

William & Mary Law Review

Volume 63 (2021-2022)
Issue 4 *Imagining the Future of Law and
Neuroscience Symposium*

Article 8

3-1-2022

Collective Cognitive Capital

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Emily R. D. Murphy, *Collective Cognitive Capital*, 63 Wm. & Mary L. Rev. 1347 (2022),
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COLLECTIVE COGNITIVE CAPITAL

EMILY R.D. MURPHY*

ABSTRACT

This Article calls for a new project for law and neuroscience. It outlines a structural, not individual, application of brain and behavioral science that is aligned with the general goal of basic science research: improving the lives of citizens with a better understanding of the human experience. It asks brain and behavioral science to move explicitly into public policy territory, and specifically onto ground more traditionally occupied by economists—but in ways the project of “behavioral economics” has not yet ventured. Put simply, policy analysts should focus on brains—“collective cognitive capital”—with the same intensity with which they focus on money, rights, or other policy metrics.

To that end, this Article introduces and explores the novel framework of “collective cognitive capital”: a way of thinking of brain health and brain function as an aggregated resource. Collective cognitive capital is a conceptual framework for synthesizing brain and behavioral data and using it to assess the impacts of policy choices. The core thesis for this future of “law and neuroscience” is simple: we can and should use brain and behavioral science to evaluate public policy decisions by how they affect the brain functioning of the people. Normatively, policies should seek to maximize

* Associate Professor of Law, University of California, Hastings College of the Law. Thanks to Teneille Brown, Ryan Calo, David Faigman, Martha Farah, Dave Owen, Reuel Schiller, Jodi Short, participants in the University of Utah Law and Biosciences Colloquium, participants in the Symposium that gave rise to this issue, the participants in the UCLA Program in Understanding Law Science and Evidence symposium, participants in the Vanderbilt Law School Behavioral Law and Economics Conference, and my colleagues at UC Hastings participating in junior faculty and works in progress workshops for this long-generating idea.

“collective cognitive capital” because it is inherently valuable. Cognitive and emotional functioning, and overall brain health, subserve and maximize individual agency and freedom.

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INTRODUCTION

This Symposium issue asks: What is the future of neuroscience in the law? Some scholars imagine technologically sophisticated futures of brain implants and mind reading, raising concerns about mental privacy and state intervention.¹ Others imagine perfect (or good enough) prediction of behavior, or forensic fact development for the courtroom.² Many return to fundamental challenges to common law notions of personhood and responsibility.³ A handful have suggested larger structural changes in legislation, legal categories, and political understanding of how particular groups of people behave and are classified by the state.⁴ But what if the future of law and

1. See, e.g., Sjors Ligthart, *Freedom of Thought in Europe: Do Advances in 'Brain-Reading' Technology Call for Revision?*, 7 J.L. & BIOSCIENCES, Jan.-June 2020, at 1, 3-5; Paul Sheldon Davies, *Foundational Facts for Legal Responsibility: Human Agency and the Aims of Restorative Neurointerventions*, in NEUROINTERVENTIONS AND THE LAW: REGULATING HUMAN MENTAL CAPACITY 319 (Nicole A. Vincent et al. eds., 2020); Nita A. Farahany, *The Costs of Changing Our Minds*, 69 EMORY L.J. 75 (2019); Gerben Meynen, *Brain-Based Mind Reading in Forensic Psychiatry: Exploring Possibilities and Perils*, 4 J.L. & BIOSCIENCES 311 (2017); Nita A. Farahany, *Searching Secrets*, 160 U. PA. L. REV. 1239 (2012). But see Emily R. Murphy & Henry T. Greely, *What Will Be the Limits of Neuroscience-Based Mindreading in the Law?*, in THE OXFORD HANDBOOK OF NEUROETHICS 635 (Judy Illes & Barbara J. Sahakian eds., 2011).

2. See, e.g., Emily R. D. Murphy & Jesse Rissman, *Evidence of Memory from Brain Data*, 7 J.L. & BIOSCIENCES Jan.-June 2020, at 1; Owen D. Jones & Anthony D. Wagner, *Law and Neuroscience: Progress, Promise, and Pitfalls*, in THE COGNITIVE NEUROSCIENCES 1015 (David Poeppel et al. eds., 6th ed. 2020); Kent A. Kiehl et al., *Age of Gray Matters: Neuroprediction of Recidivism*, 19 NEUROIMAGE: CLINICAL 813 (2018); Henry T. Greely, *Neuroscience, Mindreading, and the Courts: The Example of Pain*, 18 J. HEALTH CARE L. & POL'Y 171 (2015); Christopher Slobogin, *Bioprediction in Criminal Cases*, in BIOPREDICTION, BIOMARKERS, AND BAD BEHAVIOR: SCIENTIFIC, LEGAL, AND ETHICAL CHALLENGES 77 (Irina Singh et al. eds., 2014); Francis X. Shen & Owen D. Jones, *Brain Scans as Evidence: Truths, Proofs, Lies, and Lessons*, 62 MERCER L. REV. 861 (2011).

3. But see Stephen J. Morse, *Avoiding Irrational NeuroLaw Exuberance: A Plea for Neuromodesty*, 62 MERCER L. REV. 837 (2011); Michael S. Moore, *Responsible Choices, Desert-Based Legal Institutions, and the Challenges of Contemporary Neuroscience*, 29 SOC. PHIL. & POL'Y 233 (2012).

4. See, e.g., A.C. Pustilnik, *Imaging Brains, Changing Minds: How Pain Neuroimaging Can Inform the Law*, 66 ALA. L. REV. 1099 (2015); Stacey A. Tovino, *Will Neuroscience Redefine Mental Injury? Disability Benefit Law, Mental Health Parity Law, and Disability Discrimination Law*, 12 IND. HEALTH L. REV. 695 (2015); Francis X. Shen, *Legislating Neuroscience: The Case of Juvenile Justice*, 46 LOY. L.A. L. REV. 985 (2013); Emily R.D. Murphy, *Brains Without Money: Poverty as Disabling*, 54 CONN. L. REV. (forthcoming 2022) (manuscript at 4-5), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3893856 [<https://perma>.

neuroscience is in some ways much less high tech or movie script-worthy, and still affects vastly more people and makes use of a much broader swath of brain and behavioral science research? What if the application of brain science to law aimed to improve society through brain-prioritizing policy, rather than through one-off adjudication, private deployment of technology, or direct brain interventions in individuals?

This Article calls for a new project for “law and neuroscience.” It outlines structural, not individual, application of brain science. That is, aligned with the general goal of basic science research into brain mechanisms and behavioral outcomes: improving the lives of citizens with a better understanding of the human experience. It asks brain and behavioral science⁵ to move explicitly into public policy territory, and specifically onto ground more traditionally occupied by economists—but in ways the project of “behavioral economics” has not yet ventured. Put simply, policy analysts should focus on brains—“collective cognitive capital”—with the same intensity with which they focus on money, rights, or other policy metrics.

To that end, this Article introduces and explores the novel framework of “collective cognitive capital”: a way of thinking of brain health and brain function as an aggregated resource. Collective cognitive capital is a conceptual framework for synthesizing brain and behavioral data and using it to assess the impacts of policy choices. It is analogous to a measure of welfare, a maximizable metric used to evaluate policy choices.

The core thesis for this future of “law and neuroscience” is simple: we can and should use brain and behavioral science to evaluate public policy decisions by how they affect the cognitive (and emotional) functioning of the people. Normatively, policies should seek to maximize collective cognitive capital because it is inherently

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5. I do not separate “neuroscience” from “behavioral” research for the purposes of considering the future of neuroscience in law, notwithstanding that behavioral sciences have made many separate inroads to law already. Behavioral research alongside manipulation of neural mechanisms is essential to understanding brain functions, particularly complex brain functions such as cognition. See Yael Niv, *The Primacy of Behavioral Research for Understanding the Brain*, 135 BEHAV. NEUROSCIENCE 601 (2021).

valuable. Cognitive and emotional functioning, and overall brain health, subserve and maximize individual agency and freedom.

The timing for a concept like this is ripe. Collective cognitive capital builds on important ideas from development and health economics, including the capabilities approach.⁶ Important for the audience of this special issue, it also brings behavioral and brain science into dialogue with law and policy in ways that have not yet been attempted in “law and behavioral economics.”

Collective cognitive capital is a framework that shifts the focus of policy inquiry. In the applied program of law and behavioral economics, individuals’ behavior is the object or target. It imports paternalistic ideas about how individuals should make decisions to maximize their welfare—given their assumed shortcomings in decision-making, which itself is a narrow version of cognitive capacity—within the existing political economy status quo. In contrast, the target in the framework of collective cognitive capital is the policy, rule, or institutional design and its *effect* on collective cognitive capital. The question is whether that rule or institution consumes more cognitive capital than necessary, or promotes development and preservation of cognitive capital. Unlike law and behavioral economics, which seek to “improve” individual decision-making, the political economy status quo is up for reevaluation under the rubric of collective cognitive capital.⁷

The framework of collective cognitive capital has the potential to engage policymakers in familiar territory. It offers coherent descriptive and normative accounts for policy making. It provides a concrete lens to focus on structural and contextual effects of policy

6. Amartya Sen, *Capability and Well-Being*, in *THE QUALITY OF LIFE* 30, 31 (Martha Nussbaum & Amartya Sen eds., 1993); see also MARTHA C. NUSSBAUM, *WOMEN AND HUMAN DEVELOPMENT: THE CAPABILITIES APPROACH* (2000). Economics literature has only in the past decade begun to merge literature on the human capital approach to health economics (focused on early developmental factors on adult health outcomes) and the economics of cognitive and noncognitive skill formation into a composite termed “human capabilities.” See, e.g., James J. Heckman, *The Economics, Technology, and Neuroscience of Human Capability Formation*, 104 *PROC. NAT’L ACAD. SCI.* 13250, 13250 (2007).

7. This may be an opportune moment in legal discourse, and especially in legal scholarship as we are “at a moment when structural and political shifts have reopened essential questions about the meaning of liberty and equality, the relationship between the state and the economy, and the interactions between capitalism and democracy.” Jedediah Britton-Purdy et al., *Building a Law-and-Political-Economy Framework: Beyond the Twentieth-Century Synthesis*, 129 *YALE L.J.* 1784, 1791 (2020).

on a populace, rather than putting the responsibility for public welfare on individual behavior. And it avoids some of the critiques and shortcomings of recent efforts in “behavioral public policy” while still making use of the research and insights into human cognition and behavior. Collective cognitive capital may also help define and clarify harm when government and regulated entities directly interact with people and consume—often waste—collective cognitive capital. Moreover, its normative definition of what is valuable—brain functioning that subserves and maximizes agency—is aligned with what makes us human.

Here is the high-level sketch of “collective cognitive capital,” with expansion in the Parts that follow.

The “cognitive” aspect of the framework broadly means “derived from brain states.” It envisions synthesis of group-based data on brain development and plasticity, general intelligence and fluid reasoning, cognitive control, and cognitive reserve. Importantly, “cognitive” also includes what are sometimes defined as “noncognitive” features and skills, such as emotional and social regulatory abilities.

“Collective” emphasizes that while brain/behavioral data is collected from individuals, it is most meaningful at the group level. It also captures the distinct property of the relational nature of cognition and a lot of behavior in important contexts; the collective resource is more than the sum of individual components.

The term “capital” conveys that the resource requires investment to maximize productivity, is capable of growth, is subject to fluctuations in response to surrounding conditions, and is harmed by underinvestment or withdrawals (such as neglect, trauma, stress, health, nutrition, toxins, and injury). “Capital” is an imperfect metaphor, but nevertheless a deliberate use of the dialect of the current political economy. Making the output of law and neuroscience interdisciplinary work actionable at a structural policy level may be facilitated by speaking the language of capital.

Cognitive capital would be accurately understood as something that everyone possesses, though in varying amounts, at varying points in time. It may be grown with investment without benchmarking as to any individual’s unknowable maximum capability. Cognitive capital can be acutely spent on valuable activities that

promote long-term growth, wastefully spent, or chronically diminished by disinvestment. The concept is broader than the narrow set of cognitive abilities that are already known to strongly predict formal academic success or high earnings in the knowledge economy.⁸ It recognizes that success in life and in many sectors of the labor market—and in the non-compensated labor market, such as caregiving, relationship maintenance, self-care skills such as management of personal finances, and community-directed labor-like activities such as voting, civic engagement, and volunteering—requires a complex suite of abilities, including emotional and social capacities, as well as attentional and inhibitory control. The framework is not meant to be elitist or exclusionary of those with mental illness, neurological atypicality, cognitive disabilities, or below-average endowments of any of the four factors, because it should not be used to rank or convey relative worth or a measure of any individual's "cost" or "benefit" to society.⁹ As an aggregate property, it accounts for the inherently social and relational nature of society. Others have defined something akin to sufficient cognitive capital as necessary for a functioning participatory democracy.

The utility of the collective cognitive capital framework is first in the "naming and framing" that is critical to uptake as a policy goal. With further model development, it could be a cross-disciplinary analytical tool like cost-benefit analysis. It could also help guide normative decisions about legislation and administration in the service of human flourishing. For example, the effects of climate change may be assessed with respect to the impact on collective cognitive capital (rather than strictly economic measures). A recent study reported on a large international sample correlating detailed weather data and educational outcomes, building on literature that exposure to heat impairs short-term cognitive function.¹⁰ Within and across countries, heat exposure (due to climatic differences and differential exposure related to socioeconomic status) on school days

8. See *infra* text accompanying notes 77-82, discussing the concept of "human capital."

9. As noted above, the metaphor of "capital" is imperfect, and this is one of the imperfections. Physical and economic capital can be directly compared and valued; the framework of collective cognitive capital incorporates normative boundaries on the concept that delimit it from conveying relative human worth or dignity.

10. R. Jisung Park et al., *Learning Is Inhibited by Heat Exposure, Both Internationally and Within the United States*, 5 NATURE HUM. BEHAV. 19 (2021).

is associated with decreases in learning.¹¹ The impact of air pollution on mental health, dementia, and cognitive reserve is also beginning to be understood.¹² As a coherent descriptive and normative theory, collective cognitive capital can also generate testable hypotheses for policy experimentation. This may be particularly important in policy areas in which experimental research is pragmatically limited, but data-informed ideas can generate new theories and policy experimentation.

This Article argues that collective cognitive capital is something that law, policy, and procedure should seek to maximize in any given group encountering a particular legal or policy scheme. The analysis supplied by the framework would be: Does this law or policy, on its face or in practice, increase or decrease the collective cognitive capital of the group(s) to whom it is applied or will most directly affect (either acutely or over time)? Is there another way to achieve similar ends that less negatively impacts collective cognitive capital? These are the core questions that a framework grounded in brain and behavioral science can help policymakers address.

When many policy metrics already exist, and sociological and biological sciences have already done so much to characterize the relationships between behavior and environment, how does brain information help explain why and how policies that protect cognitive capital matter? First, and most importantly, it enables greater empirical accuracy by permitting integration of biological information such as nutrition, toxins, and other environmental stressors. These are important determinants for which behavioral economics, though dominant in policy discussions focused on shaping individual decision-making, has no sufficient model. Second, it creates room for theory and known information about brain plasticity and resilience, which facilitates the following framing: cognitive capital is not a fixed capacity but is substantially determined by life events and environments; policy helps determine what happens in those lives; and outcomes with respect to cognitive capital affect how society fares overall. Moreover, expanding a sociobehavioral model to be conceptually grounded in “the brain” provides rhetorical and heuristic

11. *Id.* at 19-22.

12. See *infra* note 43; see also Zhi Li et al., *Air Pollution Interacts with Genetic Risk to Influence Cortical Networks Implicated in Depression*, 118 PROC. NAT'L ACAD. SCIS. 1 (2021).

power, potentially critical for appealing to policymakers.¹³ Getting policymakers to consistently view the brain as the final common pathway for complicated and difficult-to-measure social, cultural, and environmental factors may have the effect of focusing attention on a model that can give an assessment of any given policy proposal in terms of its effect on collective cognitive capital. In short, brains should matter.

This Article explores these ideas in four parts. Part I offers the descriptive content of the framework by sketching the contours of “cognitive”—the areas of brain and behavioral research findings that make up the substance of the framework—and explains why the concept is “collective” rather than individualistic or diagnostic. Part II provides context and further justification. First, it puts the collective cognitive capital framework in context with other theories of human resources. Second, it contrasts collective cognitive capital with the project of behavioral law and economics—to date, the dominant framework for bringing behavioral science to bear on law and policy. Third, it outlines collective cognitive capital as an analytical process, with brief analogies to other policy analysis tools and explanation via some hypothetical examples. Part III defends the normative claim that collective cognitive capital is an output that law and policy should seek to maximize. Its grounding in brain and behavioral function subserves pursuit of other societal values such as self-governance, social cohesion, hedonics, and well-being. It can inform “political judgments about what should count as ‘costs’ and ‘benefits,’”¹⁴ including policies and citizen-state interactions affecting non-compensated labor and self-care life skills, which require and benefit from increases in collective cognitive capital. Part IV briefly addresses some of the limitations, caveats, and risks of this theory. Any attempt at such a sweeping, interdisciplinary theory will have plenty of them—foremost among them is the stipulation that this idea is nascent and will require refinement in scope, substance, and connection to other developments in law. Closely following is the stipulation that a focus on brains is not inherently reductive, essentialist, or medicalizing—though there are inherent risks of being understood as such. Nevertheless, this

13. See Lucy A. Jewel, *The Biology of Inequality*, 95 DENV. L. REV. 609, 651, 653 (2018).

14. Britton-Purdy et al., *supra* note 7, at 1805.

Article attempts to sketch the outlines of a framework for delivering the existing and forthcoming insights from brain and behavioral research into actionable tools for policymakers by using familiar language and concepts. It offers a significant departure from prior work in law and neuroscience and an ambitious agenda for future efforts.

