

A photograph of a group of people, likely in a rural or agricultural setting. In the foreground, a woman with dark skin and her hair pulled back is wearing a white lace-trimmed shirt. She is looking intently at something held in her hands. To her left, another person is partially visible, wearing a blue and white patterned headscarf. In the background, other people are blurred, and the scene is brightly lit, suggesting an outdoor environment. The overall mood is one of focused attention and learning.

Highlights of Behavioral Insights on Technology Adoption

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Behavioral Economics Insights for Technology Adoption

- Farmers face a large set of behavioral and material constraints to technology adoption.
- We will study what these constraints are, how they interact and examples of interventions that aimed to address it.
- As a teaser, let's first review some research that tried to address the procrastination constraint and fact that farmers may not be forward looking enough.





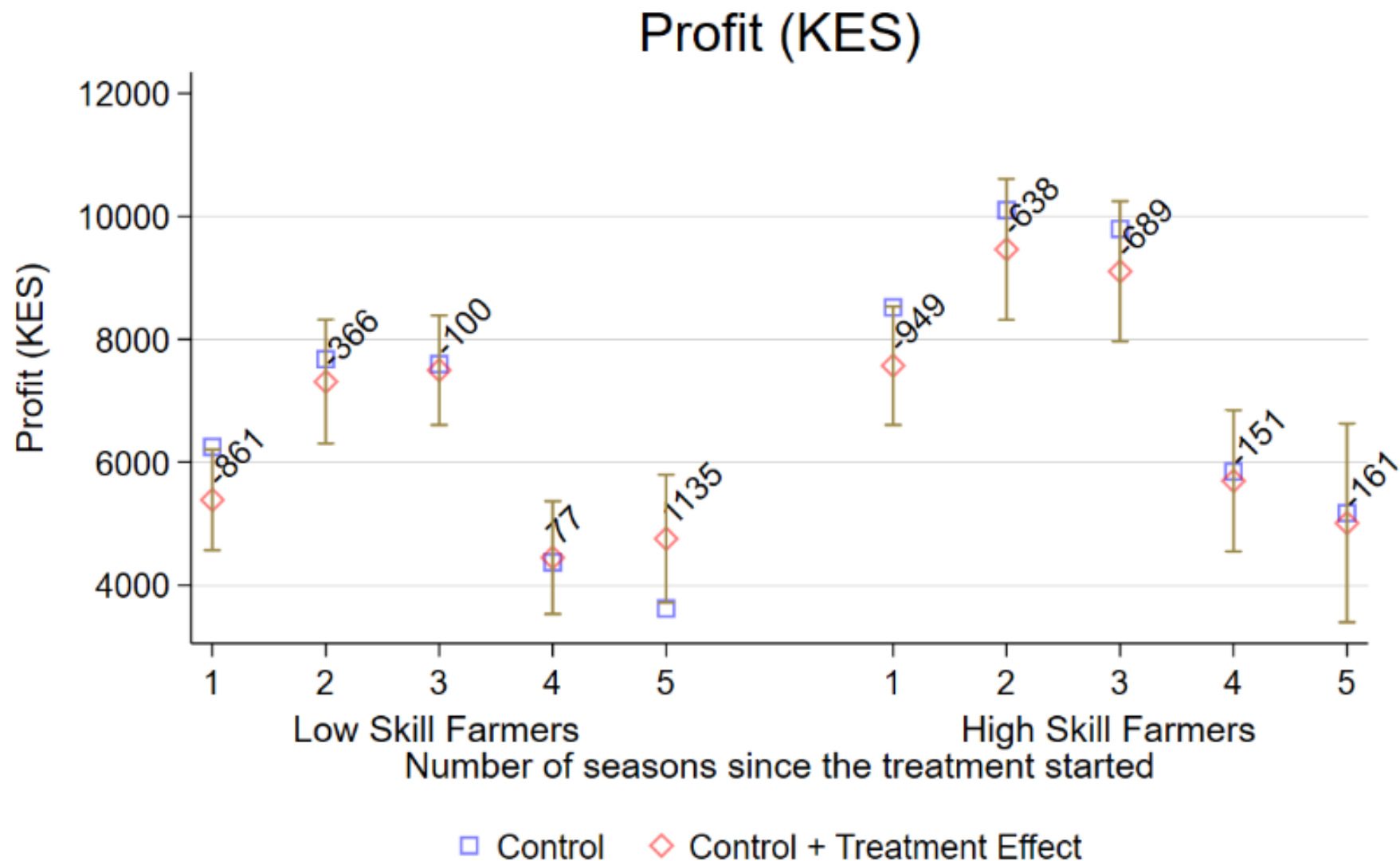
Learning about farmers' learning

Rachid Laajaj

Learning is complex and costly!

