Development Economics (EC9C0)

Week 1: Poverty
Lecture 2

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Roadmap

Taking the poverty-trap model to the data

Internal poverty traps

Evidence on attention-based poverty traps

Wrapping up

Papers to read

The state of the evidence on poverty traps

- Until recently ($\approx$ 10 years ago), finding evidence for the poverty trap model has been challenging.
- This led to some scepticism as to whether poverty traps exist in practice (e.g. Kraay and Mckenzie 2014).
- The best evidence we had came from small-scale studies of nomadic pastoralists (e.g in Ethiopia)
- The evidence we reviewed in lecture 1 on the positive long-term impacts of cash and asset transfer interventions provides new support for the poverty trap hypothesis.

Suppose all the RCTs we reviewed showed positive long-term impacts on income from one-time transfers of cash or physical assets.

Would this conclusively establish the existence of poverty traps?

The RCT evidence we reviewed is reduced form: it confirms a key prediction of the model.

However, the model makes more reduced form predictions:

- The asset distribution should be bimodal.
- The assets of those between the (high) low steady state and the threshold should (grow) over time.

- Important to quantify (i) how many people are trapped, and (ii) what is the gain ($y(k_H^*) - y(k_L^*)$) of escaping the trap.

- A recent study of the Bangladesh graduation program by BRAC makes progress on these questions.

Balboni et al. 2021

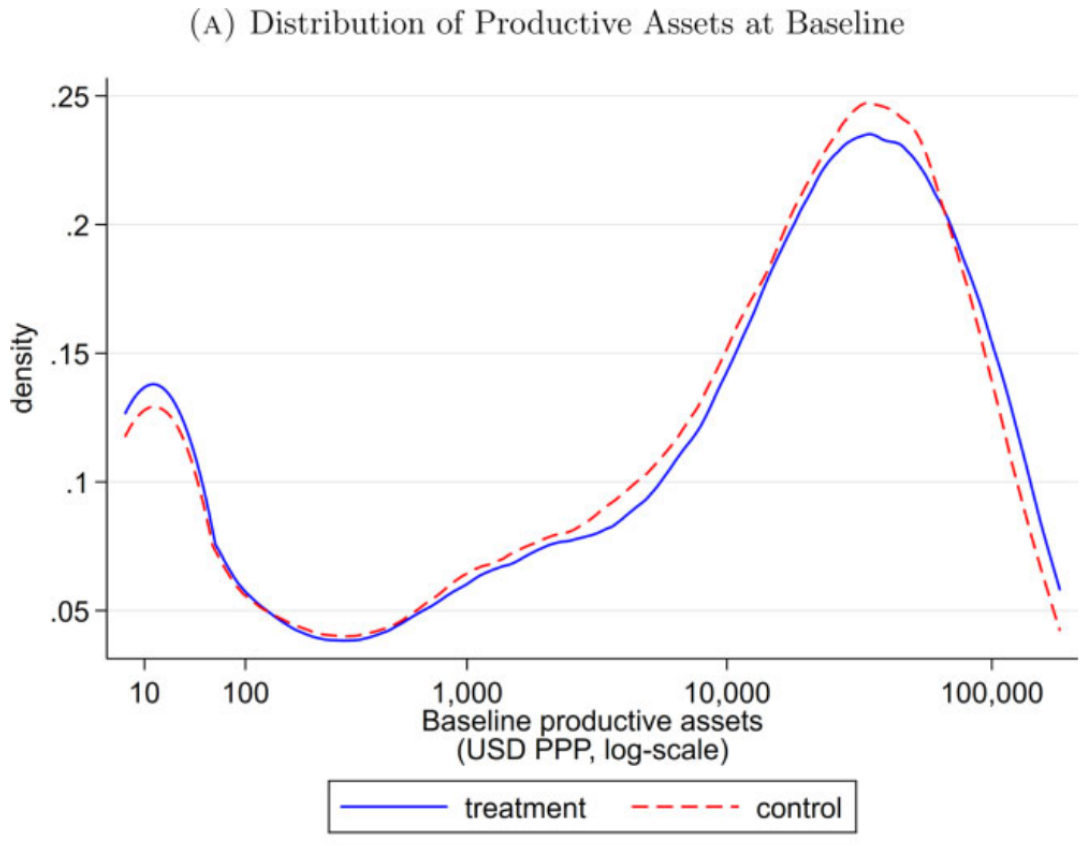
A large-scale study that tracks 6,000 people, over 11 years.

The treatment group gets an asset transfer at the start of the period (most frequently a cow).

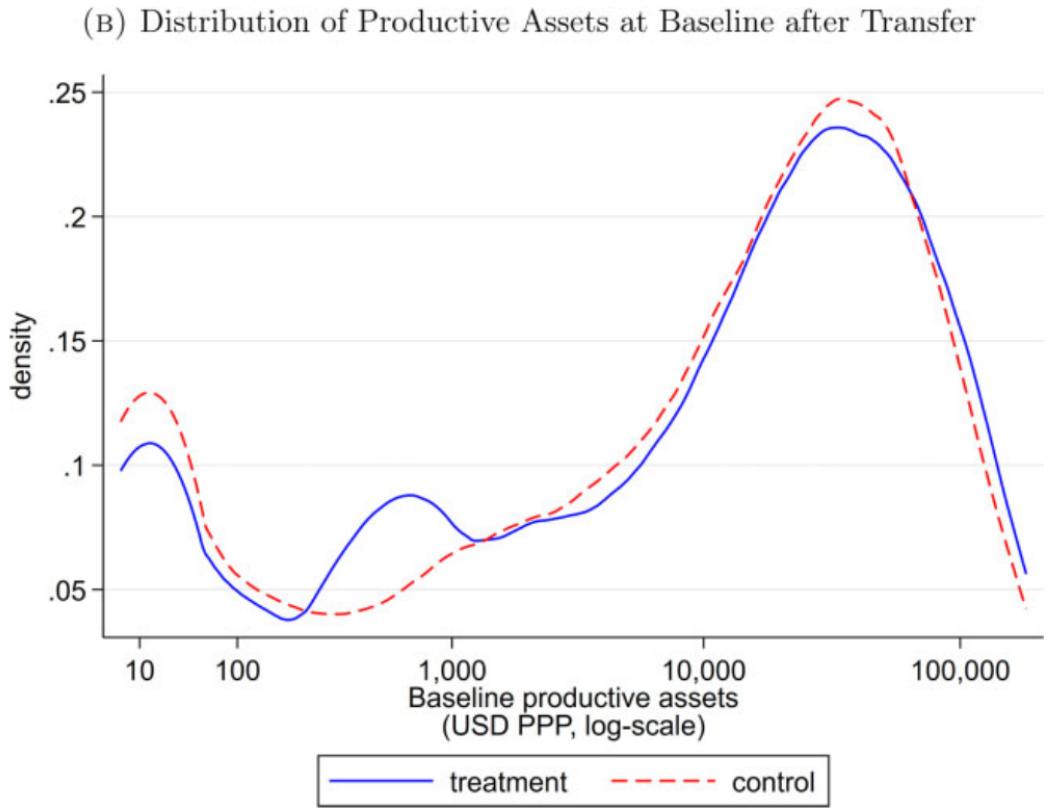
The control group is treated after 4 years.