I. THE CONTOURS OF “COGNITIVE” AND THE AGGREGATION OF “COLLECTIVE”

This Part describes the content of “cognitive” and the scope of “collective” in the framework of collective cognitive capital. It describes what fits within the concept and explains why its boundaries are unavoidably somewhat fuzzy. The purpose of this Part is to explain the rough contours of how the collective cognitive capital framework uses research findings and theories from multiple areas of brain and behavioral science research to operationalize abstract but important concepts like “capabilities.”

A. Defining the Broad Scope of “Cognitive”

“Cognitive” as used here means “derived from brain states.” It incorporates several broad domains of behavioral and brain research: brain development and plasticity, general intelligence and fluid reasoning (the capacity to think logically independent of background knowledge), and functions that are termed cognitive control (including attentional control and inhibitory control), and cognitive reserve (resilience in the face of neuropathology and aging). “Cognitive” is used more broadly here than in the classic scientific definition (and perhaps popular imagination) as functions that are rational, computational, and in opposition to emotion. The pervasive dichotomy between cognition and emotion is not particularly useful or important here, as many socially important brain functions (such as perspective-taking and empathy) are hybrid cognitive/emotional skills. Thus, “cognitive” as used here also includes classically “noncognitive” features and skills such as emotional and social regulatory abilities. It means something more

broadly like “perceiving, thinking, feeling, deciding, acting, and the means to do so.”¹⁵

By including measures of brain development, plasticity, and resilience, “cognitive capital” goes beyond functional trait-based concepts and incorporates biological information about brain functions where connections to traits may be quite distant (development and reserve) and are not yet well understood (plasticity and resilience). Yet their inclusion in the framework permits incorporation of the effects of biologically measurable stressors such as toxins, nutrition, illness, isolation, and stress, which have effects on cognition and brain function even though the precise mechanisms remain poorly understood. Each of these can be affected by policy. For the framework to adequately incorporate them, data suggesting causal relationships between environmental factors or context and behavior (which is expression of brain function)¹⁶ and the magnitude of such effects should be adequate; specific mechanisms are not required, though they would undoubtedly refine the conceptual model and make it more precise.¹⁷

15. This is distinct from the previous (but limited) use of the term “cognitive capital” in economics, first proposed by Colin Camerer and Robin Hogarth, where cognitive capital was more explicitly defined by a given individual’s set of “procedural knowledge” to solve certain experimental tasks (know-how, heuristics, analytical skills, previous experience in the task) in the context of comparing the “capital” that could be put to solve a task with the “labor” in terms of mental effort. Colin F. Camerer & Robin M. Hogarth, *The Effects of Financial Incentives in Experiments: A Review and Capital-Labor-Production Framework*, 19 J. RISK & UNCERTAINTY 7, 9-10 (1999); see also Ondřej Rydval, *Financial Incentives and Cognitive Abilities: Evidence from a Forecasting Task with Varying Cognitive Load*, 1 JENA ECON. RSCH. PAPERS 1 (2007), <https://ideas.repec.org/p/jrp/jrprwp/2007-040.html> [<https://perma.cc/P7UF-9APH>]; T. Parker Ballinger et al., *Saving Behavior and Cognitive Abilities*, 14 EXPERIMENTAL ECON. 349, 352 (2011) (describing cognitive capital as a vector of various (possibly interacting and time-variant) limits on cognition that may be imperfectly measured by various tests of cognitive abilities of a given individual). A similarly individuated concept of “human capital” is embodied in an individual’s investments in education or job training, sometimes treated as cognitive ability and tightly related to fluid and crystallized intelligence. See, e.g., John J. McArdle & Robert J. Willis, *Cognitive Aging and Human Capital*, in *GROUNDING SOCIAL SCIENCES IN COGNITIVE SCIENCES* 351, 356-58 (Ron Sun ed., 2012).

16. That behavior is an expression of brain function is an uncontroversial claim in brain and behavioral sciences. The claim is simply that behavior is a product of brain activity. This is not true for reflexes (like withdrawing a hand from a hot stove, or involuntarily kicking when the doctor taps on your knee) and other actions that are neurally mediated in the spinal cord. It is arguably true for bodily functions such as breathing, which are regulated in the brain stem. But for the kinds of “behavior” that policy cares about, it is all a product of brain activity.

17. See Till Grüne-Yanoff, *Why Behavioural Policy Needs Mechanistic Evidence*, 32 ECON.

B. Defining and Justifying “Collective”

Before delving into the details of the subcomponents of “cognitive,” it is important to define “collective” and understand why it is an inextricable component of the framework of collective cognitive capital. “Collective” means that the assessment of cognitive capital must take place at the level of the group, even though data measurements are taken from individuals. “Collective” refers to a relevant group, which may change depending upon the policy issue at hand. The framework is not static—it can accommodate different inputs depending upon the group and situation under consideration. If empirical data is not available for the specific affected group, models may be put together with a convenience sample using the best judgment about similarities of relevant group properties and treated as hypothesis-generating and needing verification based on close observation. Some fuzziness is perhaps unavoidable in determining group boundaries within different policy environments.

This focus on group-based assessment of collective cognitive capital is important and unavoidable for at least two reasons. First, understanding causal relationships between policy interventions and outcomes is possible only with aggregate data. This is familiar from epidemiology and social sciences. Moreover, the substance of “cognitive capital” is constructed from group data about complex, subtle, normal, and social behaviors—not diagnostic constructs. Robust and replicable research findings underpinning the conceptual model—particularly because of inherent “noise” in behavior within and between individuals as well as dynamic brain states¹⁸—are assessed at the group level, and even require reasonably large groups for research to have sufficient power to find small effects. The data is at its strongest in the basic research context.¹⁹ The

& PHIL. 463, 471-72 (2016).

18. DANIEL KAHNEMAN ET AL., NOISE: A FLAW IN HUMAN JUDGMENT 84, 93 (2021).

19. Skeptics may think of the “replication crisis” in psychology, other social sciences, and neuroscience, and be doubtful that research findings are indeed robust. This is a fair criticism. See, e.g., Scott E. Maxwell et al., *Is Psychology Suffering from a Replication Crisis? What Does “Failure to Replicate” Really Mean?*, 70 AM. PSYCH. 487 (2015); Colin F. Camerer et al., *Evaluating the Replicability of Social Science Experiments in Nature and Science Between 2010 and 2015*, 2 NATURE HUM. BEHAV. 637 (2018); Russell A. Poldrack et al., *Scanning the Horizon: Towards Transparent and Reproducible Neuroimaging Research*, 18 NATURE REVS. NEUROSCIENCE 115 (2017). But collective cognitive capital purports to be a theory and a

behavioral and brain science research that make up the conceptual framework are not diagnostic in nature, and thus “cognitive capital” is not useful for individual diagnosis or adjudication.²⁰ Finally, some of the key properties in the framework of collective cognitive capital—such as emotional and social regulatory abilities—might be understood as inherent qualities of groups as well as individuals.

The second reason for the necessary focus on collective is that collective outcomes are the coin of the realm for policy metrics. Even if indicators like “cognitive capital” could be identified at the individual level, policymakers should be more attuned to collective outcomes.

C. Defining the Substance of the Framework

The prior two Sections have defined the broad scope of “cognitive” and the inextricable nature of “collective.” The following Subsections will outline the major domains of brain and behavioral science data that make up the preliminary concept of the collective cognitive capital framework. The framework’s core components can be usefully organized as “biological” and “functional,” a taxonomy of convenience based on how they are and may be assayed and measured. This taxonomy does not reflect essentialization of some features over others or endorsement of a brain/mind duality. Rather, it is meant to inclusively reflect the nature of data that could make up the framework.

framework, subject to revision after policy experimentation. One feature of non-reproducible results in social and hard science fields is low statistical power. This is an opportunity for brain and behavioral scientists to get involved in policy work: large-scale policy can, if thoughtfully designed and monitored, potentially produce useful data that can contribute to the ongoing scientific process of uncertainty reduction. Theory is useful for policy making. See Kathryn Zeiler, *Cautions on the Use of Economics Experiments in Law*, 166 J. INSTITUTIONAL & THEORETICAL ECON. 178, 186 (2010) (“By recognizing that theories rather than experiment results are applied in policy analyses, we can engage in a more productive process of developing robust and useful theories that can be applied in policy analyses.”).

20. The “group-to-individual” or “G2i” problem plagues the courtroom focus of much of “law and neuroscience” efforts. Collective cognitive capital entirely sidesteps the problems of group-to-individual inference because it explicitly disclaims individual adjudication. David L. Faigman et al., *Group to Individual (G2i) Inference in Scientific Expert Testimony*, 81 U. CHI. L. REV. 417, 421-22 (2014).

1. *The “Biological” Subcomponents of “Cognitive”:
Development, Plasticity, Reserve, and Resilience*

Let’s first consider the elements of collective cognitive capital representing more “biological” features, those that could conceivably be measured with neurobiological (in addition to behavioral) assays: development, plasticity, reserve, and resilience.

For brain development, the conceptual model would focus on accounting for known and suspected detriments to growth and development, including the extensive sociological, behavioral, and neuroscientific literature on poverty and trauma, and the related sociomedical literature on poor nutrition, environmental toxins, and other social determinants of health environmental toxins. Malnutrition;²¹ sleep deprivation;²² maltreatment;²³ and in utero,²⁴ early childhood, or other life course exposure to environmental toxins²⁵ (such as lead) or ingested toxic substances (such as alcohol)²⁶ are also relevant areas of research to a conceptual model for how policies might affect brain development. Positive factors that contribute to

21. See, e.g., Bhoomika R. Kar et al., *Cognitive Development in Children with Chronic Protein Energy Malnutrition*, 4 BEHAV. & BRAIN FUNCTIONS 31 (2008); Paul Glewwe & Elizabeth M. King, *The Impact of Early Childhood Nutritional Status on Cognitive Development: Does the Timing of Malnutrition Matter?*, 15 WORLD BANK ECON. REV. 81 (2001); Kathleen S. Gorman, *Malnutrition and Cognitive Development: Evidence from Experimental/Quasi-Experimental Studies Among the Mild-to-Moderately Malnourished*, 125 J. NUTRITION, 2239S (1995).

22. See William D.S. Killgore, *Effects of Sleep Deprivation on Cognition*, 185 PROGRESS BRAIN RSCH. 105 (2010); James E. Jan et al., *Long-Term Sleep Disturbances in Children: A Cause of Neuronal Loss*, 14 EUR. J. PAEDIATRIC NEUROLOGY 380 (2010).

23. Genevieve Young-Southward et al., *Investigating the Causal Relationship Between Maltreatment and Cognition in Children: A Systematic Review*, 107 CHILD ABUSE & NEGLECT 1 (2020); Marijcke W. M. Veltman & Kevin D. Browne, *Three Decades of Child Maltreatment Research: Implications for the School Years*, 2 TRAUMA, VIOLENCE, & ABUSE 215 (2001).

24. Justin H. G. Williams & Louise Ross, *Consequences of Prenatal Toxin Exposure for Mental Health in Children and Adolescents*, 16 EUR. CHILD & ADOLESCENT PSYCHIATRY 243 (2007); PETER GLUCKMAN & MARK HANSON, *THE FETAL MATRIX: EVOLUTION, DEVELOPMENT AND DISEASE* 37 (2005); Joseph L. Jacobson & Sandra W. Jacobson, *Intellectual Impairment in Children Exposed to Polychlorinated Biphenyls in Utero*, 335 NEW ENG. J. MED. 783 (1996).

25. Alison P. Sanders et al., *Perinatal and Childhood Exposure to Cadmium, Manganese, and Metal Mixtures and Effects on Cognition and Behavior: A Review of Recent Literature*, 2 CURRENT ENV’T HEALTH REPS. 284 (2015); David Bellinger et al., *Longitudinal Analyses of Prenatal and Postnatal Lead Exposure and Early Cognitive Development*, 316 NEW ENG. J. MED. 1037 (1987).

26. Linda B. Hassing, *Light Alcohol Consumption Does Not Protect Cognitive Function: A Longitudinal Prospective Study*, 10 FRONTIERS AGING NEUROSCIENCE 81 (2018).

brain development belong here too, including the enormous literature that has built consensus on the importance and efficacy of quality early childhood environments.²⁷

But brain development is not just an issue of early childhood. Significant brain growth and pruning takes place through early adulthood.²⁸ Even in adult brains, new learning and new cellular generation continues throughout the lifespan.²⁹ Environmental insults, toxins and nutrition, sleep quality, poverty and low socioeconomic status,³⁰ excessive stress, and mental and physical health (including chronic pain),³¹ in addition to education, socialization, and regular engagement, continue to have acute and likely chronic effects on adult brain functional capacities.

“Cognitive reserve” describes the persistence of a particular cognitive function or skill against brain pathology and/or the ability to use alternative functions when a default function is diminished or destroyed. Cognitive skills, including fluid intelligence, decline with normal aging as well as with brain pathology, but with significant variation among individuals. Declines in executive functioning have an outsize impact on daily life functioning, including self-care activities not generally considered in human capital assessments focused on economic productivity or generativity. Such tasks include remembering to take medication, doing household chores such as

27. See, e.g., Kaspar Burger, *How Does Early Childhood Care and Education Affect Cognitive Development? An International Review of the Effects of Early Interventions for Children from Different Social Backgrounds*, 25 *EARLY CHILDHOOD RSCH. Q.* 140 (2010); Douglas Almond & Janet Currie, *Human Capital Development Before Age Five*, in 4B *HANDBOOK OF LABOR ECONOMICS* 1315 (David Card & Orley Ashenfelter eds., 2011); W. Steven Barnett, *Long-Term Effects of Early Childhood Programs on Cognitive and School Outcomes*, 5 *FUTURE CHILD* 25 (1995). But the policy implications are more nuanced than a “one size fits all” model of early childhood care and education. Cf. Kelly Durkin et al., *Effects of a Statewide Pre-Kindergarten Program on Children’s Achievement and Behavior Through Sixth Grade*, *DEVELOPMENTAL PSYCH.*, Jan. 10, 2022, at 1, 1-3; Michael Baker et al., *The Long-Run Impacts of a Universal Child Care Program*, 11 *AM. ECON. J.: ECON. POL’Y* 1 (2019).

28. Nitin Gogtay et al., *Dynamic Mapping of Human Cortical Development During Childhood Through Early Adulthood*, 101 *PROC. NAT’L ACAD. SCIS.* 8174 (2004).

29. Fred H. Gage, *Neurogenesis in the Adult Brain*, 22 *J. NEUROSCIENCE* 612, 612 (2002).

30. See generally Emma Boswell Dean et al., *Poverty and Cognitive Function*, in *THE ECONOMICS OF POVERTY TRAPS* 57 (Christopher B. Barrett et al. eds., 2019). See *infra* text accompanying note 58.

31. A.V. Apkarian et al., *Pain and the Brain: Specificity and Plasticity of the Brain in Clinical Chronic Pain*, 152 *PAIN* S49 (2011); see also Pustilnik, *supra* note 4.

cooking and food shopping, and effectively managing money.³² Individuals performing these types of skills and tasks for themselves, along with many types of inter-family caregiving or self-caregiving tasks, are not considered generative or included in economic policy metrics such as gross domestic product,³³ but they are sources of economic cost if they are not maintained. More importantly, cognitive reserve and preservation of function is fundamental to an individual's well-being, dignity, and autonomy, and thus has intrinsic value. The subjective experience of cognitive decline can be a source of great distress.³⁴ Valuing and preserving cognitive reserve has benefits from both an economic cost-benefit perspective as well as welfare functions that use subjective well-being; collective cognitive capital is a framework that can account for both.

