

Heckman, James J.; Corbin, Chase O.

Working Paper

Capabilities and Skills

IZA Discussion Papers, No. 10005

Provided in Cooperation with:

IZA – Institute of Labor Economics

Suggested Citation: Heckman, James J.; Corbin, Chase O. (2016) : Capabilities and Skills, IZA Discussion Papers, No. 10005, Institute for the Study of Labor (IZA), Bonn

This Version is available at:

<https://hdl.handle.net/10419/145139>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

IZA DP No. 10005

Capabilities and Skills

James J. Heckman
Chase O. Corbin

June 2016

Capabilities and Skills

James J. Heckman

*University of Chicago,
CEHD, American Bar Foundation and IZA*

Chase O. Corbin

CEHD

Discussion Paper No. 10005

June 2016

IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0

Fax: +49-228-3894-180

E-mail: iza@iza.org

Any opinions expressed here are those of the author(s) and not those of IZA. Research published in this series may include views on policy, but the institute itself takes no institutional policy positions. The IZA research network is committed to the IZA Guiding Principles of Research Integrity.

The Institute for the Study of Labor (IZA) in Bonn is a local and virtual international research center and a place of communication between science, politics and business. IZA is an independent nonprofit organization supported by Deutsche Post Foundation. The center is associated with the University of Bonn and offers a stimulating research environment through its international network, workshops and conferences, data service, project support, research visits and doctoral program. IZA engages in (i) original and internationally competitive research in all fields of labor economics, (ii) development of policy concepts, and (iii) dissemination of research results and concepts to the interested public.

IZA Discussion Papers often represent preliminary work and are circulated to encourage discussion. Citation of such a paper should account for its provisional character. A revised version may be available directly from the author.

ABSTRACT

Capabilities and Skills*

This paper discusses the relevance of recent research on the economics of human development to the work of the Human Development and Capability Association. The recent economics of human development brings insights about the dynamics of skill accumulation to an otherwise static literature on capabilities. Skills embodied in agents empower people. Enhanced skills enhance opportunities and hence promote capabilities. We address measurement problems common to both the economics of human development and the capability approach. The economics of human development analyzes the dynamics of preference formation, but is silent about which preferences should be used to evaluate alternative policies. This is both a strength and a limitation of the approach.

JEL Classification: D63, D04, D31, I31

Keywords: skills, capabilities, freedom, technology of skill formation

Corresponding author:

James J. Heckman
Department of Economics
University of Chicago
1126 East 59th Street
Chicago, IL 60637
USA
E-mail: jjh@uchicago.edu

* An earlier version of this paper was given with the title "Creating Flourishing Lives: The Dynamics of Capability Formation," as the Amartya Sen Lecture at the Human Development and Capability Association conference held at Georgetown University, September 11, 2015. We thank Steve Durlauf, Martha Nussbaum, and Amartya Sen for comments on the previous draft, and Steve Durlauf for comments and conversations on this draft. This research was supported in part by: the Pritzker Children's Initiative; the Buffett Early Childhood Fund; NIH grants NICHD R37HD065072, NICHD R01HD054702, and NIA R24AG048081; an anonymous funder; Successful Pathways from School to Work, an initiative of the University of Chicago's Committee on Education and funded by the Hymen Milgrom Supporting Organization; the Human Capital and Economic Opportunity Global Working Group, an initiative of the Center for the Economics of Human Development and funded by the Institute for New Economic Thinking; and the American Bar Foundation. The views expressed in this paper are solely those of the authors and do not necessarily represent those of the funders or the official views of the National Institutes of Health.

1 Introduction

The capability approach studies all aspects of human flourishing. It analyzes the sets of opportunities available to persons in a wide range of life-relevant outcomes and their freedom to choose from those sets. The choices considered go well beyond market transactions.¹ Unlike many traditional economic and social science approaches to policy evaluation, it does not rely exclusively on monetary measures of well-being like GDP, cost-benefit ratios, or utilitarian assessments. Instead, it considers the ranges of opportunities offered by societies to their people. The Human Development Index² is a good example of its more inclusive approach to the measurement of human flourishing.³

All versions of the capability approach go well beyond the study of the skills embodied in agents—their “*internal capabilities*”⁴—to consider the social and political institutions that inhibit or promote the expression of skills—their “*external capabilities*.” The normative and philosophical sweep of the capability approach is far more comprehensive than that of standard economics.

This greater generality comes at a price. Economists have traditionally been reluctant to endorse particular moral and ethical paradigms. They prefer more limited, but empirically rigorous analyses that are robust to different political assumptions or belied structures.⁵ Research on capability theory strongly reflects the personal beliefs of ideal ethical structures for society. While this gives it a more comprehensive, philosophical perspective, it limits its empirical application and policy relevance.⁶ Though rich in theory and argument, the capability approach faces major

¹ Sen (1985, 1991, 1999b).

² See United Nations Development Programme (2010).

³ For an early attempt to include non-market benefits in national income accounts, see Nordhaus and Tobin (1973).

⁴ See Nussbaum (2011).

⁵ See Senior (1836) for an early statement of this division: *The business of an economist is neither to recommend nor to dissuade, but to state general principles which it is fatal to neglect, but neither advisable, nor perhaps practicable, to use as the sole, or even the principal, guides in the actual conduct of affairs.*

⁶ Sen explicitly criticizes the utilitarian, consequentialist, Rawlsian, and libertarian theories of morality repeatedly. See Sen (2009).

challenges in measuring capabilities, the full array of possibilities in societies, the spaces of options available to persons, and their freedoms to exercise these options.⁷

More basic—and the central message of this paper—is that the capability approach as currently formulated, does not address how capabilities—internal or external—are created. It is an intrinsically static approach that takes individual skills and resources, as well as environmental and contextual features, as given in any analysis or evaluative exercise.

There is more than a little irony in this state of affairs. In his many writings on the capability approach, Sen has consistently eschewed reliance on any single set of preferences (social or personal) for evaluating the welfare of a given person or of a society. His powerful example is that of a poor person who would not value enhanced possibilities well outside his range of experience because his preferences are experience-dependent.⁸ Yet despite this emphasis, the capability approach lacks a theory of preference formation and, more generally, a theory of capability formation. This greatly limits its policy relevance.

This paper demonstrates how recent research in the economics of human development contributes to capability theory by showing how internal capabilities—skills—are formed and how they can be measured. It accounts for external capabilities by studying how the institutions of society inhibit or promote the development and use of skills.⁹

The economics of human development grew out of the early human capital literature, which focused on a one-dimensional construct of skill—*human capital*—that in one extreme interpretation was equated with cognitive ability.¹⁰ It focused primarily on the labor market returns to schooling

⁷ See Sen (1985, 1991, 1999b), Robeyns (2000, 2003), and Foster (2010).

⁸ See Sen (1999a, p. 15).

⁹ For recent statements of the literature, see Heckman (2008) and Heckman and Mosso (2014).

¹⁰ See Arrow (1973) and Spence (1972), who developed the “signaling” literature based on this notion.

and job training, and thus aimed to monetize the benefits of individual skills. It also considered dynamic models of skill acquisition.

The study of human capital has evolved and broadened greatly, and distinctions about education, ability and skills have become increasingly refined. For example, the distinction between cognitive (or intellectual) skills and non-cognitive (or socio-emotional) skills has come to be pivotal for understanding what ability is, how it can be measured, and the determinants of well-being.¹¹

The current literature on the economics of human development recognizes the multiplicity of skills that characterize human diversity and that contribute to creating flourishing lives.¹² It recognizes both the market returns and the non-monetary benefits of multiple skills including physical and mental health, social engagement, trust, altruism, self-control, happiness, life satisfaction, risk aversion, and patience.

Research on the dynamics of skill and preference formation demonstrates the powerful role of families, culture, and social institutions in shaping skills and preferences (Bisin and Verdier, 2001). It provides a precise framework for measuring skills. As such, the modern economics of human development addresses many of the criticisms raised by capability theorists against standard economic approaches, and does so in an empirically operational fashion.

