

CHAPTER 3

Thinking with mental models

When we think, we generally use concepts that we have not invented ourselves but that reflect the shared understandings of our community. We tend not to question views when they reflect an outlook on the world that is shared by everyone around us. An important example for development pertains to how people view the need to provide cognitive stimulation to children. In many societies, parents take for granted that their role is to love their children and keep them safe and healthy, but they do not view young children as needing extensive cognitive and linguistic stimulation. This view is an example of a “mental model.”¹ In some societies, there are even norms against verbal

it would be impossible for people to make most decisions in daily life. And without *shared* mental models, it would be impossible in many cases for people to develop institutions, solve collective action problems, feel a sense of belonging and solidarity, or even understand one another. Although mental models are often shared and arise, in part, from human sociality (chapter 2), they differ from social norms, which were discussed in the preceding chapter. Mental models, which need not be enforced by direct social pressure, often capture broad ideas about how the world works and one’s place in it. In contrast, social norms tend to focus on particular behaviors and to be socially enforced.

Mental models help people make sense of the world—to interpret their environment and understand themselves. Mental models include categories, concepts, identities, prototypes, stereotypes, causal narratives, and worldviews.

There is immense variation in mental models across societies, including different perceptions of the way the world “works.” Individuals can adapt their mental models, updating them when they learn that outcomes are inconsistent with expectations. But this chapter will explain that individuals may hold on to mental models that have destructive consequences for their lives and may continue to use them to validate their interpretations, even when those models and interpretations are patently false. Individuals can also hold onto multiple and sometimes even contradictory mental models—drawing on one or another mental model when the context triggers a particular way of looking at the world.

engagement between parents and young children (see chapter 5). This particular mental model can have huge consequences, even leading to the intergenerational transmission of poverty.

Mental models include categories, concepts, identities, prototypes, stereotypes, causal narratives, and worldviews.² Without mental models of the world,

Mental models matter for development because they affect decision making. Since a great deal of policy is based on changing people’s decisions—to save and invest, to enroll children in school, to be active citizens, to be honest—understanding the role that mental models play in individual decision making opens up the possibility of new levers for policy, while at the same time highlighting potential problems in design

and implementation. Development interventions can go wrong when policy designers have a faulty mental model of how a population will react to a program. This chapter highlights recent progress in understanding the role that mental models play in economic development and the implications for policy.

The first part of the chapter outlines some of the main ways that mental models affect decisions associated with development. Mental models bear on the evolution of institutions, and on firm behavior and cognitive performance. The chapter explains how mental models, which may once have been well adapted to the situation at hand or may once have reflected the distribution of political power, can persist even when they are no longer adaptive or when the political forces that gave rise to them have changed. The chapter then discusses implications for policy.

Institutions and mental models are closely related; sometimes a change in a mental model requires a change in an institution. But in some cases, exposure to alternative ways of thinking and to new role models—in real life, in fiction, and through public deliberation—can have a measurable influence on mental models and on behaviors, such as investment and education.

Where mental models come from and why they matter

Some mental models seem innate among humans. For example, there is some evidence that humans are innately attuned to the category of “dangerous animal.” It is easy to condition individuals to fear rats, but it may be impossible to condition infants to fear wooden objects and cloth curtains (Bregman 1934). Humans may also be innately susceptible to finding certain objects or behaviors disgusting, such as incest (Haidt 2012). Other mental models are idiosyncratic—acquired through experience particular to the individual. Many mental models come from experiences that are particular to an environment and thus are widely shared within one society but not in others (Berger and Luckmann 1966; Zerubavel 1999).

Mental models enable thought and action, but also constrain them. When the mental models people use are well adapted to the task at hand, they make individuals better off: “Time and energy are saved, rumination and doubt are reduced, and nothing important is lost,” note Ross and Nisbett (1991, 77; see also Todd and Gigerenzer 2000). But mental models may be out of sync with the real world, may substantially limit the amount of information decision makers use, and may cause them to fill in uncertain details of a situation with incorrect assumptions. When this happens

systematically to a group of people, mental models can entrench poverty.

For example, in Ethiopia disadvantaged individuals sometimes report feelings of low psychological agency: “We have neither a dream nor an imagination”; “We live only for today” (Bernard, Dercon, and Taffesse 2011, 1). They may believe that they cannot change their future, and that belief limits their ability to see opportunities they might have, for example, to invest. In 2010, a team of researchers set out to discover whether they could change that mental model. They transported video equipment to remote Ethiopian villages with camels and four-wheel-drive vehicles. They invited a randomly selected group of villagers to watch an hour of inspirational videos—four documentaries in which individuals from the region described how they had improved their socioeconomic positions by setting goals, making careful choices, persevering, and working hard. A survey conducted six months later found that the treatment had increased aspirations and brought about small but tangible changes in behavior: viewers had higher total savings and had invested more resources in their children’s schooling (Bernard and others 2014).

How mental models work and how we use them

At a given moment, there are potentially thousands of details that could be observed, but we have limited powers of observation. Mental models affect where we direct our attention.³ Mental models provide us with default assumptions about the people we interact with and the situations we face. As a result, we may ignore information that violates our assumptions and automatically fill in missing information based on what our mental models suggest is likely to be true.⁴

The links between perception and automatic thinking are strong, as emphasized by Kahneman (2003) and discussed in chapter 1. While both involve the construction of meaning, in both cases the perceiver or thinker is not aware of constructing anything. He imagines that he is responding objectively to the stimulus or the situation. Since we are social animals, our mental models often incorporate the taken-for-granted beliefs and routines of the culture in which we were raised. One way of thinking about culture is as a set of widely shared tools for perception and construal.⁵ The tools may not be fully consistent with one another. Thus, as this chapter will show, a given person might exhibit different behaviors when the mental model that is most accessible to him or her changes (Swidler 1986; DiMaggio 1997).

