

Random Harvest - Theories of Underdevelopment and the Development of Development Theory in the Experimental Era

Maitreesh Ghatak

June 2, 2014

The World Bank, ABCDE Conference

1. Introduction

- An overview of the broad theoretical mechanisms that development economists have studied that cause poor individuals and economies to stay well within their productive capabilities.
- Many of these are external, such as market frictions, but some arise from the choices of the poor themselves
- Contrast the poverty trap view with the conditional convergence view
- Connect this to recent experimental evidence concerning transfers to the poor (UCTs, CCTs etc), and financial intermediation to reflect on what we have learnt, and what we still don't understand

- Reflect broadly on the interplay between theory and empirics, drawing on both existing work and a wish-list.
- Discuss the role of theory in
 - Asking the right questions - guiding experiments
 - Guessing the forest from a few trees - interpreting existing evidence
 - What else could have been done - counterfactual analysis
 - Was the intervention worth it - welfare analysis.

2. Theories of Underdevelopment

- Development economists study
 - “What is”: study the poor as much as medical researchers have to study the afflicted.
 - “What could be”: Compare the poor with (a) the less-poor or non-poor (individuals, countries, regions), at a given point in time and/or over time and (b) with the poor, but who are subject to some policy or economic shock.

Departures from the Textbook Model

- "Classical" view of development: growth models
 - Resources flow to take advantage of arbitrage opportunities
 - Given diminishing returns, the poor will catch up faster (convergence)
 - Long run development reflects preferences, technology, endowments (conditional convergence)
- Empirical evidence suggests
 - Limited support for convergence
 - Institutions (e.g., property rights) matter

Implicit Assumptions of the (Old) Classical model

1. Markets are complete and "perfect" (i.e., no frictions)
2. For public goods, a benign government steps in and fixes problems of externalities by tax/subsidy/direct provision
3. There is a representative economic agent
4. Economic agents are rational & informed
5. Individuals are independent of social influences

Points of Departure in Development Economics

Mainly

1. Market Failure (e.g., credit rationing, lack of insurance)
2. Government Failure (e.g., corruption, waste, failures in public service delivery, political economy)

Also

- 3 Intrahousehold conflict (e.g., gender discrimination, child labour)
- 4 Departures from rational and informed agent assumption (e.g., behavioural biases, learning)
- 5 Social norms shapes behaviour (e.g., women's role, race/caste discrimination)

Broad Types of Development Policy

- Addressing market failure by improving market access to the poor
 - Reducing transactions costs (savings, credit, insurance)
 - Improving access to information
 - Tapping in social networks, like microfinance
 - Reforming property rights, speeding up legal system

- Addressing government failure by
 - Making government more responsive and accountable
 - Improving public service delivery
 - * Use incentive schemes?
 - * Involve NGOs?
 - * Would decentralization help?
 - * Empower the beneficiaries through providing information, vouchers etc?

- Direct transfers to the poor
 - Direct cash transfers (UCTs)
 - Asset transfers (land, livestock)
 - In the case of intrahousehold or behavioural issues, simple transfers may not do, potential role for conditional transfers (CCTs), in-kind transfers (IKTs), commitment products
- Specific policies such as information campaigns, or sub-classes of the above policies (e.g., specific savings products, CCTs) to deal with intrahousehold, behavioural, and shifting social norms

Experimental Revolution

- Over the last two decades, RCTs have been used to study some of these policies and have presented us with a rich landscape full of facts and puzzles
- They have evolved from simple programme evaluation to
 - Comparing alternative policies (insurance vs credit: Karlan, Udry et al, 2013, CCT vs UCT: Baird-McKintosh-Özler, 2011)
 - Testing alternative theories by designing suitable experiments (Adverse selection vs moral hazard: Karlan-Zinman, 2009)

- Confirming certain premises on which lots of theories were built (credit markets are imperfect: de Mel, McKenzie, Woodruff, 2008; better information may improve resource allocation: Jensen 2007, 2010; Giné-Goldberg-Yang, 2012)
- Providing evidence on some much publicized programmes as to how they work and how effective they are (microfinance : Banerjee-Duflo-Glennerster-Kinnan, 2010; Giné-Karlan 2014; Pande-Field-Papp-Rigol 2013)
- Pointing out new and promising directions for theoretical work (savings may be at least as important as credit, Dupas-Robinson, 2013, behavioural biases seem important in certain contexts, e.g., in fertilizer adoption, Duflo-Kremer-Robinson, 2011, social capital may be endogenously created: Feigenberg-Field-Pande, 2013)

Role of Development Theory

- Understanding the mechanism of how a policy works, and consequently, help establish external validity (Deaton, 2010)
- This allows us to interpret a disparate range of findings, put a structure or rough map around them
- This can then tell us which experiments are more or less promising to run
- After all, theory just gives us a very imperfect and imprecise map of a terrain that we do not know very well

