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The Psychological Lives of the Poor†

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There is growing interest in understanding the psychology of the poor—biases that may affect decision-making are of particular interest. The sheer diversity of potential biases—hyperbolic discounting, probabilistic, and judgmental errors just to name a few—poses a key challenge. These psychological biases cannot easily be put into a common unit such as money spent. However, two insights from psychology make this problem more tractable.

First, a large body of work points toward a two-system model of the brain.[1] System 1 thinks fast: it is intuitive, automatic, and effortless, and as a result, prone to biases and errors. System 2 is slow, effortful, deliberate, and costly, but typically produces more unbiased and accurate results.

Second, when mentally taxed, people are less likely to engage their System 2 processes. Put simply, one might think of having a (mental) reserve or capacity for the kind of effortful thought required to use System 2. When burdened, there is less of this resource available for use in other judgments and decisions. Though there is no commonly accepted name for this capacity, we will refer to it in this article as "bandwidth" (Mullainathan and Shafir 2013).

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[1] This two-system model has direct relevance to many of the heuristics and biases familiar to economists. Kahneman and Frederick (2002) and more recently Kahneman (2011) provide reviews. Fudenberg and Levine (2006) develop a model with two systems in the context of time discounting.

Psychologists often study this underlying resource by imposing "cognitive load" to tax bandwidth and measure the impact on judgments and decisions. The many ways to induce load produce similar results on various bandwidth measures and consequences from reduced System 2 thinking. This insight is particularly useful because it implies that bandwidth is both malleable and measurable. It also suggests a unified approach of studying the psychology of poverty. We can understand factors in the lives of the poor, such as malnutrition, alcohol consumption, or sleep deprivation, by how they affect bandwidth. And we can understand important decisions made by the poor, such as technology adoption or savings, through the lens of how they are affected by bandwidth. Clearly, bandwidth is not the only important aspect of the psychological lives of the poor; no single metric can take on this role. However, it provides a way to at least partly understand a great many of the thought processes that drive decision-making by the poor.

I. Bandwidth

Much like human capital is an abstraction of a diverse set of skills with common elements, bandwidth comprises a diverse set of psychological constructs with common elements. At an intuitive level, bandwidth captures the brain's ability to perform the basic functions that underlie higher-order behavior and decision-making. Underlying this broad construct are two core components, measures of which are typically used to capture bandwidth.

The first component is *cognitive capacity*, the psychological mechanisms that underlie our ability to solve problems, retain information, engage in logical reasoning, and so on. The second is *executive control*, which underlies the ability to manage our cognitive activities. Executive control oversees planning, attention allocation, initiating and inhibiting actions, and impulse control. It determines our ability to

focus, to shift attention, to work with information in our memory, and to self-monitor.

These components are rich in nuance, but they share the common feature that both are scarce resources, the taxing of which causes negative spillovers to other aspects of cognitive functioning. In this sense, while the detailed distinctions between different brain capacities are central to any psychological investigation, they are less central to those interested in the underlying determinants or downstream consequences of these capacities.

One important feature of bandwidth is that it can be readily measured, both in the lab and in field settings. One example you may be familiar with, the Raven's matrices test, measures individuals' capacity to think logically and solve problems in novel situations, independent of acquired knowledge. This task is a nearly universally accepted measure of fluid intelligence and a common component of IQ tests (Raven 1936). The online Appendix describes three other such measures of bandwidth and three common features of these tasks: (i) ease of administration; (ii) broad applicability; and (iii) ease of instruction.

The basic premise of the tests used to study bandwidth is that it is possible to "load up" cognitive resources, and to use this additional load to examine how bandwidth, behaviors, and choices change. These cognitive load studies have been conducted for over 70 years and are in the canon of experimental psychology, reliably replicating in many contexts. As a result, by studying the effects of cognitive load, we have experimental evidence of the impact of diminished bandwidth on a wide variety of aspects of mental function.