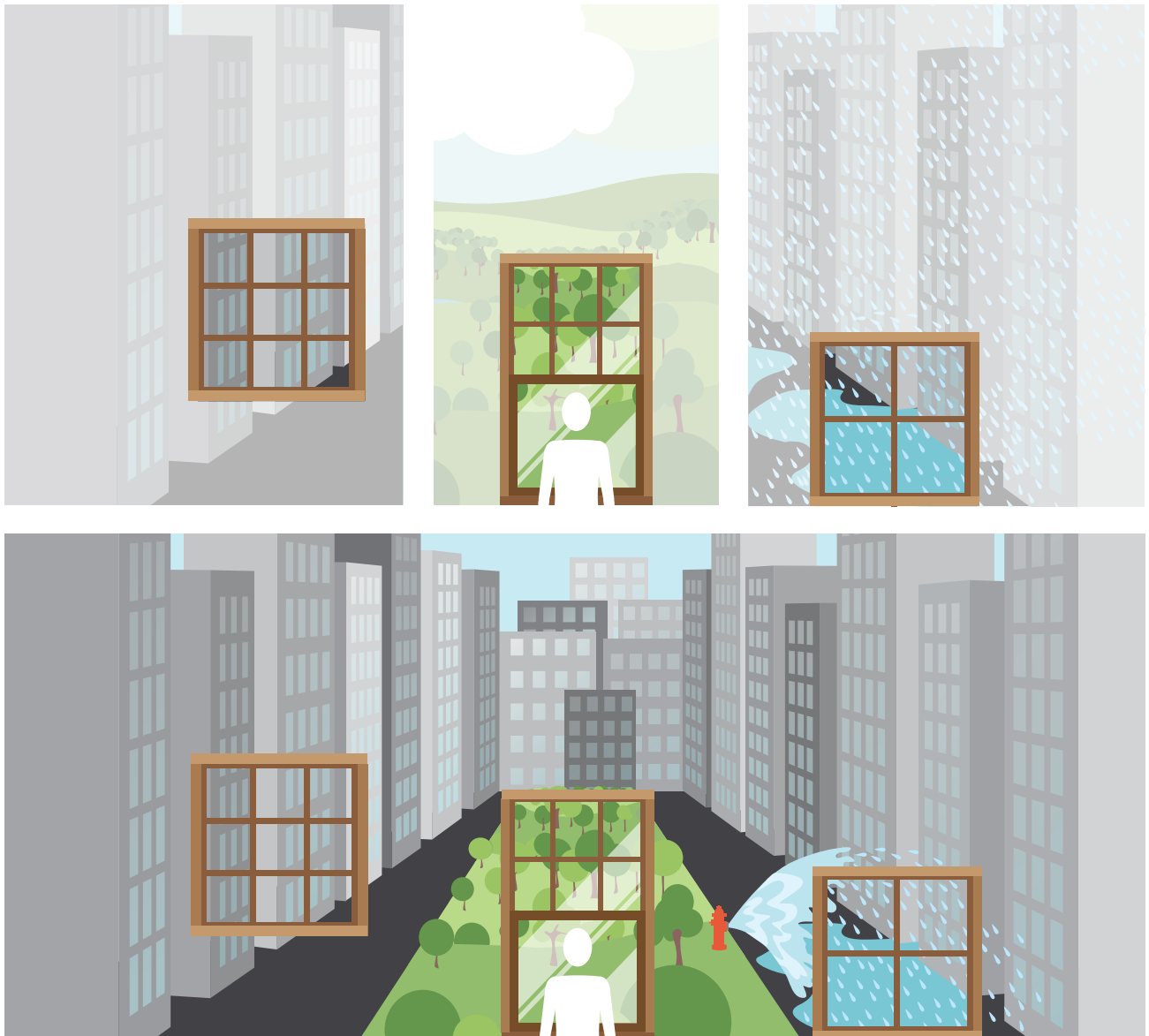
Context can activate a particular mental model, as illustrated in figure 3.1. The windows provide partial views of an urban street. Depending on which window a spectator looks out of—a metaphor for which mental model he uses to interpret the world around him—his mental representation of the scene will be very different. He is unlikely to be aware that his view might be different if he were standing somewhere else or using a different mental model. This figure illustrates

a theme introduced in chapter 1—individuals tend to automatically jump to conclusions based on limited information—and also the main idea of this chapter: thinking processes (both automatic and deliberative, as discussed in chapter 1) draw heavily on learned mental models.

As studies of immigrants show, mental models can be passed down from generation to generation: mental models of trust, gender, fertility, and government, for

Figure 3.1 What we perceive and how we interpret it depend on the frame through which we view the world around us

Individuals do not respond to objective experience but to their mental representations of experience. In constructing their mental representations, people use interpretive frames provided by mental models. People may have access to multiple and conflicting mental models. Context can activate a particular mental model. Using a different mental model can change the individual's mental representation of the world around him.



instance, are typically learned from the culture one grows up in. Social learning processes allow for the intergenerational transfer of mental models.⁶ A society's past may affect the perceptions and evaluations of opportunities by current members of the society.

The roots of mental models

Evidence suggests that historical experience exerts a powerful influence on mental models and, consequently, on how individuals understand and react to the world. An example is the legacy of the Atlantic slave trade. Slavery was ubiquitous in many eras and in many societies, but the slavery associated with the Atlantic slave trade had some properties that made it especially destructive. The middlemen for the white slave traders included local Africans. To protect themselves from being captured and sold as slaves, individuals needed guns, but to buy guns they needed cash. The main way of obtaining cash was to kidnap someone and sell him into slavery. Thus the Atlantic slave trade turned brothers against each other, chiefs against subjects, and judges against defendants. Lower levels of trust in some parts of Africa today are related to the intensity of slave trading centuries ago. Regions that were more susceptible to slave raids due to accidental features of geography have lower levels of trust today—trust toward strangers, friends, relatives, and institutions (Nunn 2008; Nunn and Wantchekon 2011).

Historical modes of production, determined by geography or circumstance, also influence mental models. One way to coordinate production within the household is to use social norms for the division of labor by gender. A technology that increases the comparative advantage of one sex in a given productive activity increases the benefits to specialization. The plough is such a technology. Because it requires a great deal of upper-body strength, it gave men a large comparative advantage in agriculture. Its adoption may have been the source of social norms that are now used to enforce gender differences in nonagricultural domains. Today, ethnic groups that used plough-based agricultural techniques in the distant past have more unequal gender norms and stricter norms about gendered activity, as Alesina, Giuliano, and Nunn (2013) show. The norms persist even when people leave these societies. The children of immigrants to Europe and the United States have gender norms that depend on whether or not their culture of origin used plough-based agricultural technology. Working women are viewed more favorably in societies that did not have the plough than in societies that did, and they represent a higher share of the labor force.

Agricultural modes of production influence mental models in other ways, as well. Cultivating rice requires more specialization by teams than cultivating wheat. People from areas of China suited for growing rice tend to have more collectivist views, while people from areas suited for growing wheat tend to have more individualist views, controlling for other factors (Talhelm and others 2014).

Societies whose current economic activities yield greater gains to cooperation (for example, because they rely on whale-hunting, which requires large teams, as contrasted with economic activities carried out at the individual or family level) exhibit more cooperative behavior in experimental games, Henrich and others (2001) show. The link between economic activities and modes of societal organization has long been recognized, whereas it is only more recently that social scientists have demonstrated that economic activities also shape individuals' mental models of social interaction.

The relationship between institutions and mental models

Some of the best evidence of the impact of mental models on development is that changes in exposure to alternative historical institutions appear to change trajectories of growth, holding constant all other factors (Guiso, Sapienza, and Zingales 2013; Nunn and Wantchekon 2011). Much of this work focuses on the effect of historical institutions on interpersonal trust. The weight of a large body of evidence is that trust in people outside one's own family or social group is strongly positively related to economic growth.⁷ Economic efficiency and growth require the exchange of goods and services to capture economies of scale. Such exchange requires trust: trust that one will be paid as promised, that disputes will be resolved in good faith, or, if not resolved, that a third party can step in and apply rules in a predictable and fair way. In the absence of trust, microevidence shows that parties will also be less willing to delegate responsibilities and less willing to specialize, which can result in inefficiency within a firm and reduced growth within a country (Bloom, Sadun, and Van Reenen 2012).