Cognitive reserve is a challenging component of collective cognitive capital to operationalize, but is a key component of collective outcomes and deserving of attention in policy decisions. The neural mechanisms of cognitive reserve are an area of active neuroscience research.³⁵ Behavioral data indicates that, on average, individuals with increased cognitive reserve tend to be more highly educated, possess higher fluid intelligence (as measured by IQ scores), reach higher ranks of occupational attainment, speak another language,

32. See Gad A. Marshall et al., *Executive Function and Instrumental Activities of Daily Living in Mild Cognitive Impairment and Alzheimer's Disease*, 7 *ALZHEIMER'S & DEMENTIA* 300 (2011); Julene K. Johnson et al., *Executive Function, More than Global Cognition, Predicts Functional Decline and Mortality in Elderly Women*, 62 *J. GERONTOLOGY: MED. SCIS.* 1134 (2007); Kathleen Insel et al., *Executive Function, Working Memory, and Medication Adherence Among Older Adults*, 61B *J. GERONTOLOGY: PSYCH. SCIS.* P102 (2006); Deborah A. Cahn-Weiner et al., *Prediction of Functional Status from Neuropsychological Tests in Community-Dwelling Elderly Individuals*, 14 *CLINICAL NEUROPSYCHOLOGIST* 187 (2000); Michelle C. Carlson et al., *Association Between Executive Attention and Physical Functional Performance in Community-Dwelling Older Women*, 54B *J. GERONTOLOGY: PSYCH. SCIS.* S262 (1999).

33. See, e.g., Valeria Esquivel, *Feminist Economics*, in *COMPANION TO FEMINIST STUDIES* 265, 268 (Nancy A. Naples ed., 2021).

34. Rachel F. Buckley et al., *Subjective Cognitive Decline from a Phenomenological Perspective: A Review of the Qualitative Literature*, 48 *J. ALZHEIMER'S DISEASE* S125, S129 (2015); David J. Vinkers et al., *Temporal Relation Between Depression and Cognitive Impairment in Old Age: Prospective Population Based Study*, 329 *BRIT. MED. J.* 881, 881 (2004).

35. See, e.g., Yaakov Stern et al., *Brain Reserve, Cognitive Reserve, Compensation, and Maintenance: Operationalization, Validity, and Mechanisms of Cognitive Resilience*, 83 *NEUROBIOLOGY AGING* 124 (2019); Laura Serra et al., *Cognitive Reserve: The Evolution of the Conceptual Framework*, 3 *J. SYS. & INTEGRATIVE NEUROSCIENCE* 1 (2017).

and are involved in a diverse range of nonwork activities.³⁶ As a potential diagnostic tool, measures of cognitive reserve have been successful at predicting clinical status in aging as well as a number of neurodegenerative disorders and brain injury.³⁷ Some risk of certain neuropathologies can be predicted from genetic testing.³⁸ But the mechanisms of diminishing cognitive reserve—or preservation of cognitive capacities in the face of normal aging—remains something of a mystery and, at present, a large market for products and services.³⁹ Well-validated and agreed-upon measurement techniques are still being developed.⁴⁰ Biomarkers are plausible but not yet definitive for diagnosis.⁴¹ For example, brains can show pathology suggestive of degenerative disease but without exhibiting behavioral symptoms.⁴² While there is significant clinical interest in individualized predictions of decline, the role of cognitive reserve in the framework of collective cognitive capital is identifying causal factors impinging on cognitive reserve that can be influenced by social policy, such as levels of education, nutrition, provision of social services, and reduction of harmful toxins or stressors.⁴³ Policy decisions

36. See Dennis Chan et al., *Lifestyle Activities in Mid-Life Contribute to Cognitive Reserve in Late-Life, Independent of Education, Occupation, and Late-Life Activities*, 70 *NEUROBIOLOGY AGING* 180 (2018); Mandana Fallahpour et al., *Leisure-Activity Participation to Prevent Later-Life Cognitive Decline: A Systematic Review*, 23 *SCANDINAVIAN J. OCCUPATIONAL THERAPY* 162 (2016); Ellen Bialystok et al., *Bilingualism, Aging, and Cognitive Control: Evidence from the Simon Task*, 19 *PSYCH. & AGING* 290 (2004); Laura Fratiglioni et al., *An Active and Socially Integrated Lifestyle in Late Life Might Protect Against Dementia*, 3 *LANCET NEUROLOGY* 343 (2004); Nikolaos Scarmeas & Yaakov Stern, *Cognitive Reserve and Lifestyle*, 25 *J. CLINICAL & EXPERIMENTAL NEUROPSYCHOLOGY* 625 (2003).

37. See Yaakov Stern, *Cognitive Reserve: Implications for Assessment and Intervention*, 65 *FOLIA PHONIATRICA ET LOGOPAEDICA* 49 (2013); Bruce R. Reed et al., *Measuring Cognitive Reserve Based on the Decomposition of Episodic Memory Variance*, 133 *BRAIN* 2196 (2010).

38. See Carolin A. M. Koriath et al., *Genetic Testing in Dementia—Utility and Clinical Strategies*, 17 *NATURE REV. NEUROLOGY* 23 (2021).

39. See Daniel Barulli & Yaakov Stern, *Efficiency, Capacity, Compensation, Maintenance, Plasticity: Emerging Concepts in Cognitive Reserve*, 17 *TRENDS COGNITIVE SCIS.* 502 (2013); Jason Steffener & Yaakov Stern, *Exploring the Neural Basis of Cognitive Reserve in Aging*, 1822 *BIOCHIMICA ET BIOPHYSICA ACTA* 467 (2012).

40. See Nadja Kartschmit et al., *Measuring Cognitive Reserve (CR)—A Systematic Review of Measurement Properties of CR Questionnaires for the Adult Population*, 14 *PLOS ONE* 1 (2019).

41. Kevin J. Sullivan et al., *Association of Midlife Plasma Amyloid- β Levels with Cognitive Impairment in Late Life: The ARIC Neurocognitive Study*, *NEUROLOGY*, Sept. 2021, at 1.

42. See *supra* note 37 and accompanying text.

43. For example, several recent observational studies demonstrate that improving air quality appears to reduce risk of cognitive decline and dementia. *Improving Air Quality*

could be analyzed with respect to whether their implementation supports or impinges upon the cognitive reserve of an affected populace.

Resilience as a component of collective cognitive capital offers theories of optimism, based on accumulating evidence of neural plasticity. Resilience is the quality of systems that permits processes of recovery and adaptation in the face of challenges, adversity, trauma, and all of the insults that can dampen brain development and affect cognitive function. The research field is young and dynamic; several “waves” of research into resilience have already crested.⁴⁴ The present call in the field of psychological resilience studies is to recognize and conceptualize resilience as not just an individual-level phenomenon—including study of genetic, epigenetic, and molecular biology—but also a social systems-level phenomenon.⁴⁵ Integration of research and theories across these levels is anticipated with computational advances in the coming years.⁴⁶ The component of resilience is perhaps the least well operationalized in the entire collective cognitive capital model, but its inclusion is essential. Resilience is what promotes hope for better futures. In contrast to the idea that “brain-based” means biologically “hard-wired” and thus determined, work on resilience and interventions supports theories of potential neurological recovery from traumas, adversity, or the sequelae of low socioeconomic status.⁴⁷ Though the

Reduces Dementia Risk, NEUROSCIENCE NEWS (July 26, 2021), <https://neurosciencenews.com/air-pollution-dementia-18984/> [<https://perma.cc/CGU4-DL8N>]; Kevin J. Sullivan et al., *Ambient Fine Particulate Matter Exposure and Incident Mild Cognitive Impairment and Dementia*, 69 J. AM. GERIATRICS SOC'Y 2185, 2189-90 (2021).

44. See ANN S. MASTEN, *ORDINARY MAGIC: RESILIENCE IN DEVELOPMENT* 6 (2014).

45. Christy A. Denckla et al., *Psychological Resilience: An Update on Definitions, a Critical Appraisal, and Research Recommendations*, 11 EUR. J. PSYCHOTRAUMATOLOGY 1822064 (2020); see also Steven M. Southwick et al., *Resilience Definitions, Theory, and Challenges: Interdisciplinary Perspectives*, 5 EUR. J. PSYCHOTRAUMATOLOGY 25338 (2014).

46. Denckla et al., *supra* note 45, at 1822064.

47. See, e.g., Ann S. Masten, *Resilience in Developing Systems: Progress and Promise as the Fourth Wave Rises*, 19 DEV. & PSYCHOPATHOLOGY 921, 922-23 (2007) (“Meanwhile, there were many children growing up with high odds for suffering and failure who could not wait for the lengthy process of basic science. This predicament motivated the third wave of work, focused on experiments to test resilience ideas directly through prevention and intervention.”). A May 2016 conference called “Poverty, the Brain and Mental Health” brought together experts in brain science, genetics, and social work. The conference proceedings are not publicly available, but a *New York Times* article provided a quote from Dr. Frances Champagne, Associate Professor of Psychology at Columbia University, summarizing the consensus

framework of collective cognitive capital favors a conceptual and empirical grounding in brain health, the potential of the brain to recover, adapt, and improve in function is key to the model being one of optimism for developing law and policy to support human flourishing.

The research into the “biological” components just discussed is challenging to operationalize. In the early years of building the framework of collective cognitive capital, it may be driven by theory more than raw data. In terms of data inputs, effect sizes, the strength of associations, and—most challengingly—the strength of causal relationships are the most important measures to synthesize. One major challenge for operationalizing factors making up this “brain biology” category is that much of the human data in this domain are observational or at best quasi-experimental, due to ethical constraints limiting experimentation on people and particularly on children, pregnant women, and other vulnerable groups. This challenge is not unique to these components of collective cognitive capital, and the implications of the weakness of causal data will be discussed below in Part IV.

Nevertheless, a focus on “brain-based” measures may be useful for operationalizing and standardizing inputs to the framework. They need not involve expensive methods. For example, one study found that a forty-five-minute assessment of three-year-old children’s “neurological soft signs, intelligence, receptive language, and motor skills”—collectively deemed a measure of their “brain health”—could predict with reasonable accuracy and large effect sizes whether an individual would end up in a segment of the adult population that accounted for a large proportion of economic burden

view from disparate fields of research:

Research in the field of epigenetics, the study of how genes and the environment interact, has explained some of the responses that cause trouble ... Early-life stress turns on genes that overreact to stress.... [T]hose genes that help us, to buffer us, from the effects of stress are epigenetically silenced.... [E]vidence showed [us] the brain’s ability to adapt meant that children and even older people were not doomed by biology and environment.

Jim Dwyer, *Studying How Poverty Keeps Hurting Young Minds, and What to Do About It*, N.Y. TIMES (May 3, 2016), http://www.nytimes.com/2016/05/04/nyregion/studying-how-poverty-keeps-hurting-young-minds-and-what-to-do-about-it.html?_r=0 [<https://perma.cc/DT26-YRP2>].

due to poor health and social outcomes.⁴⁸ While the goal of measurement for collective cognitive capital is not individual prediction, the same measure could conceivably be used to predict and then assess the impact of a given interventional policy on group outcomes over time.

2. *The Core “Functional” Components of “Cognitive”*

Next, let’s consider the components of the collective cognitive capital framework that represent functional capacities which are only assayable with behavioral measures. The first suite of these includes general intelligence and fluid reasoning, as well as executive functioning, which includes attentional and inhibitory control. The second includes what are sometimes termed “noncognitive” factors, broadly labeled here as emotional and social behavioral regulation, and included in the “cognitive” rubric because they arise from brain states and are not usefully separated from what are classically thought of as “cognitive” functions.

a. General Intelligence, Reasoning, and Executive Functioning

What are these traits and capacities, and how do we measure them? Measures of general intelligence and fluid reasoning, and their state-versus-trait nature, are controversial—particularly measurements of general intelligence (assessed as IQ or *g*).⁴⁹ But they may be taken as a starting point for conceptual model building because they can be assessed using existing tools and compared to existing data. Executive functioning is a general concept that has many definitions (depending upon the researchers defining it) but can be thought of as the set of cognitive capacities that orient behavior towards planning, complex decision-making, sequencing of action, and controlling impulses so as to achieve a set goal. While the literature offers years of distributional psychometric data

48. Avshalom Caspi et al., *Childhood Forecasting of a Small Segment of the Population with Large Economic Burden*, 1 NATURE HUM. BEHAV. 1, 5, 10 (2016).

49. See, e.g., Kristof Kovacs & Andrew R. A. Conway, *What Is IQ? Life Beyond “General Intelligence,”* 28 CURRENT DIRECTIONS PSYCH. SCI. 189 (2019).

related to general/fluid intelligence, there is less population-wide data on other cognitive control and executive function factors. That may change as researchers have recently demonstrated inexpensive and effective tools to measure nonacademic capabilities that are cognitive but knowledge domain-general, such as inhibitory control, working memory, and implicit learning.⁵⁰ There are also validated survey-based tools to assess executive functioning in everyday life.⁵¹ Greater gaps remain between laboratory tests of risk-taking behavior and naturalistic risk taking.⁵²

These functions are important to the framework of collective cognitive capital because they subserve human decision-making and can also be directly affected by policy choices. At least some of these aspects of cognitive functioning are understood to be dynamic and sensitive to what are variously described as loads, burdens, costs, or taxes on cognitive bandwidth.⁵³ These taxes seem to particularly affect executive functions, especially attentional and inhibitory control, with observable effects on judgment and decision-making.⁵⁴ Unlike some other factors in collective cognitive capital framework, cognitive loads can be experimentally manipulated and thus causality can be more strongly inferred.⁵⁵ Real-life cognitive burdens can be brought to the forefront of an individual's mind in experimental conditions, such as in a study of college students induced to think about the high costs of college who then showed impairment in cognitive functioning when those thoughts interacted with

50. See Amar Hamoudi & Margaret Sheridan, *Unpacking the Black Box of Cognitive Ability: A Novel Tool for Assessment in a Population Based Survey* (Nov. 2015) (unpublished manuscript) (on file with author). *But see* Stephanie M. Jones et al., *Assessing Early Childhood Social and Emotional Development: Key Conceptual and Measurement Issues*, 45 *J. APPLIED DEVELOPMENTAL PSYCH.* 42 (2016).

51. See, e.g., Robert M. Roth et al., *BRIEF-A: Behavior Rating Inventory of Executive Function*, PAR, <https://www.parinc.com/Products/Pkey/25> [<https://perma.cc/H7KB-764B>].

52. Tom Schonberg et al., *Mind the Gap: Bridging Economic and Naturalistic Risk-Taking with Cognitive Neuroscience*, 15 *TRENDS COGNITIVE SCIS.* 11 (2011).

53. See, e.g., Dean et al., *supra* note 30, at 58.

54. See *id.* at 65; Martha J. Farah, *The Neuroscience of Socioeconomic Status: Correlates, Causes, and Consequences*, 96 *NEURON* 56, 62 (2017); SENDHIL MULLAINATHAN & ELGAR SHAFIR, *SCARCITY: WHY HAVING TOO LITTLE MEANS SO MUCH* 55-56 (2013); Ernst-Jan de Bruijn & Gerrit Antonides, *Poverty and Economic Decision Making: A Review of Scarcity Theory*, 92 *THEORY & DECISION* 5 (2021).

55. See Dean et al., *supra* note 30, at 59.

identity frames or other perceived barriers to meeting goals.⁵⁶ In another example, subjects under low cognitive load proved more capable of behaving strategically in multiplayer games.⁵⁷ Evidence is accumulating—both within individuals and across groups—that poverty and low socioeconomic status (separate from but cumulative to their sequelae in areas of health, sleep, and nutrition) directly impose significant cognitive loads that impede cognitive functioning.⁵⁸

b. Emotional and Social Regulation

The conceptual framework of collective cognitive capital includes what are sometimes termed “noncognitive” components that are critical to behavioral control, relationships and social life, work and caregiving activities, and personal well-being.⁵⁹ These are skills and abilities such as “perseverance, motivation, time preference, risk aversion, self-esteem, self-control, preference for leisure.”⁶⁰ James Heckman and colleagues have loosely defined these “non-cognitive factors” as “self-control, time preference, sociability” and confirmed that such noncognitive factors are important in explaining numerous labor market outcomes and social behaviors.⁶¹ Some might worry that these qualities are hard to measure, and are more morally laden as attributes of character than more clinical and generalizable features of “cognition.” But all are functions of the brain, all manifest as behavior, and all are interdependent.

The interdependence of cognitive and noncognitive abilities is found in empirical work. Cognitive and noncognitive skills both facilitate accumulation of the other, and “health capabilities” are necessary to the accumulation of both.⁶² For example, in recent

56. Mesmin Destin & Ryan C. Svoboda, *Costs on the Mind: The Influence of the Financial Burden of College on Academic Performance and Cognitive Functioning*, 59 RSCH. HIGHER EDUC. 302, 320 (2018).

57. Sean Duffy & John Smith, *Cognitive Load in the Multi-Player Prisoner's Dilemma Game: Are There Brains in Games?*, 51 J. BEHAV. & EXPERIMENTAL ECON. 47, 52, 54 (2014).

58. See Dean et al., *supra* note 30, at 79; see also Murphy, *supra* note 4, at 40.

59. See James J. Heckman et al., *The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior*, 24 J. LAB. ECON. 411, 477-78 (2006).