- Let me illustrate using the theory of poverty traps and related experimental evidence on transfers to the poor, savings, and credit

Theory of Poverty Traps

- An implicit view in development is small one-shot interventions can have large long-run effects (credit, health interventions etc)
- This means there is some underlying positive feedback mechanism - a little push, the poor will be in a self-sustaining orbit of development
- Otherwise, we would just take the standard models (e.g., labour or health economics or finance) and plug in parameters suitable to developing countries (low incomes, low wages)
- Policies have to be in place permanently (taxes, subsidies) to have permanent effects

- More formally, the premise is imperfect institutions impede the operation of markets, and this coupled with low incomes generate discontinuities, corner solutions, local increasing returns in the behaviours and outcome variables of interest
- Poverty traps are an obvious but not the only way to formalize this

The Workhorse Model

- Suppose production depends only on capital given by a standard neoclassical production function:

$$q = Af(k).$$

- A denotes the productivity parameter which could be driven by skills, ability, infrastructure, institutions
- The interest rate is r
- An individual has capital endowment \bar{k}

- His profits are $\pi = Af(k) - rk$
- There is no risk (to be discussed later)
- With perfect capital markets his income is

$$y \equiv \pi + r\bar{k}.$$

Separation result: First maximize profit, and then maximize utility.
Endowments don't matter for productive efficiency.

- If you are capital-rich lend capital, borrow otherwise

- Now suppose capital markets are absent (imperfect would do) due to institutional frictions
- Now of course endowments do matter for productive efficiency in the short-run and redistribution will be good from both the equity and efficiency point of view
- But if you allow people to save or leave bequests, then endowments will not matter in the long-run

- Let us introduce dynamics and allow people to save at a constant rate s as in the Solow model
- Alternatively let individuals live for one period, pass on their wealth as bequests to the next generation as in Banerjee-Newman (1993)
- Suppose they have preferences over consumption and bequests given by:

$$U(c, b) = \log c + \beta \log b, \beta \geq 0.$$

- Maximize subject to $c + b \leq y$ and define $s \equiv \frac{\beta}{1+\beta}$

- Let k_t denote the capital endowment in time t
- Assume capital depreciates totally after use
- Bequests of generation t determines capital endowment in period $t + 1$:
 $b_t = k_{t+1}$
- With perfect capital markets we get

$$k_{t+1} = s(\pi + rk_t).$$

- Assuming $sr < 1$ we get convergence.

- Without capital markets we get

$$k_{t+1} = sAf(k_t).$$

- We still get convergence, or *conditional convergence*, if A differs across individuals or economies
- If you introduce capital markets, convergence is speeded up