2 key pieces of evidence on the existence of an assets-based poverty trap + a structural model.

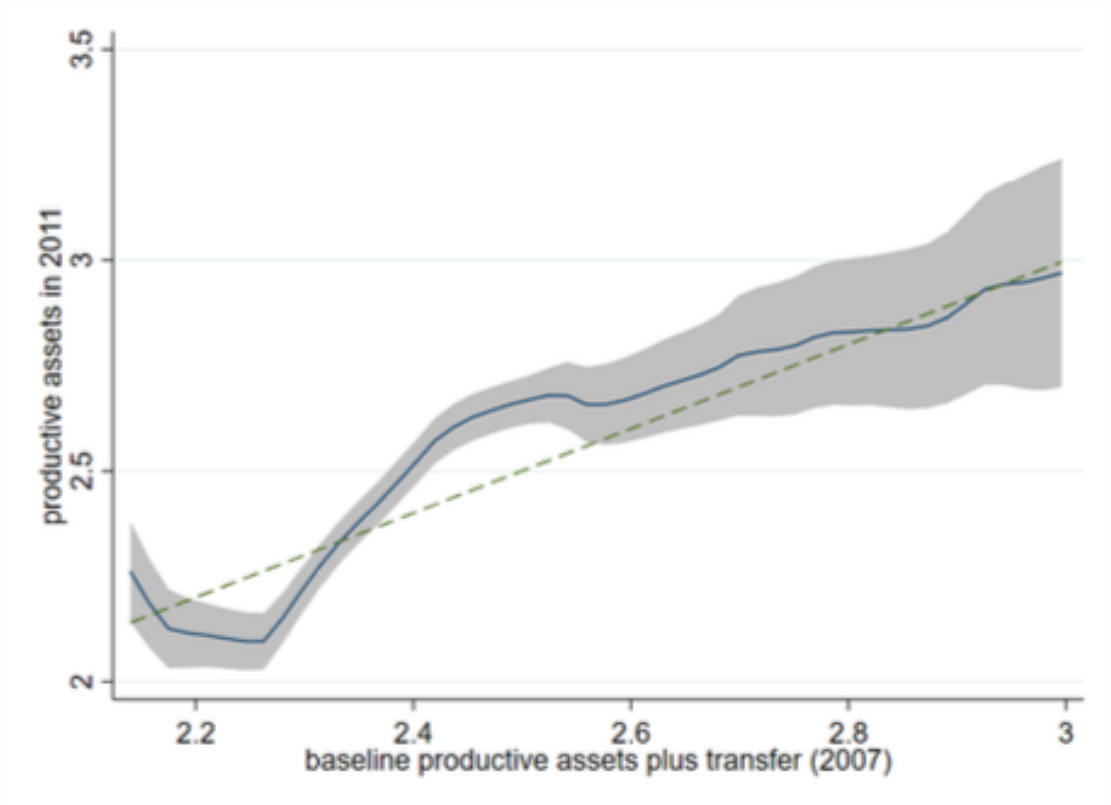
Evidence 1: the modal distribution of assets at baseline



Also the distribution of assets after treatment



Evidence 2: the asset transition equation in the treatment group



(a) Treatment villages

Regression analysis supports the conclusion of the non-parametric analysis

TABLE II

SHORT-TERM RESPONSES TO THE ASSET TRANSFER

	Dependent variable: log change of productive assets 2007–2011				
	Panel A		Panel B		
	Treatment (1)	Treatment (2)	Control (3)	Control (4)	Both (5)
Above $\hat{k}$	0.297***	0.475***	−0.020	−0.097	−0.020
	(0.043)	(0.070)	(0.052)	(0.598)	(0.057)
Baseline assets		−2.199***		−0.463*	
		(0.698)		(0.266)	
Above $\hat{k}$ × baseline assets		1.969***		−0.097	
		(0.729)		(0.269)	
Treatment					−0.483***
					(0.059)
Above $\hat{k}$ × treatment					0.318***
					(0.070)
Constant	−0.138***	−0.282***	0.345***	−0.680	0.345***
	(0.033)	(0.057)	(0.046)	(0.592)	(0.050)
N	3,292	3,292	2,450	2,450	5,742

Notes. * $p < .1$; ** $p < .05$; *** $p < .01$. Standard errors are in brackets. Sample: ultra-poor households in treatment and control villages with log baseline productive assets below 3 (observations from control households are excluded if their baseline productive assets were above 3 had they received the transfer). The dependent variable is the difference between log productive assets in 2011 and log of productive assets in 2007, where productive assets are defined as the total value of livestock, poultry, business assets (e.g., tools, vehicles, and structures), and land. Above $\hat{k}$ equals 1 if the baseline asset stock plus the imputed transfer is larger than 2.333, and 0 otherwise. In treatment, this represents households' actual posttransfer asset stock. In control, where no transfer was received, Above $\hat{k}$ indicates whether the household would be above 2.333 if it had received a transfer. Baseline assets always refers to the actual asset stock, that is, in control without the imputed transfer. Baseline assets are centered at 2.333, such that the coefficient on Above $\hat{k}$ reflects the log change at the threshold. Treatment was assigned at the village level.