60. Heckman, *supra* note 6, at 13250.

61. Heckman et al., *supra* note 59, at 420.

62. Heckman, *supra* note 6, at 13254.

behavioral economics work motivated by the desire for policymakers to encourage sound individual financial decision-making, data suggest that cognitive ability and “emotional stability” (as measured by proxies IQ and EQ) both correlate with time and risk preferences.⁶³ That is, those with higher emotional stability are “less prone to present or future bias and are more patient” and those with higher cognitive ability have risk preferences more like those of expected utility theory which “may promote wiser investment decisions.”⁶⁴ Whether and how “noncognitive” abilities may be affected by policy interventions is a more open question.⁶⁵ But it is indisputable that they have intrinsic value to individuals and groups.

* * *

The scope of data to be synthesized into the analytical model of “collective cognitive capital” is extremely ambitious, and only roughly outlined above. Eventually, it would require extensive expertise in statistical model building and a consortium of experts across the various subdisciplines engaged in a project of dynamic synthesis. Most significantly and in the first instance, it may require consensus on some type of index measures to quantify predicted effects of a given policy choice on collective cognitive capital. Translation into any sort of “indicator” is fraught with risk.⁶⁶ It seems possible that a sufficiently complex yet flexible model may someday be built with emerging capabilities in data analytics and statistics, though those techniques cannot alone substitute for human judgment about

63. Lucy F. Ackert et al., *Are Time Preference and Risk Preference Associated with Cognitive Intelligence and Emotional Intelligence?*, 21 J. BEHAV. FIN. 136 (2020).

64. *Id.* at 147.

65. Educational efforts to improve “socio-emotional learning” are a highly relevant source of data for this research question. *See, e.g.*, Joseph A. Durlak et al., *The Impact of Enhancing Students’ Social and Emotional Learning: A Meta-Analysis of School-Based Universal Interventions*, 82 CHILD DEV. 405 (2011); *see also* ALEISHA CLARKE ET AL., *ADOLESCENT MENTAL HEALTH: A SYSTEMATIC REVIEW ON THE EFFECTIVENESS OF SCHOOL-BASED INTERVENTIONS* (2021).

66. *See, e.g.*, Kevin E. Davis et al., *Indicators as a Technology of Global Governance*, 46 LAW & SOC’Y REV. 71 (2012).

dependent variable inclusion. Discussion of their possibilities and limitations is beyond the scope of this Article. The first stages of such a project would be a multidisciplinary effort to agree upon the descriptive components of collective cognitive capital: the important variables and best-available hypotheses about causality, effect sizes, and convergence of experimental and observational data. The early-stage descriptive project should be considered dynamic and generative of future hypotheses that can bring the strengths of interdisciplinary collaboration—with a common rubric or goal—to science and policy development focused on increasing collective cognitive capital.

II. USING THE FRAMEWORK TO TRANSLATE THE GAINS OF BRAIN AND BEHAVIORAL SCIENCE INTO POLICIES FOR COLLECTIVE BENEFIT

A major purpose of this Article, as the introduction to the concept of “collective cognitive capital,” is to name and frame how brain and behavioral sciences can and should aim to affect policy at a high level. This Part will first briefly justify the choice of a “capital” framing, and situate collective cognitive capital relative to other noneconomic “capital” theories and economic theories of human capabilities. Second, it will contrast collective cognitive capital with the currently dominant “behavioral” framework in policy making, namely the project of behavioral law and economics. Third, it will sketch how collective cognitive capital would be used as an analytical process, with brief analogies to other tools such as cost-benefit analysis and welfare functions, followed by some hypothetical examples. Part III will then unpack the normative claims that investing in and guarding collective cognitive capital should be an overarching goal of law and policy.

A. Collective Cognitive Capital as Capital, and Related Stories

For brain and behavioral science to be synthesized into a framework that interfaces with the law and policy engines of the United

States, it would help to speak a lingua franca.⁶⁷ For the administrative state, large swaths of public law, and scholarly and political discourse, this is often the language of capital and economic efficiency.⁶⁸ Though the metaphor to economic “capital” is imperfect and comes with ideological overtones,⁶⁹ it is nevertheless useful to frame collective brain and behavioral capacity and function as a valuable, critical resource deserving of stewardship and attention.

Understanding “collective cognitive capital” as capital helps frame how brain and behavioral science can interface with the status quo of law (and policy) affecting structural aspects of social and economic life. This is because law creates, recognizes, protects, and prioritizes capital. The law creates capital by coding resources as capital.⁷⁰ And capital, in the form of wealth and resources, directly and indirectly dominates much mainstream legal analysis. Some argue that several areas of private law have in the recent era “been reoriented around versions of economic ‘efficiency’.... anchor[ing] both the descriptive framing and the normative assessment of law.”⁷¹ Critically, “[e]fficiency itself is typically defined—in practice if not always in theory—as a kind of ‘wealth maximization’ that works to structurally prioritize the interests of those with more resources.”⁷² In public law, citizen-state interactions are scrutinized at the level of differential treatment of individuals and “shaped by ways of thinking that transposed market logics onto politics and political subjects.”⁷³ In the current U.S. “neoliberal” state, capital is

67. Cf. Joshua W. Buckholtz et al., *A Neuro-Legal Lingua Franca: Bridging Law and Neuroscience on the Issue of Self-Control* 3 (Vand. Univ. L. Sch. Pub. L. & Legal Theory, Working Paper No. 16-32, 2016) (writing about the need for a common language of understanding between behavioral neuroscience and criminal law for concepts related to responsibility and behavioral control).

68. See, e.g., Britton-Purdy et al., *supra* note 7, at 1812.

69. Perhaps most troublingly with the concept of “human capital” reflecting a prioritization of economic productivity and the marketization of human labor.

70. KATHARINA PISTOR, *THE CODE OF CAPITAL: HOW THE LAW CREATES WEALTH AND INEQUALITY* (2019). Pistor identifies the common key attributes of capital as: priority, durability, universality, and convertibility. Pistor argues that “who has access to and control over the legal code” has power to control capital and thus societal wealth creation and distribution. *Id.* at 8.

71. Britton-Purdy et al., *supra* note 7, at 1790.

72. *Id.*

73. *Id.* at 1790-91.

well understood, valued, and a source of power.⁷⁴ Brain and behavioral science can be put into the framework of collective cognitive capital to convey to law and policy actors that the brain health and behavioral function of the populace are understandable (that is, comprehensible and operationalizable), valuable, a source of power, and affected by policy choices.

The use and expansion of the concept of “capital” beyond money or monetizable material assets is familiar in the social sciences. In his seminal work launching the concepts of “social capital” and “cultural capital,” Pierre Bourdieu argued that capital is a foundational concept for understanding society: “It is in fact impossible to account for the structure and functioning of the social world unless one reintroduces capital in all its forms and not solely in the one form recognized by economic theory.”⁷⁵ Both types of capital can be possessed by a given agent, though both are also properties of the aggregated and relational nature of society.⁷⁶

Human capital theory has its origins in economics as a theory of investment in education and training in expectation of return in the form of future earnings.⁷⁷ Since 2018, the World Bank has calculated a Human Capital Index (HCI) as a measure of “the human capital that a child born today can expect to attain by her 18th birthday,” as an assessment of “her potential productivity as a future worker.”⁷⁸ The World Bank HCI is calculated with three

74. I adopt the definition of “neoliberal” used by Britton-Purdy and colleagues, as “a set of recurring claims made by policymakers, advocates, and scholars in the ongoing contest between the imperatives of market economies and nonmarket values grounded in the requirements of democratic legitimacy.” *Id.* at 1789 n.21 (quoting David Singh Grewal & Jedediah Purdy, *Introduction: Law and Neoliberalism*, 77 L. & CONTEMP. PROBS. 1, 2-3 (2014)); *see also* Jewel, *supra* note 13, at 645.

75. Pierre Bourdieu, *The Forms of Capital*, in HANDBOOK OF THEORY AND RESEARCH FOR THE SOCIOLOGY OF EDUCATION 241, 242 (John G. Richardson ed., 1986).

76. *Id.* at 241-42.

77. *See* Gary S. Becker, *Investment in Human Capital: A Theoretical Analysis*, 70 J. POL. ECON. 9 (1962); *see also* Robert J. Willis, *Wage Determinants: A Survey and Reinterpretation of Human Capital Earnings Functions*, in 1 HANDBOOK OF LABOR ECONOMICS 525, 540, 597 (Orley C. Ashenfelter & Richard Layard eds., 1986) (documenting extensive empirical support of human capital theory); GREG J. DUNCAN, YEARS OF POVERTY, YEARS OF PLENTY 106-07 (1984).

78. WORLD BANK GRP., THE HUMAN CAPITAL INDEX 2020 UPDATE: HUMAN CAPITAL IN THE TIME OF COVID-19 1 (2021). The World Bank’s definition of human capital is:

[T]he knowledge, skills, and health that people accumulate over their lives. People’s health and education have undeniable intrinsic value, and human

components: (1) child survival rate, (2) expected years of school obtained by age eighteen, including school test scores, and (3) health, including the fraction of young children not showing stunted growth and adult survival rate.⁷⁹ The World Bank's version of human capital, focused on "economic returns to education and health," treats people primarily as economic resources—units of "productivity."⁸⁰ The United States Securities and Exchange Commission recently mandated disclosure of "a registrant's human capital resources, including any human capital measures or objectives that the registrant focuses on in managing the business."⁸¹ The concept of human capital has expanded beyond economic output origins, and some current conceptions of it also "include knowledge, personality traits, health, experiences, education, and cognitive functioning."⁸²

In comparison to human capital, collective cognitive capital offers an approach that is (1) more holistic and precise in terms of the inputs and (2) less focused on conceptualizing humans as units of economic productivity and more focused on conceptualizing cognitive capacity and behavior as means to pursue the values of autonomy, liberty, and dignity. Collective cognitive capital might be understood as attempting to span both economic and personhood approaches to a concept of property, to the extent that humans are inevitably operationalized as some sort of property in policy making discourse.⁸³

With respect to existing theories in development economics, the concept of collective cognitive capital may be most closely related to the "capability approach" to well-being.⁸⁴ The capability approach is

capital also enables people to realize their potential as productive members of society. More human capital is associated with higher earnings for people, higher income for countries, and stronger cohesion in societies.

Id.

79. *Id.* at 16.

80. *Id.* at 5.

81. 17 C.F.R. §§ 229, 239, 240 (2020).

82. Julian Christensen et al., *Human Capital and Administrative Burden: The Role of Cognitive Resources in Citizen-State Interactions*, 80 PUB. ADMIN. REV. 127, 127-28 (2020).

83. Jedediah Purdy, *People as Resources: Recruitment and Reciprocity in the Freedom-Promoting Approach to Property*, 56 DUKE L.J. 1047, 1050 (2007) ("[P]roperty regimes, in some of their central operations, confront the fact that people are at once bearers of personhood and economic resources for one another.").

84. Sen, *supra* note 6, at 30; *see also* NUSSBAUM, *supra* note 6, at 12-13.

focused on an individual's capacity, and is "concerned with evaluating [a person's advantage] in terms of his or her actual ability to achieve various valuable functionings as a part of living."⁸⁵ The capability approach is distinguished from approaches using personal utility (for example, hedonics), absolute or relative wealth, "assessments of negative freedoms," and Rawlsian or Dworkinian comparisons of holdings of resources as means of freedom or basis of equality.⁸⁶ Like the capability approach (and distinct from welfarist approaches), collective cognitive capital as defined here "mak[es] room for a variety of human acts and states as important in themselves (not just *because* they may produce utility, nor just to the *extent* that they yield utility)."⁸⁷ It is focused on the core instrumentality of agency, which "is a broader exercise than the evaluation of well-being."⁸⁸ A newer version of the capability approach called the "boosts paradigm" has recently been proposed as an alternative to "behavioral public policy" as a way to "foster people's competence to make their own choices" and exercise agency.⁸⁹

A major distinction between the capability approach (and the "boosts" paradigm) and the framework of collective cognitive capital is the former's orientation towards individual versus collective functioning. While cognitive capital of course exists at the level of the individual, and individuals are the ones who choose and exercise agency (though nearly always within a collective, relational context⁹⁰), theoretical analysis and predictions of outcomes are stronger at the level of the collective. This is because, as described above, data on brain, behavior, and causal effects is most robust in groups, not individuals. Designing policy must focus on the collective, even if effects are manifested by individuals encountering policy-affected structures and environments. So what does collective

85. Sen, *supra* note 6, at 30.

86. *Id.*

87. *Id.* at 33.

88. *Id.* at 37.

89. Ralph Hertwig & Till Grüne-Yanoff, *Nudging and Boosting: Steering or Empowering Good Decisions*, 12 PERSPS. ON PSYCH. SCI. 973, 973-74 (2017); accord Gerd Gigerenzer, *The Bias Bias in Behavioral Economics*, 5 REV. BEHAV. ECON. 303, 311 (2018) (arguing that public policies should aim "to hone the skills of the general public in dealing with risks and making decisions").

90. See Albert Bandura, *Toward a Psychology of Human Agency*, 1 PERSPS. ON PSYCH. SCI. 164, 165-66 (2006).

cognitive capital add to the work on the capabilities approach? Collective cognitive capital can help operationalize concepts and put research-based foundations (including the ability to generate new and testable hypotheses) underneath such capability theories and “boosting” goals. It may also help to bring a conceptual approach that appears to be siloed in “development economics” into the mainstream for policy analysis in the United States and other “developed” economies.

B. Behavior and Brain Science in Law and Policy Can Do Better than Behavioral Economics

The integration of behavioral science into frameworks directly impacting policy is not a novel endeavor. But this Section argues that present “behaviorally informed policy” is too limited in its approach.

Collective cognitive capital is a challenge to the dominance of frameworks using “behavioral economics” or “behavioral law and economics” (BLE) as the current method of leveraging insights from brain and behavioral science into policy making.⁹¹ In short, this is because the framework of collective cognitive capital does not, as the “political project” of BLE does, limit itself to a particular policy tool set.⁹² It also does not, as the empirical project of BLE has done, limit itself to a relatively narrow spectrum of psychological tools and research questions about decision-making and rationality,⁹³ but is inclusive of a much broader range of human behavioral and biological studies.

91. There has been very little, if any, overlap in scholarship on “behavioral law and economics” and “law and neuroscience.” *But see* Owen D. Jones, *Why Behavioral Economics Isn't Better, and How It Could Be*, in RESEARCH HANDBOOK ON BEHAVIORAL LAW AND ECONOMICS 476 (Joshua C. Teitelbaum & Kathryn Zeiler eds., 2018). Collective cognitive capital changes that by calling for a different focus and scope for the interdisciplinary efforts.

92. *See, e.g.*, Ryan Bubb & Richard H. Pildes, *How Behavioral Economics Trims Its Sails and Why*, 127 HARV. L. REV. 1593, 1597 (2014) (discussing how “BLE often artificially and wrongly excludes more traditional regulatory tools, such as direct mandates, from its analysis of policy options,” in order to invest in “choice-preserving policies.” Bubb and Pildes term this “artificial truncation.”).

93. *See, e.g.*, Jones, *supra* note 91. A 2020 synthesis by Cass Sunstein states upfront that “[b]ehavioral science emphasizes how human beings depart from perfect rationality.” CASS R. SUNSTEIN, BEHAVIORAL SCIENCE AND PUBLIC POLICY 1 (Robin Boadway et al. eds., 2020).

Whereas BLE (and its normative foundations of libertarian paternalism, discussed more in Part III) prescribes the means of intervention and focuses on the ends of getting individuals to make “better” choices, collective cognitive capital as a theory is agnostic about particular policy tools as means. Moreover, it is explicit about the ends of investing in collective cognitive capacities as a policy goal in and of itself. It makes room for the “full implications of behavioral social science” and evaluates effectiveness of policies on their impact on collective cognitive capital.⁹⁴

What follows is a brief critique of BLE as the dominant “behavioral” paradigm in policy making. The core of this critique is that, while currently popular, BLE is a theory for how people act, not a theory that considers their capacities to do so. Thus, it is useful for thinking (in some contexts) how to get (some) individuals to act in a certain way (sometimes).⁹⁵ It is less useful for considering structural questions of setting government priorities. Designing implementation methods differs from substantive policy goals, and the normative content of libertarian paternalism’s “nudges” has come under critique despite having only modest, incremental policy goals.⁹⁶ Part III will make the affirmative case that collective cognitive capital is a normative value to be maximized, using BLE’s normative framework of “libertarian paternalism” as a point of contrast.

For those who are unfamiliar, BLE explores the “legal and policy implications of cognitive biases.”⁹⁷ Thus far, it has taken a view of how people relate to “the law” that is largely consistent with that in neoclassical law and economics in terms of price theory⁹⁸ and market fundamentalism, and it has not studied “[h]ow people relate to

94. Bubb & Pildes, *supra* note 92, at 1600.

95. See, e.g., Jacob Goldin, *Which Way To Nudge? Uncovering Preferences in the Behavioral Age*, 125 YALE L.J. 226 (2015).

