

Behavioral Development Economics

14.771 guest lecture Fall 2021

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Slides partially based on Handbook Chapter prepared with Michael Kremer (Chicago) and Gautam Rao (Harvard)

Plan for today and Wednesday

- Today: Overview of behavioral development economics
 - What is behavioral development economics?
 - Euler equation puzzle
 - An application: health
 - Time preferences and demand for commitment
- Wednesday: Psychology of poverty
 - Psychological poverty traps?
 - Financial strain
 - Sleep deprivation
 - Mental health

Historical perspective

- **Historical views of development:** People were thought to be very different before and after the advent of “modernity”. e.g.
 - Pre-capitalist vs. capitalist (Marx)
 - Tradition vs. rationalism (Weber and Durkheim)
 - Mechanical vs. organic solidarity
 - Modernization theory: viewed modernization as a process of radical social change but also change in ways of thinking and seeing the world
- **The rise of development economics:** Development economics emerges as a critical response to this view:
 - Sees farmers as essentially rational capitalists (but maybe facing market failures)
 - Rejects seemingly unfalsifiable cultural explanations (e.g. “Hindu rate of growth”)

The rise of behavioral development economics (cont'd)

- The dominant view in development economics up to about the 1990s is that the poor are “poor but efficient” (Schultz, 1964)
- However, this view started to change during the past two decades:
 - With rise of behavioral economics, a more psychologically realistic view of human behavior has entered development economics
 - Systematic deviations from standard models in preferences, beliefs and decision-making
 - So far, relies mostly on “universal” insights from psychology about human behavior
 - Increasing attention to differences in psychology across cultures or across rich and poor
 - Studies the interaction of behavioral biases with the institutions & markets specific to developing economies.

Caveats and critiques of behavioral development economics

Behavioral development economics...

- (1) Attempts to augment and improve, and not supplant, existing models.
- (2) Does not deny the importance of institutions for development
- (3) Is sometimes critiqued for dismissing real incentives and constraints that apparently “irrational” actions reflect (e.g. Rosenzweig and Udry 2014). The best research in this subfield overcomes this challenge by testing specific behavioral mechanisms rather than simply identifying an apparent failure of the standard model.

Caveats and critiques of behavioral development economics (cont'd)

Behavioral development economics...

- (4) Does not “blame the poor” for their poverty since it is (i) typically concerned with universal psychological factors and (ii) does not stipulate that behavioral biases are blameworthy.
- (5) Critique that behavioral econ proposes paternalistic policies that restrict individual choices. There is truth to this critique. But weigh this against bad policy outcomes that can result from misunderstanding human behavior.
- (6) Occasionally rejects robust lab-experimental results which are found to be less important in the real world (e.g. Cohen and Dupas 2010; Ashraf et al. 2010)

Topics covered (organized by behavioral concepts)

- **Non-standard preferences**
 - Time preferences (present bias)
 - Risk preferences (loss aversion, reference dependence, narrow bracketing)
 - Social preferences
- **Non-standard beliefs**
 - Naivete, projection bias
 - Non-Bayesian learning, redundancy neglect
 - Motivated reasoning
- **Non-standard decision-making**
 - Limited attention and memory
 - Mental accounting
 - Default effects

What makes behavioral development particularly exciting?

- Combines best features of several fields:
 - (1) Development economics: experimental approach to tackling high-stakes, policy-relevant questions in field settings
 - (2) Experimental economics: careful procedures and methods in carefully controlled lab settings; focus on mechanisms
 - (3) Psychology and other fields: novel ideas and concepts; new models to test
- Lots of space for creativity and novel ideas or insights!

Topics covered (organized by development economics)

- (1) Introduction
- (2) **High rates of return without rapid growth (Euler equation puzzle)**
 - (A) Euler Puzzle
 - (B) Present bias
 - (C) Reference-dependent preferences
 - (D) Other behavioral factors (e.g. biased beliefs)
- (3) Health
- (4) Savings
- (5) Risk and insurance
- (6) Technology adoption
- (7) Labor
- (8) Firms
- (9) Social preferences, culture, and development
- (10) The psychology of poverty

High returns to capital in many contexts (Banerjee and Duflo, 2005)