Laajaj and Macours (2024)

- Farmers were exposed to new sustainable practices through ag trials
- Their profits decreased in the short term, as adoption grew.
- Innovating takes them out of their comfort zone, making new costly mistakes as they learn.



Input subsidy, learning and group dynamics (Carter, Laajaj & Yang 2021)

- If learning costly but valuable, then maybe it needs to be subsidized
- The authors evaluate the impacts of an input subsidy on the beneficiaries
- Benefit cost-ratio on direct beneficiaries during the subsidy year are relatively good (1.8)
- But it is when you incorporate long-terms effects and learning from networks that the story really becomes interesting!

TABLE 4—INPUT SUBSIDY PROGRAM BENEFIT-COST ESTIMATES

	Subsidized year	Two years following the subsidy	All years
<i>Panel B. Benefit-cost ratios</i>			
Direct effect	1.8	4.2	5.9
Spillover effect	3.3	10.6	13.9
Direct and spillover effects	5.1	14.7	19.8

Closing the eyes on a gloomy future (Laajaj 2017)

- Still in Mozambique we find evidence of an endogenous time horizon
- Individuals tend to be poor if they are less forward looking.
- But it also seems that they are less forward looking if they are poor.
- Imagine consequences on poverty dynamics
- More about the lessons in a coming presentation!





Risk Matters

- **Evidence I: How many cash crops should farmers grow if they didn't mind about risk at all?**

Evidence #2 Insurance can lead to more investment (Karlán et al. 2014)