A poverty-trap model

Balboni et al. 2021 propose a model where:

- Individuals choose how much time to dedicate to wage work (h) and livestock (l). They can also hire h' labor.
- The returns to livestock rearing grow in capital (non-convexity): $q = Af(\bar{k})g(l + h')$.
- Individuals have capital $\bar{k}$. Capital cannot be borrowed (borrowing constraint).
- Wage work earns w. Outside labor earns $w' < w$.
- Individuals have idiosyncratic productivity in livestock rearing A, which determine the optimal mix of occupations.

Production function

$$f(k_i)g(l_i + h_i') = \left(ak_i^2 + bk_i\right)(l_i + h_i')^{\beta}.$$

The individual problem

$$\max_{l\geqslant 0, h\geqslant 0, h'\geqslant 0} Af(\bar{k})g(l+h') + wh - w'h' - \frac{1}{2}(\sqrt{\psi_l}l + \sqrt{\psi_h}h)^2 \tag{6}$$

subject to

$$h \leqslant \overline{H} \tag{H}$$

$$h' \leqslant \overline{N} \tag{N}$$

$$h + l \leqslant \overline{R}. \tag{R}$$

Case 1 First-order condition without corner solutions

$$Af(\bar{k})g'(l+h') = \psi_l l + \sqrt{\psi_l \psi_h} h$$

$$w = \sqrt{\psi_l \psi_h} l + \psi_h h$$

$$Af(\bar{k})g'(l+h') = w'.$$

Case 3 First-order condition when specialising in livestock

$$Af(\bar{k})g'(l+h') = \psi_l l$$

$$h = 0$$

$$Af(\bar{k})g'(l+h') = w'$$

Case 6 First-order condition when specialising in labor

$$w = \psi_h h$$

Estimation

Calibration: pick values $\bar{N}$, $\bar{R}$, $\bar{H}$ based on control distribution.

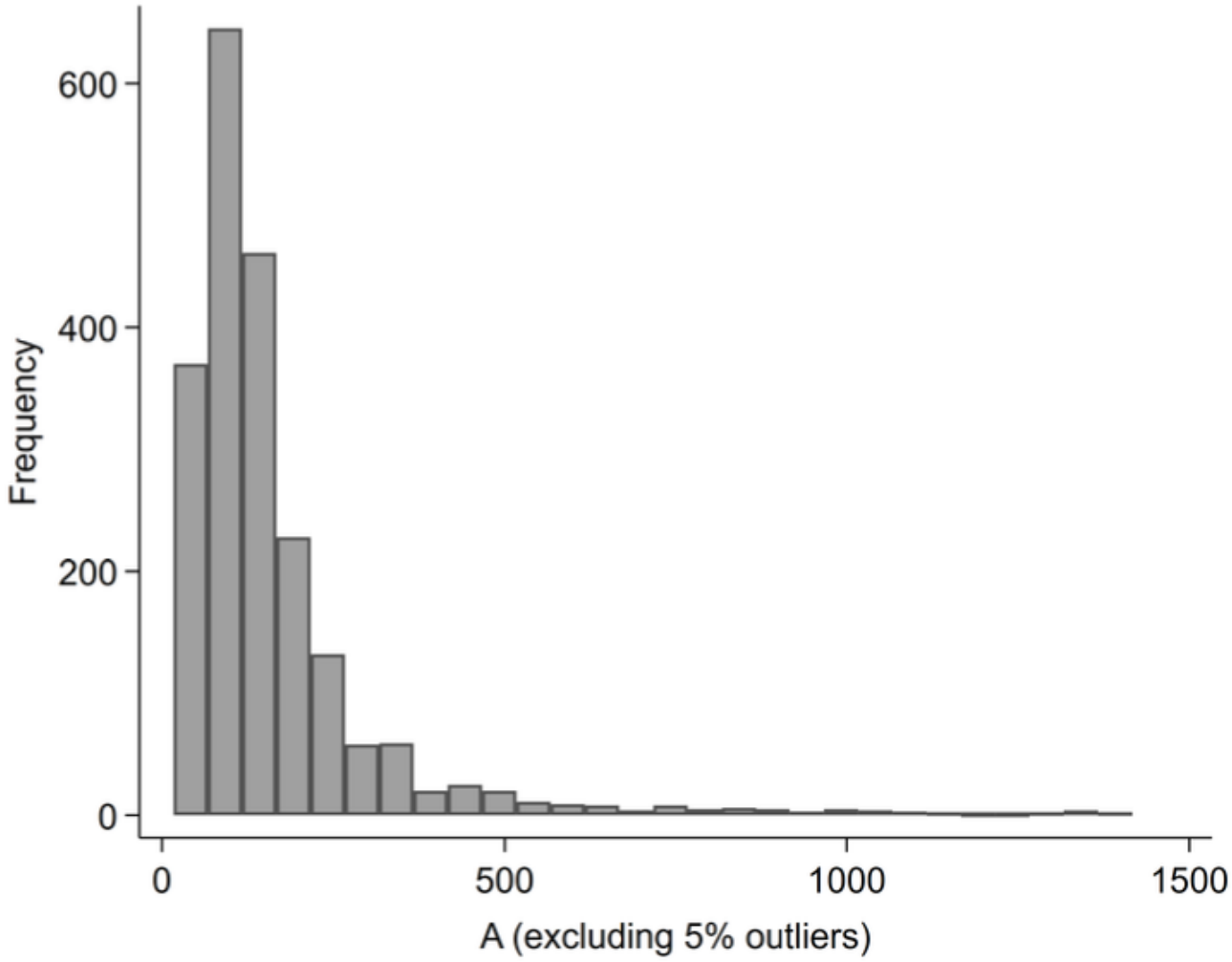
Estimate a, b and β using non-linear least squares.

Key parameters to estimate: individual-level (i) productivity parameter A, (ii) cost of effort parameters ψ_l and ψ_h.

- Case 1: FOCs give 3 equations in 3 unknowns. Parameters can be obtained by solving system of equations.
- Case 3: assume maximum value of $\psi_h \to 2$ equation and 2 unknowns. Other cases cannot be estimated.