Decision-Making.—Prospective memory, or the ability to remember to execute tasks in the future, and executive control are particularly affected by cognitive load (Marsh and Hicks 1998). For instance, dieters exhibit less self-control in the eating arena and people discount delayed rewards at significantly higher rates when under load (Ward and Mann 2000; Hinson, Jameson, and Whitney 2003).

These shifts in underlying cognition manifest in myriad contexts and for wide-ranging outcomes. For example, Finucane et al. (2000) asked respondents to judge the risks and benefits of various products and technologies (e.g., nuclear power). When bandwidth was taxed by limited time to respond, the correlations between judgments of risks and benefits were significantly more pronounced than when given more time to ponder a response. The same affective evaluation apparently serves as a heuristic attribute for assessments of both benefits and risks when resources are limited.

Economists have applied these ideas to more standard economic tasks, such as small-stakes risk aversion or monetary discounting, typically finding an impact of diminished bandwidth (Deck and Jahedi 2015). Similar results have been found in many other decisions that rely on cognitive capacity and executive control, such as food choice. Shiv and Fedorikhin (1999) is a canonical example in which participants chose between slices of cake and fruit salad under varied levels of load, manipulated through digit rehearsal. Those whose minds were busy rehearsing a seven-digit number chose the cake, the impulsive choice, 50 percent more often than those who were rehearsing a two-digit number. Not all replications have produced the same results, and the magnitudes of the original effects appear likely to be an aberration. However, the idea that occupying mental bandwidth diminishes capacity for self-discipline seems to be more generally supported by the data.

Productivity.—In contrast to the rich body of evidence on the link between bandwidth and decision-making, evidence on the relationship between bandwidth and productivity is much more limited. There is good reason to believe that this link exists: impaired cognitive function, judgment, and decision-making likely have consequences for one's performance in the labor market, especially in work that relies heavily on cognitive capacities such as attention, perseverance, or memory. For instance, a rag picker trying to find valuable items among mountains of garbage may be particularly affected by reductions in bandwidth. Although these arguments are intuitive, it would be presumptuous to believe that these effects must exist, and the magnitude of effects may vary widely with context. This is an area of research ripe for further investigation.

Utility.—All economists would agree that poverty lowers utility by decreasing consumption. However, it may lower utility through an additional channel: individuals with low bandwidth

(say, due to physical pain) may find consumption of other goods less enjoyable. That is, the utility from a *given* basket of goods may be reduced by low bandwidth. There is suggestive evidence of such a link. In a study to determine how best to rehabilitate prisoners of war from malnourishment, 32 volunteers semi-starved themselves for six months and then followed varied rehabilitation diets (Keys et al. 1950). The changes to the participants' physiological, physical, cognitive, and psychological functions were closely tracked. Unsurprisingly, interest in food increased as the starvation period progressed. Perhaps more surprisingly though, hunger substantially impacted individuals' interest in sex and other activities, generating a one standard deviation decline from baseline levels. While not conclusive, this evidence is fascinating as it suggests an entirely new channel of the link between income and happiness.

Old Questions Revisited.—Studying bandwidth also opens up a new approach to many traditional topics in development economics. In studying technology adoption, for instance, we typically consider learning by doing, credit constraints, or even psychological phenomena such as learning through noticing. However, every phase of technology adoption clearly relies on bandwidth. For example, bandwidth is necessary to an understanding of how to use the technology and adapt it to local circumstances, and to having the self-control and advance-planning to save up capital to acquire the new technology. Studying bandwidth, and the factors influencing it, can allow us to better understand technology adoption.

Many topics traditionally studied by development economists have this feature. Consider, for instance, the impact of literacy on decision-making. Of course, one enormous benefit of literacy is that it allows individuals to access knowledge through books or newspapers. However, literacy may also substantially unburden individuals' bandwidth as they are not forced to keep all relevant information stored in their minds—exactly as in the load experiments—since they can simply take notes. Imagine the load imposed on an illiterate person who receives detailed instructions on how to use fertilizer in the next season!