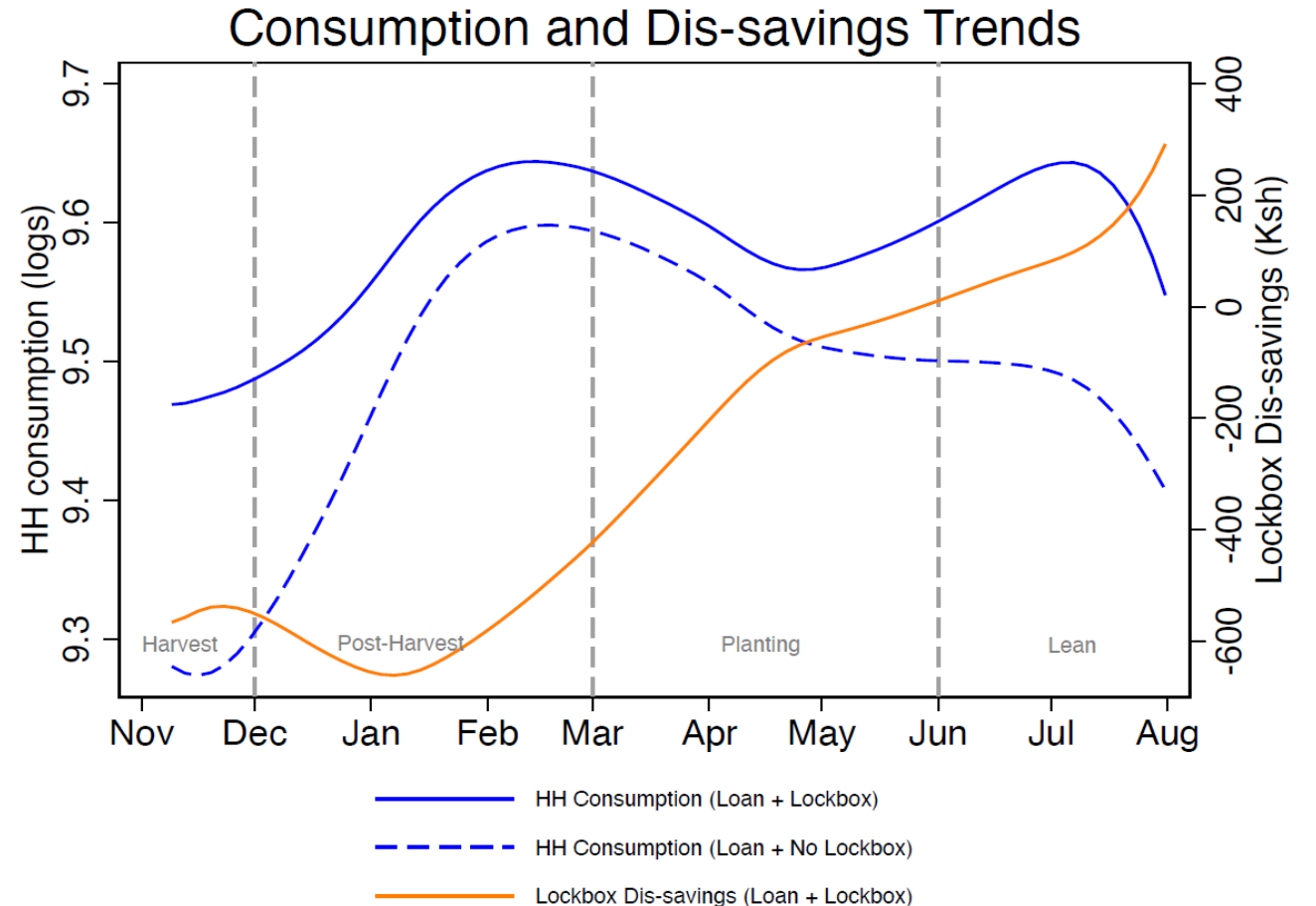
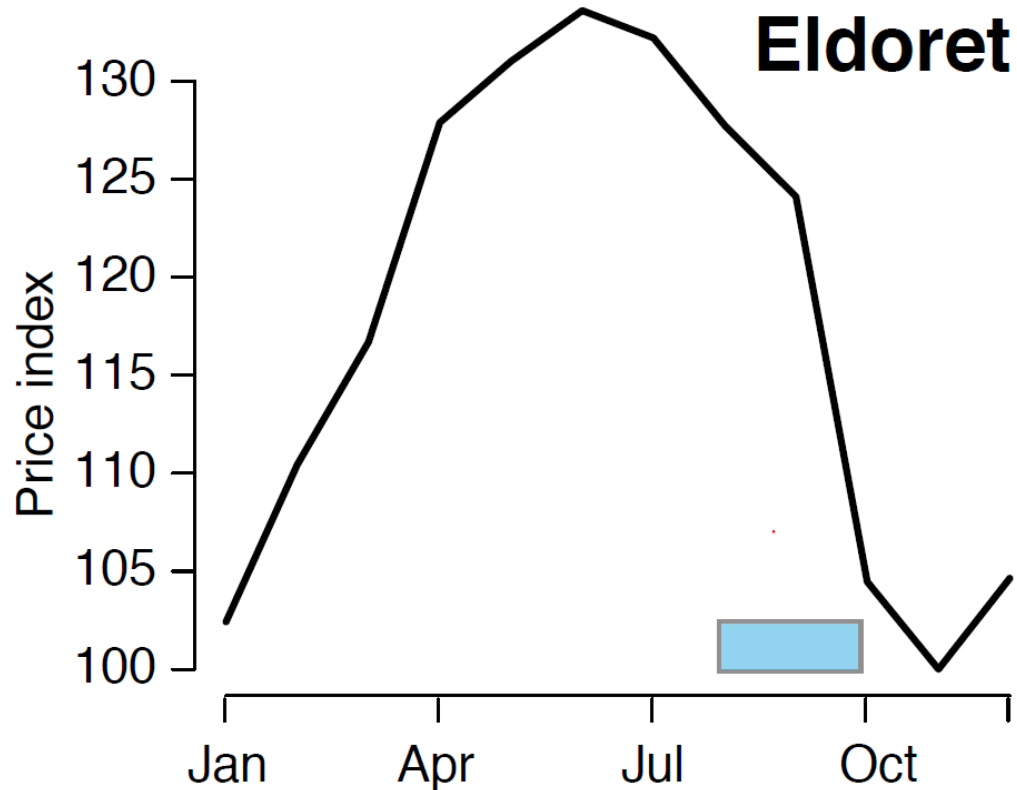
- The authors provided an encouragement to adopt an index insurance in northern Ghana
- Insurance led to significantly larger agricultural investment and riskier production choices in agriculture
- Hence uninsured risk was restricting farmers' investments
- Recent poor rains and payments further increase demand for insurance
- Trust and recency bias as behavioral challenges to solve this economic and behavioral issue!



**Complex Issues may
Require Complex
Solutions**

How to flatten the cycles of selling low after harvest and buying high before harvest?

- Material intervention: loan
- Behavioral intervention: lockbox (safe saving / mental accounting)
- Or both?



Bundling Genetic and Financial Technologies for More Resilient and Productive Small-scale Farmers in Africa

- Bundled 2 interventions:
 - Genetic: Drought tolerant seeds (protects from mid-season droughts)
 - Financial: satellite-based index insurance (protects from long-term consequences of more severe droughts)
- However, the observation of the benefits is conditional on droughts occurring
- Learning is state dependent (on drought occurrence)
- Behaviors largely driven by the salience of recent events
- Some technical and behavioral obstacles are addressed, new ones appear.



What do these studies have in common?

What do these studies have in common?