96. Mark Fabian & Jessica Pykett, *Be Happy: Navigating Normative Issues in Behavioral and Well-Being Public Policy*, 17 PERSPS. ON PSYCH. SCI. 169, 171 (2021); see also Raj Chetty, *Behavioral Economics and Public Policy: A Pragmatic Perspective*, 105 AM. ECON. REV. 1, 27-28 (2015).

97. Joshua D. Wright & Douglas H. Ginsburg, *Behavioral Law and Economics: Its Origins, Fatal Flaws, and Implications for Liberty*, 106 NW. U. L. REV. 1033, 1034 (2012).

98. Gregory Mitchell, *Alternative Behavioral Law & Economics*, in THE OXFORD HANDBOOK OF BEHAVIORAL ECONOMICS AND THE LAW 167, 182 (Eyal Zamir & Doron Teichman eds., 2014).

the law, and what people want from the law.”⁹⁹ Its normative basis of “libertarian paternalism” promises to “regulate so as to improve economic welfare by more closely aligning each individual’s actual choices with his ‘true’ or unbiased preferences without reducing his liberty, at least as it is represented by the choices available to him.”¹⁰⁰ It has been subject to critique from many angles, not all of which can be done justice here. Its scholarly impacts have primarily been felt in private law contexts (take, for example, the arguments about the effect of the endowment effect on property law, tort law, contract law, and intellectual property).¹⁰¹

In spite of the critiques, BLE and “nudging” are politically popular. Bubb and Pildes wrote in 2014 that “[t]he United States, the United Kingdom, and Europe appear flush with excitement for BLE.”¹⁰² This has proven true. In 2010, the UK government launched a Behavioural Insights Team (known colloquially as the “nudge unit”), which is now a “social purpose company” independent of the UK government.¹⁰³ The Obama administration created the Social and Behavioral Sciences Team in 2014 and, via executive order in 2015, directed federal agencies to “integrate behavioral insights into their policies and programs.”¹⁰⁴ Notably, a UN Behavioral Science Group promotes the use of behavioral science to “progress towards the Sustainable Development Goals.”¹⁰⁵ In 2020, BLE giant Cass Sunstein identified “[t]he list of nations that have used behavioral findings productively” as including: New Zealand, Australia, Germany, Qatar, Lebanon, Denmark, India, the UK, the Netherlands, Sweden, and the United States.¹⁰⁶

99. *Id.* at 168.

100. Wright & Ginsburg, *supra* note 97, at 1035.

101. *Id.* at 1043 nn.35-39.

102. Bubb & Pildes, *supra* note 92, at 1596.

103. *Behavioural Insights Team Is Now Independent of the UK Government*, GOV.UK, <https://www.gov.uk/government/organisations/behavioural-insights-team> [<https://perma.cc/B8XM-9L2A>]; *The Behavioural Insights Team in the UK*, CTR. FOR PUB. IMPACT (Mar. 31, 2016), <https://www.centreforpublicimpact.org/case-study/behavioural-insights-team-in-the-uk> [<https://perma.cc/2PMN-CQE3>].

104. W. J. CONGDON & M. SHANKAR, *THE WHITE HOUSE SOCIAL & BEHAVIORAL SCIENCES TEAM: LESSONS LEARNED FROM YEAR ONE 77* (2015).

105. *UN Behavioural Science Group*, UN INNOVATION NETWORK, <https://www.uninnovation.network/behavioural-science> [<https://perma.cc/SE7R-T5TN>]; *see also* UNITED NATIONS, *BEHAVIORAL SCIENCE REPORT* (2021).

106. SUNSTEIN, *supra* note 93, at 1.

The common focus of these BLE implementation programs has been the design of programs and policies “that depend on the decisions or actions of individuals.”¹⁰⁷ Broadly speaking, they have achieved modest (but often meaningful) results in policy areas such as: getting people to use less energy¹⁰⁸ (but perhaps only some people some of the time depending on their political ideology¹⁰⁹); getting some people to pay taxes on time;¹¹⁰ getting people to install insulation in their attics;¹¹¹ reminding people to pay their student loans on time;¹¹² and sending personalized reminders to complete tasks to obtain or maintain loans for higher education and farming.¹¹³ Perhaps the biggest policy splash for “nudging” has been changing workplace retirement savings from default opt-in to default opt-out programs,¹¹⁴ but without any real discussion of the political choice to impose burdens of decision-making about retirement savings on individuals, rather than robust social security or private defined-benefit pension plans. Moreover, some data indicates that such default shifts perversely reduced overall retirement savings because of low default contribution rates.¹¹⁵ What each

107. Congdon & Shankar, *supra* note 104, at 78.

108. Alec Brandon et al., *Testing for Crowd out in Social Nudges: Evidence from a Natural Field Experiment in the Market for Electricity*, 116 PROC. NAT'L ACAD. SCI. 5293 (2019). “Social nudges” comparing energy use to that of neighbors reduced energy use among Southern California consumers by a combined 7 percent.

109. Dora L. Costa & Matthew E. Kahn, *Energy Conservation “Nudges” and Environmentalist Ideology: Evidence from a Randomized Residential Electricity Field Experiment*, 11 J. EUR. ECON. ASS'N 680 (2013).

110. DEPT OF ENERGY & CLIMATE CHANGE, REMOVING THE HASSLE FACTOR ASSOCIATED WITH LOFT INSULATION: RESULTS OF A BEHAVIOURAL TRIAL (2013).

111. *Id.*

112. Congdon & Shankar, *supra* note 104, at 83.

113. *Id.*

114. See Pension Protection Act of 2006, Pub. L. No. 109-280, 120 Stat. 780 (codified as amended at 26 U.S.C. § 401, 29 U.S.C. § 1001); Shlomo Benartzi et al., *Choice Architecture and Retirement Saving Plans*, in THE BEHAVIORAL FOUNDATIONS OF PUBLIC POLICY 245, 252 (Eldar Shafir ed., 2013).

115. See Bubb & Pildes, *supra* note 92, at 1618 (citing Brigitte C. Madrian & Dennis F. Shea, *The Power of Suggestion: Inertia in 401(k) Participation and Savings Behavior*, 116 Q.J. ECON. 1149, 1184 (2001)), 1623-24 (citing VANGUARD, HOW AMERICA SAVES (2012)). Bubb and Pildes argue that:

Real tension exists between the social science foundations of BLE and its political aspirations. A combination of implicit judgments about the politically possible and a philosophical commitment to freedom of choice leads BLE to avoid certain options, to be less self-critical of some of its recommendations as evidence suggests it should be, and to fail to pursue fuller analysis of the range

of these examples has in common is the focus of BLE as getting individuals to change their behavior to make a particular program work “better” while accepting the political economy status quo.

This focus on an individual’s decisions and thus compliance with institutional goals as the *object* of BLE comes from the origins and core postulates of behavioral economics. Herbert Simon launched the field with the observation that mental shortcuts (“heuristics”) were used because humans do not have the requisite cognitive capacity to process all possible relevant information and make decisions necessary to maximize their welfare.¹¹⁶ The response of the project of legal libertarian paternalism—BLE—has essentially been to develop legal and institutional rules that steer people towards choices that promote their welfare while preserving their freedom of choice.¹¹⁷ Its aim is to “create decision-making environments in which it is easier for error-prone human decision makers to choose well.”¹¹⁸ Mark White has crisply criticized this project:

Implicitly, BLE considers a person as a thing to be manipulated, a machine that needs to be fixed, even if only for its own good. In the case of cognitive bias, the processing mechanism (the brain) is not working properly, so the inputs must be manipulated to achieve the desired ends.¹¹⁹

of policies the underlying behavioral insights might suggest.

Id. at 1610. Overall, they argue that a more complete understanding and use of behavioral science would go beyond “tinkering with choice architecture” in status quo programs, and “consider the overall federal policy scheme in retirement savings as a whole.” *Id.* at 1633. *But see* Raj Chetty et al., *Active vs. Passive Decisions and Crowd-Out in Retirement Savings Accounts: Evidence from Denmark*, 129 Q.J. ECON. 1141 (2014) (finding that automatic enrollment in retirement plans has a larger impact on retirement savings than tax incentives).

116. Herbert A. Simon, *Rational Decision Making in Business Organizations*, 69 AM. ECON. REV. 493, 495 (1979); *see also* Herbert A. Simon, *A Behavioral Model of Rational Choice*, 69 Q.J. ECON. 99, 99-100 (1955).

117. Richard H. Thaler & Cass R. Sunstein, *Libertarian Paternalism*, 93 AM. ECON. REV. 175, 179 (2003); *accord* RICHARD H. THALER & CASS R. SUNSTEIN, *NUDGE: IMPROVING DECISIONS ABOUT HEALTH, WEALTH, AND HAPPINESS* 73-75 (2008).

118. Paul Solman, *Thaler Responds to Posner on Consumer Protection*, PBS NEWSHOUR (July 28, 2009), <https://www.pbs.org/newshour/economy/thaler-responds-to-posner-on-c> [<https://perma.cc/TUZ9-KUFT>].

119. Mark D. White, *Behavioral Law and Economics: The Assault on Consent, Will, and Dignity*, in *ESSAYS ON PHILOSOPHY, POLITICS AND ECONOMICS: INTEGRATION AND COMMON RESEARCH PROJECTS* 201, 205 (Christi Favor et al. eds., 2010).

That is, in the applied program of BLE, individuals' behavior is the object, target, or means. Working as a tool within the existing modern political economy, what BLE does not do (and has never done) is enable a critique of the state or that status quo political economy of individualism and market fundamentalism.¹²⁰ But designing implementation methods differs from establishing substantive policy goals. The normative content of libertarian paternalism's "nudges" program has come under critique notwithstanding its modest, incremental policy implementing goals.¹²¹

In contrast, the framework of collective cognitive capital seeks to promote legal rules, institution design, and substantive policy goals that further collective cognitive capacity itself—focused on the ends, rather than exclusively on the means. The object of analysis, and target of intervention, in collective cognitive capital is the policy, rule, or institutional design. The question is whether that object consumes more cognitive capital than necessary, or whether it promotes development and preservation of cognitive capital.

This is not to say that collective cognitive capital and BLE are mutually exclusive projects. Some of BLE's newer projects align nicely with a collective cognitive capital focus. Take, for example, the seemingly organic shift in BLE policy discourse (which we will call BLE 2.0) that has just recently begun to focus on "sludge" as the "evil cousin" of a "healthy nudge."¹²² "[S]ludge just mucks things up and makes wise decision-making and prosocial activity more difficult."¹²³ Sludge cleanup campaigns are aimed at government requirements, not individual behavior: the target of intervention is different. But while "sludge audits" operate narrowly within the status quo of existing systems and political economy, much as the "nudging" projects of BLE 1.0, collective cognitive capital is a more comprehensive framework for governance. It helps assess and value

120. See Mark Whitehead et al., *Neoliberalism: Cognition, Context, and the Geographical Bounding of Rationality*, 43 PROGRESS HUM. GEOGRAPHY 632 (2019).

121. Fabian & Pykett, *supra* note 96, at 171; see also Raj Chetty, *Behavioral Economics and Public Policy: A Pragmatic Perspective*, 105 AM. ECON. REV. 1 (2015).

122. See *Nudge's Evil Cousin: Sludge*, INSIGHTS HUB (May 2020), <https://www-2.rotman.utoronto.ca/insightshub/behavioural-economics-marketing/nudges-evil-cousin-sludge> [<https://perma.cc/B8RW-THRE>]; see also Richard Thaler, *Nudge, Not Sludge*, 361 SCIENCE 431 (2018); CASS R. SUNSTEIN, *SLUDGE: WHAT STOPS US FROM GETTING THINGS DONE AND WHAT TO DO ABOUT IT* (2021).

123. Thaler, *supra* note 122, at 431.

positive interventions (like public investment in education, nutrition, health and mental health care, and reduction of pollution) and evaluate all kinds of policies that do not come with direct bureaucratic burdens for individual citizens. Collective cognitive capital can account for the benefits of reducing “sludge”—probably the lowest hanging fruit for implementing the overall framework—while also offering a comprehensive normative goal with broader impact than affecting policy implementation methods: increasing collective cognitive capital is good.

C. Collective Cognitive Capital as an Analytic and Framing Tool, and Some Modest Examples

This Section begins to defend the concept of collective cognitive capital as a coherent rubric for thinking about law and policy in many different subject areas and offers a few examples of how it might operate. Conceptually, naming and framing collective cognitive capital can focus attention (of the public, policymakers, and, importantly, brain and behavioral science research) on policy making focused on citizen-state interaction and regulation of private entities. From a process point of view, it can function as an analytical framework for making choices amongst different legislative, regulatory, and policy options. Critically, the political framing of effective policies and interventions can have an important impact on public acceptance.

The framework of collective cognitive capital would be applied as an analytical method to evaluate the impact of law or policy. The questions would be: Does this law or policy, on its face or in practice, increase or decrease the cognitive capital of the group(s) to whom it is applied or will most directly affect? Is there another way to achieve similar ends that less negatively impacts cognitive capital? As described in the examples below, the framework helps guide what are ultimately political decisions about what counts as costs and benefits. It does not use the maximization/satisfaction of substantive preferences—those of experts or those purportedly of the populace—as a definition of well-being.¹²⁴ Collective cognitive

124. See MATTHEW D. ADLER, MEASURING SOCIAL WELFARE: AN INTRODUCTION 7, 10-13 (2019) (defining well-being as preference satisfaction); Fabian & Pykett, *supra* note 96, at 170.

capital does not rely on an unknowable end-state such as a “true preference.”

So how does a collective cognitive capital analysis compare to existing policy decision tools or social welfare functions? Perhaps the most familiar to public law scholars is cost-benefit analysis, widely discussed and deployed (albeit with uncertain consequences) at the federal policy level since the Reagan administration.¹²⁵ Whether cost-benefit analysis was the “only appropriate response [as a] market-mediated technocracy” concerned about “interest-group capture” in the regulatory state,¹²⁶ or permits post-hoc rationalization of politically driven policy outcomes, or is merely the prevailing fashion in policy-analysis theater, it has indisputably been the subject of much academic critique and many calls for alternatives.¹²⁷

In response, other social welfare functions have proliferated.¹²⁸ One such “well-being analysis” proposes operationalizing findings from hedonic psychology (specifically, life satisfaction surveys and experience sampling methods) to more directly account for how people experience life.¹²⁹ Yet assessment of private and public costs

But see Joram Nanne Pieter Feitsma, *The Behavioural State: Critical Observations on Technocracy and Psychocracy*, 51 POL’Y SCIS. 387, 404-05 (2018).

125. Exec. Order No. 12,291, 3 C.F.R. § 127 (1982), *reprinted in* 5 U.S.C. § 601 (1982), *revoked by* Exec. Order No. 12,866, 3 C.F.R. § 638. As reaffirmed by every president since Reagan, including Clinton (Exec. Order No. 12,866, 3 C.F.R. § 638), Obama (Exec. Order No. 13,563, 3 C.F.R. § 215 (2012)), and Trump (Exec. Order No. 13,777, 82 Fed. Reg. 12,285 (2017)). *See also* Michael A. Livermore & Richard L. Revesz, *Retaking Rationality Two Years Later*, 48 HOUS. L. REV. 1, 13-16 (2011) (recounting the entrenchment of cost-benefit analysis through subsequent administrations).

126. Britton-Purdy et al., *supra* note 7, at 182 n.102 (noting that Cass Sunstein “defend[ed] cost-benefit analysis ‘as a way of diminishing interest-group pressures on regulation.’” (quoting Cass R. Sunstein, *The Cost-Benefit State* 4 (Coase-Sandor Inst. for L. & Econ., Working Paper No. 39, 1996)).

127. *See, e.g.*, Alexander Volokh, *Rationality or Rationalism? The Positive and Normative Flaws of Cost-Benefit Analysis*, 48 HOUS. L. REV. 79, 82 (2011); Robert H. Frank, *Why Is Cost-Benefit Analysis So Controversial?*, 29 J. LEGAL STUD. 913, 913-14 (2000); Thomas O. McGarity, *A Cost-Benefit State*, 50 ADMIN. L. REV. 7, 18 (1998); Duncan Kennedy, *Cost-Benefit Analysis of Entitlement Problems: A Critique*, 33 STAN. L. REV. 387, 388 (1981); MATTHEW D. ADLER & ERIC A. POSNER, *NEW FOUNDATIONS OF COST-BENEFIT ANALYSIS* 154-58 (2006).

128. Matthew Adler defines social welfare functions as having three components: a measure of individual well-being, a rule for aggregating individuals’ well-being, and an uncertainty module for dealing with the inevitable uncertainty about outcomes. *See* ADLER, *supra* note 124, at 10.