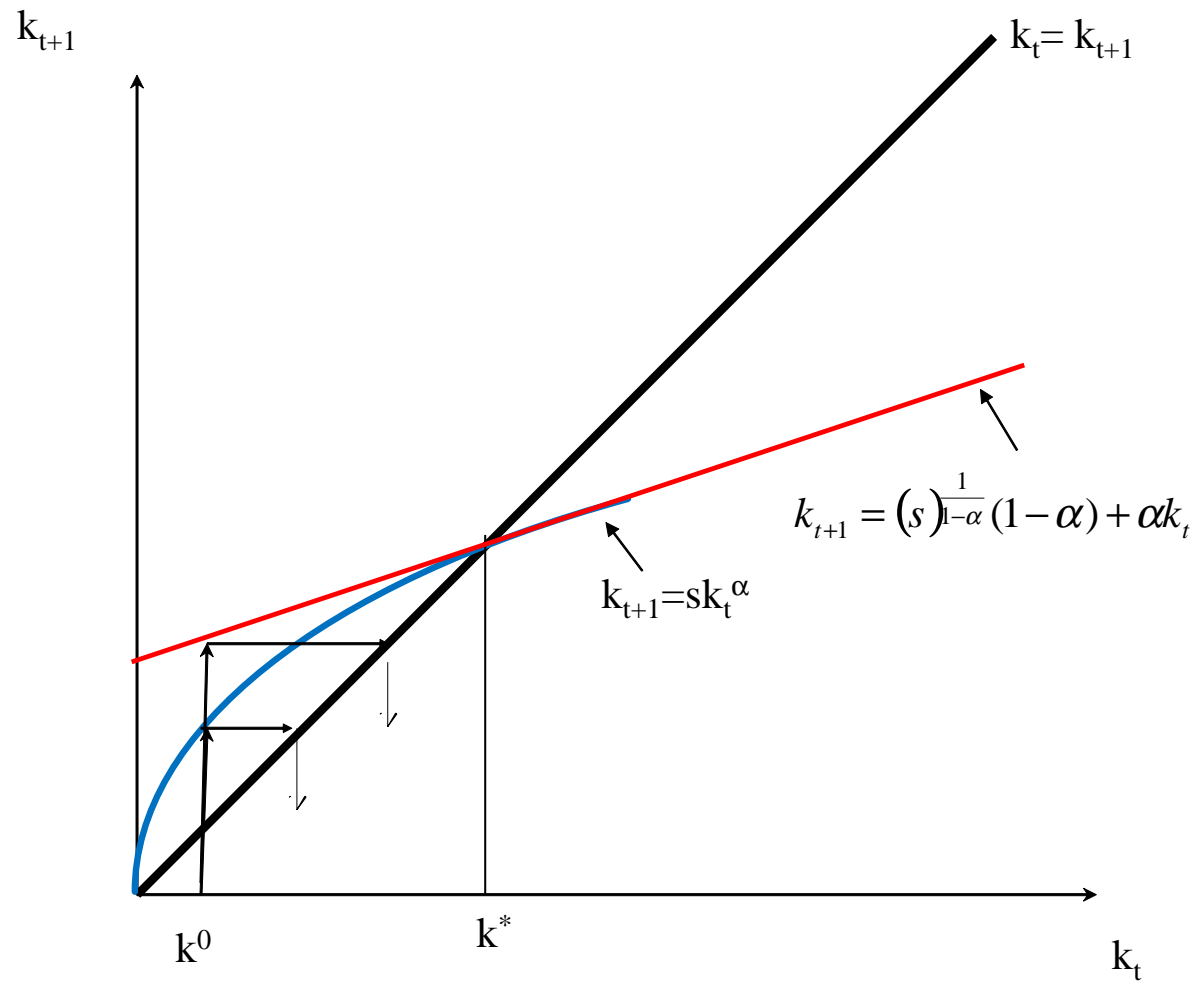


Figure 1: Convergence in the Solow Model

So, how do we get poverty traps?

- Two individuals *identical in all respects except for k_t* can end up with very different levels of incomes and capital stocks in steady state.
- There are multiple stable steady states, initial conditions matter, one-shot policies may have long-run effects
- We will distinguish between two types of poverty traps
 - Due to factors external to the individual (e.g., market frictions)
 - Due to factors internal to the individual (e.g., income effects, or the poor being less well-informed or more subject to behavioural biases)

External Friction Driven (EFD) or Supply-side Poverty Traps

- Ignore the behaviour (or, going one step back, preferences) of the individual for now and look at what is feasible
- We saw that capital markets being absent/imperfect is not sufficient for poverty traps.
- What are some of the other implicit assumptions in this simple model?

1. Technology $f(k)$ is convex
 2. The savings technology is frictionless
 3. A is not subject to wealth effects
 4. People can survive even if c is arbitrarily small
 5. No other market frictions (e.g., human capital)
- Suppose capital markets are perfect, but consider relaxing the above assumptions one by one

Non-convexities in the production technology

- For example, let us introduce set-up costs
- $y = Af(k)$ for $k \geq \underline{k}$, $= \underline{w}$ otherwise.
- $\underline{w} < Af(\underline{k})$ is returns from subsistence activity
- You can still save up: sr will be slope
- In this case, there will be multiple steady states (Figure 2)

