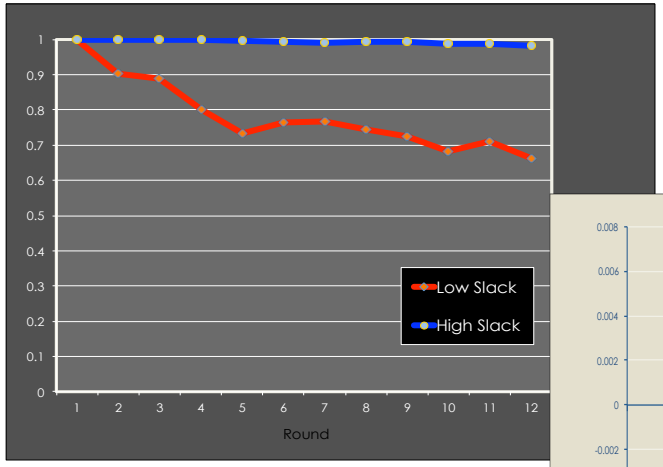
Rounds Completed

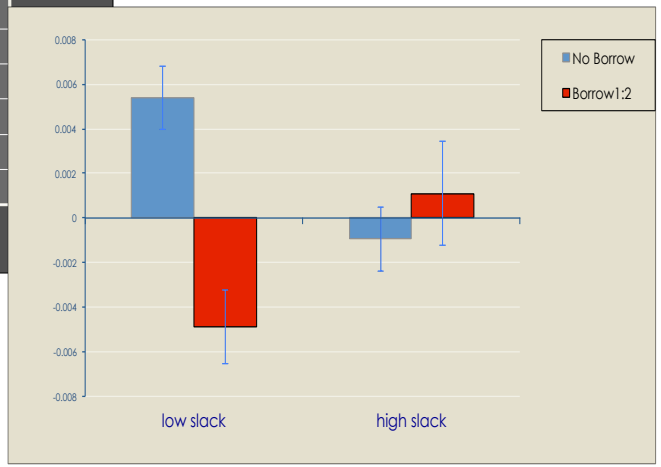


Points Earned

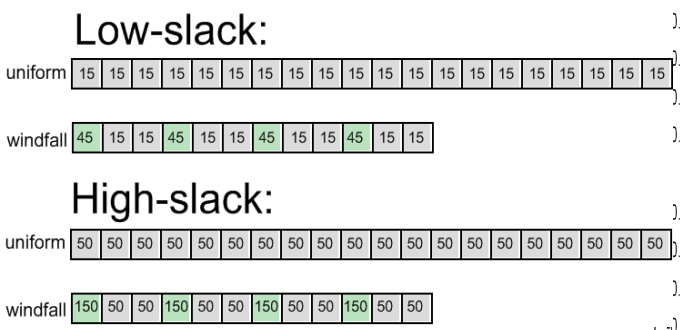