- Borrowing at very high rates (70 to 100% annual rates and more)
 - Small-time fruit vendors in Chennai who borrow at daily rates of 5% (Karlan, Mullainathan and Roth, 2018)
- High returns to small-business grants (de Mel et al., 2008)
- High returns to inventories (Kremer, Lee, Robinson, Rostapshova, 2013)
- Predictable large increases in prices between seasons (Burke et al., 2018)

Euler equation

- Suppose production function $F(K)$ with $F'(K) \geq 0$ and $F''(K) \leq 0$.
- Standard Euler equation links consumption growth to marginal return to capital:

$$u'(c_t) = \delta F'(K_t) u'(c_{t+1}) \quad (1)$$

- Implies (unrealistically) high consumption growth rates. Why?
 - If log utility, $F'(K) = 50\%$ annually, and $\delta = 0.96$, then $\frac{\dot{c}}{c} = 44\%$.
 - If constant intertemporal elasticity of substitution utility with $\sigma = 2$, then $\frac{\dot{c}}{c} = 20\%$.
 - Still implies 38-fold consumption growth in 20 years.
- How can we resolve this puzzle?
 - Need high “tax” and/or high discount rate

Puzzle persists even with non-concave production function.

- Non-concave production functions are a feature of poverty trap models
 - Imply multiple steady-states and sustained poverty below threshold level
- But observed initial conditions need to be consistent with model
 - Steady state will have low rate of return
 - Euler equation will be satisfied (FOC)
 - Individuals with high rate of return should have fast consumption growth
- Poverty trap models also suggest a transformative effect of credit
 - Seems counterfactual: limited uptake, limited transformation (Banerjee, Karlan, and Zinman, 2015)

Stochastic income and risk aversion?

- Maybe people don't invest because investments (e.g. fertilizer) are risky? Suppose income in period t is:

$$Y_t = Y_0 + \epsilon_t + \sum_{i=1}^n \mu_{i,t} F_i(K_{i,t}), \quad (2)$$

where n assets/capital goods, arbitrary pattern of correlation.

- Stochastic Euler equations:

$$u'(c_t) = \delta \mathbb{E}_t[\mu_{i,t} F'_i(K_{i,t}) u'(c_{t+1})], \quad i = 1, 2, \dots, n \quad (3)$$

- Given initial capital stock, risk aversion will:
 - Reduce investment in assets which covary positively with consumption
 - Increase investment in assets which covary negatively with consumption

But: Optimal to build buffer stock savings (Deaton 1991; Carroll 1997)

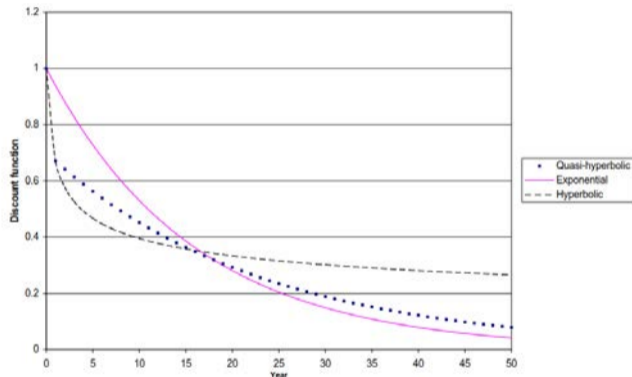
- If patient, risk averse, subject to large shocks, want large safe buffer stock. At any one time, only a few people should have low buffer stock.
- For majority with large buffer stock, consumption should not move much with:
 - high-frequency income shocks
 - predictable income changes (e.g. seasons)
- Implies that even if returns to fertilizer highly correlated with income in season, only modestly correlated with lifetime income and thus consumption
 - Beta of fertilizer investment will be modest (i.e. using fertilizer doesn't add much risk to lifetime consumption), so risk aversion will only modestly reduce fertilizer investment.

Model with patient consumers seems to make incorrect predictions.

- In fact:
 - Liquid buffer stocks are often modest.
 - Consumption covaries with income, including *predictable* income.
 - Karlan et al. (2014) find that rainfall insurance increases fertilizer use.
- These predictions emerge if agents are impatient.
- Thus with either deterministic or stochastic Euler equation, matching the data requires a high effective discount rate.

Time preferences?