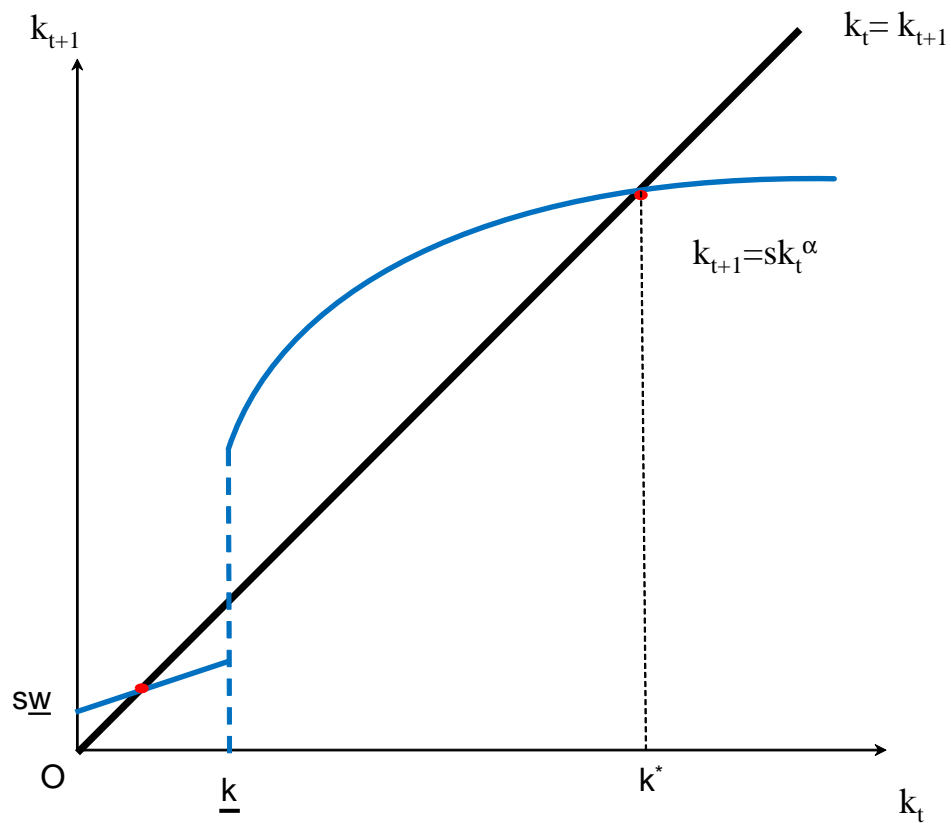


Figure 2: Non-convergence in the Solow Model

- With perfect capital markets, you can borrow \underline{k} or more, and there is no poverty trap.
- Or, if s or \underline{w} or r are high enough, then can save your way out of the poverty trap
- However, with imperfect financial markets you will get poverty traps.
- Non-convexities can take other forms (Figure 3)

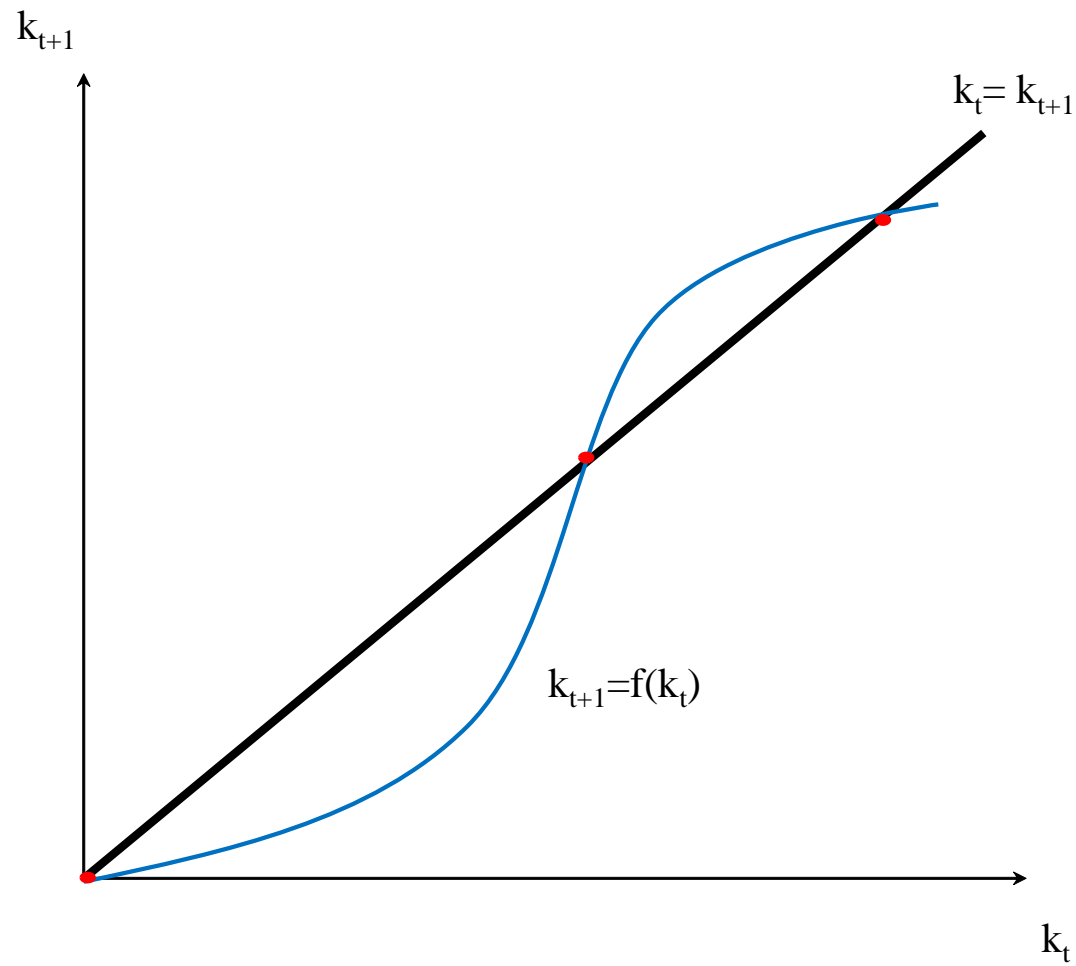


Figure 3: Non-convergence in Solow Model

Non-convexities in the savings technology or A

- Recall that without capital markets the wealth transition equation is:

$$k_{t+1} = sAf(k_t).$$

- Suppose everyone has the same s as far as preferences go, but due to imperfect property rights (easy to steal from the poor), only the wealthy are able to save effectively
- Alternatively, suppose A (which captures complementary inputs such as skills or infrastructure) depends on k such that wealthy get a disproportionate advantage

- Formally, s and A depend on k , namely, $s = s(k)$ and $A = A(k)$ but these functions are subject to non-convexities.
- Again, will get poverty traps without any technological non-convexities.