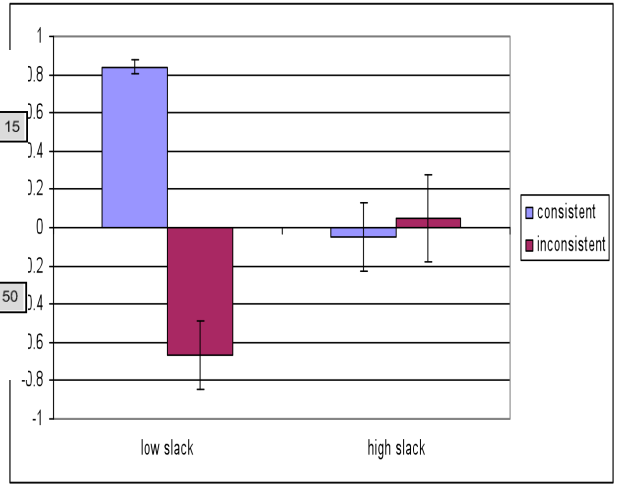
- Debt Traps



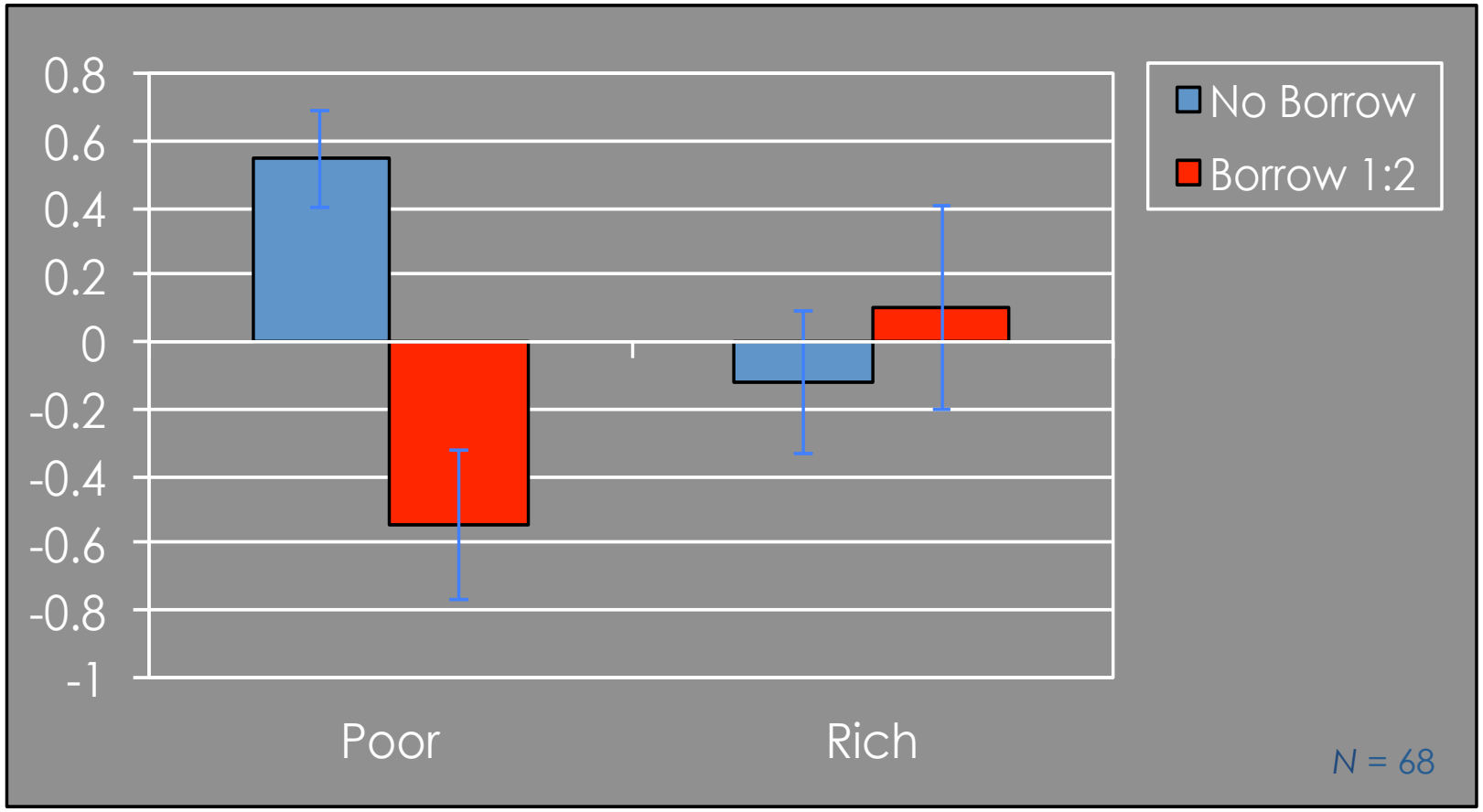


- Smoothing consumption