II. Poverty and Bandwidth

While it may seem odd that a person's fundamental "capacity" can be easily affected in many basic dimensions, that oddity is precisely the point. We have traditionally viewed cognitive capacity as fixed, but in fact it can change with circumstances. More specifically, we will now discuss how bandwidth can be influenced by poverty. Our discussion includes some of the factors which have already been shown to influence bandwidth, and others for which evidence is limited but suggestive, warranting additional investigation.

Nutrition.—Economists understand nutrition both as consumption—consuming food provides pleasure—and as an investment—nutrition can also affect physical productivity. However, too little food may also affect mental function: thoughts may become lethargic, attention difficult to sustain, and temptations harder to resist. Hunger may be more than unpleasantness or a cause of physical weakness; it might also diminish bandwidth.

Schofield (2014) tests this idea using an experiment to examine the impact of providing calories on measures of bandwidth among low-BMI cycle-rickshaw drivers in India. One task had subjects search through a grid of symbols for a specific set of symbols and cross them out. This tedious task requires mental stamina, making it a natural measure of bandwidth. Individuals with higher caloric intake showed an almost immediate 12 percent improvement in performance on such tasks, a gain that was sustained at endline.[2]

Of course, such effects are particularly interesting to economists if they also affect economic decisions. Schofield (2014) finds some evidence of this in a real-world effort discounting task in which participants were given a choice to provide no labor and earn nothing, or take a journey with a lighter load today or a heavier load tomorrow, with both trips earning the same

[2]Treated individuals received a portion of their compensation in-kind, as food, resulting in somewhat greater attrition among high-earning treated individuals at endline. While likely to work against finding an effect on labor market outcomes, its impact on cognitive function tests is less clear. A second iteration of the study addressing this concern is ongoing.

payment tomorrow. Treated participants were 25 percent more likely to take the journey today rather than delay until tomorrow at the cost of a more difficult trip, suggesting a meaningful reduction in discount rates for effort in their professional activities.

Alcohol.—Excessive alcohol consumption has long been associated with poverty (Fisher 1926), but its economic consequences are poorly understood. Steele and Joseph's (1990) "alcohol myopia" theory offers insights into the effects of alcohol on human behavior. This theory posits that the narrowing effect on attention is a defining feature of alcohol, which in turn causes individuals to focus on simple, present, and salient cues. Viewed through the lens of this paper, alcohol lowers bandwidth.

Schilbach (2015) conducted a three-week field experiment to investigate whether such cognitive effects can translate into economically meaningful real-world consequences. In his study, reducing daytime drinking among low-income workers in Chennai via financial incentives increased individuals' daily savings at a study office by 60 percent compared to a control group that received similar average study payments independent of their alcohol consumption. A simple calibration exercise suggests that these effects are not purely mechanical, i.e., individuals do not just save more as a consequence of increased earnings. This argument is further supported by the fact that sobriety incentives and the commitment savings feature were substitutes in terms of their effects on savings.

Monetary Concerns.—Being poor means having less money to buy things, but it also means having to spend more of one's bandwidth managing that money. The poor must manage sporadic income, juggle expenses, and make difficult trade-offs. Even when the poor are not actually making financial decisions, these preoccupations can be distracting. Thinking and fretting about money can effectively tax bandwidth.

To establish a causal relationship between poverty and mental function, Mani et al. (2013) use two distinct but complementary designs. First, they experimentally induce rich and poor participants to think about everyday financial demands. For the rich, these financial snags are of little consequence. For the poor, however, they can trigger persistent and distracting concerns. The second study uses quasi-experimental variation in actual wealth. Indian sugar cane farmers receive income annually at harvest time, and find it hard to smooth their consumption. As a result, they experience cycles of poverty—poor before harvest and richer after—generating the opportunity to compare cognitive capacity across states and within person.

Both studies show large and direct impacts of poverty on bandwidth, which tells us something about poverty's mental consequences; when you are poor, economic challenges are more than just economic, they are also cognitive. These difficult decisions tax scarce cognitive resources even further.