The economics of human development explicitly considers the role of preferences in shaping how skills are measured, which skills are expressed, and which skills are acquired. Skills empower. They enlarge opportunity sets. Individual preferences are used to determine which options are exercised. Social preferences are used to order alternative social states.

¹¹ See Heckman, Stixrud, and Urzúa (2006), Heckman (2008), Borghans et al. (2008), Almlund et al. (2011), Lindqvist and Vestman (2011), and Kautz et al. (2014).

¹² See Kautz et al. (2014).

Preferences are also central to capability theory.¹³ While Sen explicitly rejects reliance on any particular set of personal or social preferences, sets of admissible preference evaluations are central to determining what constitutes a capability, what constitutes “more” capability, and which freedoms and procedural rules are “better.”¹⁴ All evaluations in the capability literature rely on preferences.

A more limited focus on skills as partial generators of capability sets may appear to offer a clean separation between preferences over capabilities and skills. Nussbaum (2001, 2003) argues for the need to define a set of capabilities that are fundamentally entitled and independent of any preferences.

However, the distinction between preferences and skills, while analytically convenient, is not as sharp as one might hope. Preferences are often valued skills.¹⁵ More conscientious people may be less happy than others, but they may make better watchmakers or surgeons. The preference-skill dichotomy is ultimately a false one. We discuss this question after we present an overview of recent research on the economics of human development. We first maintain the preference-skill dichotomy and later discuss it in detail.

The capability literature and the economics of human development have much in common. Both analyze inequality, equality of opportunity, and social mobility. Both use inclusive measures of inequality. Both evaluate policies and states of the world, going beyond one-dimensional measures like GDP, rates of return, or scores on achievement tests, which still dominate many public policy discussions. Both literatures examine the core sets of skills that explain the capacities of persons to function. Both distinguish between what is in principle attainable from what is realized in practice.

¹³ Sen (1985, 1991, 1999a).

¹⁴ See Robeyns (2000, 2003) and Foster (2010).

¹⁵ See Bowles, Gintis, and Osborne (2001a, 2001b).

Both literatures face common problems in using measured actions to capture the latent skills or capabilities on which their theories are built.

Despite these commonalities, there are important differences. Unlike capability theory, the economics of human development presents explicit theories of skill formation and skill measurement. It also considers the dynamics of preference formation.

The plan of this paper is as follows. In Section 2, we acquaint the reader with recent developments in the economics of human development and show its relevance to the capability approach. We summarize both theory and the evidence. We show how the economics of human development incorporates the roles of political, social, and economic institutions in facilitating or inhibiting incentives to acquire skills and in shaping the incentives of individuals and groups to acquire skills. In Section 3, we discuss issues that arise in measuring skills, freedoms, and opportunities. Section 4 explicitly discusses the role of preferences in each approach. Section 5 concludes.

2 Skills and Skill Formation

Skills—broadly defined—are major sources of well-being and flourishing in society. They enable action in a wide array of life domains and are central ingredients of capabilities. There are, of course, other important contributing factors to capabilities, such as the freedoms to use and enhance skills.

Low levels of skill are causes of major social problems (dropping out of school, crime, teenage pregnancy, obesity, and poor health).¹⁶ Gaps between the advantaged and disadvantaged, in all dimensions of skill, have been found to open up early in the lives of children. While schools

¹⁶ See Kautz et al. (2014).

contribute to these gaps, they are not the major source of them. Early life experiences are major producers of cognitive, socio-emotional, and health skills. These skills, in turn, predict the outcomes most often considered as important for individual well-being, including earnings, crime, physical health and mental health, trust, social engagement, and participation in society. Family influence extends well beyond the transmission of genes. Cognitive skills, social skills, and emotional skills are not fixed at birth, nor are they determined solely by genetics. They can be enhanced through the investments made by parents and by society.

One common criticism of standard approaches to evaluating welfare in economics is their focus on earnings and income. However, this criticism is misguided if applied to the economics of human development. Though income and earnings have been studied extensively due to their inherently quantifiable nature, other dimensions are not ignored. The literature on the economics of human development explicitly considers multiple dimensions of human flourishing and models agent choices for achieving their desired ends in ways that more accurately reflect what we know and what we observe in the world.¹⁷

The multiple nature of skills is often ignored in many public policy discussions. For example, policy discussions surrounding education and the output of schools often focus on measuring, enhancing, and rewarding cognitive ability using achievement tests. OECD countries are often compared to one another and their educational systems evaluated using PISA test scores, ignoring the full range of skills produced by schools.¹⁸ Similarly, fixations on GDP or per capita income in the comparison of developmental policies offer a very limited perspective on national well-being.¹⁹

¹⁷ See, e.g., Lochner (2011), Heckman, Stixrud, and Urzúa (2006), Borghans et al. (2008), and Almlund et al. (2011).

¹⁸ See Kautz et al. (2014).

¹⁹ See Sen (1999b).

An important lesson from the recent economics of human development is that cognitive skills are only *part* of what is required for success in life. Personality skills—i.e., “soft skills,” like trust, altruism, reciprocity, perseverance, attention, motivation, self-confidence, and personal health—are also important. Health and nutrition—macro- and micro-nutrients—are essential skills.²⁰ So are the abilities to make wise decisions, to guide one’s life by reflective reason, and to plan ahead. These skills are often neglected in scientific analyses and policy discussions alike.

Skills are only part of the story for explaining and interpreting actions of individuals, albeit an important part and one that can be shaped by policy. Figure 1 shows how skills fit into the capability approach.²¹ At a point in time, agents have endowments, including cognitive skills, personality and character skills, and health, as well as access to information, financial resources, and peers. These combine to produce the space of *potential* actions (“capabilities”). Which actions (functionings) are selected depend on preferences (personal and social), norms, and the efforts of individuals which are shaped in part by both preferences and socio-cultural norms. We return to this diagram after discussing the dynamics of skill formation.

[FIGURE 1 HERE]

2.1 *Dynamics of Skill Formation*

A major difference between capability approach and the economics of human development is in their respective treatment of dynamics – how capabilities and skills evolve over time. Properly accounting for these differences in dynamics is important because doing so gives a richer understanding of the origins of inequality, and suggests opportunities to design effective policies for

²⁰ In much of the capability approach literature, standard economic analysis is criticized for its inattention to the importance of personal health and nutrition, but such criticism is not well founded. Even the earliest work in the economics of human development acknowledged nutrition and choices that promote health as being investments in one's human capital and a means for achieving more desirable outcomes. See Mushkin (1962).

²¹ Robeyns (2005, p.193, Table 1) has a related diagram more in the spirit of capability theory, but does not isolate the role of skills. See Appendix Table A-1.

reducing inequality and eliminating injustice. Without a theory of how capabilities are developed, capability theory is confined to addressing policies for facilitating the expression (but not the development) of skills. That is an important part of the story, but is by no means the whole story.

The economic approach to human development seeks to explain how outcomes like health, wage earnings, crime, voting, and educational achievement are produced by investment and experience interacting with multiple skills. It has developed theories and models that explain how those skills evolve over time.²²

Life cycle skill formation is dynamic in nature. Skill begets skill; motivation begets motivation. If a child is not motivated and stimulated to learn and engage early enough in life, the more likely it is that when the child becomes an adult, he or she will not flourish in social and economic life. These dynamics begin at birth—even during the pregnancy—and imply increasing productivity of later investment conditional on the investments made earlier. These dynamics are represented in Figure 2.

[FIGURE 2 HERE]

This figure summarizes modern understanding of the life cycle of skill formation. Skills create stocks of skills that cross-fertilize the formation and expression of other skills. Health is an important ingredient beyond personality and cognition. More motivated and healthier children are better learners.²³ The process is synergistic—academic success promotes greater self-confidence and a willingness to explore. It also promotes greater health. A key lesson of the recent literature is that early advantages and disadvantages lead to substantial differences in adult advantages and disadvantages. Figure 3 expands on the message of Figure 2 for each stage of the life cycle.

²² See Cunha and Heckman (2007, 2008), Cunha, Heckman, and Schennach (2010), and Heckman and Mosso (2014).

²³ Currie and Almond (2011).