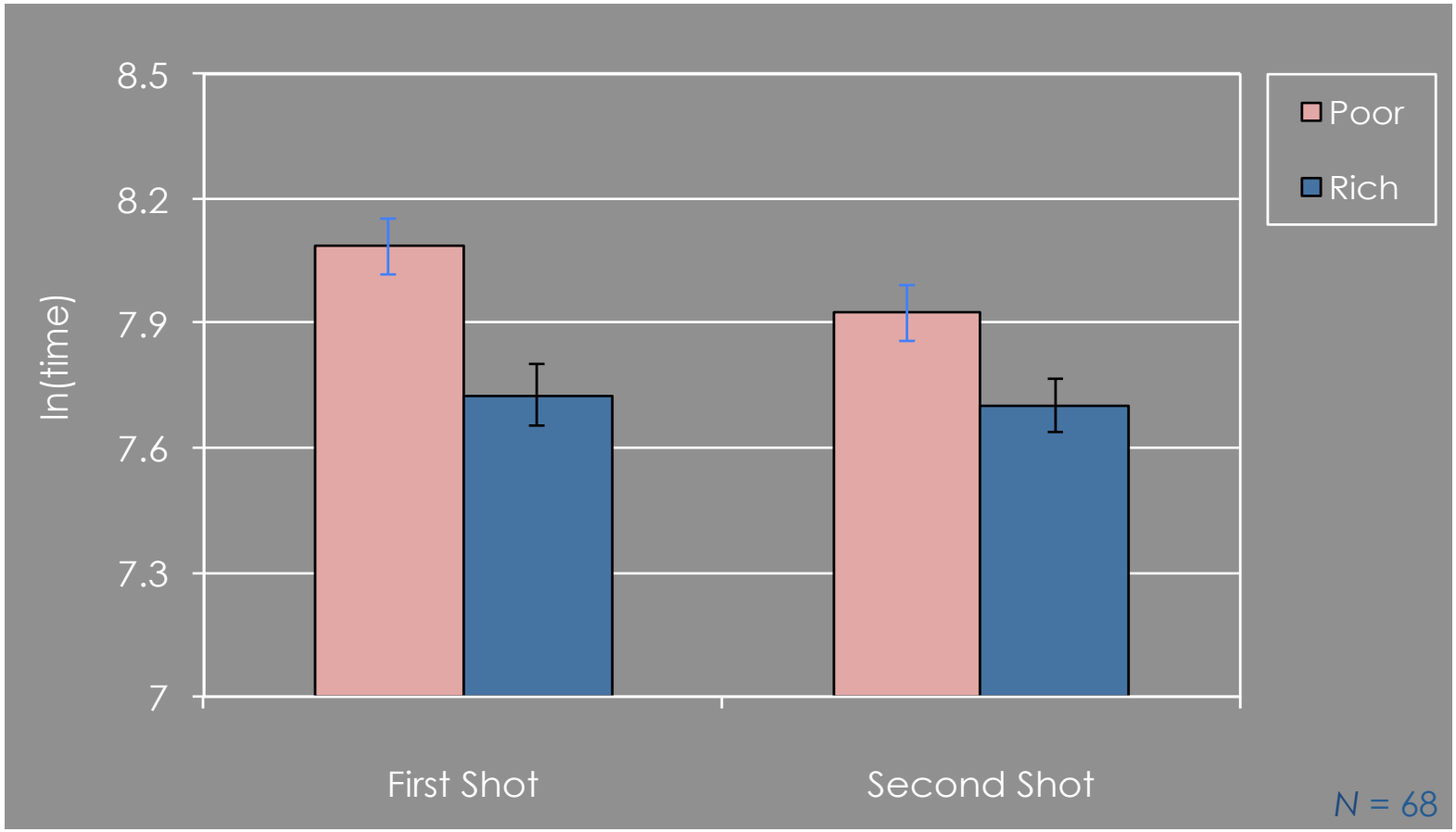




Overall performance
(poor vs rich)



Momentary Focus
(poor vs rich)



Scarcity is distracting..