In total, they estimate parameters for 65% of individuals.

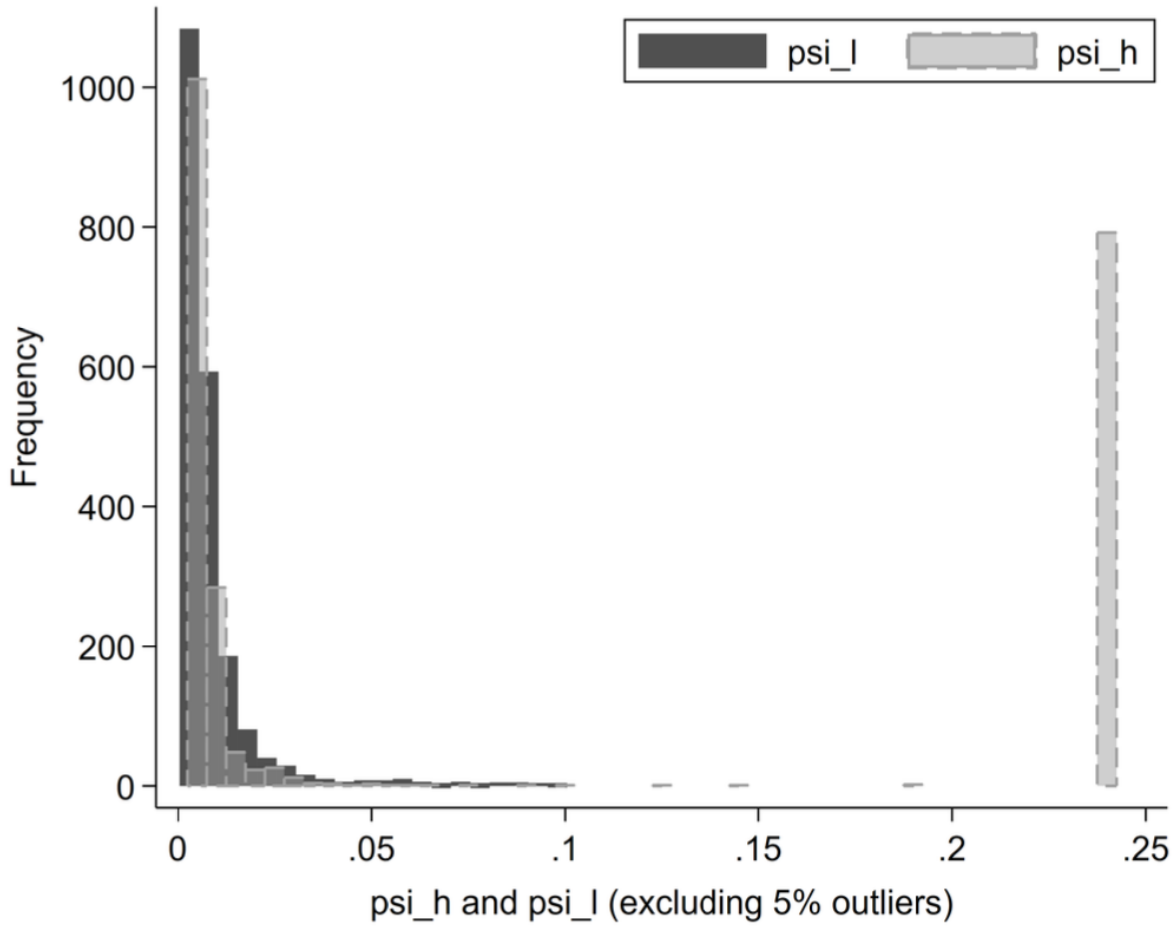
Distribution of A



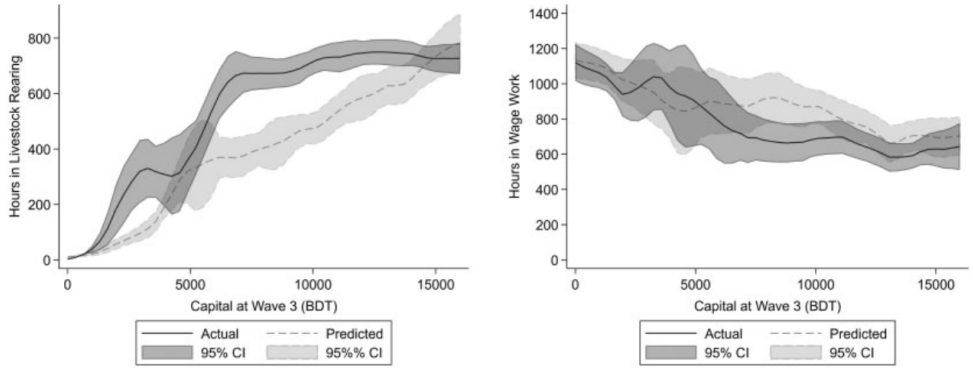
(c) Distribution of Productivity, structural estimation