[FIGURE 3 HERE]

Children are born with endowments of innate skills, which are determined by genetic factors and family environments. These endowments provide initial stocks of skills, which can be developed further by parental investments.²⁴ Initial stocks include multiple components of skill, including cognitive ability, socio-emotional traits, and health. Parental investment comes in many forms, such as through the quality and quantity of time spent with the child, financial resources invested in day-care, educational toys, etc. Investment choices depend on levels of skills and the productivity of investments. Parents facing more productive investment opportunities (i.e., children with high levels of innate ability) may choose to make larger marginal investments. Investment can also depend on the parent's own stock of skills. Highly skilled parents tend to be more productive in child rearing but also may face higher opportunity costs due to their higher wages in the labor market.

2.2 *Static and Dynamic Complementarity*

A major finding of the recent developmental literature is evidence for *critical* and *sensitive* periods for investment. There is evidence for *static complementarity* of investment at any stage of the life cycle: having a higher level of a skill boosts productivity of investment in other skills.²⁵ This might suggest that society should only invest in the most skilled. On efficiency grounds, this might justify Social Darwinist social policies.

The literature documents the empirical relevance of the *Matthew Effect*: equal treatment of children with different skills and environments leads to enhanced differences on outcomes favoring the more advantaged. This might suggest that there is a substantial tradeoff between social fairness and economic efficiency in considering policies for skill formation.

²⁴ Here, "parenting" is used in a very general way and includes extended family, schooling, and other environmental influences.

²⁵ See Heckman and Mosso (2014).

Such a conclusion ignores a key finding of the recent literature.²⁶ Offsetting the disequalizing effects of static complementarity is *dynamic complementarity*. Investing today boosts the skill base for tomorrow and enables disadvantaged children to benefit more from future investments. Dynamic complementarity increases with age. It becomes harder and harder to remediate skill deficits at older ages. Building the skill base of a young child is an economically efficient strategy. Creating the opportunity to benefit from future investment for disadvantaged children is both economically efficient and socially fair. *For investments in the early years, there is no tradeoff between equity and efficiency.*²⁷ However, to be effective, enriched early-life environments need to be followed up by later-life enriched environments.

The powerful role of the early years in shaping skills is concerning because early childhood environments are poor in quality for many children around the world, especially those in developing countries. If society intervenes early enough and in a consistent fashion over the life cycle of a child, it can promote cognitive and socio-emotional abilities, as well as the health and well-being of children born into disadvantage. Through multiple channels, these effects percolate across the life cycle and across generations.

2.3 Adolescent Remediation

What should be done for disadvantaged adolescents who get off to a poor life start? What are the costs and benefits of remediation? How important are experiences and investments at various stages of the life cycle? While it is very effective to invest heavily in the early years of the disadvantaged because it boosts productivity of investment at later ages, there is also evidence of resilience to adversity and recovery at later ages. Early conditions are not fully determinative of life skills. Later-life experiences are also important.

²⁶ See Cunha and Heckman (2007, 2009), Cunha, Heckman, and Schennach (2010), and Heckman and Mosso (2014).

²⁷ See Heckman (2008).

If early and late remediation are equally effective for adult achievement, discounting always favors later intervention. However, a large body of evidence (see Kautz et al., 2014) suggests that many later remediation efforts targeted to less able adolescents are costly and ineffective. As currently implemented, most adolescent remediation efforts to boost skills have low returns. Examples include most public job training programs, adult literacy programs, and tuition reduction programs. The general pattern from the literature is that there are higher returns on later life programs for the more able. There are lower returns for the less able adolescents (those with lower cognitive/personality/health skills).

However, there are effective adolescent programs. The effective programs recognize the age-related malleability of cognitive, non-cognitive, and health skills. Such programs promote an age-adapted version of parenting, sometimes called *mentoring*.²⁸

2.4 Targeted Programs?

It might be more effective to address problems when they occur rather than to try to prevent them before they arise. This is the approach taken in many societies. For example, juvenile delinquents are punished, but the onset of juvenile delinquency is not prevented. Gaps in school readiness are addressed in schools, but not by preschools.

A powerful body of empirical evidence summarized in Elango et al. (2016) shows substantial returns to *targeted* early investment for disadvantaged children. Any benefits from delaying investment until problems appear in later life are offset by the greater productivity of early life investment. Waiting for problems to appear in children is an economically and socially ineffective policy, although many societies adopt it. A large body of evidence shows the populations that are most affected by early life disadvantages.²⁹ The Perry School Program targeted 3-4 year-old children.

²⁸ See Kautz et al. (2014).

²⁹ See Caspi et al. (2016) and Elango et al. (2016).

Aggressive behavior is known to emerge at that age. Such behavior is strongly predictive of later-life criminal activity.³⁰ Reduced crime is a major benefit of the Perry Program.³¹

2.5 Scaffolding and Investment

Investment is an impersonal term. By it, we mean mentoring, emotional support, and scaffolding—not just bricks and mortar or books. The universal ingredient of successful skill interventions at all ages is scaffolding—a form of personalized education that adapts to each child and promotes interaction, trust, and attachment. Sound parenting is the best form of personalized education.

Education involves more than teaching cognitive skills. Schools, families, and other institutions of society mold character. In the words of Horace Mann, the founder of the common school movement in America, writing on the true purpose of education,

Arithmetic, grammar, and the other rudiments, as they are called, comprise but a small part of the teachings in a school. The rudiments of feeling are taught not less than the rudiments of thinking. The sentiments and passions get more lessons than the intellect. Though their open recitations may be less, their secret rehearsals are more. (Mann, 1867, p. 420)

Effective policies for adolescents provide mentoring and integrate schooling and work. The core of effective mentoring is a version of effective parenting: attachment, interaction, and creating trust. To paraphrase John Dewey, *good interventions do what good parents do*. They provide the young child or the adolescent mentee with love and warmth. Effective policies focus on developing social and emotional skills, as well as health, healthy behaviors and cognitive skills. The evidence on the effectiveness of these policies is consistent with recent work in psychology and neuroscience on the development of the prefrontal cortex—associated with self-control and decision-making.

Workplace-based interventions shape non-cognitive skills and motivate adolescents to learn. Love,

³⁰ Moffitt (1993).

³¹ Heckman et al. (2010a, 2010b).

parenting, attachment, moral guidance, and mentoring are universal ingredients of successful skill interventions.

3 Measurement

The fundamental data common to both approaches is actions taken by individuals and by institutions (see Figure 1). Actions include a broad set of activities, including many outside of the marketplace. But measured actions depend on many factors (see Figure 1). To isolate skills from the other factors is a daunting task and one not yet well-solved in existing literatures, although work underway.³²

Consider something as basic as IQ, for which tests were developed more than a hundred years ago. Many trust the measures of IQ reported by psychometricians. However, scores on these IQ tests are not invariant constants, despite their widespread use by many scholars. Taking an IQ test is a task—an action—one of many that people perform in life. Undoubtedly, if everything else is the same, people who are truly more intelligent have higher IQ scores.

But everything else is usually not the same. Studies going back 40 years³³ show how easy it is to affect IQ scores. Disadvantaged children given one candy for each successful answer on an IQ test have much higher scores. The less conscientious they were, the stronger were the effects of these incentives. The Black-White test score gap was virtually eliminated in this test setting. IQ test scores, achievement test scores, and measures of personality are easily incentivized. They are not incentive- and context-specific invariant measures. This point applies more generally to the measurement of other skills. An active research program attempts to isolate skills from the other factors influencing their expression.

³² Kautz et al. (2014).

³³ See the survey in Borghans et al. (2008).