- They started from developing some understanding of the material and behavioral constraints to technology adoption
- They develop interventions (or a bundle of interventions) designed to address the constraints identified
- Often brings new surprises and challenges, which themselves stimulate new studies to improve the design of future projects
- The objective is to share some of these lessons together



LIMITED ATTENTION & COMPLEXITY

Behavioral Insights to Encourage Savings and Investment in Improved Agricultural Technologies

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02/27/2024

Technology adoption and Behavioral constraints

- Large literature believes that if farmers would adopt innovations they could sustainably get out of poverty
- Simple technologies like fertilizer, improved seeds, or combinations of sustainable practices and inputs.
- Why are they not adopted despite potential benefits?
- Literature structured around “constraints to adoption”
 - Information
 - Risk
 - Financial constraint
 - Profitability
 - Input and output markets
- Each one of these constraints has a strong behavioral component. We will focus on the first 3.



Lack of Information

Lack of information

- Lack of information about the potential benefits or about know-how, or both at the same time
- Some interventions can promote learning:
 - Demonstration plots, field days, Extension services trainings or input subsidies
- Particular challenges include:
 - Learning in the midst of noise and with “limited attention”
 - Adapting to heterogeneity (different technologies may work best in different places)
 - Sustainable technologies tend to be even more information intensive
- Behavioral insights:
 - Herding and use of institutional signals are rational ways to manage decisions in complex environment
 - Only promote once one has enough evidence of potential (and inputs and outputs markets are available)
 - Need to find the right balance between information provision (from intervention) and autonomy of adaptation
 - Tap on high skills and network to disseminate successful experiences

Input subsidy, learning and group dynamics

(Carter, Laajaj & Yang 2021)

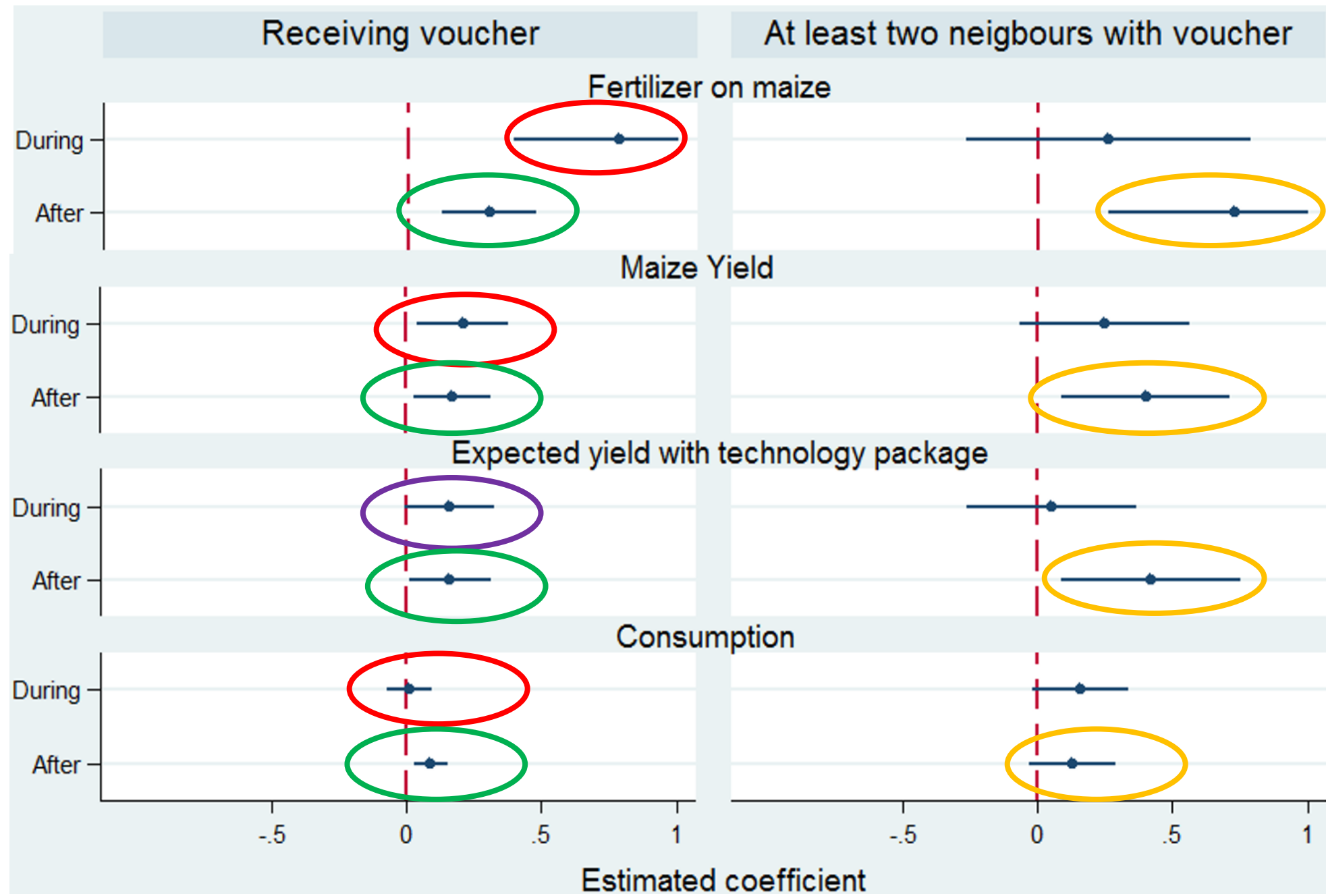
Impacts of an input subsidy (fertilizer and maize seeds)

Increased input use, yields, expected returns and consumption.