Weak constraints on a ruling group are a potent cause of low national incomes that remain remarkably persistent over time (Acemoglu and Robinson 2012). The standard argument for explaining that persistence is that inequality of wealth shapes rules, which then tend to preserve the initial inequality of wealth. But social scientists have long argued that institutions have a "schematizing role"; they are not just rules, but also a way of seeing.⁸ Institutions shape the categories

and concepts that people accept as natural and use to interpret the world.

Recent work on governance in Sierra Leone and India can be interpreted in this light. In Sierra Leone, “paramount chiefs,” who are elected for life, rule the villages. The only people who can compete to be a paramount chief are those from one of the ruling families originally recognized by British colonial authorities. For accidental historical reasons, villages differ in the number of such families, ranging from 1 to 12. Villages with fewer ruling families and thus less political competition have systematically worse government (in particular, less secure property rights in land) and systematically worse development outcomes (such as lower rates of child health, of nonagricultural employment, and of educational attainment), Acemoglu, Reed, and Robinson (2013) find. Standard economic models would predict that individuals in the villages with fewer ruling families (and thus poorer development) would have less respect for the chiefs’ authority and be less satisfied with their government than individuals in the villages with many families (and thus generally better governance). But this is not the case.

Acemoglu, Reed, and Robinson (2013) asked respondents to agree with one, both, or neither of the following statements: (1) As citizens, we should be more active in questioning the actions of leaders; and (2) In our country these days, we should have more respect for authority.

Chieftaincies with *fewer* ruling families, which are correlated with *worse* governance, reported *higher* respect for authority, as measured by higher agreement with the second statement. One explanation, which is emphasized by the authors, is that individuals have entered into a patron-client relationship, which gives them an interest in perpetuating the traditional

much land the traditional landlord caste owns. In villages in which the traditional caste is dominant (dominant caste members own at least half the land), a system of clientelism appears to prevail that does not occur in other villages. Workers “sell” their votes to landlords in the dominant caste in exchange for insurance and access to the trading network. The vote selling eliminates political competition. Just as in the villages in Sierra Leone that have limited competition, in Maharashtra villages with a dominant landlord group, governance is worse: in particular, there is a 75–100 percent decline in the availability of pro-poor national programs. However, surveys indicate that the low-caste individuals tend to view the situation as satisfactory. Low-caste individuals are 14 percent more likely to say that they trust the large landholders in villages in which the government is dominated by the landlord class than in villages in which the landlord class is not dominant. It seems plausible that in the traditional oligarchic villages, individuals expect little, get what they expect, and so count themselves not unfairly treated. “Legitimacy follows power,” as Ribot (2009, 125) notes, but for a reason that may have more to do with ways of seeing the world than with the quality of services provided.

A recent experiment in India sheds more light on the power of institutions to shape perceptions. The experiment investigated whether the social interactions in a community can lead community members to overlook or fail to seize opportunities for mutually beneficial cooperation. To investigate the question, the authors invented a simple variant of the public goods game and gave anonymous players the opportunity to vote on a rule to require a minimum contribution to the public good (Hoff, Somanathan, and Strimling 2014). The higher the required contribution (up to the maximum feasible level), the higher each individual’s payoff would be. Villages varied in how high they raised the required contribution. The less socially inclusive villages and those with lower trust adopted a lower rule for contributions.

To get independent information on village characteristics that might affect cooperation, the authors conducted a survey in the villages where the experimental subjects lived. The respondents were not related to the subjects of the experiment. Nonetheless, village cooperation and trust, as measured by the surveys, predict cooperation in the experiment. The villages that were more inclusive (for example, those in which different social groups collectively celebrated festivals together) and in which trust and perceptions of security were higher (for instance, individuals reported that they could leave their bikes unlocked), as well as the villages

Most mental models emerge in a society through shared experiences, and they can be passed down across generations. They can persist even if they are dysfunctional.

authority. But a study of clientelism in the Indian state of Maharashtra suggests that a mental model may also play a role in enhancing the legitimacy of the oligarchic institutions (Anderson, Francois, and Kotwal 2014).

In Maharashtra, all villages have democratic rules, but the villages differ, by historical accident, in how

in which respondents felt that they had benefited from government programs, were the villages that raised the public good rule the most. These findings are consistent with those of Guiso, Sapienza, and Zingales (2013): history shapes the ability to recognize the possibility for improving outcomes through collective action.

Mental models may create beliefs that limit individuals' ability to adapt to new opportunities. The culture of honor in the U.S. South is associated with the sentiment, "If you wrong me, I'll punish you." This cultural response to conflict may have been adaptive in an environment without centralized means of protecting property, so that a man's willingness to punish the merest slight was important in deterring theft. Experiments show that insulting men in these cultures causes a jump in the levels of cortisol (a stress hormone) and testosterone (an aggression hormone) and triggers an urge to punish, whereas it provokes no such responses among men from communities without a culture of honor (Cohen and others 1996). Perhaps not surprisingly, a culture of honor impairs the ability of individuals to build cooperative conventions: when mistakes in coordination occur, the hurt party tends to withdraw cooperation, which can lead to less coordination, more misunderstanding, and an unraveling of cooperative behavior (Brooks, Hoff, and Pandey 2014).

The effects of making an identity salient

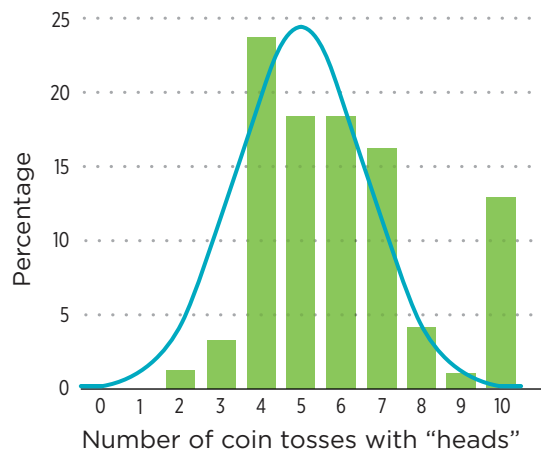
An individual's self-concept consists of multiple identities (that is, multiple mental models), each associated with different norms that guide behavior (Turner 1985). One way to test the influence of mental models on behavior is to experimentally manipulate the salience of a mental model.