- Maybe $\delta = 50\%$
 - Implies would not give up \$1 today for \$1 billion in 30 years
 - No one would own land, get an education, etc.
- Alternative hypothesis: present bias (β, δ)
 - High discount rate between now and tomorrow
 - Low discount rate between future periods



Source: Authors' calculations. Exponential: $\delta = 0.938$; hyperbolic: $(1+\beta)^{-\delta}$, with $\beta=4$ and $\delta=1$; and quasi-hyperbolic: $(1+\beta)^{-\delta} \beta^t$, with $\beta=0.7$ and $\delta=0.937$.

Figure: Comparison of exponential, hyperbolic, and quasi-hyperbolic discount functions [Angeletos et al., 2001]

Quasi-hyperbolic discounting

- **Exponential Discounting:** at time t , the person aims to maximize

$$u_t + \delta u_{t+1} + \delta^2 u_{t+2} + \delta^3 u_{t+3} + \dots,$$

where $0 < \delta \leq 1$ is the *short-term discount factor* and $\delta \leq 1$ is the *long-term discount factor*.

- **Quasi-Hyperbolic Discounting:** at time t , the person aims to maximize

$$u_t + \delta u_{t+1} + \delta^2 u_{t+2} + \delta^3 u_{t+3} + \dots,$$

where $0 < \beta \leq 1$ is the *short-term discount factor* and $\delta \leq 1$ is the *long-term discount factor*.

- measures an individual's **present bias**.
- Model goes back to Phelps 1968 and Laibson 1997.

Implications of present-focused preferences

- Present-focused agents will:
 - Rapidly spend down liquid assets, becoming effectively liquidity constrained
 - Build up (or hold) a stock of *illiquid* assets that pay off in distant future
 - Leave high rate of return investments on the table, if effectively liquidity constrained
 - Not be able to smooth consumption; consumption will co-move with income shocks, even with predictable income variation
- The sophistication of the present-biased actor will determine the degree of procrastination and demand for commitment devices (more below).
- See Laibson 1997; Angeletos et al., 2001; O'Donoghue and Rabin 1999 & 2001.

Can loss aversion help explain high expected returns?

- Complementary explanation for Euler puzzle: loss aversion
- Experimental evidence suggests that many people are loss averse (rather than risk averse).
- Kink in utility function around a reference point; losses felt more strongly than gains.
 - Empirical estimates that people weigh losses 2-3 times as much as gains: e.g. turn down gambles with equal chance of winning \$2 and losing \$1.
 - With narrow bracketing, this could inhibit many investments facing farmers and small businesses in developing world

Loss aversion and investment

- Shopkeepers in Kenya exhibiting greater loss aversion in experimental tasks maintain lower inventories (Kremer et al., 2013).
- Asset by asset; people may be hesitant to give up existing assets to invest in new assets, making asset allocations sticky, maybe reducing migration
- Under loss aversion, loans collateralized with assets purchased under the loan will have high uptake and low default (Jack et al., 2016; Carney et al., 2018).
- Predicts stickiness of wealth rather than poverty trap
 - Under poverty trap model, \$100 to shopkeeper → growth or fall back
 - Under loss aversion, potentially \$100 more indefinitely

Topics covered

- (1) Introduction
- (2) High rates of return without rapid growth (Euler equation puzzle)
- (3) **Health**
 - (A) Underinvestment in preventive health
 - (B) Present bias
 - (C) Biased beliefs
 - (D) Incorrect mental models
- (4) Savings
- (5) Risk and insurance
- (6) Technology adoption
- (7) Labor
- (8) Firms
- (9) Social preferences, culture, and development
- (10) The psychology of poverty

Under-investment in preventive health

- One widely studied case of underinvestment in high-return opportunities: low investment in preventive health (e.g. vaccinations, deworming, bed nets, water treatment, hypertension)
- The recent literature has established several stylized facts regarding health behavior in developing countries (Kremer and Glennerster 2011; Dupas and Miguel 2017):
 - (1) Low willingness to pay for preventive health
 - (2) High expenditures for treatments of acute conditions
 - (3) High sensitivity of health investments to price and convenience