3.1 Measuring Skills

Two approaches to measuring skills have emerged that address this problem. Both attempt to control for background factors and avoid uncritical reliance on pencil and paper test-based or interview-based psychometric measures that are often treated as if they are context-free. One approach is based on how people perform in response to variations in incentives and situations in controlled settings, such as laboratories or game-based play. Both approaches for measuring skills can be incentivized in attempts to study agent actions in real-world settings. Dictator games, centipede games, ‘beauty contest’ games, and other game-based elicitations of an individual’s ability to cooperate with others have all been used to measure altruism, reciprocity, and other skills. See, for example, List (2007), Nagel (1995), Falk, Fehr, and Fischbacher (2008), LaMar (2014), and Mislevy et al. (2016).³⁴

A second approach uses measures of past behaviors that are known to correlate strongly with future outcomes of interest as a way to measure skills. Behaviors, such as juvenile truancy, discipline problems in school, and participation in deviant activities, can be useful measurements of cognitive and non-cognitive skills, as reported in Almlund et al. (2011), Kautz et al. (2014), Kautz and Zanoni (2015), Hofer et al. (2012) and Heckman, Humphries, and Veramendi (2016). Such measures predict later behaviors important to human flourishing, such as educational progress, reliability in the workplace, earnings, employment, and criminal activity.³⁵ Grades (and GPA) are some of the best predictors of future outcomes. Grades are highly loaded on non-cognitive measures and, properly standardized, provide good measures of social and emotional skills.³⁶ Borghans et al. (2016) show that high school grades predict later life achievement in a range of

³⁴ See the link to a recent HCEO conference on measuring skills: <http://cehd.uchicago.edu/page/conference-measurement>.

³⁵ See Bowen, Chingos, and McPherson (2009), Kautz and Zanoni (2015), and Hanson (1999) for examples.

³⁶ Borghans et al. (2011, 2016).

domains.³⁷ These authors compare their predictive validity with those of standard achievement tests and find them much more predictive.

3.2 Measuring Capabilities

The capability approach confronts major challenges in measuring the full array of possibilities and the spaces of options facing individuals in society.³⁸ Sen is properly cautious in his many discussions of capability theory. He acknowledges the need to base any comparison or other evaluation using information from individual preferences. Without such information, reliable judgements about well-being are impossible.

Skills are just one of the constituents of capabilities. Social and other external factors are also determinative. This measurement challenge is just beginning to be confronted. Efforts to measure agency or freedom are necessarily subjective, and are challenging to quantify.³⁹

As bystanders to the capability literature, we make two remarks about attempts to measure capability sets or levels of freedom. The first is that self-reported surveys, especially those based on subjective feelings of respondents, have consistently been found to be poor predictors of future outcomes, whether market outcomes, like earnings, or non-market ones, like health and education.⁴⁰

The second is that these measures, by construction, depend on both the individual and socially imposed preferences of the respondents. Agency and individual freedom are often not perceived to be important concepts in collectivist or totalitarian societies. Using surveys with only “a

³⁷ Geiser and Santelices (2007) show how early grades predict later life educational attainment.

³⁸ See Sen (1985, 1999b), Robeyns (2000, 2003), and Foster (2010).

³⁹ Bruni, Comim, and Pugno (2009) attempt to unify the happiness literature with the capabilities literature. They focus on the recent development of surveys meant to measure subjective values and the importance of agency; evaluating agent's agency over all possible functionings is argued as a means for better evaluating agency, freedom and well-being. Such surveys, which include, among others, the world values survey relied upon in constructing domains of the OECD's better life index, ask respondents to rank the importance of different domains of so-called “self-direction” or “empowerment” and include domains like “social status and prestige,” “hedonism,” “achievement,” “independent thought,” and “universalism.”

⁴⁰ Groot (2000) is one example of the effects of bias in such self-assessments.

passing regard for the setting and significance is hasty and ill-advised.”⁴¹ This is a manifestation of the fundamental identification problem implicit in Figure 1.

3.3 Valuing Freedom and Opportunities

The inherent value of having options to choose has long been established in the standard economic analysis of well-being. For example, Weisbrod (1964) considered why, for example, an urban socialite in New York City might value public land set aside for a national park in, say, Montana or Alaska—namely, for its ability to maintain the socialite's options to later visit and enjoy the parklands. Puppe (1996) discusses preferences for freedom and for flexibility that lead individuals to place value over sets that provide more options, even if those options might not be exercised.

Weisbrod (1962), Comay, Melnik, and Pollatschek (1973), Stange (2012), and Eisenhauer, Heckman, and Mosso (2015), among others, discuss option values produced by education and human capital accumulation. In a similar vein, Dixit and Pindyck (1994) consider the inherent value of an option to forego investment in a current period until more information may become available later. Sen dismisses relevance of this literature to the capability approach.⁴²

One approach for valuing freedoms and opportunities is to assume that it is always preferable to have more options. Foster (2010) offers counts of the number of options as measures of capabilities and freedoms.⁴³ Such a measure is of limited use. More options are not always preferred to less.⁴⁴ This approach also begs the issue of which options should be counted. Inevitably, this takes us back to the issue of which preferences should be used to make valuations or sets of valuations. We return to the valuation of options after we discuss preferences.

⁴¹ See Bruni, Comim, and Pugno (2009, p. 208).

⁴² Sen (1991, pp. 20-21).

⁴³ Sen (1999a, p. 44) considers and shows the difficulties with using this approach.

⁴⁴ See Lancaster (1990), who discusses the costs of decision making among large numbers of choices.

4 Preferences

We have thus far maintained the preference-skill dichotomy. Yet, as demonstrated by Bowles, Gintis, and Osborne (2001a, 2001b), many preferences are valued skills.⁴⁵ If preferences are skills, in what sense can one say that more of a skill is preferred to less? Is it better to be risk averse? Should people be far-sighted and discount the future less? Such statements, while common, are intrinsically paternalistic. On what basis can they be justified?

This discussion takes us to a core problem in capability theory, which is bypassed in the economics of human development. Which preferences should be used to make evaluative statements or to construct spaces of alternative evaluative statements? Using all possible preferences leads to a vacuous theory.

Skills provide agents with *the power to act* in multiple capacities. Preferences can be understood as providing the desires and wants to choose which of the available actions agents choose to take. They generate the incentives that motivate how much or how little effort is expended in performing those actions. An individual, given sufficient cognitive ability and math skills can be an accountant, a mathematician, or a financial analyst. However, his preference for earnings versus intellectual prestige will influence which outcome he pursues.

The role of preferences within the capability approach can be understood in a similar way. Only ‘functionings’ (“actions” in Figure 1) can be observed. The allocation of resources used to achieve those functionings depends on the agent’s preferences for one achieved outcome vs. another. The choices that were possible but not taken, represent the capability set. Standard economic analysis argues that without information beyond the choice taken, the value of

⁴⁵ Altruism and reciprocity, for example, are commonly considered as economic preferences that are important for making and maintaining social relationships and for interacting with one’s neighbors and peers. Dohmen et al. (2010) report the correlation between preferences and skills.

unobserved choices cannot be known to any outside observer. This does not imply that such choices have no value.

Methods for evaluating alternative options are available in the economics literature.⁴⁶ They can be identified by measuring the responses to incentives which encourage or discourage agent choices. Sen rejects this approach as inadequate because applications of it typically identify particular valuation functions.⁴⁷ However, nothing intrinsic to the approach excludes conducting a sensitivity analysis using a variety of preference specifications to generate sets of option values associated with alternative specifications of preferences. Set-valued options are readily produced once sets of preferences are justified.

Preferences can depend on context and environment.⁴⁸ See Figure 1. The dependence of observed performance on context, effort and skill is represented in Figure 4, which condenses Figure 1. As a practical example, consider an ongoing debate regarding women scientists in certain fields. It suggests that social context can reduce the incentives for them to act on their preferences, while also increasing the effort required for a woman to achieve the same level of outcome as a male engineer with otherwise equal ability and initial preference to work in that field.⁴⁹ With the same preferences as men, women may shift effort away from engineering and towards fields without the same social barriers or high costs of effort. But the adverse effects may cumulate and shift preferences as well. The capability approach raises the concern that contextual or environmental influences can affect both the expression of preferences and the preferences themselves. Yet, to date, the capability theory lacks a systematic analysis of preference formation.

⁴⁶ See Heckman and Vytlačil (2007a, 2007b) for an extensive discussion of identification of counterfactual states from samples of observed choices. See also Heckman (1990) and Heckman and Honoré (1990).

⁴⁷ Sen (1991, pp. 20-21) and Sen (1999a).