A study in a maximum security prison in Zurich, Switzerland, found that increasing the salience of an individual's criminal identity increased his dishonesty (Cohn, Maréchal, and Noll 2013). The prisoners were asked, in private, to report the outcomes of flipping 10 coins and were promised that they could keep those coins for which they reported "heads," while they had to return the coins for which they reported "tails." Before flipping the coins, the prisoners filled out a survey. Randomly, prisoners received a survey that either included questions about their prisoner identity or that did not. In the group that had been primed to think about themselves as prisoners, more subjects cheated (figure 3.2, panel b). Since the decision-making situation was exactly the same and only the prior set of thoughts triggered by the questionnaire had changed, it is clear that context changed the way the subjects evaluated their choices. Cheating was 60

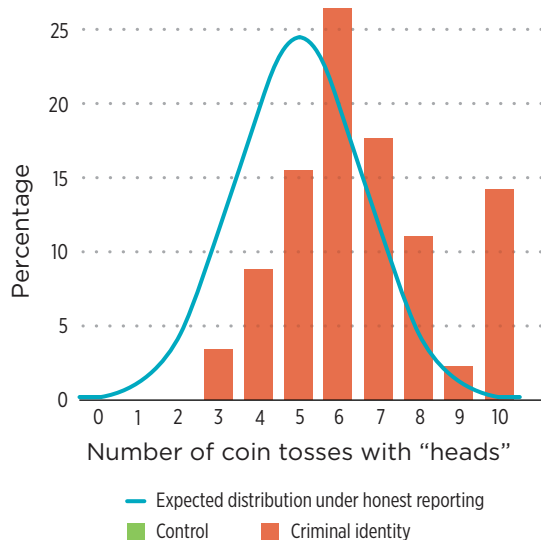
Figure 3.2 Making criminal identity more salient increases dishonesty in prison inmates

Prisoners were asked, in private, to report the outcome of flipping 10 coins and were promised that they could keep those coins for which they reported "heads." Panel a shows the distribution of heads in 10 coin tosses that prisoners reported when their criminal identity was not made salient. Panel b shows the distribution of heads that prisoners reported when their prisoner identity was made salient. In both figures, the blue curve depicts the distribution of heads that would be expected if everyone honestly reported the outcomes of his coin tosses. In both figures, the reported distribution is skewed toward a greater number of heads than honest behavior predicts. But the distribution of the criminal identity treatment is shifted toward more heads (resulting in higher payoffs) than the distribution for the group whose criminal identity was not made salient.

a. Criminal identity not made salient



b. Criminal identity made salient



— Expected distribution under honest reporting
■ Control ■ Criminal identity

Source: Cohn, Maréchal, and Noll 2013.

percent higher in the criminal identity group than in the control group.

A follow-up experiment sheds light on why. The experiment again randomly assigned the “criminal identity” survey to one group of prisoners and the control survey to the other group. After completing the survey, prisoners were asked to complete a word whose initial letters were, for example, “pol.” Those in the criminal identity group were almost twice as likely to complete “pol” with a crime-related word, such as “police,” than to choose words not related to crime, such as “politics.” The results of the word-completion task show that the criminal identity survey increased the mental accessibility of crime-related thoughts. The results support the interpretation that individuals in the Zurich coin-flipping game were made more dishonest by the context that made their criminal identity more salient in their minds. Significantly, the effect is

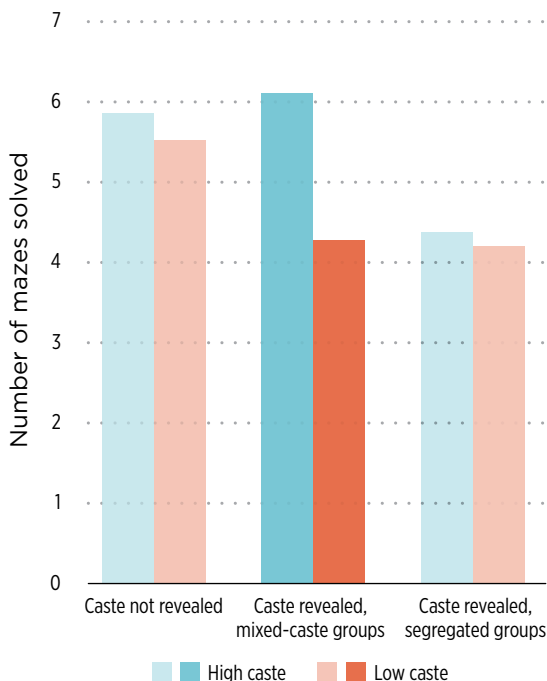
specific to individuals who have a criminal identity. No similar effect occurred when participants were drawn from the general population.

Research on performance and identity shows that context also influences the ability and motivation to learn and to expend effort, with potentially large effects on human capital formation. Context seems to trigger beliefs about what one is capable of and what one should achieve. An experiment on caste in India finds that context can have an important impact on performance.

The experiment assessed the effect of manipulating the salience of caste on children’s intellectual performance in classrooms (Hoff and Pandey 2006, 2014).⁹ The control condition, in which caste identity was not revealed, demonstrated that low-caste boys solve mazes just as well as high-caste boys. However, publicly revealing caste in mixed-caste groups reduced the performance of the low-caste boys, which (controlling for individual characteristics) created a 23 percent caste gap in total mazes solved in favor of the high castes (figure 3.3). Here, a context that primed a social identity (by revealing caste) affected performance. When caste was revealed in segregated groups, the high-caste boys also underperformed. Why might this be? If segregation, a mark of the privileges of the high caste, evokes a sense of entitlement in which the high-caste boys feel less need to achieve, then the effect of making caste salient may be to cause the high-caste students to feel, “Why try?” Meanwhile, the low-caste may feel, “I can’t, or don’t dare to, excel.”¹⁰

Figure 3.3 Cuing a stigmatized or entitled identity can affect students’ performance

High-caste and low-caste boys from villages in India were randomly assigned to groups that varied the salience of caste identity. When their caste was not revealed, high-caste and low-caste boys were statistically indistinguishable in solving mazes. Revealing caste in mixed classrooms decreased the performance of low-caste boys. But publicly revealing caste in caste-segregated classrooms—a marker of high-caste entitlement—depressed the performance of both high-caste and low-caste boys, and again their performance was statistically indistinguishable.



Source: Hoff and Pandey 2014.

The staying power of mental models

The power and persistence of mental models are strikingly captured by a story Nelson Mandela told of a time when he flew from Sudan to Ethiopia (Mandela 1995, 292). He started to worry when he noticed that the pilot was black:

We put down briefly in Khartoum, where we changed to an Ethiopian Airways flight to Addis. Here I experienced a rather strange sensation. As I was boarding the plane I saw that the pilot was black. I had never seen a black pilot before, and the instant I did I had to quell my panic. How could a black man fly an airplane?

Mental models may outlive their usefulness or, indeed, may persist when they were never useful to begin with. We have a hard time abandoning mental models that are not serving us well. The Atlantic slave trade, and the immense destruction of local institutions that it caused, ended over 100 years ago. Few people are

now exposed to the risk of being sold into slavery. Why don't people change their mental model and become more trusting, now that the danger has passed?

In standard economic models, many of the mismatches described here between mental models and reality would not persist. Individuals make inferences from their experiences about what works and what does not. If beliefs are inconsistent with outcomes, then the decision maker in the standard economic model (see figure 1.2, panel a, in chapter 1) would revise his beliefs as he observes new information. In contrast, what a “psychological, social, and cultural actor” sees and the inferences he draws from it are themselves affected by his mental models. The result is that we can live in a world that Hoff and Stiglitz (2010) describe as an “equilibrium fiction.” A belief in a race-based or gender-based hierarchy can affect self-confidence in ways that create productivity differences that sustain the beliefs, although no underlying differences exist. Four broad factors, discussed next, can explain the staying power of mental models that are not serving individuals well.