Investment in preventative health: Low WTP and high sensitivity to price

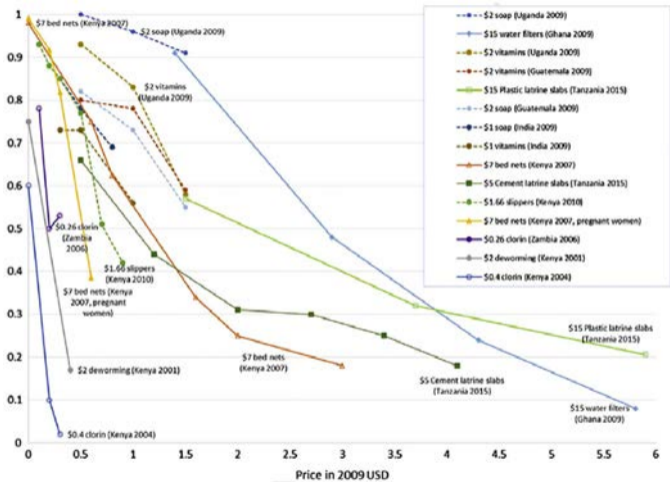


Figure: Share of individuals taking up the product as function of price (From Dupas and Miguel 2017)

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Under-investment in preventive health: High-price sensitivity

- High price sensitivity: Deworming medication (Kremer and Miguel, 2007); mosquito nets (Cohen and Dupas, 2010); water treatment (Ashraf, Berry, and Shapiro, 2010).
- Small (and time-limited) incentives for vaccination (Banerjee et al., 2010) or collecting HIV tests (Thornton, 2008).
- For example, estimated private financial benefit of deworming is \$142 (Baird, et al. 2015), yet \$0.30 per child cost-sharing fee decreased take up 80 percent (Kremer and Miguel, 2007).

Under-investment in preventive health: expenditures on acute conditions

- Arguably excessive treatment for some acute conditions.
- May be information in part, but many say they believe in biomedical explanations.
- Implied cost of prevention is high
- Knife-edge balance between benefits and costs of prevention?
- Two ways present bias may generate this underinvestment:
 - (1) Procrastination
 - (2) Liquidity constraints due to present bias

Present bias and procrastination

- Driven by the immediate utility costs of the investment:
 - Examples: hassle and psychic costs of going to doctor, walking to farther-away water source, using dilute chlorine solution, changing diet, learning painful news about health status, taking medication
- Procrastination requires both present bias and some degree of naivete.
 - Prefer to do painful task tomorrow, mis-predict that they will do it tomorrow
- Consistent with:
 - Effect of time-limited incentives: e.g. Banerjee et al. 2010,
 - Effect of reducing hassle costs: e.g. water dispensers
- Note: Would not procrastinate on acute condition, since benefits immediate

Present bias and liquidity constraints

- Present bias can lead to liquidity constraints (Angeletos et al. 2001)
- Once liquidity-constrained:
 - High-return preventive investments may be left unexploited
 - Moreover, monetary expenditures might now translate into (almost) immediate utility costs, since need to cut back on other consumption in order to, e.g., pay for doctor visit
- Consistent with:
 - Evidence on effects of increased liquidity (Dupas and Robinson, 2013)
 - Discounted fertilizer offer soon after harvest (Duflo et al. 2011)

Present bias, sophistication, and deadlines

- The effect of naivete versus sophistication about one's present bias will depend on the nature of the investment in question.
- Distinguish between 2 cases of high-return health investments:
 - (I) Case I: Investments without deadlines
 - Naïve → repeated decisions to procrastinate
 - Sophisticated → may delay for a few time periods but will eventually make investment therefore no major welfare losses (O'Donoghue and Rabin, 2001)
 - (II) Case II: One-shot investments with deadlines (but negligible monetary costs)
 - Present biased agents will make the investment since there is no way to procrastinate

Biased beliefs

- Making good decisions regarding health requires forming accurate beliefs about numerous variables which may be difficult due to uncertainty and heterogeneity across individuals (Arrow 1963).
- Inaccurate beliefs (e.g. misperceived returns to health investments) could help explain underinvestment in health.
- There is some evidence for inaccurate beliefs regarding health in developing societies (e.g. Delavande and Kohler 2009; Godlonton et al. 2016)
- Information interventions appear to have large impacts on health outcomes in some contexts and small to null in others. More work is required to understand the determinants of success in various contexts (Dupas and Miguel 2017).
- Motivated beliefs could play an important role.