129. John Bronsteen et al., *Well-Being Analysis vs. Cost-Benefit Analysis*, 62 DUKE L.J.

and benefits, and measures of subjective well-being, are still controversial.¹³⁰ Even implementation of findings from behavioral economics about where decisionmakers deviate from rational choice behavior ideally requires estimation of the social costs of such errors and social benefits gained by reducing the error.¹³¹

Cognitive capital offers a measure of “well-being” that focuses on means—brain function—not a measure of ends, such as “happiness,” that are to be maximized.¹³² So can it be a social welfare function? Perhaps with further development, but challenges are ahead. According to Matthew Adler, social welfare functions also require a “rule for aggregation” and an “uncertainty module.”¹³³ For collective cognitive capital, it may be hard to determine a clear “rule” for aggregation, given that the boundaries of affected stakeholder groups are dynamic and perhaps inherently fuzzy. The “uncertainty module”—to account for uncertainty about outcomes of various predictions—might come from refinement of the input measures, based on observed outcomes of policy experimentation, though further work is necessary.

Nevertheless, some governments are making moves that look a lot like cognitive capital frameworks already. In the early 2000s, the UK government commissioned a report from the Foresight Mental Capital and Wellbeing Project, which was published in 2008.¹³⁴ In

1603, 1621-22 (2012).

130. See, e.g., NAT'L RSCH. COUNCIL, SUBJECTIVE WELL-BEING: MEASURING HAPPINESS, SUFFERING, AND OTHER DIMENSIONS OF EXPERIENCE (Arthur A. Stone & Christopher Mackie eds., 2013).

131. Wright & Ginsburg, *supra* note 97, at 1040. Wright and Ginsburg argue that we have moved from the “is” of empirical findings of heuristics and biases straight into the “ought” of policy to “correct” such errors, while lacking a coherent theory of and way to account for social costs and benefits of those interventions.

132. See WILLIAM DAVIES, THE HAPPINESS INDUSTRY: HOW THE GOVERNMENT AND BIG BUSINESS SOLD US WELL-BEING 181-86 (2015).

133. See ADLER, *supra* note 124, at 140, 144.

134. GOV'T OFF. FOR SCI., MENTAL CAPITAL AND WELLBEING: MAKING THE MOST OF OURSELVES IN THE 21ST CENTURY (2008). Mental capital

encompasses a person's cognitive and emotional resources. It includes their cognitive ability, how flexible and efficient they are at learning, and their “emotional intelligence”, such as their social skills and resilience in the face of stress. It therefore conditions how well an individual is able to contribute effectively to society, and also to experience a high personal quality of life. The idea of “capital” naturally sparks association with ideas of financial capital and it is both challenging and natural to think of the mind in this way.

the Netherlands, the Scientific Council for Government Policy has “advis[ed] the Dutch government to take a realistic approach on people’s mental capacities when designing rules and institutions.”¹³⁵ The Dutch report labels the necessary capacity “self-reliance” and “mental resilience,” but it is qualitatively and conceptually similar to cognitive capital.¹³⁶ In response to the research and synthesis of a major report on why there are gaps between government policies, information about them, and people’s ability to respond, the Dutch government now subjects new policies to a “capacity to act test.”¹³⁷ The test asks the key question: “Is the legislation based on realistic assumptions about people’s mental resilience?” It poses a series of process questions (about preliminary testing of proposed legislation, inclusion of target groups, and consultation of research or similar legislation) and content questions (about imposed mental burdens, cumulative burdens, consequences of someone failing to take action or making a mistake, and how someone can obtain help) designed to assess the quality of proposed legislation.¹³⁸

Id. at 10. Mental well-being, on the other hand, “is a dynamic state” that refers to individuals’ ability to “develop their potential, work productively and creatively, build strong and positive relationships with others, and contribute to their community.” *Id.* It is not clear what has come of this significant project in terms of policy, governance, or academic discourse; it appears to be cited under forty times, though a related short article in *Nature* has been cited more than 280 times. See John Beddington et al., *The Mental Wealth of Nations*, 455 NATURE 1057 (2008).

135. Anne-Greet Keizer et al., *Why Knowing What to Do Is Not Enough: A Realistic Perspective on Self-Reliance*, NETH. SCI. COUNCIL FOR GOV’T POL’Y (2019), <https://english.wrr.nl/publications/reports/2019/10/14/why-knowing-what-to-do-is-not-enough> [<https://perma.cc/5LN7-AKKA>].

136. *Id.*

There is a difference between what people are expected to do and what they are actually capable of. It is not just a small group of “vulnerable” individuals—for example those with a low IQ—who have trouble living up to such expectations. Even people with a good education and a favourable position in society can end up feeling overwhelmed, certainly when they are going through a difficult patch. That is not because they are not intelligent or knowledgeable enough, but because demands are being made on all sorts of other mental capacities, such as the capacity to take action, to remain calm, and to stick to their resolutions.

Id.

137. *Id.*

138. Anne-Greet Keizer et al., *The Capacity to Act Test: Make the Public’s Perspective Part of Implementation Tests*, NETH. SCI. COUNCIL FOR GOV’T POL’Y (2019), <https://english.wrr.nl/publications/reports/2019/10/14/why-knowing-what-to-do-is-not-enough> [<https://perma.cc/GB8N-VLS9>].

To help make this more concrete, let's consider a few examples of how collective cognitive capital might function as an analytic tool or framework for approaching some current social problems.

Example 1: Administrative Burdens and “Sludge” as Wasting Collective Cognitive Capital

Collective cognitive capital's initial application in the United States may merge well with a growing attention to the state's imposition of cognitive load on citizens when interacting with the government. Imposition of cognitive load is very significant for citizen-state interactions. Such burdens/costs have been called, variously: bureaucratic disenfranchisement,¹³⁹ “structured rationing,”¹⁴⁰ “administrative burdens,”¹⁴¹ “sludge,”¹⁴² and “time taxes.”¹⁴³ What they all are is involuntary consumption of cognitive capital by the state and regulated entities such as healthcare (though rampant in corporations, too). Notwithstanding the Paperwork Reduction Act,¹⁴⁴ which applies only to the federal government and is considered to be a failure,¹⁴⁵ much of today's “administrative work of the state” is pushed onto individual citizens.¹⁴⁶

To some degree, “admin” (as characterized by Elizabeth Emens) is simply a part of adult life, consuming “mental energy ... drain[ing] our mental resources not only when we focus squarely on it, but at

139. See Murphy, *supra* note 4.

140. See, e.g., Else Oyen, *Structural Rationing of Social Service Benefits in a Welfare State*, in *WELFARE OR BUREAUCRACY? PROBLEMS OF MATCHING SOCIAL SERVICE TO CLIENTS' NEEDS* 45, 53-54 (Dieter Grunow & Friedhart Hegner eds. 1980).

141. See PAMELA HERD & DONALD P. MOYNIHAN, *ADMINISTRATIVE BURDEN: POLICYMAKING BY OTHER MEANS* (2018).

142. See *supra* text accompanying notes 122-23.

143. Annie Lowrey, *The Time Tax: Why Is So Much American Bureaucracy Left to Average Citizens?*, *THE ATLANTIC* (July 27, 2021), <https://www.theatlantic.com/politics/archive/2021/07/how-government-learned-waste-your-time-tax/619568/> [<https://perma.cc/59B3-7N78>].

144. 44 U.S.C. §§ 3501-21. Regulations implementing the Act are found at 5 C.F.R. §§ 1320.1-18 (2010). Elizabeth Emens, in writing about “admin,” “wonder[s] whether, in effect, the statute merely prompts entities to *disclose* how much of a burden they create—without really leading entities to reduce admin to its ‘least burdensome’ form—given that paperwork burden hours have continued to increase in recent years.” Elizabeth F. Emens, *Admin*, 103 *GEO. L.J.* 1409, 1464 (2015).

145. Adam M. Samaha, *Death and Paperwork Reduction*, 65 *DUKE L.J.* 279 (2015).

146. Lowrey, *supra* note 143.

other times as well.”¹⁴⁷ But much interaction with the government (and regulated entities, like health care systems and utilities) involves massive collective expenditure of cognitive capital that no one would *choose* to do and which could be enjoyed elsewhere. Such burdens are generally inequitable, regressive, and with racialized consequences that reproduce and perpetuate inequality.¹⁴⁸ State consumption of cognitive capital is worse for people with disabilities¹⁴⁹ and people who are poor and attempting to access public support or who lack the means to purchase cognitive capital in the labor market—in the form of accountants, attorneys, financial advisors, and the like.

Indeed, cognitive loading can be both a cause and direct consequence of citizen-state interactions. This is identified by some researchers as a “catch-22”: “common life factors (scarcity, health problems, and age-related cognitive decline) both increase people’s likelihood of needing state assistance *and undermine their cognitive resources*.”¹⁵⁰

For example, take up of the Earned Income Tax Credit (which is only claimed by about 80 percent of eligible taxpayers each year¹⁵¹) is lower among those with lower incomes (compared to those still eligible, but with higher incomes). The data suggest that inability to overcome the cognitive costs needed to learn about the program and take advantage of it is part of the reason.¹⁵² A follow-up experiment targeting potentially eligible non-filers with information

147. Emens, *supra* note 144, at 1448.

148. Victor Ray et al., *Racialized Burdens: Applying Racialized Organization Theory to the Administrative State*, J. PUB. ADMIN. RSCH. & THEORY (2022) (accepted manuscript available at <https://doi.org/10.1093/jopart/muac001>); Lowrey, *supra* note 143; *see also* Sara S. Greene, *Stealing (Identity) From the Poor*, 106 MINN. L. REV. 59, 65 (2021) (identifying “plutocratic” remedies for identity theft that disproportionately harm low-income and minority victims, and arguing that plutocracy also operates in occupational licensing and bail. Navigating each of these domains consumes cognitive capital as well as time.).

149. Michael Anne Kyle & Austin B. Frakt, *Patient Administrative Burden in the US Health Care System*, 56 HEALTH SERVS. RSCH. 755 (2021); Elizabeth F. Emens, *Disability Admin: The Invisible Costs of Being Disabled*, 105 MINN. L. REV. 2329 (2021).

150. Christensen et al., *supra* note 82, at 128 (emphasis added).

151. *Briefing Book*, TAX POL’Y CTR., <https://www.taxpolicycenter.org/briefing-book/do-all-people-eligible-eitc-participate> [<https://perma.cc/4UNY-WWEE>].

152. Saurabh Bhargava & Dayanand Manoli, *Psychological Frictions and the Incomplete Take-Up of Social Benefits: Evidence from an IRS Field Experiment*, 105 AM. ECON. REV. 3489, 3489-90 (2015).

about their potential eligibility did not result in increased take-up of the benefit, suggesting that mere “information costs”—only part of “bandwidth taxes,” which also include the abilities to understand the process, make a plan, obtain the required documentation, and follow through—are not the significant driver of failure to take up the benefit.¹⁵³ As another example, Temporary Aid for Needy Families recipients with lower levels of education are more likely to lose benefits for failure to meet compliance requirements.¹⁵⁴ Cognitive resources to keep track of such requirements and make a plan to meet them could aid in meeting that burden—but collective cognitive capital also frames an argument that the burdens themselves should be eliminated to consume less cognitive capital.

The collective cognitive capital framework can account for the psychological costs and burdens of the eligibility requirements of such programs. It can break the “catch-22” by indicating the need to reduce the burden, facilitating access to the benefit, and thus improving the collective cognitive capital because receiving the benefits reduces immediate scarcity and improves available cognitive bandwidth.¹⁵⁵ This is largely consistent with the BLE 2.0 suggestion that “Sludge Audits”¹⁵⁶ be conducted with a particular focus on populations with lower executive functioning (such as the sick, poor, and elderly).¹⁵⁷ Interventions such as the EAST (easy, attractive, social, and timely) framework¹⁵⁸ that affect the design of policy implementation may be useful precisely because they focus on reducing cognitive burdens and increasing bandwidth, likely resulting in a net increase in cognitive capital. In contrast, the dominant BLE 1.0 policy approach in the area of consumer credit is more or better disclosure of the terms of consumer credit agreements.¹⁵⁹ Collective

153. ELIZABETH LINOS ET AL., CAL. POL’Y LAB, INCREASING TAKE-UP OF THE EARNED INCOME TAX CREDIT 23 (2020), <https://www.capolicylab.org/wp-content/uploads/2020/03/Increasing-TakeUp-of-the-Earned-Income-Tax-Credit.pdf> [https://perma.cc/98A4-H98C].

154. Evelyn Z. Brodtkin & Malay Majmudar, *Administrative Exclusion: Organizations and the Hidden Costs of Welfare Claiming*, 20 J. PUB. ADMIN. RSCH. & THEORY 827, 832 (2010).

155. For a review of the literature on scarcity and cognitive function, see Murphy, *supra* note 4.

156. See, e.g., Cass R. Sunstein, *Sludge and Ordeals*, 68 DUKE L.J. 1843 (2019).

157. Christensen et al., *supra* note 82, at 133.

158. DAVID HALPERN, INSIDE THE NUDGE UNIT: HOW SMALL CHANGES CAN MAKE A BIG DIFFERENCE 60-61 (2015).

159. Bubb & Pildes, *supra* note 92, at 1644.

cognitive capital might predict that this intervention would not be effective (and it is not),¹⁶⁰ because providing ever more information about financial products assumes that the recipient has enough cognitive bandwidth available to process that information.¹⁶¹ Collective cognitive capital is a more comprehensive, and more accurate, way than BLE 1.0 to evaluate the impact of policy changes on people affected by those policies.

Example 2: “Welfare” Reframed as Investment in Collective Cognitive Capital

Related to the process of removing administrative burdens are underlying substantive policies of a social safety net. Consider a state or municipality contemplating a universal basic income or negative income tax as a measure to combat poverty. Standard economic cost-benefit analysis might consider costs to taxpayer-funded budgets and potential externalized costs to society of individuals choosing not to work in low-wage, tedious jobs, with resulting impacts on wages and prices in the service sector economy. Economic benefits might be calculated as costs saved in provision of in-kind social services, reduced need for emergency healthcare, and greater consumption behavior in the local economy. A well-being analysis would assess those benefits into terms of hedonics without the crude conversion of incommensurable subjective experience of lived lives with the extra funds to dollar values.¹⁶² But a cognitive capital analysis would be even more holistic. It could account for the cognitive bandwidth freed up for recipients of the money and the consequent activities of self-determination that would follow, including better and increased caregiving, investment in social relationships, and pursuit of education and training and meaningful, well-compensated work. Indeed, these outcomes are what is described both quantitatively and qualitatively in preliminary

160. Enrique Seira et al., *Are Information Disclosures Effective? Evidence from the Credit Card Market*, 9 AM. ECON. J.: ECON. POL'Y 277 (2017) (reporting a randomized controlled trial finding no or only very modest effects of Truth In Lending Act-type disclosures to indebted consumers).

161. See generally Oren Bar-Gill & Omri Ben-Shahar, *Rethinking Nudge: An Information-Costs Theory of Default Rules*, 88 U. CHI. L. REV. 531 (2021).

162. Bronsteen et al., *supra* note 129.

reporting from a universal basic income experiment in Stockton, California, that gave an unconditional \$500 per month to a subset of residents.¹⁶³ It is well documented that people do better across multiple domains when they have more resources and fewer cognitive burdens.¹⁶⁴ The costs to collective cognitive capital would be assessed by considering how alternate deployment of the public funds would impact the collective cognitive capital of the counterfactual group to whom expected benefits would accrue.

Example 3: Access to Fundamental Rights Without Paying a Price in Collective Cognitive Capital

Consider as another example a law seeking to restrict voting access by creating additional requirements to prove identity and eligibility to vote. Such burdens are well documented to have a disparate impact on marginalized communities such as racial minorities, the poor, and persons with disabilities.¹⁶⁵ Yet the political rhetoric in states enacting such laws is that their costs are trivial—that the restrictions are necessary for election integrity and that people who really want to, and really are eligible, can figure out when, where, and how to vote, as well as how to obtain the requisite documentation. If those justifications are taken seriously, inherent in them are assumptions that information about a policy is all that need be provided to a citizenry in order to achieve their goals, such as casting a ballot.¹⁶⁶ But such an analysis of the costs completely

163. STACIA WEST ET AL., STOCKTON ECON. EMPOWERMENT DEMONSTRATION, PRELIMINARY ANALYSIS: SEED'S FIRST YEAR (2020), <https://www.stocktondemonstration.org/#summary-of-key-findings> [<https://perma.cc/4QFR-WJKA>].

164. Mesmin Destin & Ryan C. Svoboda, *Costs on the Mind: The Influence of the Financial Burden of College on Academic Performance and Cognitive Functioning*, 59 RSCH. HIGHER EDUC. 302 (2018); see Eyal Carmel & David Leiser, *From Perceived Control to Self-Control, the Importance of Cognitive and Emotional Resources*, 40 BEHAV. & BRAIN SCIS. 22, 22 (2017); Jirs Meuris & Carrie Leana, *The Price of Financial Precarity: Organizational Costs of Employees' Financial Concerns*, 29 ORG. SCI. 1, 3 (2017).