(Calorie) Scarcity Hypothesis: Tempting foods monopolize the attention of dieters (more than of non-dieters…)

Word Search

M	D	O	B	W	I	D
N	R	B	B	V	D	C
K	B	C	Z	M	L	X
V	T	P	M	R	S	S

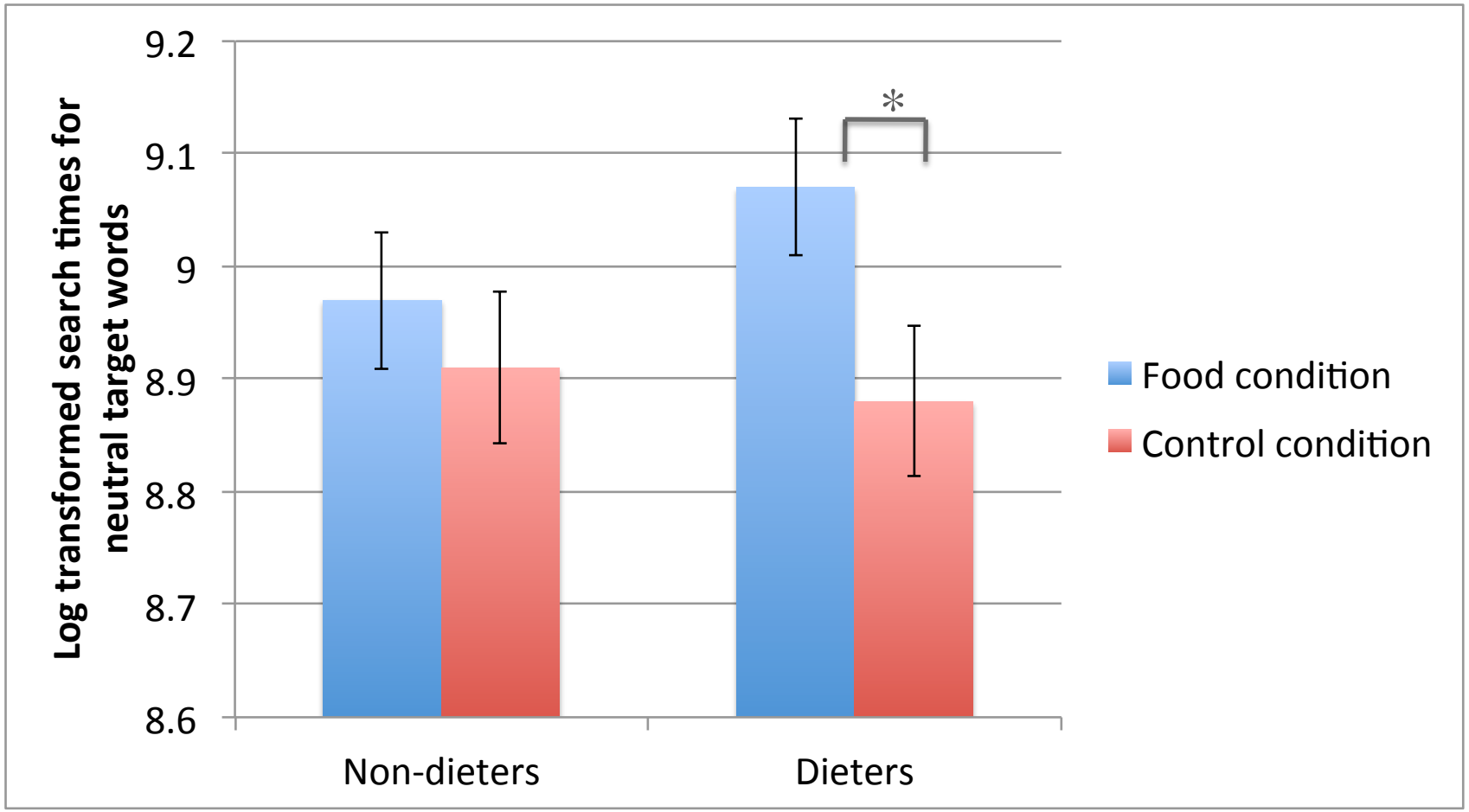
CAKE
TREE
DONUT
CLOUD
SWEETS
LAMP
INDULGE
RAIN
DESSERT
DOOR

Word Search

A	Q	G	P	P	O	F
D	J	T	R	R	C	Q
U	X	E	C	H	Q	L
A	K	E	D	O	V	V
G	L	R	T	F	Z	A
C	I	T	F	V	G	A
J	A	S	C	R	F	P

STREET
TREE
PICTURE
CLOUD
CARPET
LAMP
DAYTIME
RAIN
VACUUM
DOOR

Search times – for neutral targets -- by condition and group



(3 practice trials)
Interaction: Significant!