Attention and perception

Mental models influence what individuals perceive, pay attention to, and recall from memory. If, for instance, people continually perceive leaders as untrustworthy, the perceptions will reinforce the mental model that they must be on guard against betrayal. Without realizing it, people tend to fill in information gaps based on default assumptions consistent with their mental models. Individuals may even reinterpret information about a person or object that seems inconsistent with the category to which the person or object is assigned so that the information fits the category (Baldwin 1992).

The need to test some types of beliefs at the level of the society

Some beliefs—for example, that women cannot be capable political leaders—cannot be tested at the individual level. There must be a critical mass in society that tests the belief together by experiencing the alternative world. Thus a test requires an event that leads many people to question old beliefs.

For example, one of the factors that support trust in society is a norm against taking advantage of other people's trust. Beliefs about whether others are trustworthy influence whether parents teach children to trust others. As a result, mental models about whether others are trustworthy or not are transmitted across generations, and initial beliefs are reinforced and therefore never tested at a wide scale (Frank 1997; Tabellini 2008).

Belief traps

The beliefs that people hold today may lead to choices that foreclose putting the belief to a test tomorrow. It is easy to see how this can happen in the case of trust. If people believe that trusting strangers or putting money in a bank is risky, they will be reluctant to use financial intermediaries. If they did, they might discover that the trust they placed in them was warranted, and after enough good experiences, they would revise their belief. But the potential cost (as they see it) of testing the belief may be too high. People who live in high-trust areas of Italy, for example, use banking services, such as checks, savings accounts, financial instruments, and formal credit, rather than cash (Guiso, Sapienza, and Zingales 2013). People in low-trust areas use banking services less—which could deprive them of the opportunity to update their beliefs when, and if, banking services became secure.

When the stakes are even higher, it is asking a great deal of people to challenge their mental model. For example, the practice of female genital cutting is supported by many social norms and beliefs, including, in some groups, a belief that it increases fertility or that contact with a woman's genitals in their natural state can be harmful or even fatal (Mackie 1996; WHO 1999; Gollaher 2000). When people hold such beliefs as these, it takes a brave soul to test them. In some countries, mothers bring their ill newborns to visit tooth extractors who dig out the undeveloped baby tooth with a sharp metal stick in order to avoid contamination from “false teeth,” which are believed to be dangerous or even deadly (Borrell 2012). It may be asking a great deal from a parent to test this belief.

Ideology and confirmation bias

Beliefs can lead people to ignore, suppress, or forget observations that would tend to undermine their beliefs. *Confirmation bias*, discussed in chapter 1, is the tendency to search for and use information that supports one's beliefs. If the bias is sufficiently strong, it is possible that the false hypothesis will never be discarded, no matter how much evidence exists that favors the alternative hypothesis (Rabin and Schrag 1999). The absence of a concept of a particular phenomenon can leave individuals unable to discern actual patterns, or able to discern them only incompletely. For instance, a woman who suffers sexual harassment before the concept exists in her society cannot properly comprehend her experience or communicate it intelligibly to others; the problem “stems from a gap in shared tools of social interpretation” (Fricker 2007, 6). Chapter 10 presents experimental evidence that individuals, including development professionals, who are otherwise quite capable of solving numerical

problems, struggle to interpret data correctly when the implications of the data conflict with their mental models. The general point is that just as mental models are tools for constructing mental representations, inappropriate mental models limit our ability to perceive and communicate a pattern accurately.

The lack of an appropriate mental model can also impede learning. In experiments in Malawi, women farmers who are trying to communicate new agricultural techniques are consistently rated as less knowledgeable than men, even though they have the same knowledge base (BenYishay and Mobarak 2014). In an experiment in India, women who are in a dispute with men have less power of persuasion than their male counterparts, even when they are judged equally articulate, wise, and otherwise credible (Hoff, Rahman, and Rao 2014). The findings provide an example of what Fricker (2007) calls “epistemic injustice”—discrimination against an individual as a source of knowledge because of his or her social identity. The historical distribution of power and prestige between groups affects perceptions of their credibility and thus can perpetuate these inequities.

Policies to improve the match of mental models with a decision context

The close relationship between mental models and institutions such as caste and gender roles makes the process of changing mental models difficult. Some policies, such as self-help group programs, try to change institutions and mental models at the same time: they try to decrease economic dependence or other forms of dependence and to expand ways of understanding the world. Other policies try to change only institutions, with the hope that the intervention will change mental models as an indirect effect. Still other policies target mental models alone. This section considers the latter two types of policy.

Changing institutions

An example of the potential for policy that changes institutions to change mental models comes from a program of political affirmative action for women in West Bengal, India. The policy led some villages to have female leaders for the first time. Just seven years’ exposure to women leaders reduced men’s bias in evaluating women in leadership positions. The men still preferred male leaders to female leaders. However, in evaluating the performance of a given leader, gender was no longer a strong source of bias. Seven years’ exposure to women leaders also raised parents’ aspira-

tions for their teenage daughters, raised the daughters’ aspirations for themselves, and led to a slight narrowing of the gender gap in schooling (Beaman and others 2009, 2012). The evidence suggests that the change in mental models caused the changes in behavior.

However, it is only under certain circumstances that changes in interactions—created by political affirmative action or other policies—lead to a positive change in attitudes. If negative stereotypes shape perceptions strongly enough, interaction may simply reinforce the negative stereotypes, undermining the hoped-for effects of the policy. A study of political affirmation for low-caste individuals in village government in India finds evidence that it increased absenteeism by high-caste teachers and lowered outcomes in primary schools, which were under the jurisdiction of the local village government (Pandey 2010). High-caste teachers essentially boycotted the attempted change in the status of low-caste individuals.

Changing mental models through the media

Exposure to fiction, such as a serial drama, can change mental models (see spotlight 2 on entertainment education). For example, when people who have not been exposed to societies with low fertility were exposed to engaging soap operas about families with few children, fertility rates declined (Jensen and Oster 2009; La Ferrara, Chong, and Duryea 2012). The impact of exposure to long-running serial dramas in Brazil, which deliberately crafted soap operas with small families to bring about social change, was large and immediate. The fertility decline across municipalities in Brazil began after the first year the municipality had access to TV soap operas. The decline was especially great for respondents close in age to the leading female character in at least one of the soap operas aired in a given year, which is consistent with a role model effect. The decline was comparable to the effect of two additional years in women’s education. For women ages 35–44, the decrease was 11 percent of mean fertility.