Distribution of ψ_l and ψ_h

Figure B.11: Frequency Distribution of Calibrated Disutility of Labor Parameters

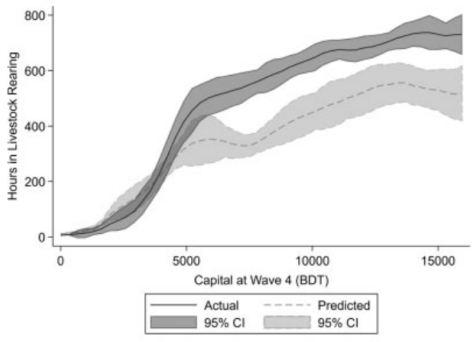


Structural model: fit with the data

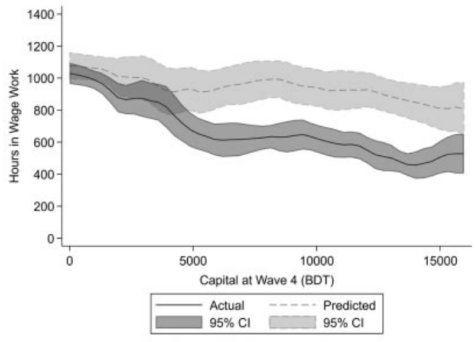


(A) Livestock: Year 4

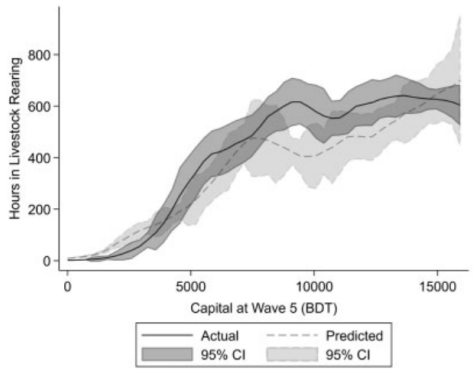
(B) Wage: Year 4



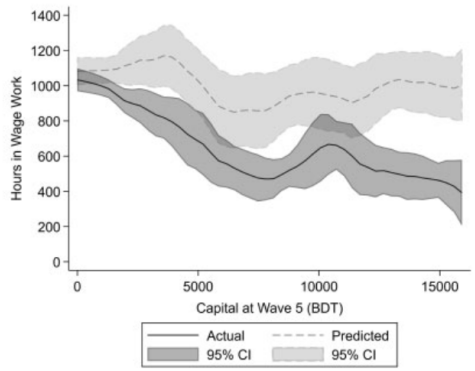
(C) Livestock: Year 7



(D) Wage: Year 7



(E) Livestock: Year 11

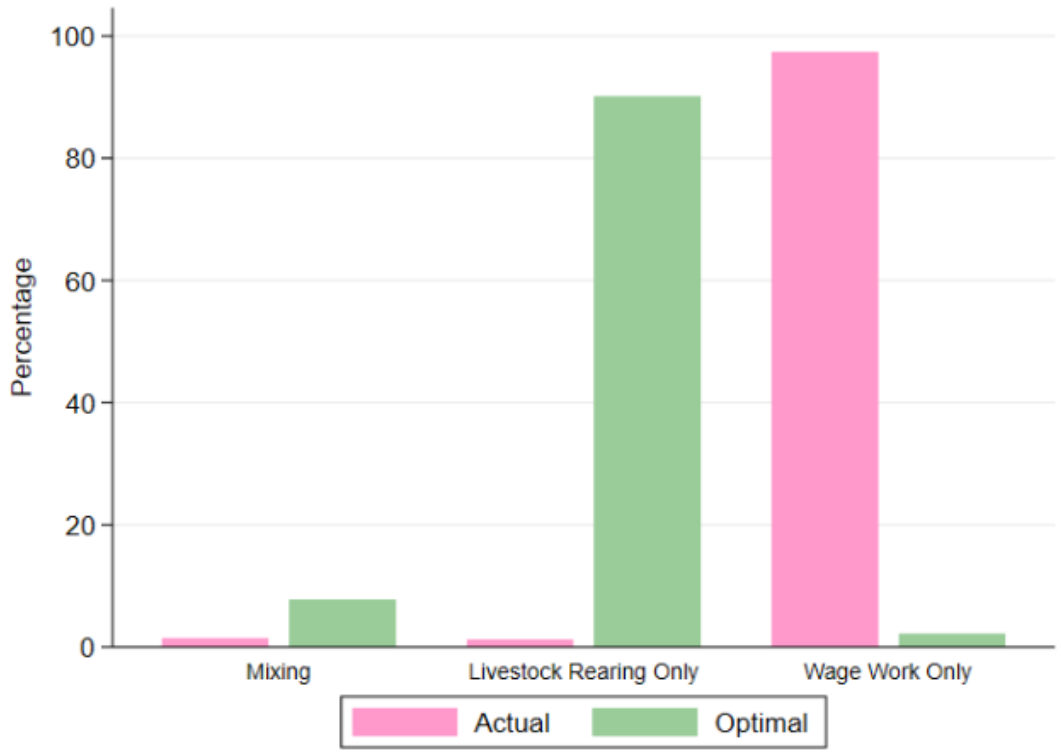


(F) Wage: Year 11

FIGURE VII

Livestock rearing optimal for 98% of poor, only 2% do it. Misallocation worth $16 million.

Figure 10: Occupational Choice: Actual vs. Model Prediction in the Absence of Capital Constraints



Is it plausible that livestock rearing is the optimal livelihood for most of the poor?

- Counterfactual policy experiment: if returns to livestock fell by 50%, livestock would be optimal for 69% of individuals.

- Recent RCT by Egger et al 2022 document minimal price inflation in response to a transfer worth 15% of local GDP.

- Burke et al 2018 find significant decrease in maize price seasonality in response to a credit intervention.

Roadmap

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Internal poverty traps

Evidence on attention-based poverty traps

Wrapping up

Papers to read

External and internal poverty traps

- Thel models we considered so far were of 'external' traps generated by technologies and markets.
- We will now look at models of 'internal' traps.
- These models shed light on how poverty affects productivity and decision-making through its effect on factors such as *attention* or *mental health*.

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The importance of attention: a simple model

- Many models of internal poverty traps are based on the assumption that attention is limited.
- Being poor imposes a tax on attention: making ends meet is very hard when money is scarce.
- This tax on attention reduces productivity on other tasks, making it harder to escape poverty.
- We will look at the model of Banerjee and Mullainathan (2008), which captures this dynamic.

Consumption and attention

- An agent gets utility from food f and a comfort good c.
- With probability p_h a problem occurs at home, which decreases utility by $b - c$.
- The agent can spend attention $\theta \in [0, 1]$ to catch problems before they create any damage.
- Utility is given by:

$$c^{\alpha} f^{1-\alpha} - p_h * (1 - \theta) * (b - c) \tag{1}$$

Production and attention

- The agent has human capital h and produces output h.
- With probability p_w a problem occurs at work, which decreases output by $1 - \beta$.
- The problem is caught before it creates any damage with probability $1 - \theta$.
- Output is given by:

$$h(1 - p_w * \theta * (1 - \beta)) \tag{2}$$

The attention trade-off

- The agent has only one unit of attention to allocate.
- The more attention is spent catching problems at home, the less attention is available to be productive at work.
- The comfort good c reduces the need to allocate attention to solve problems at home.