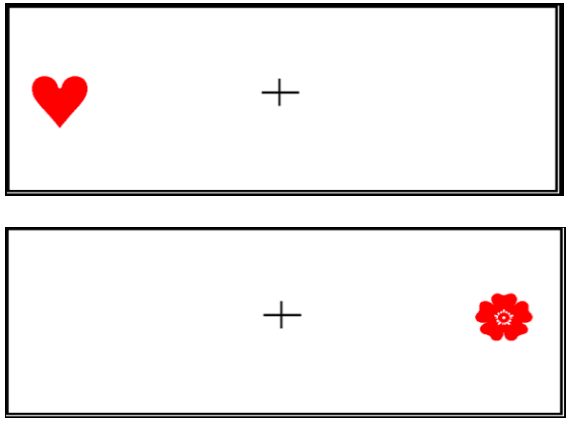
Financial challenges…

In a NJ mall: Participants think about financial challenges, and complete cognitive tasks…

Imagine that your car...requires a..[hard*: $1,500;* easy*: $150] service… How would you go about making this decision?...*

Cognitive control task

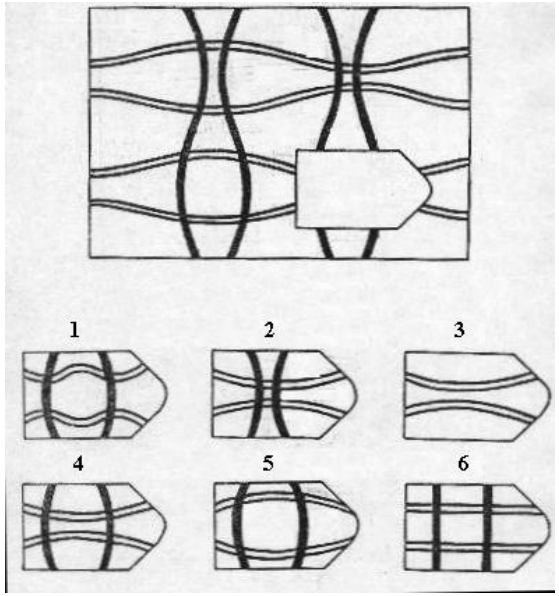
press the same side as the heart
press the opposite side as the flower