Documents learning as part of the mechanism

Effects persistent after subsidy is over

Effects as strong on farmers with at least 2 neighbors treated.



A photograph of a rural landscape. In the foreground, a concrete water channel runs through a field of tall grass. In the middle ground, two people are walking on a path that crosses the channel. The background features rolling green hills and mountains under a cloudy sky. The text "Risk Aversion" is overlaid in large white letters across the center of the image.

Risk Aversion

Risk Aversion

- Farmers may forego an increase in expected payoffs if it increases risk
- Often 2 major elements of risk:
 - From the technology itself (upfront investment with returns conditional on conditions)
 - From not knowing the actual return of the new technology
- How is risk addressed?
 - Local solutions: diversification, informal loans or assets, but it can be quite costly
 - Technical solutions e.g. drought tolerant seed or irrigation
 - Institutional solutions, e.g. insurance made more feasible by remote sensing, (Karlan et al. 2014)
 - Also think of possible combinations (Boucher, Carter et al. 2024 combine insurance and drought tolerant seeds)
- Behavioral insights:
 - Understand farmers preferences: they may not always go for the highest expected profit
 - Perceived risk matters even more than actual risk (for investment decisions)
 - Salience State dependent learning and lack of trust are key obstacles to the demand for insurance
 - Strong aversion against complex designs and solutions



Financial Constraint

Cash Constraint

- When the lack of cash prevents technology adoption, missing on profitable opportunities
- **Micro-credit** is probably the most widely promoted solution, but:
 - High interest rates (from 20 annual and above), requires investments with very high returns
 - While temporary credit makes sense to get out of poverty trap, the extended and repeated use of credit at such rate is harder to explain?
- **Savings** program also offers a promising alternative or complement with other advantages and disadvantages:
 - + all business need some savings for their cash flow
 - + No need to discount an interest rate once saving is built up
 - + Perhaps underpromoted because rural banks don't gain as much from savings
 - - It can make asset accumulation much slower (than credit) at the beginning
 - - It requires more self-discipline and forward-looking farmers
- **Behavioral Insights:**
- The cash availability or constraint is endogenous to farmers behaviors and decisions, which may be suboptimal because of procrastination, limited time horizon, self-control, etc.
- External solutions include the 2 following examples (& the forthcoming presentations from Lauren and Andrew)
- Internal solution in my next presentation

“Tying Odysseus to the Mast: Evidence from a Commitment Savings Product in the Philippines” (Ashraf, Karlan and Yin 2006)

- Offered commitment savings products : take-up as “smoking gun evidence” of inconsistent preferences / inability to control oneself
- Also shows that they are “sophisticated” = aware of their time inconsistency and thus willing to restrict their own freedom
- Led to 46 % more savings in the treatment group
- But only 34% of individuals continued using the account
- Net and long-term effects on welfare can be ambiguous
- It can be negative if it dis-empowers, or reduces valuable unexpected uses
- It can be positive if it creates new habits

“Nudging farmers to use fertilizer: Theory and experimental evidence from Kenya (Duflo et al. 2011)”

- Theoretical model that explains procrastination and its consequences
- Offered a 50% discount on fertilizer to farmers at time to buy fertilizer
- Also offered an early-on 10% time limited discount just after harvest (after the sales of agricultural production)
- Both interventions had similar effects on purchase of fertilizer > attributed to farmers' procrastination

- Dillon will dive more into implementing discounts and/or credit.
- Then I'll come back to discuss endogenous preferences