Minimum Consumption Constraint

- Suppose if $c \leq \underline{c}$ then people (including their children) don't survive or are unproductive (similar to Dasgupta & Ray, 1986)
- Now the transition equation is

$$\begin{aligned}k_{t+1} &= sAf(k_t) \text{ for } (1-s)f(k_t) \geq \underline{c} \\ &= 0, \text{ otherwise}\end{aligned}$$

- It is easy to see that we will get a threshold \underline{k}
- If capital markets are perfect, can borrow to and invest - no poverty trap, otherwise possible

Other Market Frictions

- Suppose capital markets are perfect but production requires human capital (h)
- While money helps to some degree, the human capital of parents matter
- Those who have educated parents have an advantage (e.g., due to better exposure)
- Suppose there is no perfect "rental market" for this resource

- Let the human capital of generation $t + 1$ be

$$h_{t+1} = \sigma + \gamma y + \lambda h_t.$$

- Two values of $y(h)$, $y \in \{\underline{y}, \bar{y}\}$ and only when h crosses a threshold, \bar{y} is achieved
- More generally, $y(h)$ can be continuous, e.g., S-shaped
- When income goes up beyond a threshold they reach the higher steady state.

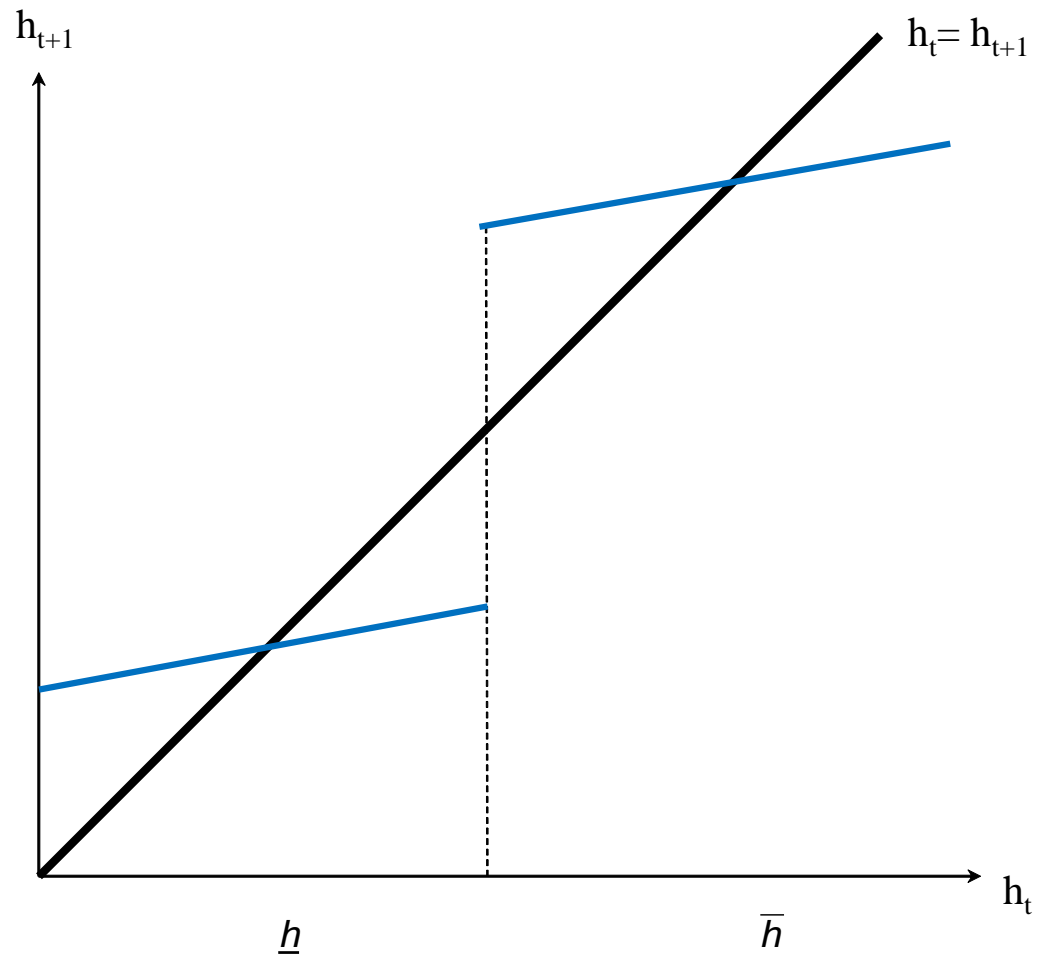


Figure 4: Human capital & poverty traps

- It would seem like that we could potentially have poverty traps in h
- But with perfect capital markets, possible to borrow and/or save and get over the hump
- Whether agents might want to do it is another matter, to which we will turn shortly