Measures cognitive control & executive function…

"Driving test"…

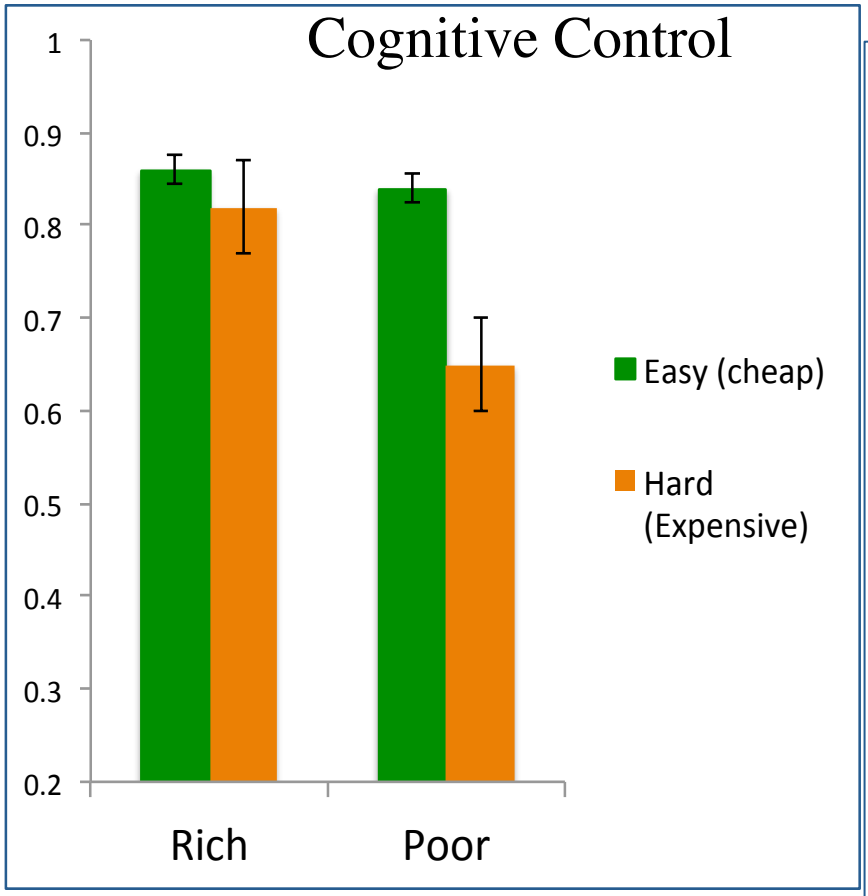
Raven's Progressive Matrices

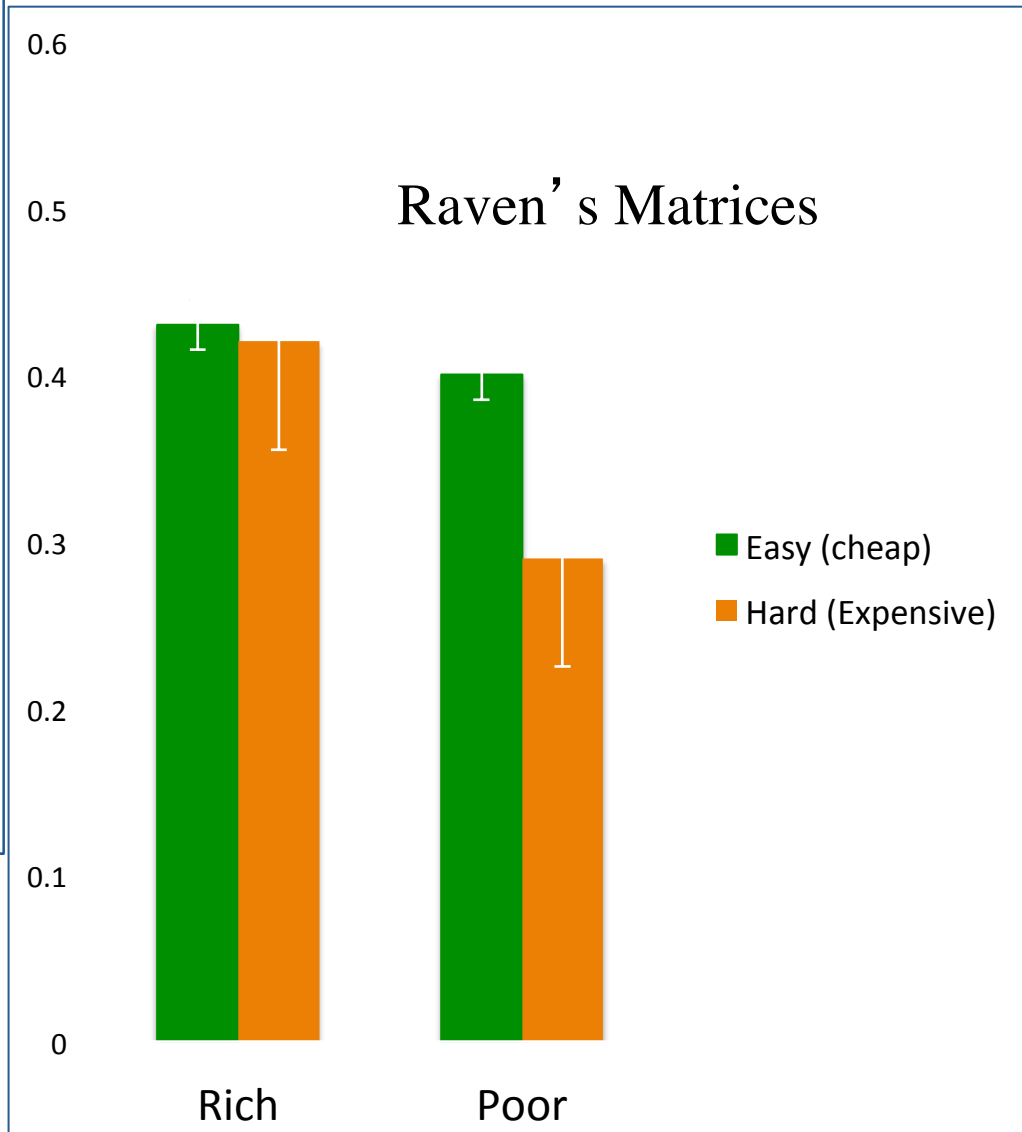


"Measures high-level observation skills, clear thinking ability, and intellectual capacity."