The solution to the model: h determines attention and productivity at work

- The agent spends a fixed portion $m(\theta, p_h)$ of their income on the comfort good.
- $m(\theta, p_h)$ is a function of θ and p_h. When θ increases, m decreases: attention and the comfort good are substitutes.
- The optimal choice for θ is either 0 or 1.

$\rightarrow$ There is a threshold level h^c of h, such that if $h \geq h^c$ people choose $\theta = 0$, and if $h < h^c$ people choose $\theta = 1$.

Enriching the model to study its dynamics

- Suppose there are two jobs:
  - A high-productivity job that requires attention: output is τh ($\tau > 1$); the probability of a problem is p_w.
  - A low-productivity job that does not requires attention: output is h; the probability of a problem is 0.

- The high-productivity job will be chosen if $h \geq h^*$ (with $\theta = 0$), while the low-productivity job will be chosen if $h < h^*$ (with $\theta = 1$).

- Suppose the human capital of the next generation is given by σ + a fraction κ of the consumption of food of the current generation.

A non-convex human capital equation

Human capital at $t+1$ is given by $\sigma + \kappa * (1 - m(\theta, p_h)) * y_t$.

Given that people have sorted in a high and low productivity occupation, the human capital transition equation is non-linear:

$$h_{t+1} = \begin{cases} \sigma + \kappa * (1 - m(0, p_h)) * h_t * \tau & h_t \geq h^* \\ \sigma + \kappa * (1 - m(1, p_h)) * h_t & h_t < h^* \end{cases} \tag{3}$$

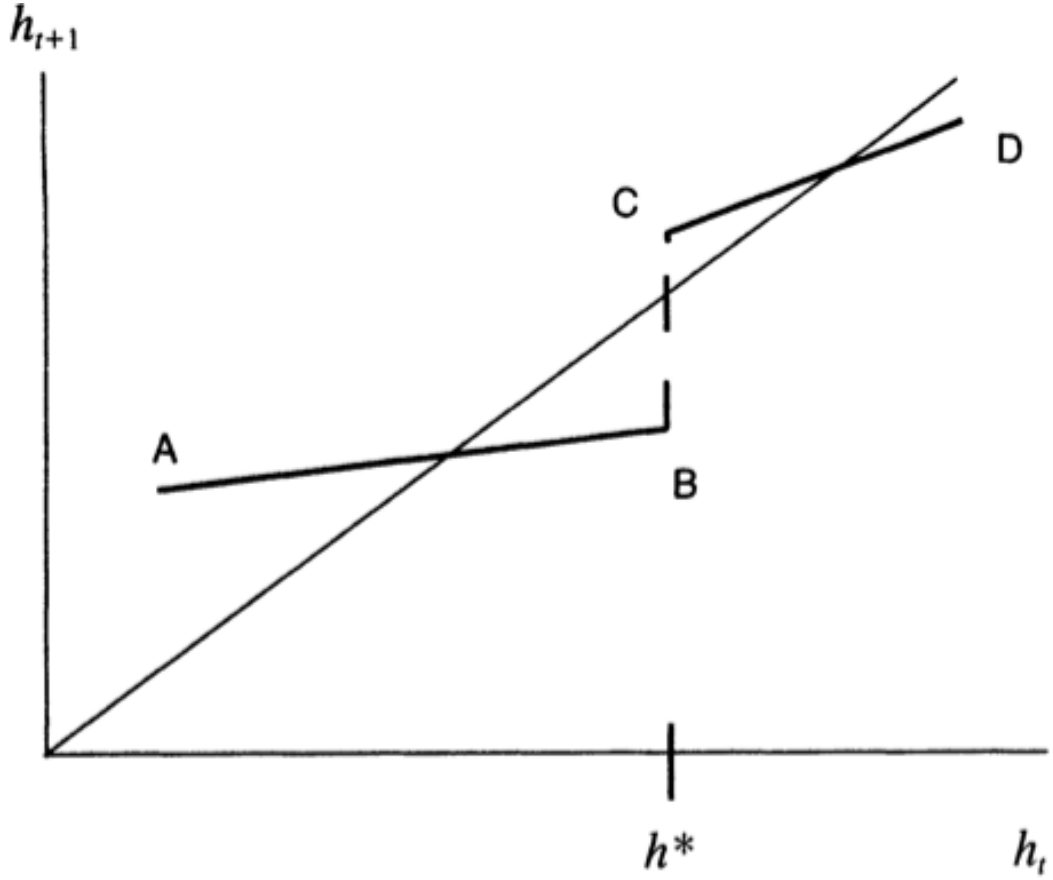

FIGURE 1. HUMAN CAPITAL DYNAMICS

A poverty-trap driven by limited attention

- Those who start with low human capital specialise in low-productivity jobs that do not require attention. This constraints their future human capital.

- Those who start with high human capital specialise in high-productivity jobs that require attention. This helps them accumulate even more human capital.

$\rightarrow$ A transfer of human capital or an infrastructure investment that reduces p_h can let people escape the trap.

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We will look at two studies that support a key building block of the model: poverty decreases attention and productivity.

Mani et al. (2013)

- 2 experiments, in the US and India.
- Experiment 1 is in a mall in the US.
- Participants are first asked to consider a scenario where their car breaks down and needs urgent repair.
  - In the hard treatment, the cost of the repair is 1,500$.
  - In the easy treatment, the cost of the repair is 150$.
  - The hard treatment is designed to trigger financial worries, especially for the poor.
- Participants are then tested on cognitive function using a Raven test (fluid intelligence) and a test of cognitive control.