⁴⁸ Robeyns (2005) discusses this issue. See Appendix Figure A-1.

⁴⁹ See Rossi (1965).

[FIGURE 4 HERE]

4.1 Paternalism

Whether a preference expands or limits opportunity is ambiguous without considering the interaction with skill, environment, and context. Recent research suggests that preferences are malleable, and subject to environmental and contextual influences.⁵⁰ Some preferences, like a preference for knowledge or learning, can expand the set of opportunities for developing skills and improve the opportunities available for expressing them.⁵¹ A preference for solitude may diminish access to opportunities for learning. This raises an important question about valuing different preferences. If they run afoul of other preferences, should we value them?

Any specified capability set, whether the list of ten fundamental capabilities espoused in Nussbaum (2011) or the contextually dependent lists argued for by Robeyns and others, reflect the preferences used by the analyst making an evaluation. Although there exist some historical arguments in favor of policies that instill ‘better preferences’—e.g. Victorian morals—within the lower class as a way of lifting them out of poverty; there is little, if any, contemporary support for such policies.⁵²

The problem of whether or not society should try to shape or manipulate individual preferences raises serious challenges for the capability approach. Should we respect the preferences of adolescents, even if it leads them to make poor and potentially harmful choices? What about preferences for ends that are counterproductive for achieving desirable outcomes or are even contradictory to the achievement of other capabilities? Persons who support libertarian political

⁵⁰ See Borghans et al. (2008), Bandiera, Barankay, and Rasul (2005), and Einav et al. (2010).

⁵¹ Bowles, Gintis, and Osborne (2001b) considers preferences that can provide incentives in favor of desirable outcomes, and that may shape non-cognitive skills.

⁵² Alfred Marshall and Richard Ely gave arguments for improving life of the poor by shifting them towards Victorian morals. See, e.g., Himmelfarb (1995) and Ely (1891).

institutions typically have strong preferences for individual freedom and often favor freedoms for others to use drugs should they so desire. Maintaining this freedom places people who may have genetic predispositions to become addicted at risk of achieving undesirable outcomes. It would deprive those facing addiction of many broad freedoms argued for in the capability literature.⁵³

How can Nussbaum's "freedom of control over one's environment" and "freedom of affiliation" be reconciled with "freedom of good health" and "freedom of life" for a society that includes both drug addicts and strong libertarians? Despite its foundations in philosophical ideas about justice and freedom, the capability approach has several elements of paternalism which deprive at least some freedoms. Robeyns (2000) suggests that this is an obvious feature and that the question is not whether the capability approach is paternalistic, but rather if it is unjustifiably so.

The economics of human development evades these problems by maintaining a skill-preference dichotomy. However, in its analyses of preference formation, it considers how experiences, including actions taken by agents shape preferences (see, e.g., Becker and Murphy, 1988, Becker, 1996, Bisin and Verdier, 2001, and Yi, 2013). No normative statement is made about preferences.

In this regard, the capabilities approach is far more ambitious. Accounting for preference formation broadens the scope of policies that can be considered by the capability approach. At the same time, this extension of capability theory raises a fundamental challenge to the entire enterprise. If preferences are malleable, by what principles should society evaluate policy alternatives? The evaluative problem is not just one of selecting spaces of capabilities, but of determining which capability sets should be created and through which policies.

⁵³ See Sen (2009).

5 Conclusion

Both the economics of human development and the capability approach seek deeper understandings of poverty, disadvantage, and inequality and how they can be reduced, if not eliminated. In this essay, we have discussed commonalities across the approaches as well as key features that differentiate the two approaches. We focus on the dynamics of skill formation developed in the economics of human development compared to the currently static capability approach.

We also address issues of measurement common to both approaches and those that are distinctive to the capability approach. The crucial role of preferences in both literatures is discussed. To our taste, the capability approach treats preferences in a somewhat evasive fashion. Nussbaum's list of her ten favorite capabilities is a wonderfully clear exception to this claim, although she might deny that her list reflects her preferences.⁵⁴

The economics of human development has a theory of skill and preference formation, but is explicitly evasive on normative issues. It suspends judgement and in this regard, backs away from the ambitious agenda of capability theory. It is agnostic about which preferences are "good." It provides meaningful analysis about how preferences and skills evolve over the life cycle, but lacks any moral or ethical criteria. This illustrates both the benefits and limitations of the approach.

⁵⁴ See Nussbaum (2001, 2003).