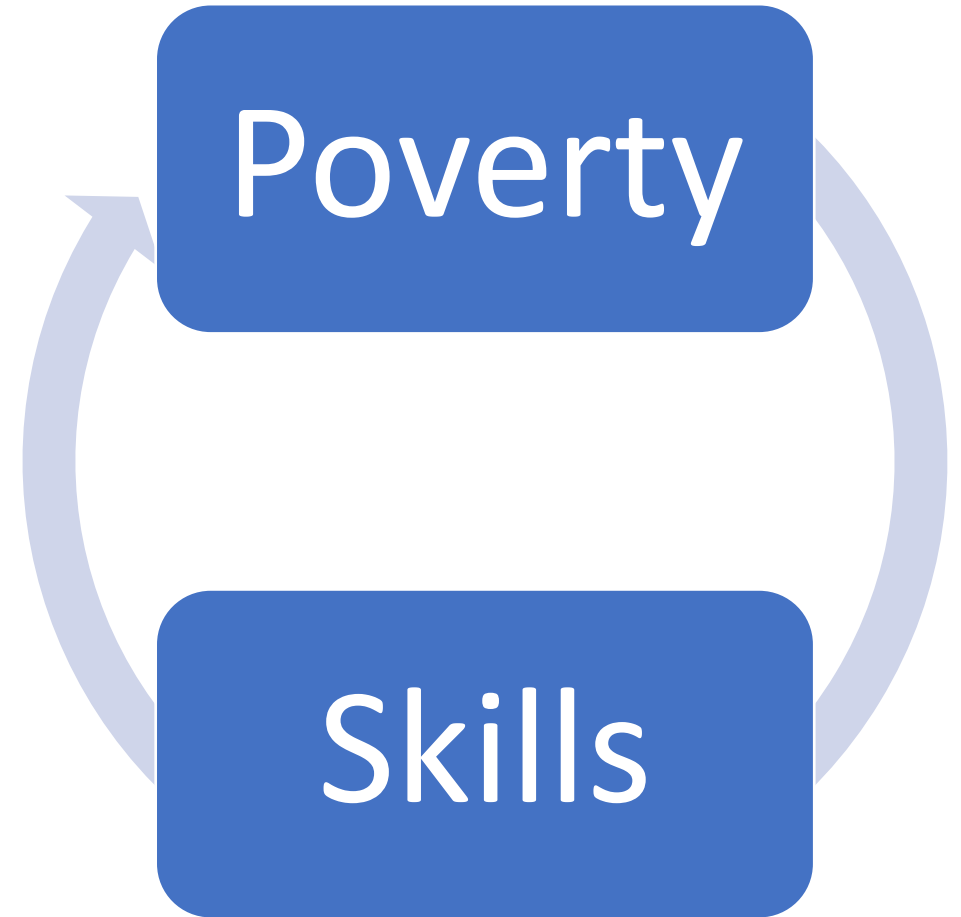
A woman in a red shirt and patterned skirt is harvesting rice in a lush green field. She is holding a bundle of rice stalks. In the background, there are green trees and mountains. A dog is visible in the field to the right.

Endogenous behavioral traits and behavioral poverty traps

Rachid Laajaj

Behavioral poverty traps

- When poverty affects skills or behavior, and these skills affect poverty
- It can result in 2 equilibria
- The skills that result from low equilibrium behaviors lead the person to decisions that perpetuate the low equilibrium



Ways to break the vicious cycle:

1) External solutions that compensate the lack of skills (lockbox, commitment, timely small discount)

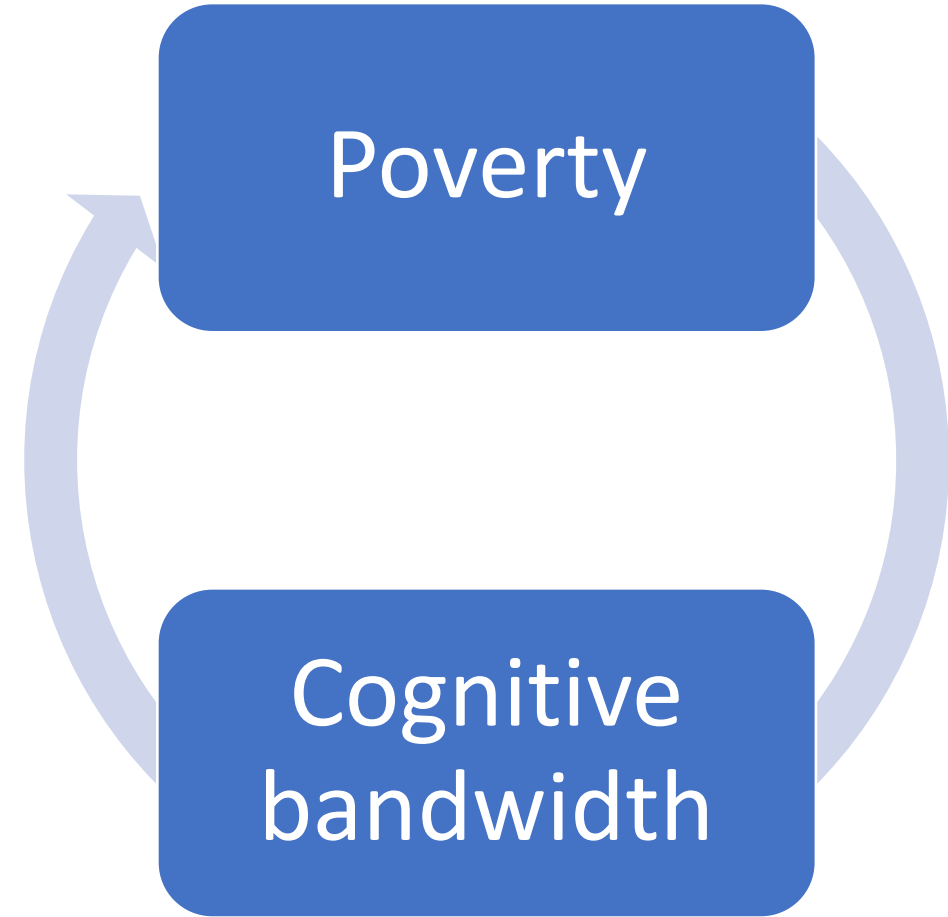
2) Directly change the skills: e.g. address psychological trauma, or raise aspirations