Incorrect mental models

- Individuals may interpret what they observe through the wrong causal model or theory (Schwartzstein 2014, Gagnon-Bartsch et al. 2018)
- Incorrect mental models that may be important for health outcomes in developing societies include superstitious beliefs or beliefs in magical theories of sickness and health which include witchcraft.
- Ashraf et al. 2017 illustrate this with the case of maternal risk in Zambia and a wide-spread belief about marital infidelity and complications during childbirth
- Parents across the world confidently hold the wrong beliefs about the need to rehydrate their children in response to diarrhea (Datta and Mullainathan 2014)

How do we measure time preferences?

- There is no broadly accepted and easily implementable approach to measuring time preferences. See Cohen et al. (2020) for review.
- Common approaches include:
 - (1) Providing choices between monetary payments earlier or later in time (Andersen et al. 2008; Andreoni and Sprenger 2012). But choices over money may not reveal time preferences since people MPC not equal to 1 (i.e. money receipt \neq consumption).
 - (2) Providing choices between consumption events or effort at different points in time (McClure et al. 2007; Augenblick et al. 2015; Augenblick and Rabin 2019). But behavior outside the experiment might adjust in response. These methods are also likely to be logistically more challenging.
 - (3) Self-assessed survey answers, e.g. from Global Preferences (Falk et al. 2018). But concerns that answers might be reflect demand effects and/or social image concerns.

Different approach: measure demand for commitment¹

- **Commitment device:** an arrangement entered into by an agent who restricts his or her future choice set by making certain choices more expensive, perhaps infinitely expensive.
 - The agent would, on the margin, pay something in the present to make those choices more expensive, even if he or she received no other benefit for the payment.
 - The arrangement does not have a strategic purpose with respect to others.
- Present-biased preferences are time-inconsistent.
 - Different selves differ in their assessment of the best course of action.
 - Each time period's decision maker would like to restrict the set of choices available to his or her future selves.
- Sophisticated present-biased individuals may choose commitment contracts in an effort to change their future selves' choices.

¹See the excellent overview by Bryan et al. 2010

Example of commitment contracts (Schilbach 2019)



- Large fractions of low-income men drink daily
- High fractions of income spent on alcohol
- Severe consequences for men and their families
- Strong reported demand to reduce drinking (among men and their wives!)
- Extremely little known about alcohol consumption in developing countries

Day drinking among cycle-rickshaw drivers in Chennai

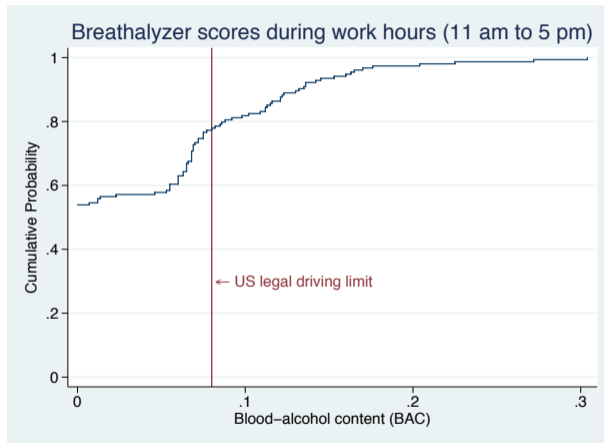


Figure: Breathalyzer scores from tests during *regular* work hours

Setup of experiment

- Three-week field experiment with low-income workers in India
- Visit study daily between 6 pm and 10 pm
- Short survey and breathalyzer test
- Financial incentives for sobriety for random subset of individuals

How to measure demand for commitment?