Figures

Figure 1: Embedding Skills in Capability Theory

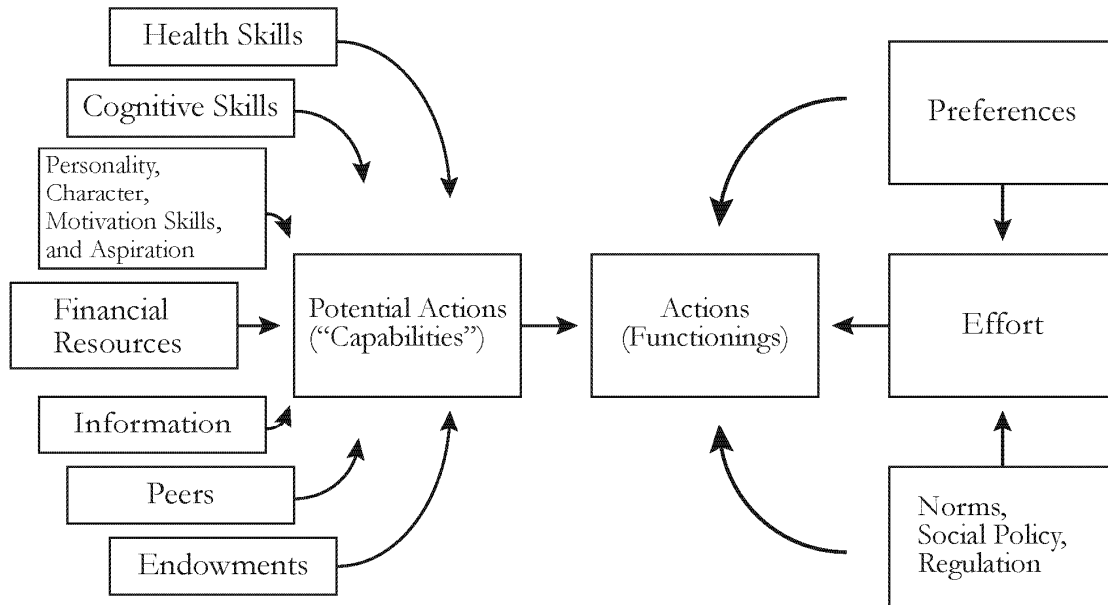


Figure 2: The Technology of Skill Formation

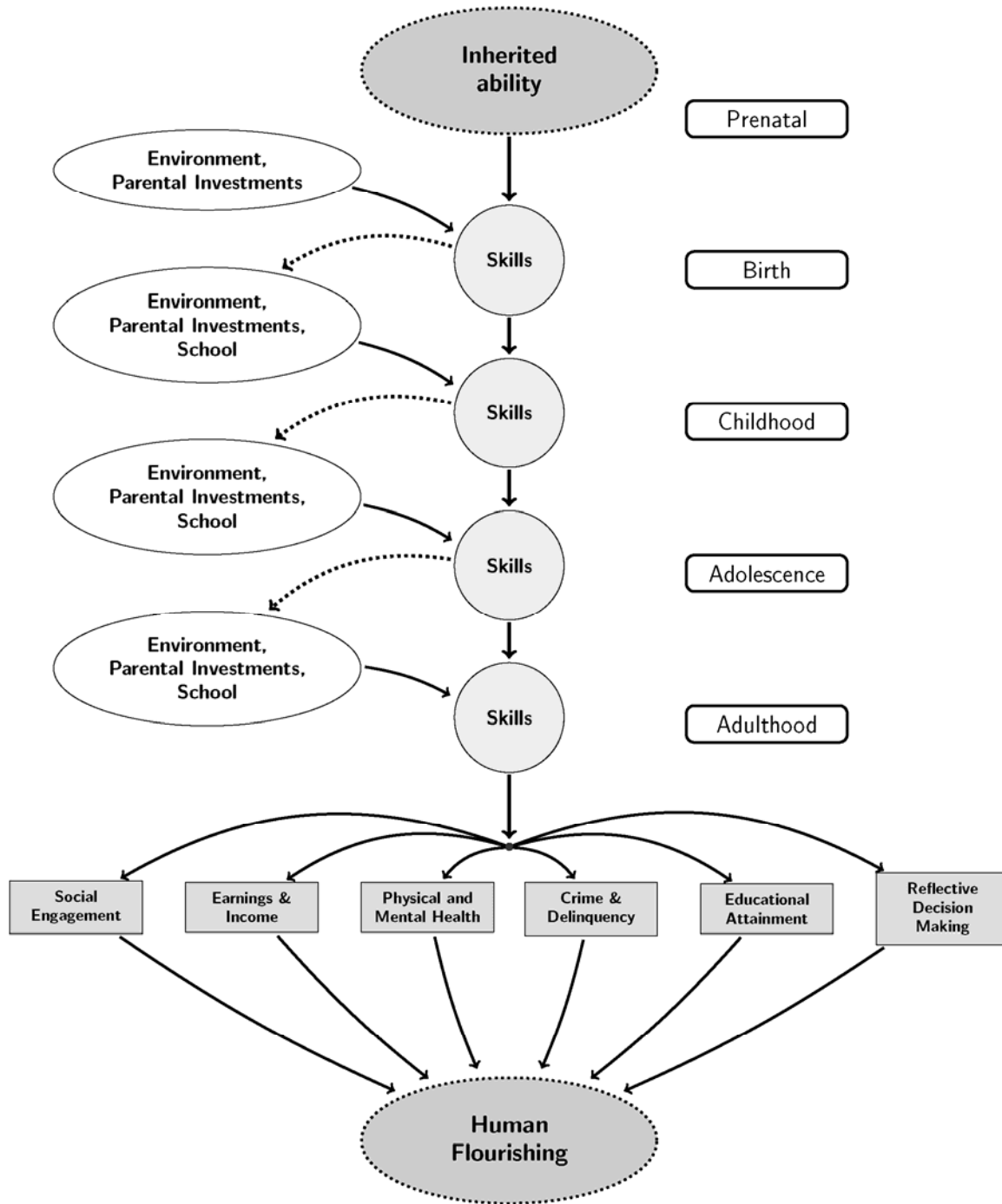
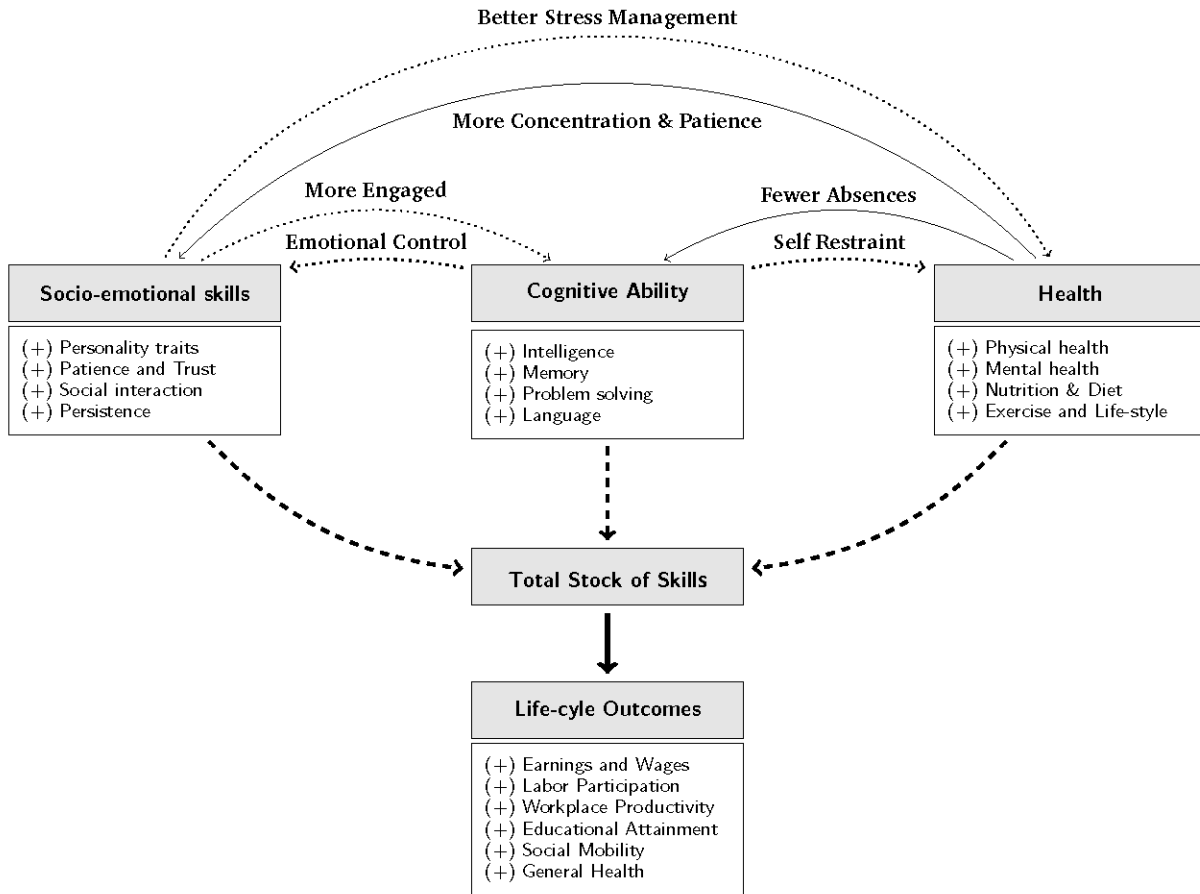
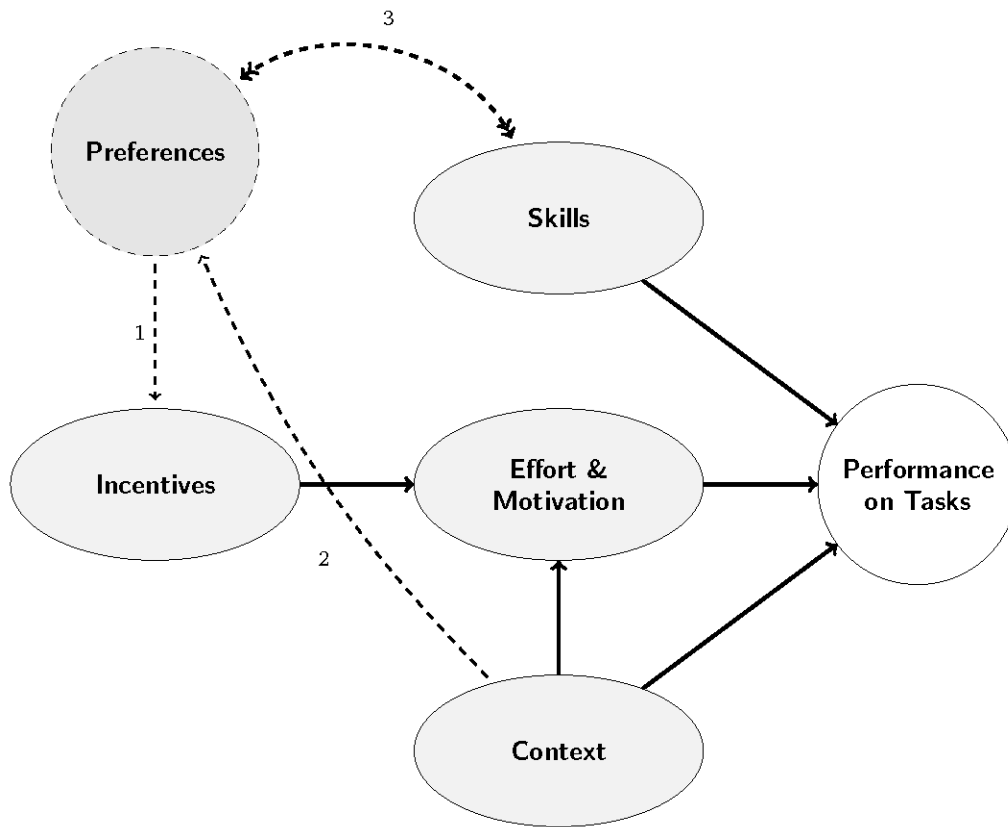


Figure 3: Synergisms: Skills Enhance Each Other



Note: The figure shows the synergies between different components of total skill. Dashed lines show synergies of cognitive skill with socio-emotional skills and health, dotted lines show synergies of socio-emotional skills with cognitive ability and health, and solid lines show synergies of health with cognitive ability and socio-emotional skills. Labels describe mechanism of synergies.