Financial worries lower cognitive function for the poor

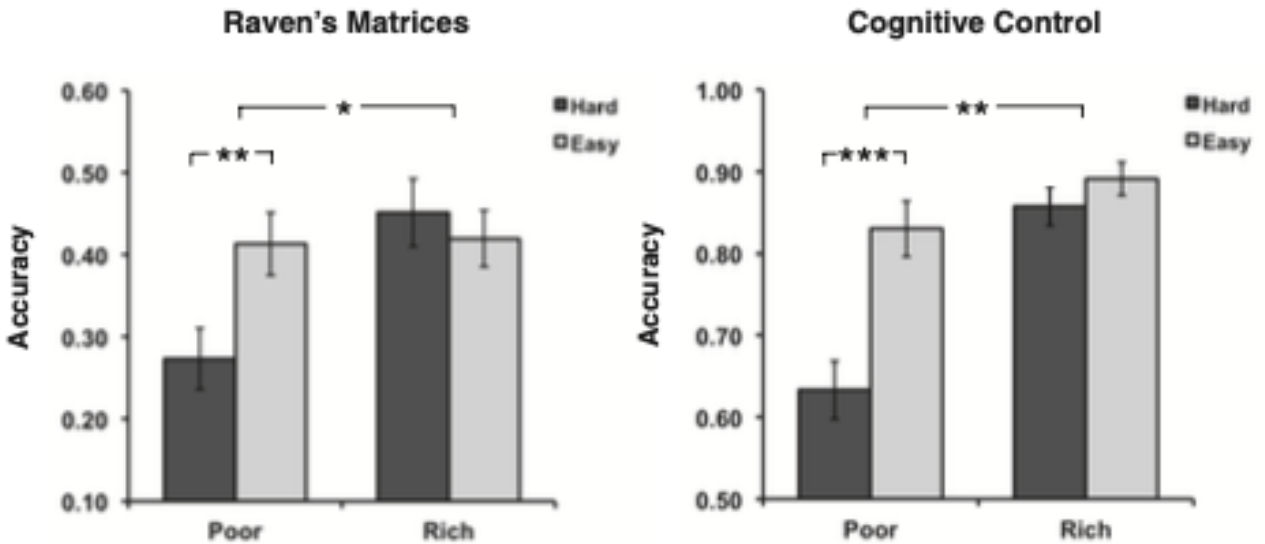

Fig. 1. Accuracy on the Raven's matrices and the cognitive control tasks in the hard and easy conditions, for the poor and the rich participants in experiment 1. (**Left**) Performance on the Raven's Matrices task. (**Right**) Performance on the cognitive control task. Error bars reflect ±1 SEM. Top horizontal bars show two-way interaction (poor versus rich × hard versus easy). $*P < 0.05$, $**P < 0.01$, $***P < 0.001$

The study in India

- 464 sugarcane farmers in Tamil Nadu, India.
- Each farmer is interviewed twice: before and after harvest.
- Participants are tested on cognitive function using a Raven test (fluid intelligence) and a test of cognitive control.
- Can control for both learning and calendar effects.

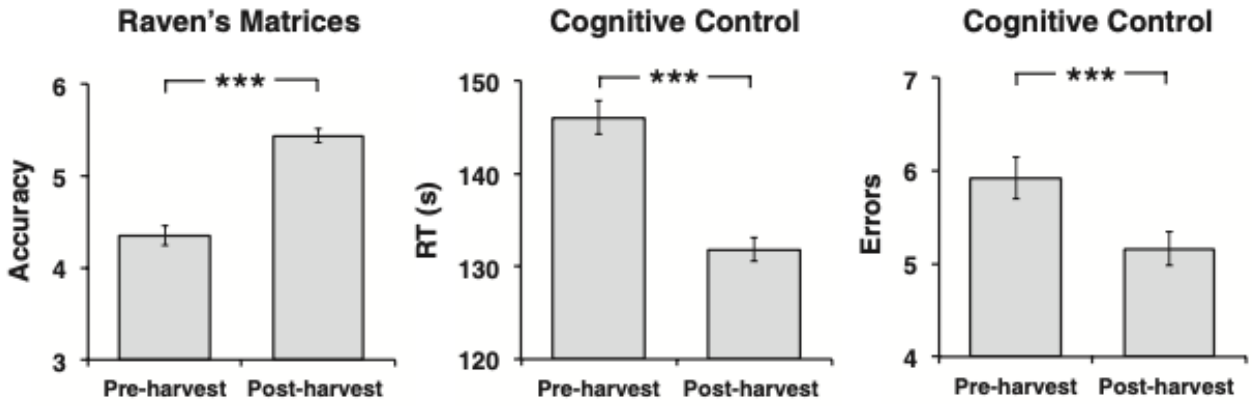

Fig. 4. Accuracy on the Raven's matrices and the cognitive control tasks for pre-harvest and post-harvest farmers in the field study. (**Left**) Performance on Raven's matrices task. (**Middle** and **Right**) Stroop task (measuring cognitive control) response times (RT) and error rates, respectively; error bars reflect ±1 SEM. Top horizontal bars show test for main effect of pre- versus post-harvest (***$P < 0.001$).

Kaur et al. (2021)

- 408 male workers in rural Odisha, India. Timing: lean season, so large financial strain.
- Workers are paid piece rates to produce disposable plates, for two weeks.
- Control workers are paid at the end of the 2 weeks period.
- Treated workers are paid a first instalment 4 days before the end of treatment period (and rest at the end of the period).
- There is an immediate impact on financial strain (e.g. paying off debt)