3) Address the poverty and economic conditions that resulted in lower skills -> Acts as a multiplier

Poverty impedes cognitive function

Mani et. al (2013)

- Poverty-related concerns consume mental resources and reduces the cognitive bandwidth
- It leaves less cognitive capacity to perform other tasks-> becomes less productive and poorer.



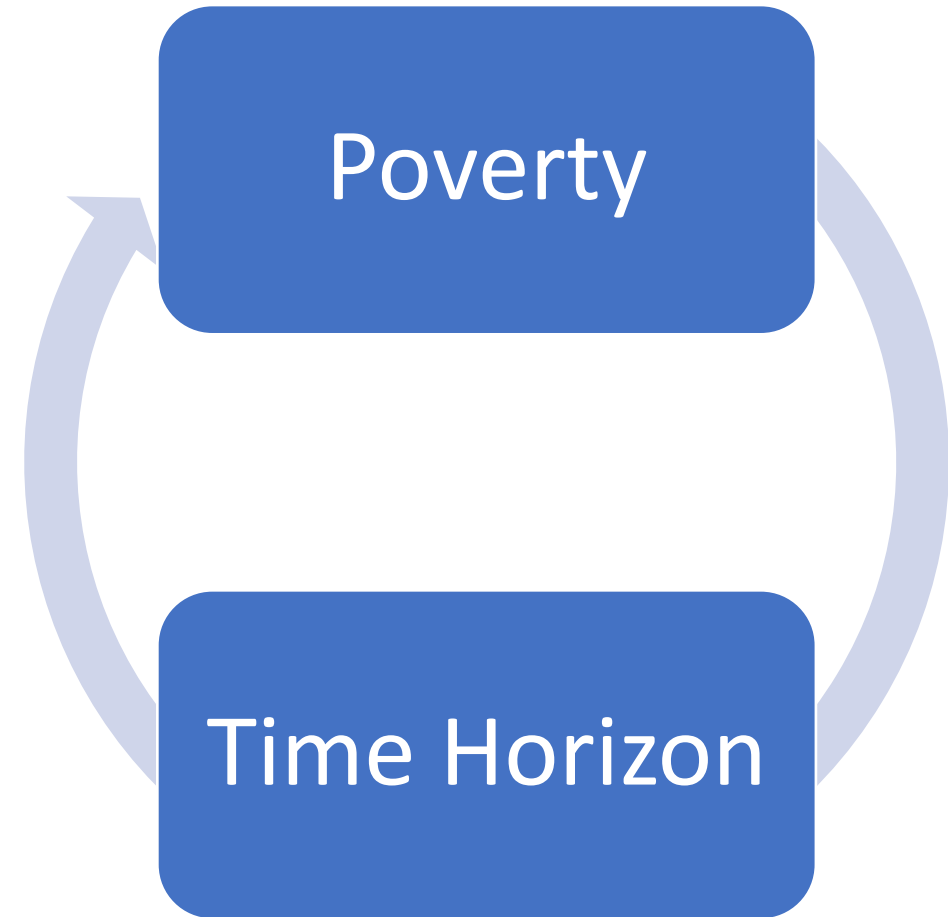
Back to the gloomy future (Laajaj 2017)

- Psychological concepts:
- Utility from anticipation: disutility from future poverty
- Cognitive dissonance is a psychological process through which preferences are modified (to preserve the ego): if you know you cannot satisfy your future self, then pretend you don't care
- Conclusion: if you know you will be poor, you care even less about the future



Endogenous time horizon & behavioral poverty trap (Laajaj 2017)

- The perspective of a gloomy future makes it more unpleasant to think about the future (disutility from anticipation)
- Being shortsighted reduces savings and investment, which perpetuates poverty.