Figure 4: The Skill-Performance Relationship



Note: The figure shows the relationship among preferences, context, and incentives in determining the effort and skills applied in any task. Line (1) reflects the role of preferences in setting incentives for a given task. Line (2) reflects that preferences can be influenced by context, social, cultural, and otherwise. Line (3) represents that preferences can be considered a skill in many important life tasks, and the mischaracterizations that is implied by the skill-preference dichotomy.

References

- Almlund, Mathilde, Angela L. Duckworth, James J. Heckman, and Tim Kautz. 2011. "Personality Psychology and Economics." In *Handbook of the Economics of Education*, edited by Eric A. Hanushek, Stephen Machin and Ludger Wößmann, 1-181. Amsterdam: Elsevier B. V.
- Arrow, Kenneth J. 1973. "Higher Education as a Filter." *Journal of Public Economics* 2 (3):193-216.
- Bandiera, Oriana, Iwan Barankay, and Imran Rasul. 2005. "Social Preferences and the Response to Incentives: Evidence from Personnel Data." *Quarterly Journal of Economics* 120 (3):917-962.
- Becker, Gary S. 1996. *Accounting for Tastes*. Cambridge, MA: Harvard University Press.
- Becker, Gary S., and Kevin M. Murphy. 1988. "A Theory of Rational Addiction." *Journal of Political Economy* 96 (4):675-700.
- Bisin, Alberto, and Thierry Verdier. 2001. "The Economics of Cultural Transmission and the Dynamics of Preferences." *Journal of Economic Theory* 97 (2):298-319.
- Borghans, Lex, Angela L. Duckworth, James J. Heckman, and Bas ter Weel. 2008. "The Economics and Psychology of Personality Traits." *Journal of Human Resources* 43 (4):972-1059.
- Borghans, Lex, Bart H. H. Golsteyn, James J. Heckman, and John Eric Humphries. 2011. "Identification Problems in Personality Psychology." *Personality and Individual Differences* 51 (3: Special Issue on Personality and Economics):315-320.
- Borghans, Lex, Bart H. H. Golsteyn, James J. Heckman, and John Eric Humphries. 2016. "What Do Grades and Achievement Tests Measure?" Submitted to *Proceedings of the National Academy of Sciences*.
- Bowen, William G., Matthew M. Chingos, and Michael S. McPherson. 2009. "Test Scores and High School Grades as Predictors." In *Crossing the Finish Line: Completing College at America's Public Universities*, 112-133. Princeton, NJ: Princeton University Press.
- Bowles, Samuel, Herbert Gintis, and Melissa Osborne. 2001a. "The Determinants of Earnings: A Behavioral Approach." *Journal of Economic Literature* 39 (4):1137-1176.
- Bowles, Samuel, Herbert Gintis, and Melissa Osborne. 2001b. "Incentive-Enhancing Preferences: Personality, Behavior, and Earnings." *American Economic Review* 91 (2):155-158.
- Bruni, Luigino, Flavio Comim, and Maurizio Pugno, eds. 2009. *Capabilities and Happiness*. Oxford, UK: Oxford University Press.
- Caspi, Avshalom, Renate M. Houts, Daniel W. Belsky, Honalee Harrington, Sean Hogan, Sandhya Ramrakha, Richie Poulton, and Terrie E. Moffitt. 2016. "A Small Segment of the Population with Large Economic Burden: Childhood Forecasting." Submitted to *Nature Human Behavior*.
- Comay, Yochanan, Arie Melnik, and Moshe A. Pollatschek. 1973. "The Option Value of Education and the Optimal Path for Investment in Human Capital." *International Economic Review* 14 (2):421-435.
- Cunha, Flávio, and James J. Heckman. 2007. "The Technology of Skill Formation." *American Economic Review* 97 (2):31-47.
- Cunha, Flávio, and James J. Heckman. 2008. "Formulating, Identifying and Estimating the Technology of Cognitive and Noncognitive Skill Formation." *Journal of Human Resources* 43 (4):738-782.
- Cunha, Flávio, and James J. Heckman. 2009. "The Economics and Psychology of Inequality and Human Development." *Journal of the European Economic Association* 7 (2-3):320-364.
- Cunha, Flávio, James J. Heckman, and Susanne M. Schennach. 2010. "Estimating the Technology of Cognitive and Noncognitive Skill Formation." *Econometrica* 78 (3):883-931.
- Currie, Janet, and Douglas Almond. 2011. "Human Capital Development Before Age Five." In *Handbook of Labor Economics*, edited by Orley C. Ashenfelter and David Card, 1315-1486. Amsterdam: Elsevier B. V.
- Dixit, Avinash K., and Robert S. Pindyck. 1994. *Investment under Uncertainty*. Princeton, NJ: Princeton University Press.
- Dohmen, Thomas, Armin Falk, David Huffman, and Uwe Sunde. 2010. "Are Risk Aversion and Impatience Related to Cognitive Ability?" *American Economic Review* 100 (3):1238-1260.
- Einav, Liran, Amy Finkelstein, Iuliana Pascu, and Mark R. Cullen. 2010. "How General Are Risk Preferences? Choices Under Uncertainty in Different Domains." NBER Working Paper no. 15686. National Bureau of Economic Research, Cambridge, MA.