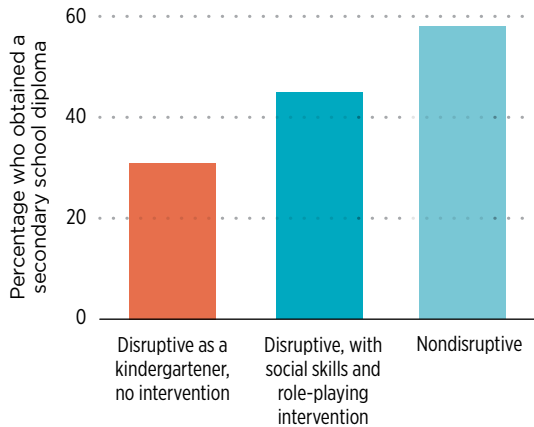
Changing mental models through education methods and early childhood interventions

A promising arena in which policy can affect mental models is early education. Primary school is a formative experience for children. The experience can shape the mental models that the individuals possess as adults. There is some evidence that “horizontal teaching systems,” in which children interact with one another and engage in class discussions, are an important learning tool and increase their level of trust. This

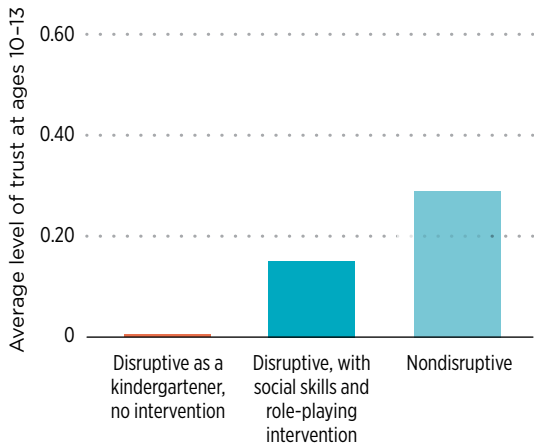
Figure 3.4 Changing disruptive children’s mental models related to trust improved adult outcomes

A role-playing intervention for disruptive boys ages 7–9 reduced the gap in the rate of secondary school completion between the disruptive and the nondisruptive boys by more than half.

a. Rate of obtaining a secondary school diploma



b. Levels of trust at ages 10–13



Source: Algan, Beasley, and others 2013.

Note: Trust is the average of the normalized responses to several different questions about trust, setting the control group mean to zero.

body of evidence suggests new policy options. A shift in teaching strategies—incorporating more group work projects, especially in education systems that have traditionally relied heavily on rote learning and memorization—may be a promising avenue for improving social capital (Algan, Cahuc, and Shleifer 2013).

Insight into the long-term effects of interventions that aim to increase trust among children comes from an experiment in Montreal that fostered self-control and social skills in disadvantaged and disruptive schoolchildren through a series of role-playing exercises with more cooperative children (Algan, Beasley, and others 2013). This program was targeted toward the most disruptive boys in kindergarten: those who were the most aggressive and had the most problems with self-control. The disruptive boys were randomly assigned to a treatment group or to a control group whose members received no special help. Data were collected over 20 years on these two groups, as well as on a representative group of boys who were not disruptive as kindergarteners. As adolescents, the boys in the treatment group were found to be more trusting and to have more self-control. They also had substantially improved adult outcomes, including much

Policy interventions may be able to expose people to alternative experiences, ways of thinking, and role models that expand mental models and thereby broaden prototypes (such as a woman leader), improve trust, encourage collective action, and increase investments.

higher rates of completing secondary school, shown in figure 3.4, panel a. Increased trust (not only self-control) seems to have been a factor in the improvements in adult outcomes. Figure 3.4, panel b, shows the level of trust—calculated as an average of many questions that ask about levels of trust—in the control, treatment, and nondisruptive groups at ages 10–13, where the variable is normalized with the control group mean equal to zero. The gap between the nondisruptive group and the disruptive group without the treatment is 0.29 standard deviations. Treatment reduced that gap by about 50 percent. The evidence shows that higher levels of trust explain the narrowing of the achievement gap between the initially disruptive children and those who were nondisruptive.

Conclusion

People use mental models to make sense of the world around them. Most mental models emerge in a society through shared experiences, and they can be passed down across generations. They can persist even if they have negative consequences for individuals and communities. Mental models influence both the legitimacy of predatory governance institutions and the prospects for jointly beneficial collective action. Policy interventions may be able to expose people to experiences that change their mental models.

Much evidence demonstrates the role of mental models in domains important for development. This chapter discussed only a few. Later chapters will discuss others, including mental models of child development (chapter 5), “mental accounting” for money matters (chapter 6), mental models of productivity and technology (chapter 7), mental models of health (chapter 8), and mental models of climate change (chapter 9).

Historians attribute the rise of the modern world to a change in the mental model of how the universe works. Shifting to believing we live under universal physical laws rather than divine caprice made it possible for individuals to move from handicrafts to mass production technologies (see, for instance, Mokyr 2013). The Enlightenment represented a changed mental model that gave rise to sweeping changes in economic structures, which in turn gave rise to massive changes in social patterns that helped create the modern world.

Economic and political forces influence mental models, but mental models can have an independent influence on development by shaping attention, perception, interpretation, and the associations that automatically come to mind. This chapter has illustrated how a focus on mental models both gives policy makers new tools for promoting development and provides new understandings for why policies based on standard economic assumptions can fail.

Notes

1. In using the term *mental models*, the Report follows the usage by Arthur Denzau and Douglass North (1994) and Elinor Ostrom (2005). Psychology, sociology, anthropology, and political science use related concepts, including *schemas* or *cognitive frames* (Markus 1977; DiMaggio 1997).
2. A simple example of a category—a mental model—that has received a great deal of attention in behavioral economics is a *mental account*. Economists use the term to describe how individuals may bracket a decision, using some information and discarding other information that affects the payoffs to the decision (Thaler 1999).
3. This effect of mental models gives rise to the *availability heuristic*. The heuristic entails basing judgments on information and scenarios that immediately come to mind, rather than on using all information appropriately. To take a simple example, most English-speaking people, when asked, will say that seven-letter words ending in *ing* are more common than seven-letter words whose sixth letter is *n*, even though the former category is a subset of the latter. The explanation for this common mistake is that English-speakers have a familiar category for *ing* words.
4. This is called the *prototype heuristic*. It explains why, for example, the median estimate of the annual number of murders in the city of Detroit, Michigan, is twice as high as the estimate of the number of murders in the state of Michigan (Kahneman and Frederick 2002). Detroit has a reputation for violence; Michigan as a whole does not.
5. Over the years, there have been hundreds of definitions of the term “culture.” Many economists use the term to mean individual values that are broadly shared within a group, but many anthropologists and sociologists today do not accept the premise—which underlies that usage—that there are broadly shared, uncontested values within a society. Instead, the prevailing definition of *culture* in anthropology and sociology is the collection of mental models (or “schemas”) that are maintained and nurtured by rules and norms, actions, and rituals (Swidler 1986; DiMaggio 1997). Drawing on work in anthropology, sociology, and cognitive science, many social scientists have gravitated toward a cognitive approach in which culture is composed of mental tools (ways of interpreting the world) instead of, or in addition to, values (ends of action). See, for example, Rao and Walton (2004); North (2005); Greif (2006); Rao (2008); Nunn (2012); Gauri, Woolcock, and Desai (2013); and Mokyr (2013).
6. Nunn and Wantchekon (2011); Fernández and Fogli (2009); Algan and Cahuc (2010).
7. See the vast literature that emerged from the work of Knack and Keefer (1997), reviewed in Algan and Cahuc (2013).
8. See, for example, Douglas (1986) and Fourcade (2011).
9. A feature of the caste system that makes it well suited to identifying the effect of culture and identity on learning is that the meaning of the caste categories is not in doubt. The caste system is a closed order: status is fixed by birth. High-caste individuals are considered socially and intellectually superior in all respects to low-caste individuals. Individuals at the bottom of the caste order were once called “untouchables.” Perhaps the most important fact about caste has been its emphasis on social segregation: “Segregation of individual castes or groups of castes in the village was the most obvious mark of civic privileges and disabilities” (Jodhka 2002, 1815). Today, untouchability is illegal, and evidence of a new social order is visible to every schoolchild in the measures to encourage

school enrollment and in the broad participation of low-caste individuals in the political process. Yet children are still likely to encounter the traditional order of caste, segregation, and untouchability in their own experiences, through the fables they learn and in the continued discrimination, insults, and atrocities against upwardly mobile members of low castes.