165. See, e.g., Rabia Belt, *Contemporary Voting Rights Controversies Through the Lens of Disability*, 68 STAN. L. REV. 1491, 1493-94 (2016); Rachael V. Cobb et al., *Can Voter ID Laws Be Administered in a Race-Neutral Manner? Evidence from the City of Boston in 2008*, 7 Q.J. POL. SCI. 1, 3 (2012). But see Mark Hoekstra & Vijetha Koppa, *Strict Voter Identification Laws, Turnout, and Election Outcomes* 3-4 (Nat'l Bureau of Econ. Rsch., Working Paper No. 26206, 2019).

166. Keizer et al., *supra* note 135.

ignores the cognitive burdens such restrictions impose on marginalized voter groups. When polls are more restricted in opening times, people must expend more cognitive bandwidth to figure out when they would be able to vote—if their schedule permits it at all. When mail-in voting requires special justification and application by a given deadline, this imposes cognitive taxes on already marginalized voters who must incur learning costs, administrative costs, and bandwidth costs in order to successfully learn about, anticipate, and execute the necessary forms and correspondence. These actions spend cognitive capital, and serve only to diminish the collective cognitive capital of marginalized voting groups. Governments should have a really good justification for compelling the populace to spend cognitive capital, especially when people must do so to exercise fundamental rights.

Example 4: Environmental Insults Can Directly and Indirectly Damage Collective Cognitive Capital

Consider a situation of lead-tainted water in a municipality. The costs of that policy and infrastructure failure can and should be measured in terms of the costs to the collective cognitive capital of the persons—especially children—who are vulnerable to irreversible brain damage from lead.¹⁶⁷ The collective cognitive capital framework does not require conversion of these harms into economic terms to be valued, though it is now widely recognized that removal of environmental lead has had salutary effects on society, measured primarily in terms of economic indicators.¹⁶⁸ Moreover, a remedial measure of providing bottled water has costs to the cognitive capital of affected groups, too, in the form of additional “life admin”¹⁶⁹ of the additional mental chores of tracking water needs and reserves, coordinating water pickups, disposing of bottles, and separating water for drinking from other uses. This is not to say that the collective cognitive capital costs of providing bottled water outweigh those of the effects of lead on brain and cognitive development, but

167. See Sanders et al., *supra* note 25, at 285.

168. Peter L. Tsai & Thomas H. Hatfield, *Global Benefits From the Phaseout of Leaded Fuel*, 74 J. ENV'T HEALTH 8 (2011).

169. See, e.g., Emens, *supra* note 144, at 1448.

instead to demonstrate that the costs of providing an alternative bottled water source while water infrastructure is repaired are not simply those of the water itself or the logistics of distribution. Collective cognitive capital costs are also incurred by families needing to monitor and obtain water when the taps are not safe; these are unaccounted for in a typical cost-benefit analysis.

As mentioned above, environmental insults such as air pollution and climate change are being shown to have direct effects on brain function and mental health.¹⁷⁰ They are also areas of law and policy in which behavioral economics and BLE offer nibbles around the edges (such as research into changing consumer behavior about energy use and decisions to purchase goods with less environmental impact), but has nothing to say about structural policies like developing alternative energy sources. It is unreasonable to expect an individual agent to make “better” decisions, otherwise hindered by their cognitive biases of misfearing, miscalculation of risk, or shortsightedness, to choose to avoid ambient air pollution.¹⁷¹ First, they may not have good information that it is happening or affecting them because of policy decisions beyond their individual control.¹⁷² But also, they may not have a real choice to move to a different location. And even if one individual does, the collective population in an affected area simply does not. This illustrates how the focus of BLE on shaping the decisions of individuals limits its scope in policy analysis.

As with the example of lead, these harms need not be fully translated into economic terms to assess the effects of policies designed to reduce pollution or greenhouse gas emissions. Also in the ledger of collective cognitive capital may be the cognitive burdens imposed on people in businesses who must implement regulations restructuring operations. Air pollution and climate change may have meaningful but less dramatic effects than lead exposure, and

170. See *supra* notes 10-12 and accompanying text.

171. See, e.g., Elke U. Weber, *Doing the Right Thing Willingly: Using the Insights of Behavioral Decision Research for Better Environmental Decisions*, in *THE BEHAVIORAL FOUNDATIONS OF PUBLIC POLICY* 380, 382-84 (Eldar Shafir ed., 2013).

172. Rachel Leven, *Most of the EPA's Pollution Estimates Are Unreliable. So Why Is Everyone Still Using Them?*, *CTR. FOR PUB. INTEGRITY* (Jan. 29, 2018), <https://publicintegrity.org/environment/most-of-the-epas-pollution-estimates-are-unreliable-so-why-is-everyone-still-using-them/> [https://perma.cc/E3DH-VE7G].

certainly the strength of the causal relationship is more complicated to figure out.¹⁷³ And, indeed, economists make efforts at placing dollar values on things like the IQ-lead blood level relationship and the economic impact of regulations phasing out leaded gasoline.¹⁷⁴ Converting brain health and functioning to dollar values—especially in an increasingly knowledge-based economy—is extremely challenging as well as demoralizing. The framework of collective cognitive capital provides an alternative and deeply humane way of understanding the toll of environmental insults on the human experience.

* * *

None of these examples are meant to argue that brain and behavioral science imply that a completely stress-free environment optimizes cognitive capital, and that law and policy should strive towards a sanguine, stressless utopia where all life needs are provided for. Indeed, some research into resilience comes from the perspective that adversity can enhance some components of learning, memory, problem-solving, and decision-making strategies in a way that is adaptive in unpredictable environments.¹⁷⁵ Moreover, significant evidence has accumulated supporting the notion that meaningful work—which will involve some degree of stress—and goal achievement are key components of life satisfaction and overall well-being.¹⁷⁶

But larger structural policy choices mean that, collectively, Americans spend a lot of cognitive capital on things like choosing a health insurance plan or planning their retirement savings. These are difficult, complex decisions, and the BLE literature has had a fair amount to say about how such choice environments can be architected to help people make “better” choices. But BLE does not

173. Aaron Reuben et al., *Association of Childhood Blood Lead Levels with Cognitive Function and Socioeconomic Status at Age 38 Years and with IQ Change and Socioeconomic Mobility Between Childhood and Adulthood*, 317 JAMA 1244, 1244-51 (2017).

174. Tsai & Hatfield, *supra* note 168, at 9.

175. See, e.g., Bruce J. Ellis et al., *Beyond Risk and Protective Factors: An Adaptation-Based Approach to Resilience*, 12 PERSPS. ON PSYCH. SCI. 561, 576-77 (2017).

176. Blake A. Allan et al., *Outcomes of Meaningful Work: A Meta-Analysis*, 56 J. MGMT. STUD. 500, 514 (2019).

provide a framework to question why those choices have to be made in the first place, and whether the public generally would be better off with certain necessities treated as public goods.¹⁷⁷ These are structural, political choices that collective cognitive capital offers a new framework to evaluate: How should we account for the expenditure of collective cognitive capital on deciding the “right” health plan? Collective cognitive capital gives us a way to question whether systems are truly working to support human flourishing. BLE generally accepts systems as they are and figures out ways to make individuals bear their burdens slightly more efficiently.

Collective cognitive capital as a governing ethos seeks not to make decisions for individuals, but to make decisions on behalf of the collective—as is the role of the government—in service of creating environments where cognitive capital grows and thus people are as capable as possible of exercising choice and individual autonomy. It is to the normative justification for this project that we turn next.

III. COLLECTIVE COGNITIVE CAPITAL SHOULD BE MAXIMIZED BY LAW AND POLICY

Having established what collective cognitive capital is as a descriptive project, we can turn now to the normative justification for developing and applying the framework to law and policy.

Here is the strongest normative claim in this Article: collective cognitive capital represents the sum of human capabilities and capacities that are foundational for self-determination and cooperative governance. They are an inherent good with incommensurable values. Put simply: it is good for human flourishing when our collective brains work well and together. So, we should try to do things

177. See, e.g., Peter Sterling & Michael L. Platt, *Why Deaths of Despair Are Increasing in the US and Not Other Industrial Nations—Insights From Neuroscience and Anthropology*, JAMA PSYCHIATRY (2022), <https://doi.org/10.1001/jamapsychiatry.2021.4209> [<https://perma.cc/WM4K-SU7R>] (arguing that the increase in mid-life mortality for U.S. adults, documented by the National Academy of Sciences report, NAT'L ACADS. OF SCIS., ENG'G & MEDICINE, HIGH AND RISING MORTALITY RATES AMONG WORKING-AGE ADULTS (Kathleen Mullan Harris et al. eds., 2021), might be improved to levels seen among sixteen other wealthy nations by providing public support across the life cycle for “basic human needs”).

that make collective brains work better, for longer, in the face of unavoidable challenges.

Collective cognitive capital is something that a democratic state should seek to maximize in its people when considering law and policy choices.¹⁷⁸ That is, collective cognitive capital both defines objects of value (cognitive capital) and creates a framework to determine how value is created or harmed by policies that affect objects of value, permitting judgments and choices about how to maximize collective cognitive capital.¹⁷⁹ What truly promotes autonomy, freedom, and human flourishing may require more egalitarian social investments.

As introduced in Part II, collective cognitive capital offers a different process but also a different substantive normative theory than the libertarian paternalism of BLE or “behavioral public policy.”¹⁸⁰ The differences exist both in the target of the analysis and the values to be maximized. As to the target of the analysis, collective cognitive capital is collectivist and focused on the effects of context and institutional/societal structure on capacities, rather than situating directional changes to individual behavior at the center of responsibility for public welfare. The substantive values to be maximized are also distinct. Whereas libertarian paternalism and “nudge theory”¹⁸¹ applies to policymakers seeking to influence individual behavior towards particular (paternalistic) ends, collective cognitive capital applies to evaluating and ultimately making political judgments about the quality of different options in law and policy because of anticipated impact on the collective cognitive capital of stakeholder groups.

That is, collective cognitive capital does not seek to “nudge” individuals towards particular “positive” or “beneficial” outcomes prioritized by the status quo of the capitalist political economy—such as default contributions to retirement savings invested in

178. This is not to claim that it is the only value. Physical health matters, as does the human dignity of every individual regardless of their own degree of cognitive capital. Money matters, not least because it can translate to collective cognitive capital. Legal and moral rights and other social values matter too. Future work can determine the rankings and trade-offs between these perhaps incommensurable goods.

179. Sen, *supra* note 6, at 32.

180. Fabian & Pykett, *supra* note 96, at 6-7.

181. See generally THALER & SUNSTEIN, *supra* note 117.

market products (in the absence of policies providing truly robust social safety nets for elders) or guiding a “better” choice of complex health care plans (in the absence of a single-payer system). It does not rely on the difficult and problematic assessments of subjective preferences, whether “rational” or “hidden but true” because of presumed behavioral biases. Moreover, adoption of collective cognitive capital as a governing ethos would not remove “important decisions” from people.¹⁸² It would minimize the decisions and cognitive burdens that no one wants to make, but that they cannot avoid, such as filing and paying taxes, dealing with the administrative burdens of interacting with government agencies, understanding why and how one is being billed for necessary healthcare, and jumping through all kinds of hoops to exercise the right to vote. It also impacts policy priorities that *cannot* be substantially impacted by individual decisions of the demos updating information about the consequences of their individual actions, such as environmental degradation, toxic pollution, and climate warming—even though these things affect the collective cognitive capital of the people.

Instead, the substantive normative goal of maximizing collective cognitive capital is a way to maximize the citizenry’s ability to learn, incorporate information, and decide for itself how to establish and best meet life goals. These are valuable attributes in themselves, but also perhaps necessary for ideals of democratic self-governance. Enhancing collective cognitive capital facilitates a citizenry’s conscious recognition of the reasons for its behavior, avoiding critiques that “nudges” can reinforce heuristics and ultimately undermine the “democratic ideal of acting in accordance with and in conscious recognition of reasons.”¹⁸³ A related critique of nudges is that they work “epistemic injustice” by bypassing deliberative cognition.¹⁸⁴

182. Some critics of the “paternalism” of BLE’s libertarian paternalism cite some (thin) evidence of those raised in a “paternalistic state, and hence relieved of the need to make many important decisions for themselves, to have less well-developed decisionmaking skills and to be more risk averse.” Wright & Ginsburg, *supra* note 97, at 1073-75 (discussing a smattering of evidence from characteristics associated with entrepreneurship and contrasting it to narratives from communist countries, as well as the conclusion from a study that those countries have “low levels of entrepreneurial human capital that have been engendered by decades of existence under a central planning system that tended to blunt individual incentives”).

183. Fabian & Pykett, *supra* note 96, at 172 (emphasis omitted).

184. See Evan Riley, *The Beneficent Nudge Program and Epistemic Injustice*, 20 *ETHICAL*

The consequence of enhancing collective cognitive capital is to favor the means of engagement and deliberation essential to the project of democratic governance, a society with pluralistic ideals,¹⁸⁵ and self-determination.

The necessity of collective cognitive capital to ideals of governance links to the emerging concept of cognitive liberty.¹⁸⁶ Nita Farahany argues that cognitive liberty is “[t]he right to self-determination over our brains and mental experiences ...[and] is so fundamental to all other freedoms we enjoy that we ought to incorporate strong legal norms that preserve rather than undermine it.”¹⁸⁷ She defines cognitive liberty as an individual interest, rather than a group property, which then “must be balanced against the societal costs it introduces.”¹⁸⁸ But these costs seem to be far outweighed by the benefits that argue for a normative stance of maximization of collective cognitive liberty: “Cognitive liberty secures authority to individuals over actions essential to their self-determination. Self-determination requires the autonomy to control one’s own destiny, the competence to do so, and relatedness or connection to others.”¹⁸⁹ Note that the “relatedness or connection to others” can be understood as part of the “collective” part of collective cognitive capital. Competence and relatedness are necessary but not completely sufficient means to the ends of self-determination.

The framework of collective cognitive capital also brings brain and behavioral science into the discourse of political power. While a full political theory treatment is beyond the scope of this brief introduction, as a placeholder we can recognize that when people are treated in ways that enhance their collective cognitive capital—safe and stable environments, good education—political power tends to flow to them. The absence of these things keeps people without political power; without meeting basic needs first, it is not possible

THEORY & MORAL PRAC. 597 (2017).

185. See generally Nathan Berg & Yuki Watanabe, *Conservation of Behavioral Diversity: On Nudging, Paternalism-Induced Monoculture, and the Social Value of Heterogeneous Beliefs and Behavior*, 19 MIND & SOC’Y 103 (2020).

186. Nita A. Farahany, *The Costs of Changing Our Minds*, 69 EMORY L.J. 75, 98 (2019).

187. *Id.* at 98-99.

188. *Id.* at 98.

189. *Id.* at 99 (footnotes omitted).

to participate in the polity.¹⁹⁰ (On the flip side, hiring attorneys or consultants or other professional service providers is essentially a way of buying cognitive capital, and thus political power.)

Collective cognitive capital aligns with an orientation of law and policy analysis towards structural concerns (given its collective nature) and can be thought of as a fundamental element of meeting an ideal of equality “animated by a commitment to self-rule and sensitive to the importance of social subordination along intersectional lines.”¹⁹¹ Collective cognitive capital can analyze (and perhaps model) how social subordination affects the cognitive capital of the subordinated group, namely how cognitive burdens perceived as reasonable by powerful decision makers are actually experienced by subordinated groups. They may then be understood and framed as undermining their ability to gain power and true equality. In this way, the collective cognitive capital may provide a method of making concrete what are perceived as dignitary—and non-compensable—harms.

Collective cognitive capital uses the language of capital (and thus markets) but does not evoke exactly the same ideal of neutrality and assumptions about prices revealing preferences. As described above, it is more neutral than the libertarian paternalism theory founded on behavioral economics that still prioritizes rationality and use of (purported) preferences for outcomes analysis.¹⁹² Unlike the primacy of the market and the “market’s neutrality with respect to any particular version to the social good,” collective cognitive capital provides a different assessment of a social good that should be maximized: that of cognitive capital.¹⁹³ Yet it is not a social good that requires coercion or any assessment of “true” or even revealed

190. See, e.g., JUDITH N. SHKLAR, *AMERICAN CITIZENSHIP: THE QUEST FOR INCLUSION* 1-3 (1991).

191. Britton-Purdy et al., *supra* note 7, at 1824.

192. See Nathan Berg & Gerd Gigerenzer, *As-If Behavioral Economics: Neoclassical Economics in Disguise?*, 18 *HIST. ECON. IDEAS* 133 (2010).