Lower financial strain increases productivity by .12 SD

Figure 3: Treatment Effects of Early Pay Cash Infusion

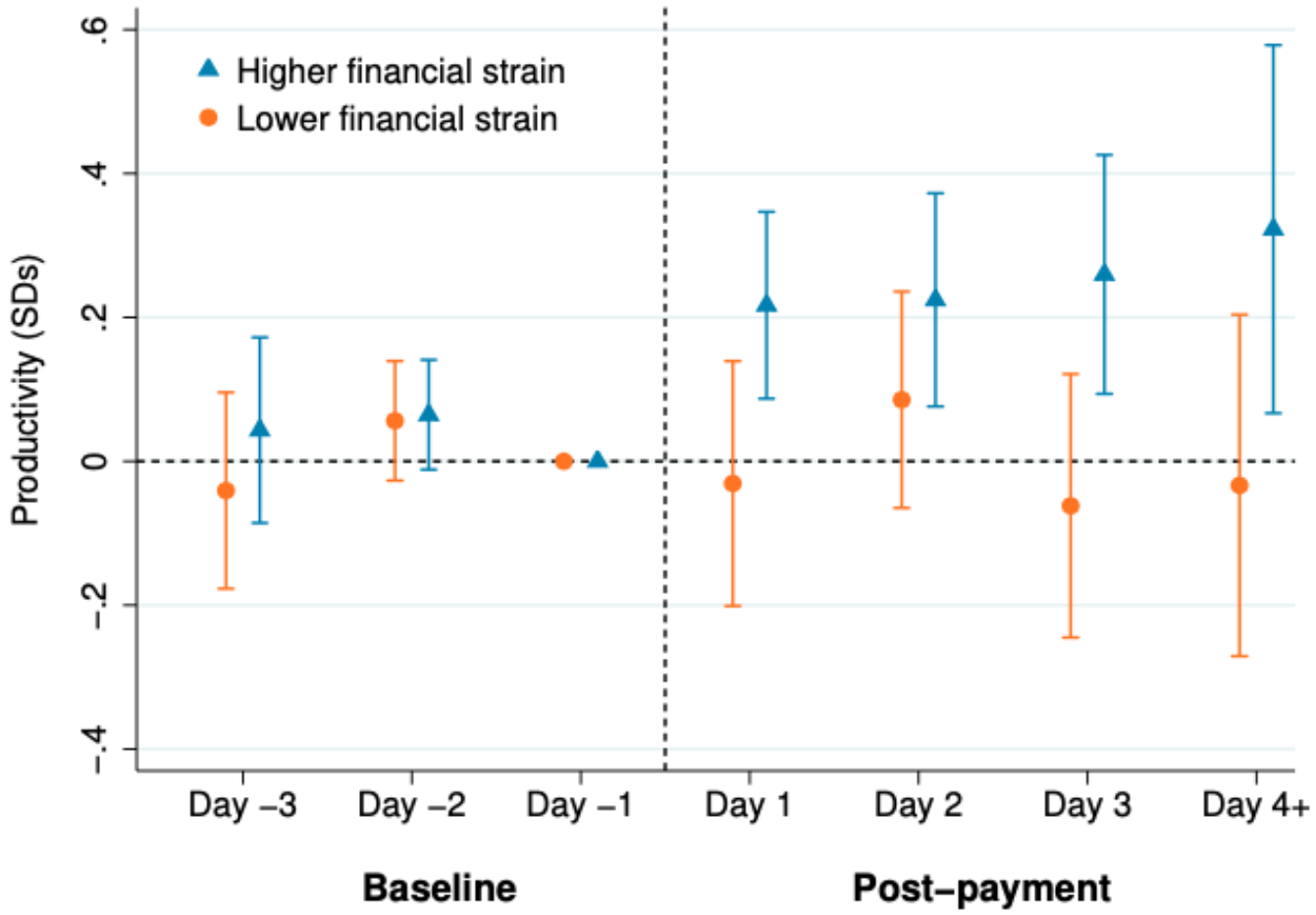

Table 3: The Impact of the Cash Infusion on Attentiveness

	Attentiveness index				**High attentiveness**			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cash × Post-pay	0.080**	0.087	0.274**	0.229***	0.077***	0.097**	0.200***	0.186***
	(0.037)	(0.061)	(0.107)	(0.086)	(0.025)	(0.038)	(0.070)	(0.055)
Cash × Post-pay × Lower financial strain			-0.493**	-0.287**			-0.276**	-0.185**
			(0.226)	(0.122)			(0.139)	(0.075)
Announcement controls	N	Y	Y	Y	N	Y	Y	Y
Financial strain index			Continuous	Binary			Continuous	Binary
P-val: cash effect + interaction				0.513				0.985
N: worker-hours	15,265	15,265	15,227	15,227	15,265	15,265	15,227	15,227

Alternative explanations

- Could this be driven by fairness concerns?
- Could this be driven by nutrition effects?

- The evidence from these two studies robustly shows that poverty decreases attention and productivity (but in small samples!)

- These studies do not fully establish the existence of an attention-based poverty trap.

- Also, note that these studies try to manipulate θ by changing the perception of income.

- An alternative strategy would be to change the environment where the poor live (p_h).

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What have we learnt?

- The world is not on track to end extreme poverty by 2030 despite projected sustained economic growth.
- Why are some people persistently in poverty?
- Poverty trap models give a possible answer:
  - Technologies + market failures may prevent the poor from accumulating assets and human capital;
  - Limited attention may reduce productivity, and thereby asset accumulation.

What policies do we need?

If the poverty trap view of the world holds some truth, growth alone will not end poverty.

Well-designed interventions may lead to persistent gains:

- Large transfers of cash or assets;
- Access to financial markets and to labor markets;
- Interventions that reduce the attention tax and the mental health strain of poverty.

What have we left out?

A lot!

For example, we have not explored the role of politics. This paper is a great introduction.

Also, we talked about attention, but not mental health. This paper by Matthew Ridley and other is a great starting point.

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Readings

(*) Balboni, Clare, Oriana Bandiera, Robin Burgess, Maitreesh Ghatak, and Anton Heil. Why do people stay poor?. Quarterly Journal of Economics (2021).

Egger, Dennis et al. General-Equilibrium Effects of Cash Transfers: Experimental Evidence from Kenya. Econometrica, 2021.

Burke et al. Sell Low and Buy High: Arbitrage and Local Price Effects in Kenyan Markets Quarterly Journal of Economics, 2018

(*) Banerjee, Abhijit V., and Sendhil Mullainathan. Limited attention and income distribution. American Economic Review 98, no. 2 (2008): 489-93.

Mani, Anandi, Sendhil Mullainathan, Eldar Shafir, and Jiaying Zhao. Poverty impedes cognitive function. Science 341, no. 6149 (2013): 976-980.

Optional reading

Kaur, Supreet, Sendhil Mullainathan, Suanna Oh, and Frank Schilbach. Do Financial Concerns Make Workers Less Productive?. No. w28338. National Bureau of Economic Research, 2021.

Ridley, Matthew, Gautam Rao, Frank Schilbach, and Vikram Patel. Poverty, depression, and anxiety: Causal evidence and mechanisms. Science 370, no. 6522 (2020).

Thank you!