10. A seminal work on the ability of cues to an identity stereotyped as intellectually inferior to impair cognitive performance is Steele and Aronson (1995). The argument in this chapter is that identity cues may affect preferences to expend effort, as well as the ability to perform, by triggering a sense of entitlement or a particular social role.

References

- Acemoglu, Daron, Tristan Reed, and James A. Robinson. 2013. "Chiefs: Economic Development and Elite Control of Civil Society in Sierra Leone." Working Paper 18691, National Bureau of Economic Research, Cambridge, MA.
- Acemoglu, Daron, and James A. Robinson. 2012. *Why Nations Fail: The Origins of Power, Prosperity, and Poverty*. New York: Crown.
- Alesina, Alberto, Paola Giuliano, and Nathan Nunn. 2011. "Fertility and the Plough." *American Economic Review* 101 (3): 499–503.
- . 2013. "On the Origins of Gender Roles: Women and the Plough." *Quarterly Journal of Economics* 128 (2): 469–530.
- Algan, Yann, Elizabeth Beasley, Frank Vitaro, and Richard Tremblay. 2013. "The Long-Term Impact of Social Skills Training at School Entry: A Randomized Controlled Trial." Working Paper, Sciences Po, Paris.
- Algan, Yann, and Pierre Cahuc. 2010. "Inherited Trust and Growth." *American Economic Review* 100 (5): 2060–92.
- . 2013. "Trust and Growth." *Annual Review of Economics* 5 (1): 521–49.
- Algan, Yann, Pierre Cahuc, and Andrei Shleifer. 2013. "Teaching Practices and Social Capital." *American Economic Journal: Applied Economics* 5 (3): 189–210.
- Anderson, Siwan, Patrick Francois, and Ashok Kotwal. 2014. "Clientelism in Indian Villages." <http://econ.arts.ubc.ca/fpatrick/documents/clientAERmay1313.pdf>.
- Baldwin, Mark W. 1992. "Relational Schemas and the Processing of Social Information." *Psychological Bulletin* 112 (3): 461–84.
- Beaman, Lori, Raghavendra Chattopadhyay, Esther Duflo, Rohini Pande, and Petia Topalova. 2009. "Powerful Women: Does Exposure Reduce Bias?" *Quarterly Journal of Economics* 124 (4): 1497–1540.
- Beaman, Lori, Esther Duflo, Rohini Pande, and Petia Topalova. 2012. "Female Leadership Raises Aspirations and Educational Attainment for Girls: A Policy Experiment in India." *Science* 335 (6068): 582–86.
- Ben-Yishay, Ariel, and A. Mushfiq Mobarak. 2014. "Social Learning and Communication." Working Paper 20139, National Bureau of Economic Research, Cambridge, MA.
- Berger, Peter L., and Thomas Luckmann. 1966. *The Social Construction of Reality: A Treatise in the Sociology of Knowledge*. Garden City, NY: Anchor Books.
- Bernard, Tanguy, Stefan Dercon, Kate Orkin, and Alemayehu Seyoum Taffesse. 2014. "The Future in Mind: Aspirations and Forward-Looking Behaviour in Rural Ethiopia." Working Paper WPS/2014–16, Centre for the Study of African Economies, Oxford, U.K.
- Bernard, Tanguy, Stefan Dercon, and Alemayehu Seyoum Taffesse. 2011. "Beyond Fatalism: An Empirical Exploration of Self-Efficacy and Aspirations Failure in Ethiopia." IFPRI Discussion Paper 01101, International Food Policy Research Institute, Washington, DC.
- Bloom, Nicholas, Raffaella Sadun, and John Van Reenen. 2012. "The Organization of Firms across Countries." *Quarterly Journal of Economics* 127 (4): 1663–1705. doi: 10.1093/qje/qje029.
- Borrell, Brendan. 2012. "Magic or Medicine? If You Were a Poor Ugandan Mother with a Desperately Ill Baby, Would You Turn to Western Medicine or the Village Healer?" *Aeon*. <http://aeon.co/magazine/philosophy/african-healers-and-western-medicine/>.
- Bregman, Elsie O. 1934. "An Attempt to Modify the Emotional Attitudes of Infants by the Conditioned Response Technique." *Pedagogical Seminary and Journal of Genetic Psychology* 45 (1): 169–98.
- Brooks, Benjamin, Karla Hoff, and Pryanka Pandey. 2014. "Insult versus Accident: Caste Culture and the Efficiency of Coordination." Paper presented at the Latin American and Caribbean Economic Association Conference.
- Cohen, Dov, Richard E. Nisbett, Brian F. Bowdle, and Norbert Schwarz. 1996. "Insult, Aggression, and the Southern Culture of Honor: An 'Experimental Ethnography'." *Journal of Personality and Social Psychology* 70 (5): 945–60. doi: 10.1037/0022-3514.70.5.
- Cohn, Alain, Michel André Maréchal, and Thomas Noll. 2013. "Bad Boys: The Effect of Criminal Identity on Dishonesty." Working Paper 132, University of Zurich, Zurich.
- Denzau, Arthur T., and Douglass C. North. 1994. "Shared Mental Models: Ideologies and Institutions." *Kyklos* 47 (1): 3–31.
- DiMaggio, Paul. 1997. "Culture and Cognition." *Annual Review of Sociology* 23 (1): 263–87.
- Douglas, Mary. 1986. *How Institutions Think*. Syracuse, NY: Syracuse University Press.
- Fernández, Raquel, and Alessandra Fogli. 2009. "Culture: An Empirical Investigation of Beliefs, Work, and Fertility." *American Economic Journal: Macroeconomics* 1 (1): 146–77.
- Fourcade, Marion. 2011. "Cents and Sensibility: Economic Valuation and the Nature of 'Nature.'" *American Journal of Sociology* 116 (6): 1721–77.
- Frank, Robert H. 1997. "The Frame of Reference as a Public Good." *The Economic Journal* 107 (445): 1832–47.