- Eisenhauer, Philipp, James J. Heckman, and Stefano Mosso. 2015. "Estimation of Dynamic Discrete Choice Models by Maximum Likelihood and the Simulated Method of Moments." *International Economic Review* 56 (2: Special Issue: Estimation of Dynamic Stochastic Models in Empirical Microeconomics: In Honor of Kenneth I. Wolpin):331-357.
- Elango, Sneha, Andrés Hojman, Jorge Luis García, and James J. Heckman. 2016. "Early Childhood Education." Forthcoming, in Moffitt, Robert (ed.), *Means-Tested Transfer Programs in the United States II*. Chicago: University of Chicago Press.
- Ely, Richard T. 1891. "Pauperism in the United States." *North American Review* 152 (413):395-409.
- Falk, Armin, Ernst Fehr, and Urs Fischbacher. 2008. "Testing Theories of Fairness – Intentions Matter." *Games and Economic Behavior* 62 (1):287-303.
- Foster, James E. 2010. "Notes on Effective Freedom." OPHI Working Paper no. 34. University of Oxford, Oxford, UK.
- Geiser, Saul, and Maria Veronica Santelices. 2007. "Validity of High School Grades in Predicting Student Success Beyond the Freshman Year: High-School Record vs. Standardized Tests as Indicators of Four-Year College Outcomes." Research & Occasional Paper Series no. CSHE.6.07. Center for Studies in Higher Education at the University of California, Berkeley, Berkeley, CA.
- Groot, Wim. 2000. "Adaptation and Scale of Reference Bias in Self-Assessments of Quality of Life." *Journal of Health Economics* 19 (3):403-420.
- Hanson, Thomas L. 1999. "Does Parental Conflict Explain Why Divorce Is Negatively Associated with Child Welfare?" *Social Forces* 77 (4):1283-1316.
- Heckman, James J. 1990. "Varieties of Selection Bias." *American Economic Review* 80 (2: Papers and Proceedings of the Hundred and Second Annual Meeting of the American Economic Association):313-318.
- Heckman, James J. 2008. "Schools, Skills, and Synapses." *Economic Inquiry* 46 (3):289-324.
- Heckman, James J., and Bo E. Honoré. 1990. "The Empirical Content of the Roy Model." *Econometrica* 58 (5):1121-1149.
- Heckman, James J., John Eric Humphries, and Gregory Veramendi. 2016. "Returns to Education: The Causal Effects of Education on Earnings, Health and Smoking." Under revision, *Journal of Political Economy*.
- Heckman, James J., Seong Hyeok Moon, Rodrigo Pinto, Peter A. Savelyev, and Adam Q. Yavitz. 2010a. "Analyzing Social Experiments as Implemented: A Reexamination of the Evidence from the HighScope Perry Preschool Program." *Quantitative Economics* 1 (1):1-46.
- Heckman, James J., Seong Hyeok Moon, Rodrigo Pinto, Peter A. Savelyev, and Adam Q. Yavitz. 2010b. "The Rate of Return to the HighScope Perry Preschool Program." *Journal of Public Economics* 94 (1-2):114-128.
- Heckman, James J., and Stefano Mosso. 2014. "The Economics of Human Development and Social Mobility." *Annual Review of Economics* 6 (1):689-733.
- Heckman, James J., Jora Stixrud, and Sergio Urzúa. 2006. "The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior." *Journal of Labor Economics* 24 (3):411-482.
- Heckman, James J., and Edward J. Vytlacil. 2007a. "Econometric Evaluation of Social Programs, Part I: Causal Models, Structural Models and Econometric Policy Evaluation." In *Handbook of Econometrics*, edited by James J. Heckman and Edward E. Leamer, 4779-4874. Amsterdam: Elsevier B. V.
- Heckman, James J., and Edward J. Vytlacil. 2007b. "Econometric Evaluation of Social Programs, Part II: Using the Marginal Treatment Effect to Organize Alternative Economic Estimators to Evaluate Social Programs, and to Forecast Their Effects in New Environments." In *Handbook of Econometrics*, edited by James J. Heckman and Edward E. Leamer, 4875-5143. Amsterdam: Elsevier B. V.
- Himmelfarb, Gertrude. 1995. *The De-moralization Of Society: From Victorian Virtues to Modern Values*. New York: Alfred A. Knopf.
- Hofer, Manfred, Claudia Kuhnle, Britta Kilian, and Stefan Fries. 2012. "Cognitive Ability and Personality Variables as Predictors of School Grades and Test Scores in Adolescents." *Learning and Instruction* 22 (5):368-375.

- Kautz, Tim, James J. Heckman, Ron Diris, Bas ter Weel, and Lex Borghans. 2014. "Fostering and Measuring Skills: Improving Cognitive and Non-Cognitive Skills to Promote Lifetime Success." Organisation for Economic Co-operation and Development, Paris.
- Kautz, Tim, and Wladimir Zanolini. 2015. "Measuring and Fostering Non-Cognitive Skills in Adolescents: Evidence from Chicago Public Schools and the OneGoal Program." University of Chicago, Department of Economics.
- LaMar, Michelle M. 2014. "Models for Understanding Student Thinking Using Data from Complex Computerized Science Tasks." Dissertation, University of California, Berkeley.
- Lancaster, Kelvin. 1990. "The Economics of Product Variety: A Survey." *Marketing Science* 9 (3):189-206.
- Lindqvist, Erik, and Roine Vestman. 2011. "The Labor Market Returns to Cognitive and Noncognitive Ability: Evidence from the Swedish Enlistment." *American Economic Journal: Applied Economics* 3 (1):101-128.
- List, John A. 2007. "On the Interpretation of Giving in Dictator Games." *Journal of Political Economy* 115 (3):482-493.
- Lochner, Lance. 2011. "Nonproduction Benefits of Education: Crime, Health, and Good Citizenship." In *Handbook of the Economics of Education*, edited by Eric A. Hanushek, Stephen Machin and Ludger Wößmann, 183-282. Amsterdam: Elsevier B. V.
- Mann, Horace. 1867. *Lectures and Annual Reports on Education*. Boston, MA: George C. Rand & Avery.
- Mislevy, Robert J., Seth Corrigan, Andreas Oranje, Kristen E. DiCerbo, Malcolm I. Bauer, Alina A. von Davier, and Michael John. 2016. "Psychometrics and Game-Based Assessment." In *Technology and Testing: Improving Educational and Psychological Measurement*, edited by Fritz Drasgow, 23-48. New York: Routledge.
- Moffitt, Terrie E. 1993. "Adolescence-Limited and Life-Course-Persistent Antisocial Behavior: A Developmental Taxonomy." *Psychological Review* 100 (4):674-701.
- Mushkin, Selma J. 1962. "Health as an Investment." *Journal of Political Economy* 70 (5, Part 2):129-157.
- Nagel, Rosemarie. 1995. "Unraveling in Guessing Games: An Experimental Study." *American Economic Review* 85 (5):1313-1326.
- Nordhaus, William D., and James Tobin. 1973. "Is Growth Obsolete?" In *The Measurement of Economic and Social Performance*, edited by Milton Moss, 509-564. Cambridge, MA: National Bureau of Economic Research.
- Nussbaum, Martha C. 2001. *Women and Human Development: The Capabilities Approach*. Cambridge, UK: Cambridge University Press.
- Nussbaum, Martha C. 2003. "Capabilities as Fundamental Entitlements: Sen and Social Justice." *Feminist Economics* 9 (2-3):33-59.
- Nussbaum, Martha C. 2011. *Creating Capabilities: The Human Development Approach*. Cambridge, MA: Belknap Press.
- Puppe, Clemens. 1996. "An Axiomatic Approach to "Preference for Freedom of Choice"." *Journal of Economic Theory* 68 (1):174-199.
- Robeyns, Ingrid. 2000. "An Unworkable Idea or a Promising Alternative? Sen's Capability Approach Re-examined." Center for Economic Studies Discussions Paper no. 00.30. Katholieke Universiteit Leuven, Leuven, Belgium.
- Robeyns, Ingrid. 2003. "Sen's Capability Approach and Gender Inequality: Selecting Relevant Capabilities." *Feminist Economics* 9 (2-3):61-92.
- Robeyns, Ingrid. 2005. "Selecting Capabilities for Quality of Life Measurement." *Social Indicators Research* 74 (1):191-215.
- Rossi, Alice S. 1965. "Women in Science: Why So Few? Social and Psychological Influences Restrict Women's Choice and Pursuit of Careers in Science." *Science* 148 (3674):1196-1202.
- Sen, Amartya. 1985. "Well-being, Agency and Freedom: The Dewey Lectures 1984." *Journal of Philosophy* 82 (4):169-221.
- Sen, Amartya. 1991. "Welfare, Preference and Freedom." *Journal of Econometrics* 50 (1-2):15-29.
- Sen, Amartya. 1999a. *Commodities and Capabilities*. Oxford, UK: Oxford University Press.
- Sen, Amartya. 1999b. *Development as Freedom*. Oxford, UK: Oxford University Press.

- Sen, Amartya. 2009. *The Idea of Justice*. Cambridge, MA: Belknap Press.
- Senior, Nassau William. 1836. *An Outline of the Science of Political Economy*. London: W. Clowes and Sons.
- Spence, A. Michael. 1972. "Market Signalling: The Informational Structure of Job Markets and Related Phenomena." PhD Dissertation, Harvard University.
- Stange, Kevin M. 2012. "An Empirical Investigation of the Option Value of College Enrollment." *American Economic Journal: Applied Economics* 4 (1):49-84.
- United Nations Development Programme. 2010. *Human Development Report 2010: The Real Wealth of Nations: Pathways to Human Development*. Basingstoke, UK: Palgrave Macmillan.
- Weisbrod, Burton A. 1962. "Education and Investment in Human Capital." *Journal of Political Economy* 70 (5, Part 2):106-123.
- Weisbrod, Burton A. 1964. "Collective-Consumption Services of Individual-Consumption Goods." *Quarterly Journal of Economics* 78 (3):471-477.
- Yi, Junjian. 2013. "The Rational Formation of Altruism: Theory and Evidence." PhD Dissertation, Chinese University of Hong Kong.