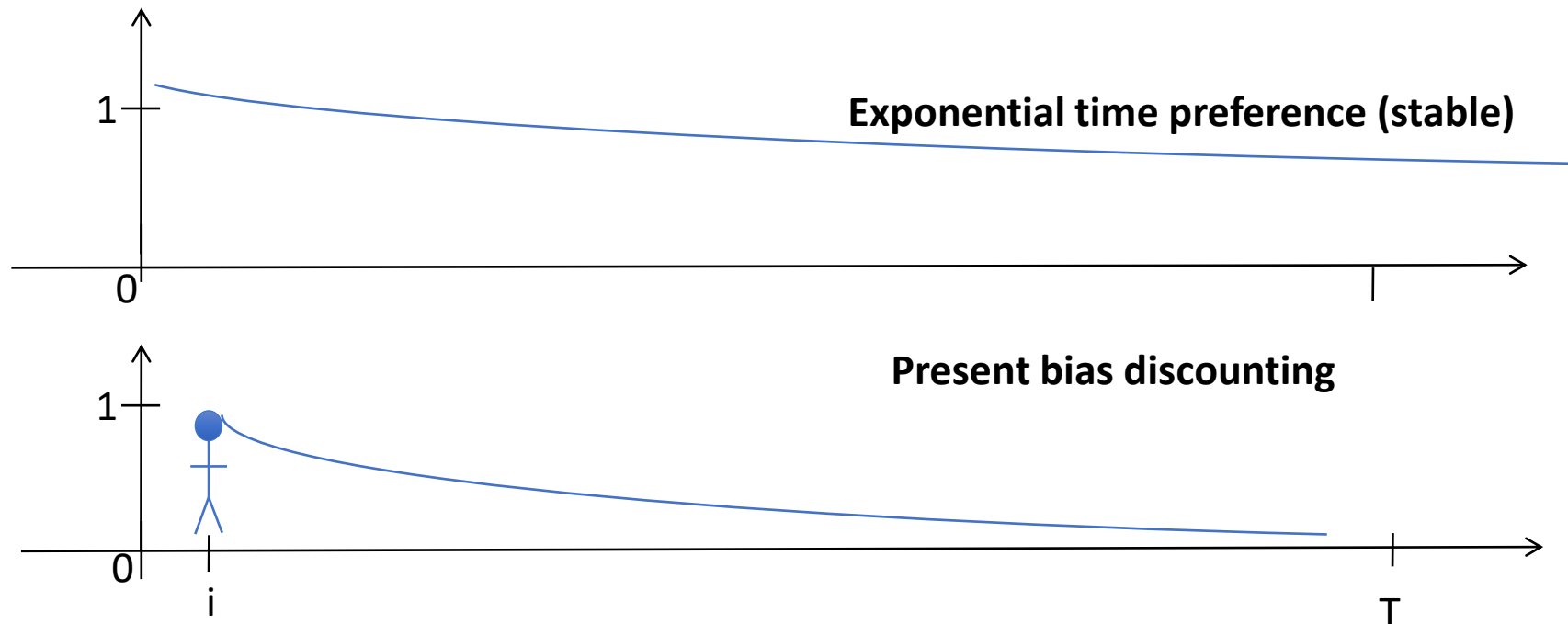
Voices of the poor

Narayan and Ebrary (2000)

- *“Mental health problems—stress, anxiety, depression, lack of self-esteem and suicide—are among the more commonly identified effects of poverty and ill-being by discussion groups.”*
- *“These agonizing decisions take their toll. People cope by focusing on one day at a time, becoming indifferent, apathetic or hovering near losing their mind.”*

Decomposition of Time Discounting into Time Preference and Time Horizon

- The economy literature tends to separate a real/stable time preference from a present bias.
- Psychology: Association with future self can reduce present bias, but comes with utility from anticipation, which is negative if expects a gloomy future.



The main results

- Interventions randomly assigned:
 - Vouchers that give right to a 70% subsidy for a seed and fertilizer package for a half hectare of maize production
 - Financial education
 - 50% Matched Savings over 3 months period
- Both the voucher for input subsidies and the “matched savings” significantly increased the farmers’ planning horizon
- Effect concentrated on poor households
- Changes in planning horizon predict well increases in savings, fertilizer, assets and optimism (being better off in 5 years)



Conclusions

- Many constraints to technology adoption are accentuated by the fact that humans have limited cognitive bandwidth, patience, ability to take on risk, trust, etc.
- Poverty itself can make these behaviors even worse and create a behavioral poverty trap.
- Wide range of interventions that can directly target the behavior, compensate for it, or try to change the dynamic of the low equilibrium.
- Even non-behavioral interventions are likely to be affected and need some understanding of such phenomena.