- Ericker, Miranda. 2007. *Epistemic Injustice: Power and the Ethics of Knowing*. Oxford, U.K.: Oxford University Press.
- Gauri, Varun, Michael Woolcock, and Deval Desai. 2013. "Intersubjective Meaning and Collective Action in Developing Societies: Theory, Evidence, and Policy Implications." *Journal of Development Studies* 49 (1): 160–72.
- Gollaher, David L. 2000. *Circumcision: A History of the World's Most Controversial Surgery*. New York: Basic Books.
- Greif, Avner. 2006. *Institutions and the Path to the Modern Economy: Lessons from Medieval Trade*. New York: Cambridge University Press.
- Guiso, Luigi, Paola Sapienza, and Luigi Zingales. 2013. "Long-Term Persistence." Working Paper 23/13, Einaudi Institute for Economics and Finance, Rome.
- Haidt, Jonathan. 2012. *The Righteous Mind: Why Good People Are Divided by Politics and Religion*. New York: Random House.
- Henrich, Joseph, Robert Boyd, Samuel Bowles, Colin Camerer, Ernst Fehr, Herbert Gintis, and Richard McElreath. 2001. "In Search of *Homo Economicus*: Behavioral Experiments in 15 Small-Scale Societies." *American Economic Review* 91 (2): 73–78.
- Hoff, Karla, and Priyanka Pandey. 2006. "Discrimination, Social Identity, and Durable Inequalities." *American Economic Review* 96 (2): 206–11.
- . 2014. "Making Up People: The Effect of Identity on Performance in a Modernizing Society." *Journal of Development Economics* 106: 118–31.
- Hoff, Karla, Tauhidur Rahman, and Vijayendra Rao. 2014. "Epistemic Discrimination." Unpublished manuscript.
- Hoff, Karla, Rohini Somanathan, and Pontus Strimling. 2014. "Community Contracts: An Experimental Investigation of Rule Formation in Indian Villages." Working Paper, University of Virginia, Charlottesville.
- Hoff, Karla, and Joseph Stiglitz. 2010. "Equilibrium Fictions: A Cognitive Approach to Societal Rigidity." *American Economic Review* 100: 141–46.
- Jensen, Robert, and Emily Oster. 2009. "The Power of TV: Cable Television and Women's Status in India." *Quarterly Journal of Economics* 124 (3): 1057–94.
- Jodhka, Surinder S. 2002. "Caste and Untouchability in Rural Punjab." *Economic and Political Weekly* 37 (19): 1813–23.
- Kahneman, Daniel. 2003. "Maps of Bounded Rationality: Psychology for Behavioral Economics." *American Economic Review* 93 (5): 1449–75.
- Kahneman, D., and S. Frederick. 2002. "Representativeness Revisited: Attribute Substitution in Intuitive Judgment." In *Heuristics and Biases: The Psychology of Intuitive Judgment*, edited by T. Gilovich, D. Griffin, and D. Kahneman, 49–81. New York: Cambridge University Press.
- Knack, Stephen, and Philip Keefer. 1997. "Does Social Capital Have an Economic Payoff? A Cross-Country Investigation." *Quarterly Journal of Economics* 112 (4): 1251–88.
- La Ferrara, Eliana, Alberto Chong, and Suzanne Duryea. 2012. "Soap Operas and Fertility: Evidence from Brazil." *American Economic Journal: Applied Economics* 4 (4): 1–31.
- Mackie, Gerry. 1996. "Ending Footbinding and Infibulation: A Convention Account." *American Sociological Review* 61 (6): 999–1017.
- Mandela, Nelson. 1995. *Long Walk to Freedom: The Autobiography of Nelson Mandela*. New York: Little, Brown.
- Markus, Hazel. 1977. "Self-Schemata and Processing Information about the Self." *Journal of Personality and Social Psychology* 35 (2): 63–78.
- Mokyr, Joel. 2013. "Cultural Entrepreneurs and the Origins of Modern Economic Growth." *Scandinavian Economic History Review* 61 (1): 1–33.
- North, Douglass C. 1990. *Institutions, Institutional Change and Economic Performance*. Cambridge, U.K.: Cambridge University Press.
- . 2005. *Understanding the Process of Economic Change*. Princeton, NJ: Princeton University Press.
- Nunn, Nathan. 2008. "The Long-Term Effects of Africa's Slave Trades." *Quarterly Journal of Economics* 123 (1): 139–76.
- . 2012. "Culture and the Historical Process." *Economic History of Developing Regions* 27 (Supplement 1): 108–26.
- Nunn, Nathan, and Leonard Wantchekon. 2011. "The Slave Trade and the Origins of Mistrust in Africa." *American Economic Review* 101 (7): 3221–52.
- Ostrom, Elinor. 2005. *Understanding Institutional Diversity*. Princeton, NJ: Princeton University Press.
- Pandey, Priyanka. 2010. "Service Delivery and Corruption in Public Services: How Does History Matter?" *American Economic Journal: Applied Economics* 2 (3): 190–204.
- Rabin, Matthew, and Joel L. Schrag. 1999. "First Impressions Matter: A Model of Confirmatory Bias." *Quarterly Journal of Economics* 114 (1): 37–82.
- Rao, Vijayendra. 2008. "Symbolic Public Goods and the Coordination of Collective Action: A Comparison of Local Development in India and Indonesia." In *Contested Commons: Conversations between Economists and Anthropologists*, edited by Pranab Bardhan and Isha Ray, chap. 10. Hoboken, NJ: Wiley-Blackwell.
- Rao, Vijayendra, and Michael Walton. 2004. "Conclusion." In *Culture and Public Action: A Cross-Disciplinary Dialogue on Development Policy*, edited by Vijayendra Rao and Michael Walton, chap. 16. Palo Alto, CA: Stanford University Press.
- Ribot, J. C. 2009. "Authority over Forests: Empowerment and Subordination in Senegal's Democratic Decentralization." *Development and Change* 40 (1): 105–29.
- Ross, Lee, and Richard E. Nisbett. 1991. *The Person and the Situation: Perspectives of Social Psychology*. New York: McGraw-Hill.
- Steele, Claude M., and Joshua Aronson. 1995. "Stereotype Threat and the Intellectual Test Performance of African Americans." *Journal of Personality and Social Psychology* 69 (5): 797–811.

- Swidler, Ann. 1986. "Culture in Action: Symbols and Strategies." *American Sociological Review* 51 (2): 273–86.
- Tabellini, Guido. 2008. "The Scope of Cooperation: Values and Incentives." *Quarterly Journal of Economics* 123 (3): 905–50.
- Talhelm, T., X. Zhang, S. Oishi, C. Shimin, D. Duan, X. Lan, and S. Kitayama. 2014. "Large-Scale Psychological Differences within China Explained by Rice versus Wheat Agriculture." *Science* 344 (6184): 603–08.
- Thaler, Richard H. 1999. "Mental Accounting Matters." *Journal of Behavioral Decision Making* 12 (3): 183–206.
- Todd, Peter M., and Gerd Gigerenzer. 2000. "Précis of Simple Heuristics That Make Us Smart." *Behavioral and Brain Sciences* 23 (5): 727–41.
- Turner, John C. 1985. "Social Categorization and the Self-Concept: A Social Cognitive Theory of Group Behavior." In *Advances in Group Process: Theory and Research*, Vol. 2, edited by Edward J. Lawler, 77–122. Greenwich, CT: JAI Press.
- WHO (World Health Organization). 1999. "Female Genital Mutilation Programmes to Date: What Works and What Doesn't." Geneva: WHO.
- Zerubavel, Eviatar. 1999. *Social Mindscales: An Invitation to Cognitive Sociology*. Cambridge, MA: Harvard University Press.