193. Britton-Purdy et al., *supra* note 7, at 1813-14. (“The affirmative idea that a market order secures an important form of the liberal value of neutrality interacts here with the negative idea that any political judgments about which social interests to secure or advance are likely to involve capture, entrenchment, and spurious claims to a (probably non-existent) ‘public interest,’ giving examples of what we earlier called market-fundamentalist and market-tragedy arguments.... [T]his version of neutrality conceals and enforces significant judgments about who gets what (distribution) and who gets to do what to whom (coercion).”).

preferences; instead it seeks to maximize a tool that itself enables the liberal values of self-determination and autonomy.¹⁹⁴ Again, egalitarian distributive choices may be the substantive policy means that maximize collective cognitive capital. But from enhanced collective cognitive capital flows surpluses that can apply to the difficult political tasks of self-governance, including choices about distributive justice.¹⁹⁵

Collective cognitive capital thus speaks in the existing policy discourse of neoliberal capitalism, but does so as a means towards shifting the values away from the purported neutrality of the market (or the challenges of assessing “true” preferences) towards the purported neutrality of the means of human flourishing—the capacity to think, feel, socially engage, pursue goals and pleasures, and determine the course of one’s life. If it is regarded as a form of welfarism, it is a version that prioritizes rather than degrades autonomy.¹⁹⁶

To some extent, cognitive capital already exists as an unstated concept in law.¹⁹⁷ The law recognizes that certain categories of persons who could be characterized as lacking sufficient cognitive capital are accorded less legal autonomy¹⁹⁸ and held to lower standards of accountability¹⁹⁹ (though marginal cases or conflicts about these decisions are necessarily adjudicated on an individualized basis). Public investment in cognitive capital already exists in the form of compulsory education. But as an aggregate property, it is

194. For the idea that “cognitive liberty” is necessary to self-determination, see Farahany, *supra* note 186, at 99.

195. At the risk of stating the obvious, while collective cognitive capital is a “big theory” it is not meant as a universal principle to the exclusion of other theories, particularly about distributive justice.

196. See, e.g., Gigerenzer, *supra* note 89; Fabian & Pykett, *supra* note 96, at 177-78.

197. See Farahany, *supra* note 186, at 98-101 (arguing that cognitive liberty as an unstated value in law helps make sense of disparate common law doctrines).

198. Here I refer to the concepts of legal competency and incapacity that cut across family law, contract law, conservatorships, guardianships, et cetera, in situation-specific ways. See, e.g., Charles P. Sabatino & Suzanna L. Basinger, *Competency: Reforming Our Legal Fictions*, 6 J. MENTAL HEALTH & AGING 119, 119-20 (2000) (suggesting that medical, social, and practical variables must be weighed in guardianship cases); Jessica Wilen Berg et al., *Constructing Competence: Formulating Standards of Legal Competence to Make Medical Decisions*, 48 RUTGERS L. REV. 345, 346-47, 352 n.22 (1996) (discussing how competence in the medical context is “designed to promote patients’ autonomous decisionmaking”).

199. The doctrines of infancy, incapacity, and insanity are the primary examples here. See Sabatino & Basinger, *supra* note 198, at 119.

something that law, policy, and procedure should explicitly seek to maximize, regardless of the *a priori* level of cognitive capital found in any given group encountering a particular legal or policy scheme.

Of perhaps greatest interest to neuro- and behavioral science research communities, collective cognitive capital answers the call for an interdisciplinary attempt to establish workable normative principles to apply behavioral science to public policy and facilitate “a smoother translation of psychological science from research communities to government.”²⁰⁰ It should also create research opportunities and priorities. Collective cognitive capital as a theory generates hypotheses about factors or elements of policy (and policy implementation) that decrease or increase cognitive capital.²⁰¹ While there are many candidates for circumstances or factors that decrease cognitive capital that the law already affirmatively prohibits (for example, neglect or maltreatment), there are many that may be beyond the reach of a law of negative rights to enforce, though could potentially be addressed with social programs, educational policy, or enhanced welfare entitlements.

Further work on the legal and normative implications of cognitive capital should be directed at a number of questions concerning the relationship of the state to the collective: Does the laissez-faire, capitalist state have an obligation not to enact laws or regulations that spend, deplete, or diminish cognitive capital? Does the state’s failure to remediate structural elements that diminish cognitive capital for a given group (such as the poor) give grounds for an equal protection claim? Do due process and procedural justice support and enhance cognitive capital in theory, or is accessibility to justice so challenging in practice that it diminishes the cognitive capital of the

200. Fabian & Pykett, *supra* note 96.

201. For example, I hypothesize that shame has a strong negative influence on cognitive capital. See, e.g., Crystal C. Hall et al., *Self-Affirmation Among the Poor: Cognitive and Behavioral Implications*, 25 PSYCH. SCI. 619, 619-20 (2014) (reporting findings that, among low-income individuals at a soup kitchen, individuals who underwent an oral self-affirmation procedure exhibited better executive control, higher fluid intelligence, and a greater motivation and willingness to enroll in benefits programs than non-affirmed participants). If this is true, then laws and policies that create or perpetuate shame should be modified so as not to inflict the harm on cognitive capital. Law’s attempts to eliminate social interactions or institutional factors that systematically create and perpetuate shame—such as antidiscrimination laws—should be enacted, robustly enforced, and perpetually evaluated for their effectiveness in shame reduction and cognitive capital promotion.

unrepresented or underrepresented (who cannot afford to buy the cognitive capital of highly trained counsel)?

This Part has asserted that collective cognitive capital is an inherent good that should be maximized by law and policy. It argued that we should leverage the best available understanding of human behavior in the service of building government and institutional structures that maximize human flourishing and thus freedom. Collective cognitive capital calls for behavioral and brain sciences to move from a basic research program to an applied one, assessing behavioral capacities and brain health in response to hypothesis-driven policy interventions.

IV. LIMITATIONS, CAVEATS, AND RISKS

This Article introduces the concept of collective cognitive capital as a descriptive metric and normative theory of policy making. This idea, and the call that it be the future of law and neuroscience (bringing the subfield in closer alignment with the applied project of behavioral economics and law²⁰²), is a rough sketch and is thus full of potential limitations, caveats, and risks. This Part will lay out some of the most obvious; other critiques are invited in order to refine and operationalize collective cognitive capital. Let us take each of these broad categories in turn: (1) limitations of the descriptive project, (2) caveats about its scope, and (3) outstanding risks.

A. Limitations

Perhaps the biggest limitation to building the concept of collective cognitive capital is the complexity and robustness of the data required to flesh out each of its components. The first is in defining and measuring what will count as collective cognitive capital. They are multidisciplinary areas of study that range from genetics to cellular and molecular level work on the psychopharmacology of inhibitory control to the wide range of empirical methods in the social sciences. And “legitimate” methodological approaches are

202. See Grüne-Yanoff, *supra* note 17, at 467-69.

rightfully under scrutiny in the behavioral sciences, as they have prioritized certain ways of knowing and defined dominant groups as normative.²⁰³ Psychology and social science research (and the application of those fields to law and policy) is, at present, contemplating the consequences and challenges of the “replication crisis.”²⁰⁴ Moreover, there are major gaps in how data is collected, with documented over-representation of WEIRD (Western, educated, industrialized, rich, and democratic) subjects in behavioral science.²⁰⁵ This is also the reason this Article says nothing about race or how policy assessment under the rubric of collective cognitive capital would intersect with disparate impact analysis: we presently lack race-conscious brain and behavioral science.²⁰⁶ Even when focused on the United States, specific identity groups of interest in creating just law and policy—such as racial and ethnic minorities and other protected classes—are generally not parameters for collection of social and behavioral neuroscience data.²⁰⁷

However, these limitations about the scope of data are research opportunities if law and policy aims towards the analytical framework of collective cognitive capital. Changing methods in behavioral science, including preregistration of methods and open data sets, augur a future of greater confidence in research findings. But it is also true that when such research takes place in a greater socio-political context, and that context changes, perfect replication

203. See Neil A. Lewis, Jr., *What Counts as Good Science? How the Battle for Methodological Legitimacy Affects Public Psychology*, 76 AM. PSYCH. 1323 (2021).

204. See Colin F. Camerer et al., *Evaluating the Replicability of Social Science Experiments in Nature and Science Between 2010 and 2015*, 2 NATURE HUM. BEHAV. 637, 637-39 (2018) (replicating “13 out of 21 findings from experimental social and behavioural science studies published in *Science* or *Nature* between 2010 and 2015 based on the statistical significance criterion”); see also Krin Irvine et al., *Law and Psychology Grows Up, Goes Online, and Replicates*, 15 J. EMPIRICAL LEGAL STUD. 320, 321-23, 345-48 (2018).

205. Mostafa Salari Rad et al., *Toward a Psychology of Homo Sapiens: Making Psychological Science More Representative of the Human Population*, 115 PROC. NAT’L ACAD. SCI. 11401, 11402 (2018).

206. Oliver Rollins, *Towards an Antiracist (Neuro)Science*, 5 NATURE HUM. BEHAV. 540 (2021) (“This science is ill-equipped to capture the effects of race; thus, researchers risk reproducing scientific racism through the omission of racial experiences that do not fit or are too tricky to understand, in neurobiological calculations.”).

207. Lewis, *supra* note 203; see also Jessica D. Remedios, *Psychology Must Grapple with Whiteness*, NATURE REVS. PSYCH. 1-2 (2022).

should not be expected as the external conditions are not precisely the same.²⁰⁸

The second area in which both data and theoretical understanding needs to be more robust is in identifying causal relationships between collective cognitive capital outcomes and policy choices. Randomized controlled trials, often heralded as the gold standard of evidence in making causal inferences, are simply not always possible. Behavioral and social sciences must often rely on correlation analysis and careful observation, which can lead to weaknesses in determining effectiveness of interventions, particularly at the macro or systems level and when investigating hard-to-define dependent variables such as subjective well-being.²⁰⁹ Calls for psychology and behavioral science to become more comfortable with nonexperimental methods for establishing causation have a significant place in building the data sets that would make up the collective cognitive capital model.²¹⁰ Other ways of assessing the breadth and complexity of the human experience must also be considered.²¹¹

B. Caveats

Collective cognitive capital may seem to fetishize brain function over other factors of health. Indeed, the model as described above does not directly account for physical health, except insofar as poor physical health impedes cognitive functioning and taxes cognitive bandwidth via subjective experience of illness or chronic pain, the “life admin” of managing a medical condition, and the inherent psychosocial stress of ill health. But both can be valued, and both can be factored into policy decisions. Brain function and behavior does not need to be a final, exclusive measurement. While collective cognitive capital is itself a valuable resource, it is not the only value; inherent human dignity and length of lifespan can be separate, noncompeting values to be maximized by public policy choices.

208. See Irvine et al., *supra* note 204, at 320-23, 345-48.

209. See Fabian & Pykett, *supra* note 96.

210. See, e.g., Michael P. Grosz et al., *The Taboo Against Explicit Causal Inference in Nonexperimental Psychology*, 15 PERSPS. PSYCH. SCI. 1243, 1247, 1253 (2020).

211. See Lewis, *supra* note 203.

A second key caveat is that operationalizing the concept of collective cognitive capital requires resolving difficult questions about how the relevant collective(s) should be determined. In the collective aspect of the model, group boundaries are meant to be fluid, but there are still choices to be made about the boundaries of such groups and their relative comparison to groups on which relevant data exists. These choices may ultimately be political, and the subject of hidden assumptions and judgments about degrees or kinds of similarities between reference groups and populations subject to a given policy. For broadly applicable laws, the determination of the most impacted group to assess may be subject to interest group capture.

C. Risks

The risks inherent in even the best possible version of collective cognitive capital are many. First, it may prove impossible to keep the model truly collective in a highly individualistic culture such as the United States.²¹² The metric could become individualized and tempting to use as a way to rank or prioritize individuals. This could present a particular “group-to-individual” inference risk of a normative character if it becomes descriptively possible to treat cognitive capital as a diagnostic component. This would present a genuine problem if an individual’s capacity and plasticity mechanisms became discernible such that it was possible to determine whether someone had reached or not reached their full “cognitive capital” potential. If that were to become the case, which seems scientifically unlikely even for decades, there are then obvious risks that the collective concept of cognitive capital would become obscured by individualized metrics, with implications for individual agency and freedom to choose one’s life course.

Moreover, even if the concept is resistant to being individualized, there exists the risk of stigmatization of groups with perceived low collective cognitive capital relative to other groups. This risk would persist in spite of the fact that the true measure of policy impact on collective cognitive capital is one of change from a present value and

212. See, e.g., GEERT HOFSTEDÉ, *CULTURE’S CONSEQUENCES: INTERNATIONAL DIFFERENCES IN WORK-RELATED VALUES* 150 (abr. ed. 1984).

not of absolute value against a norm. This, however, is not a usual feature of “indicators” as a tool of governance; they are typically used for evaluative purposes.²¹³ But these risks exist whether or not we attempt to use some collective measure or “indicator” of cognitive capital as a policy tool, as it seems likely that some other “scientific” measure would arise. There is a dark and recent history of scientific justifications for moral atrocities. And the phenomenon is not just historical; active proponents of “social selection” theories still (mis)interpret biological evidence to justify structural social marginalization.²¹⁴ The short space given to discussion of this risk is not meant to minimize its seriousness, but it is one that is ubiquitous when social and biological sciences are applied to societal problems and deserving of separate and extensive treatment.

A further risk is the perception that any project focused on “brains” is inherently essentializing, medicalizing, and pathologizing what are complex human experiences. This may be because of deep cultural tendencies to think in terms of dichotomies such as nature *or* nurture, biological *or* social, internal *or* external, and even residual dualist ideas about mind *or* brain. But these dualities misunderstand the nuanced, complex nature of how the brain works and how brain and behavioral science, taken as a whole, proceeds. Brains adapt to the environment; environments and experiences deeply, importantly influence brain function in ways both short term and long term. Each of these assumed dualities is really a both/and rather than an either/or proposition: there is no inexorable drive towards essentializing humans as “mere” brains, cells and fluids and electricity. Neuroscience and behavioral science are not inherently reductionist, and instead are made up of parallel,

213. See Davis et al., *supra* note 66, at 73-75 (defining an “indicator” as “a named collection of rank-ordered data that purports to represent the past or projected performance of different units. The data are generated through a process that simplifies raw data about a complex social phenomenon. The data, in this simplified and processed form, are capable of being used to compare particular units of analysis ... synchronically or over time, and to evaluate their performance by reference to one or more standards.”).

214. See generally KATHRYN PAIGE HARDEN, *THE GENETIC LOTTERY: WHY DNA MATTERS FOR SOCIAL EQUALITY* (2021) (cataloging contemporary conservative “social selection” theorists and explaining why their interpretation of heritability of IQ and educational attainment misunderstands the science and is incorrectly deterministic). On the biopolitics of race, see DOROTHY E. ROBERTS, *FATAL INVENTION: HOW SCIENCE, POLITICS, AND BIG BUSINESS RECREATE RACE IN THE TWENTY-FIRST CENTURY* (2011).

multilevel approaches to understanding different mechanisms.²¹⁵ This, however, is a nuanced and difficult concept that may be over-ridden by powerful impulses towards binary thinking.

Finally, though this proposal is conceived as a method of engaging neoliberal capitalist policy discourse on its own terms, with technocratic appeal but emphasizing the importance of the collective and structural, the packaging is no guarantee it would be received that way. Instead of subverting discourse about the nature of the capitalistic political economy, collective cognitive capital could be misappropriated to reify it, falling prey to existing powerful forces.²¹⁶ This would be a version of the risks of substituting “a discourse of science for a discourse of justice.”²¹⁷ What we fundamentally need are discussions about substantive political priorities and means to decide between them. Collective cognitive capital may not be sufficient to get us there, because of misplaced optimism in the general nature of humans as causal agents motivated to collectively pursue meaningful goals and relationships, due to distortions from the individualist, market-driven culture we already live in.

CONCLUSION

Neuroscience and behavioral sciences are empirical, descriptive fields (undertaken within a social context); mere data cannot and does not supply normative justifications for policy making. But coherent bodies of work in brain and behavioral sciences are updating and sometimes challenging theories that legitimize existing policy. The future of law and neuroscience should play to the strengths of basic science research, using aggregated data and theory-building applied to legislation and policy to strengthen and improve society. This can be done while the nature of scientific production itself is questioned and expanded.²¹⁸ At a minimum, findings from behavioral and brain science can reframe the harms

215. CARL F. CRAVER, *EXPLAINING THE BRAIN: MECHANISMS AND THE MOSAIC UNITY OF NEUROSCIENCE* (2007).

216. *See, e.g.*, Samuel R. Bagenstos, *Implicit Bias's Failure*, 39 *BERKELEY J EMP. & LABOR L.* 37, 40 (2018).

217. *See, e.g., id.* at 39.

218. Lewis, *supra* note 203.

inflicted (or tolerated) by societal structures as having concrete, biological consequences. Such new frameworks, however, must account for the status quo of the political economy. Just as the law will have to grapple with improving understanding of human behavior, so should those new insights be packaged in a way that the existing structures of the law can digest.

This Article sketches the outlines of a future for law and neuroscience that is both ambitious and quotidian. It argues that brain and behavioral science should seek to shape citizen-state interactions by creating a framework to assess policy choices and maximize the collective cognitive capital of its people. Applying a holistic brain science framework to analyze and decide how a state interacts with its citizens—with the normative goal of making their lives better by improving brain function, cognitive capacity, and thus autonomy and freedom—is an aggressive goal for the future of neuroscience in law.