Centrality of Capital Market Frictions in this Framework

- So if capital markets are perfect even if the other imperfections exist, individually or jointly, the poor can always borrow and/or save the "right" amount of k and overcome those.

Capital Market Frictions: In this framework, capital market frictions are necessary but not sufficient for EFD poverty traps.

- The centrality of capital markets *in this model* has to do with the definition of poverty traps in terms of "money" & closing the channel for all possible income effects
 - Those with little money have a disadvantage whether due to non-convexities in the production or savings technology or in the access to complementary inputs.
 - If money can be borrowed and/or saved without any problem, this disadvantage goes away
 - People may not want to, due to risk aversion or other sources of income effects, to which will turn shortly

Social Barriers

- This point is quite general if applied to market economies
- If the external frictions are social factors that block mobility (e.g., race, caste), then one can have poverty traps with perfect capital markets
- The *entry barrier* is no longer money
- But to the extent there is some "opening" for market forces to enter, they will tend to undermine discriminatory practices (Becker)
- For example, neutral employers or blacks themselves can borrow capital and hire black workers - segregation, not discrimination

Take Away Message - EFD Poverty Traps

- To prevent the poor to "mimic" the behaviour of the rich, one needs to block a market channel
- However, the poor can "build" up the stock slowly under autarchy, and to prevent this one needs non-convexities
- There can be many other channels of market frictions, not just capital
- There can be many possible sources of non-convexities, not just production technology

Behaviour Driven or Demand-side Poverty Traps

- Suppose there are no external frictions whatsoever
- All technologies (production, savings etc) are convex & there are no market frictions
- Consider income effects in the behaviour of agents
- Possible to get poverty traps if the rich save more than the poor, and this process is subject to non-convexities
- Agents derive utility from consumption c and from bequest b .

- Individuals' preferences are represented by the following utility function

$$\begin{aligned} U(c, b) &= \log c + \beta \log (b + B) \text{ for } b \leq \bar{b} \\ &= \log c + \beta \log (\bar{b} + B) \text{ for } b \geq \bar{b} \end{aligned}$$

- $B > 0$ and $\beta > 0$
- This is a simple way of capturing satiation in b
- There are "smoother" models making a similar point, as in Azariadis (1996)
- Suppose everyone earns some wage w and can put their money in a bank that earns gross interest R .

- Let a_t be financial assets, and as before, $a_{t+1} = b_t$.

- No borrowing constraints:

$$c_t + b_t = w + Ra_t.$$

- Bequests cannot be negative: $b_t \geq 0$

- The choice of the individual would be

$$b_t = \frac{\beta}{1 + \beta} (Ra_t + w) - \frac{B}{1 + \beta}$$

- Get a lower threshold below which $b_t = 0$:

$$\underline{a} = \frac{B - \beta w}{\beta R}$$

- After that b is rising in a_t until the upper limit \bar{b} is hit at wealth threshold \bar{a}
- So long as $\frac{\beta}{1+\beta}R > 1$ and $B - \beta w > 0$ (possible in high interest low wage economies), we get a poverty trap