- Majority of people say they would like to drink less.
- Majority also say their lives would be better if all liquor stores closed.
- How can we provide rigorous evidence of demand for commitment?
 - Antabuse
 - Dominated contracts

Demand for incentives

- **Option A:** incentives for sobriety
 - Same payment structure as Incentive Group
 - Rs. 60 if $BAC > 0$, Rs. 120 if $BAC = 0$
- **Option B:** payment regardless of BAC

	Option A		Option B
	BAC > 0	BAC = 0	regardless of BAC
(1)	Rs. 60	Rs. 120	Rs. 90
(2)	Rs. 60	Rs. 120	Rs. 120
(3)	Rs. 60	Rs. 120	Rs. 150

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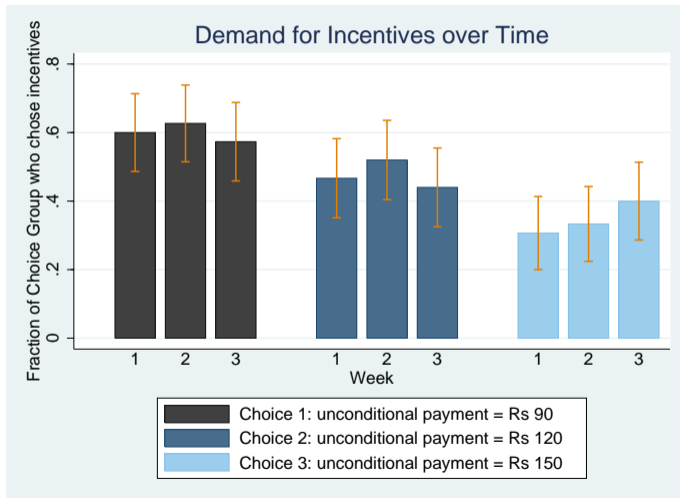
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Persistently high demand for commitment



Summary of results

- Intervention successful in reducing day drinking
 - Day drinking falls by about one third in treatment group.
 - But individuals mostly substitute to drinking later at nights.
 - No impact on labor market outcomes but increased savings for given resources
- Persistently high demand for commitment to increase sobriety
 - About 50% choose options that are dominated in study payments
 - About one third are willing to forego 10% of their daily earnings to receive incentives for sobriety
- Results consistent with naïve quasi-hyperbolic discounting

Open questions

- What are the consequences of alcohol consumption for poverty?
- How can we use these insights to design policies that help people reduce their drinking in the long-run (if they would like to do so)?
- What drives the underlying self-control problems?
- Are different commitment devices complements or substitutes?
- Why does demand for commitment vary so much across settings?

When commitment fails

- Even with commitment device, people often fail to follow through.
 - Commitment contract can be harmful for partially naïve individuals.
- John 2020: Field experiment in Philippines
 - Positive ITT estimate of offering commitment
 - But majority of clients default on commitment contract and incur penalty.
- Similar results in Bai et al. 2021
 - Low demand for for commitment device for health visits in India
 - Among people who demand commitment, few people follow through.
- Can we tailor and target commitment devices better (Dizon-Ross and Zucker 2021)?
 - Need to estimate naïveté ($\hat{\alpha}$)
 - Or can we use machine learning to tailor contracts better?
 - Or perhaps we should just offer tailored incentive contracts instead?

Demand for commitment: open questions

- What explains the large variation in demand for commitment across domains/contexts?
 - Some studies find high demand for commitment (e.g. Kaur et al. 2015; Schilbach 2019; Casaburi and Macchiavello 2019) or demand for deferred payments (Brune et al. 2021).
 - But find others relatively low demand (e.g. Bai et al. 2021). Why?
- Why do we see so few commitment products in the real world (Laibson 2015)?
 - Commitment vs. flexibility (Amador et al. 2006)
 - States of nature are (often) not publicly observable.
 - Transaction costs
 - Partial naïveté
- Can we design other commitment devices with (large) positive welfare effects?
 - Incentives for sobriety (following a large literature on 'contingency management')
 - Incentives to sleep? (Avery et al. 2020)
 - Incentives to do therapy?

Handbook chapter covers many other exciting topics!

- (1) Introduction
- (2) High rates of return without rapid growth (Euler equation puzzle)
- (3) Health
- (4) Savings
- (5) Risk and insurance
- (6) Technology adoption
- (7) Labor
- (8) Firms
- (9) Social preferences, culture, and development
- (10) The psychology of poverty (next lecture)
 - Financial strain
 - Sleep deprivation
 - Mental health

Conclusion

- Ideas from behavioral economics help explain important puzzles in development.
- Taking behavioral development economics seriously, going forward, will involve testing specific mechanisms and providing calibrations and estimations where possible (DellaVigna 2018)
- Many unanswered questions remain!
- Other important topics in development to which behavioral economics may be fruitfully applied (e.g. education, political economy, economics of the family).

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