"Intelligence test"…

Performance in financial challenge





Sugar cane farmers in India…

Significantly greater # of errors pre-harvest compared to post-harvest…

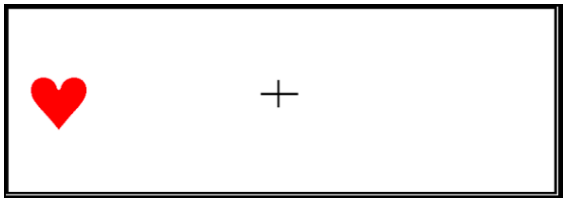
(Also heart rate,
blood pressure, etc.)

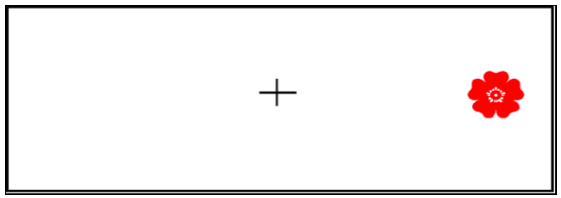
Affirmation at a Soup Kitchen

Cognitive control task

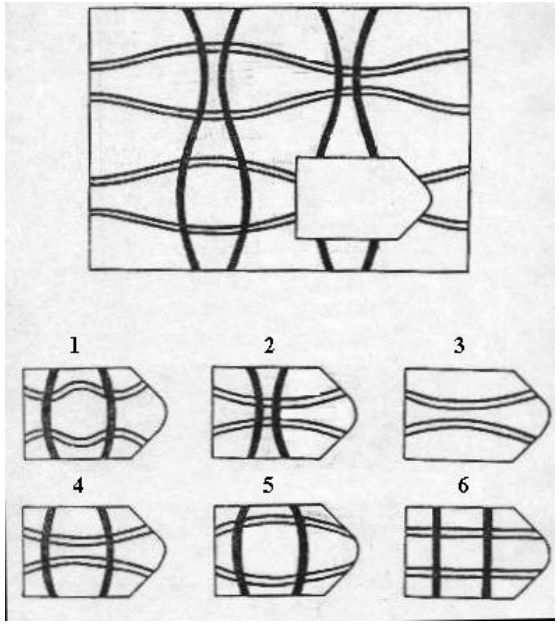
press the same side as the heart

press the opposite side as the flower

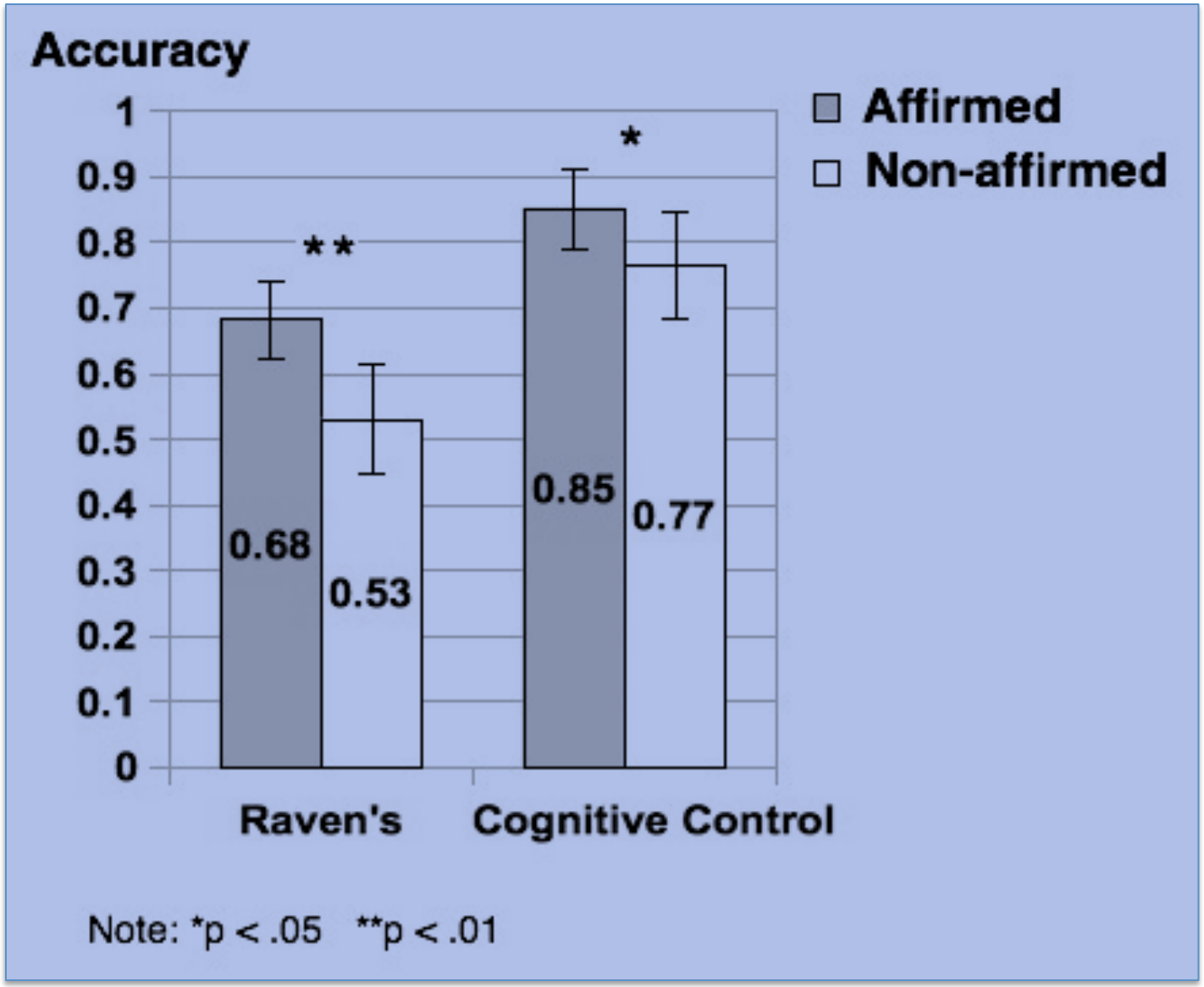




Raven's Progressive Matrices



Results


Accuracy
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Affirmed
Non-affirmed
**
*
0.68
0.53
0.85
0.77
Raven's
Cognitive Control
Note: *p < .05 **p < .01

Affirmation in the context of welfare benefits programs (EITC and local VITA sites) …

	Condition:		
	Neutral	Affirmation	
Stopped to consider:	44%	58%	(*ns*)
Of those, took the information:	36%	79%	p=.03
(Total take up:)	16%	46%	$p<.01$

Irony of Poverty

- Poor must make higher quality decisions
  - Packing problems are harder under scarcity
  - Many more temptations under scarcity
  - Can't afford mistakes under scarcity
- Poor are in worse position to make high quality decisions
  - Distracted by other stressors/decisions/conditions
  - Depleted by challenges/temptations/past failures
  - Hampered by context/culture/stereotype
  - Unappreciated! (Both they and their packing problems...)

Problem

Bottleneck

Nudges

Inventions

Low Income Workers
Less Productive
High Turnover

Psychic Tax of Poverty

Financial Stabilizer

ideas42 is piloting a package of financial services designed to simplify and stabilize finances for low income employees

1 Set up session with financial representative

Create budget

Direct deposit into 3 dedicated accounts:

1) Bill payment
2) Discretionary spending
3) Emergency savings

Automate payments

- Bill payment
- Emergency savings

2 Ongoing interaction with employee

Provide customer service

Give timely feedback & automate messaging

- Reminders about important financial deadlines
- Progress tracking for financial goals and commitments

Provide emergency buffer

- Low-cost credit access
- Emergency savings

Thank you!