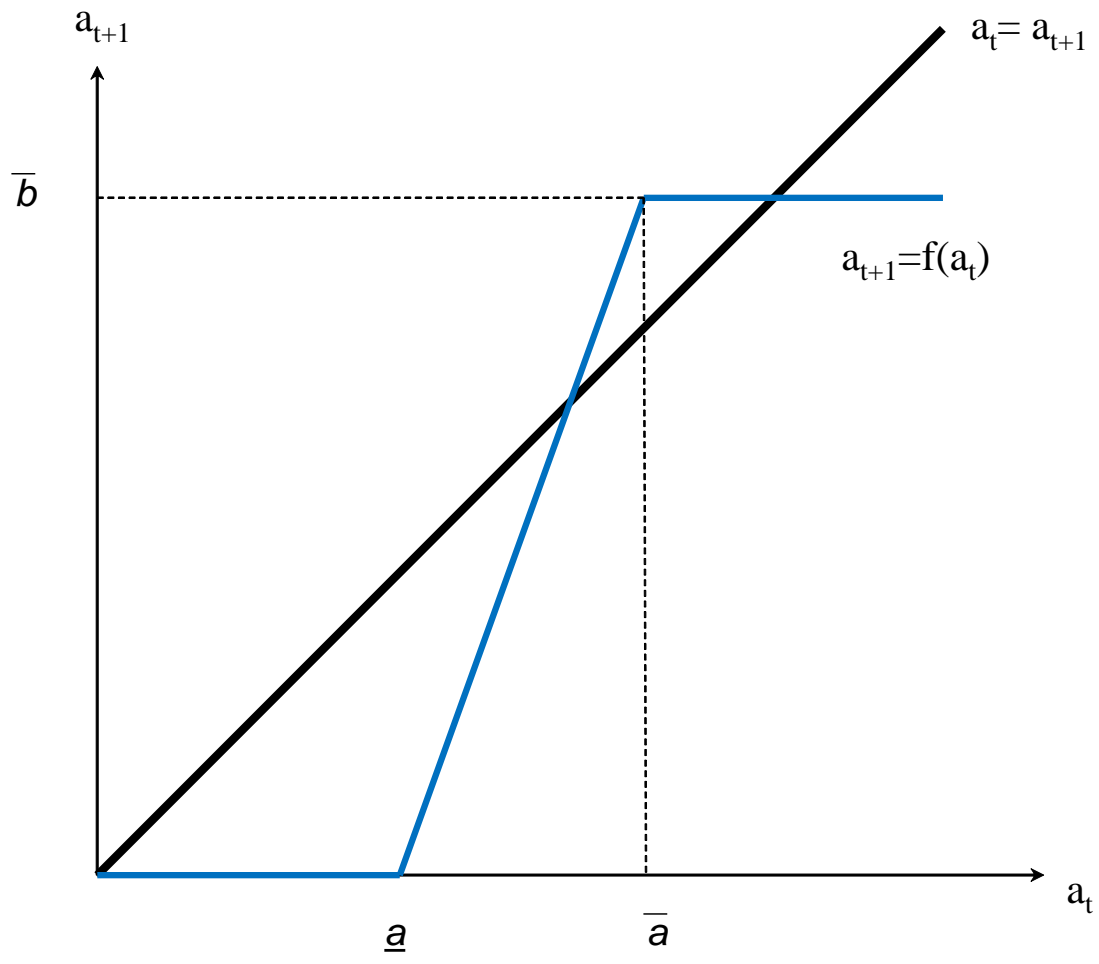


Figure 5: Income effects & poverty traps

Combining EFD and BD Poverty Traps

- Banerjee-Mullainathan (2008) "Limited Attention Span and Income Distribution"
- There are two goods: food (f) and comfort good (c) (such as, electricity supply or good baby sitter at home)
- The main idea is, the poor have to spend too much time worrying about domestic problems that the rich have a way of "buying out"
- As a result the rich can pay more attention at work, get a higher income, and this in turn keeps them rich

- Similar to efficiency wage models (Dasgupta-Ray, 1986)
- They then combine this with a human capital model like one we saw above to generate poverty traps, even with perfect capital markets
- The key factor though is the income effect, as otherwise, it is possible to overcome the trap through borrowing
- The poor do not value future generations sufficiently and are not borrowing to get more h for their kids, even when feasible

Another example - risk and insurance

- Suppose we allow individuals to be risk averse
- Now frictions that prevent individuals to mitigate risk exposure would also play an important role
- Insurance market frictions coupled with decreasing absolute risk aversion could generate poverty traps - the poor will focus on low risk low return projects
- Theoretically, hard to separate credit from insurance - the optimal contract should factor both liquidity constraints and uninsured risk

- Therefore, our emphasis on capital market frictions can be broadened to financial markets more generally

Take Away Message - BD Poverty Traps

- Even if there are no market or government frictions, poverty traps can emerge from income effects
- The sources for this are more general than in the model above
- Can result from the poor discounting the future too heavily
- Can result from departures of the representative agent or full rationality assumption

- Child labour, less schooling for girls can be the result of imperfect altruism and income effects
 - The poor may be more subject to behavioural biases (Banerjee-Mullainathan "Shape of Temptation", 2010)
-
- Here too the premise is everyone is subject to these problems, but low incomes exacerbate them.

What Can Theory Tell us About Policy

Lesson 1: Other than access to capital (at some suitably flexible terms), savings, or an unconditional income transfer, no other *single* intervention is likely to get rid of poverty traps.