Other Factors.—Many other correlates of poverty may impact bandwidth, including physical pain, sleep deprivation, or noise pollution. While lab evidence, described in the online Appendix, suggests that these factors can severely impede many aspects of cognitive function, field evidence on economic outcomes is much more limited.

Other factors do not fit as well. First, stress or allostatic load fits only imperfectly. Some components of stress—what we commonly refer to as worries or having something on your mind—fit the concept of bandwidth well. Stress also entails a biological element though, which has long-term physical and mental consequences. For instance, chronic stress can have cardiovascular consequences or may lead to depression. Such effects extend beyond the notion of bandwidth described above.

Second, while depression is an important understudied aspect of the lives of the poor, it does not fit well under the umbrella of bandwidth. Some of the symptoms of depression, such as sleep deprivation or appetite loss, may produce effects on bandwidth as described above. However, depression entails a plethora of other symptoms, such as hopelessness, helplessness, sadness, or even suicidal tendencies, that go well beyond our concept of bandwidth.

Why Focus on Poverty?—Everyone has limited bandwidth, and many of the factors listed above—hunger, pain, or sleep deprivation—can impact anyone. And the psychological studies described in this paper were conducted on a wide spectrum of people. Some factors such as monetary concerns do seem to single out the

poor, but perhaps other factors, such as concern for status, may disproportionately impact the rich. However, these observations do not invalidate bandwidth as a lens for studying poverty for several reasons.

First, take the analogy to human capital, another concept that applies across the income spectrum. Understanding the lives of the poor through this lens has proven invaluable. Similarly, understanding various correlates of poverty through the lens of bandwidth can be equally insightful by drawing attention to impacts we might not traditionally consider, or to the potential for feedback loops. The universality of the concept increases its usefulness, allowing us to apply it in many contexts around the world, knowing that we are relying on a basic feature of human psychology.

Second, there are reasons to believe that the effects of diminished bandwidth are larger for the poor. Individuals in poverty are more likely to be exposed to many of these factors (e.g., malnutrition, pain, heat) and to experience them more extensively. Further, the poor are less likely to have coping mechanisms, such as direct deposits or automatic enrollments, available to reduce the negative effects of limited bandwidth. Not only is their exposure greater, but the "same mistake" is likely to be more costly for the poor than for the rich. Finally, money is a potential substitute for bandwidth. It is often possible to buy yourself the extra slack you need—hiring someone to cook and clean—or to reduce the factors which lead to lower bandwidth—purchasing a comfortable bed in a quiet neighborhood.

III. Research Directions Forward

For all of its promise, the study of bandwidth in development is young, so we conclude with future research directions.

First, much as we often examine outcomes such as health or income, bandwidth should become more commonly measured. It is relatively easy to integrate measures of bandwidth into RCTs, and doing so would allow us to summarize many dispersed effects using a metric with well-known downstream consequences.

Second, specific to poverty itself, additional work to clarify what it means to "feel poor," and the mechanisms leading to these perceptions, would move the field forward significantly. Understanding these perceptions helps to classify and identify those likely to experience decrements in bandwidth. It is also a first step toward finding ways to limit the impact of bandwidth reductions among the poor.

Third, evidence relating to bandwidth occurs in two, typically distinct, parts: (i) direct evidence that some factor affects bandwidth; and (ii) often indirect evidence that these changes in bandwidth are likely to affect many downstream behaviors. We have little evidence showing the whole chain from factors impacting bandwidth to changes in real-world choices with serious consequences, such as mortgage financing or the choice of medical care, operating through bandwidth. This dearth of evidence is particularly acute outside of the lab. Crisper evidence is needed to fully map out these relationships and understand the scope of these impacts in field settings.

Finally, benchmarking the magnitude of decision errors against other commonly accepted metrics such as dollar values would help to calibrate the importance of bandwidth in the lives of the poor.

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