- Seemingly obvious - to combat poverty, tackle the problem at source
- Not much evidence the poor fritter the money away
- GiveDirectly (Haushofer & Shapiro, 2013) gives unconditional transfers in Kenya, and impacts are quite good in terms helping build assets, investment in and revenue from businesses

- Other policies, such as providing training, improving infrastructure or schools, while perfectly good may not remove poverty traps on their own.
- McKenzie & Woodruff (2012) review training business owners from a dozen RCTs - little lasting impact on profits or sales.
- In contrast, financial market interventions have large potential payoffs:
 - de Mel, McKenzie and Woodruff (QJE 2008) finds returns to capital among Sri Lankan microenterprise owners are considerably higher than prevailing interest rates
 - Dupas-Robinson (AER 2013) show that providing individuals with simple savings technologies substantially increase investment in preventative health. Simply providing a safe place to keep money increased

savings by 66%. People are actually willing to save at a negative interest rate.

- In another paper (AEJ-Applied 2013) they show that providing access to non interest-bearing bank accounts led to significant increase in savings, productive investments and private expenditures.

Lesson 2: Also, even with these policies, at best poverty traps in a narrow sense will be eliminated. Two individuals who, except for income, are identical will not end up very differently in the long-run. But if other markets are underdeveloped (e.g., acquiring skills), infrastructure is poor, then neither will do very well.

- Cash transfer may not work if markets are not developed
- May be training is the missing input, or some infrastructure.
- Ghatak, Mitra, Kumar (2014) who study the bicycle programme in Bihar found that the poorer sections, who lived in more remote areas with little market access did prefer in-kind transfers to cash.

- That is, the problem of conditional convergence remains
 - Otherwise identical individuals in better environments (market access, infrastructure) will do better
- Solution - either improve A or encourage migration
- Perhaps our focus on poverty traps has shifted our attention from this more basic problem.
- Even if there are no multiple steady states, the elasticity of response to changes over certain regions can be quite high.

- Conditional convergence models too can explain large effects from small changes
- Take the Solow model again

$$q = Ak^\alpha.$$

- The transition equation is

$$k_{t+1} = sAk_t^\alpha.$$

- Therefore, the steady-state level q is

$$q^* = (A)^{\frac{1}{1-\alpha}} s^{\frac{\alpha}{1-\alpha}}.$$

- Steady state output is a *convex* function of A and so elasticity of response to policy changes could be quite high

Lesson 3: Demand and supply side interventions are likely to be complementary. In the context of our model, if we fix financial markets or give a large cash grant, AND improve access to training or infrastructure, gains are likely to be much higher than these individual interventions.

- Recall $q = Af(k)$
- That is k (or h) and A are complements
- Bandiera, Burgess et al (2013) find that sizable transfers of assets and skills in Bangladesh enable the poorest women to shift out of agricultural labor and into running small businesses, which persists and strengthens after assistance is withdrawn, leads to a 38% increase in earnings.

- Similar finding by Blattman et al (2014) - cash transfers coupled with business training very effective among impoverished Ugandan women.

Lesson 4: Some interventions (e.g., credit, savings) are likely to have similar effects, and it is important to diagnose which one is more important.

- Dupas-Robinson (2013) find that take-up for their savings package is very high - 87% took up the savings account, and 41% made at least two transactions within the first six months
- In contrast, Banerjee et al's 2009 study of microfinance shows 27% take up in urban India, and Crepon et al (2011) found a take up of 16% in Morocco.
- Also, Banerjee et al (2009) found positive (but small in absolute magnitude) effects on business creation and purchase of business durables, and

Karlan and Zinman found zero effects on business investment in an urban area in the Philippines

- Judging by this, popularity of microfinance may be due to providing an access to savings technology

Summing Up - Development of Development Theory in the Experimental era

- Need to go beyond saying that an interesting contractual arrangement (sharecropping, joint liability lending, informal risk-sharing, non-profits) may exist under certain conditions, but also to show when they would not exist, i.e., what are its costs and benefits of adopting them
- An interesting effect may exist but is it potentially small or large in positive or normative terms, and if so, under what conditions - for this one way forward is quantitative explorations using existing data to calibrate a theory model (e.g., Besley-Burchardi-Ghatak, QJE 2011)
- Given that RCTs or lab experiments are now able to test theoretical implications, it is we should think through how to test the empirical implications of a theory, or to test between competing theories

Theory helps us design appropriate empirical tests & experiments

- By asking right questions: what are the causes and what are the consequences or symptoms
- For example, may be poverty is caused by behavioural problems (e.g., the poor are present-biased or have limited cognitive capacity due to poor health and lack of education
- Then we need to design tests that can confirm this, e.g., offering different savings products
- If this is confirmed, then we need to ask what savings products will help the poor overcome these

- Then we need to ask why were these products not offered in the market to start with
- This will push us towards understanding institutional failures (market/government)

Theory allows us to do counterfactual analysis

- What happened is one of many possibilities
- External validity would require many, many experiments
- A theoretical framework allows us to generate alternative hypothetical scenarios
 - What alternative programmes could have done
 - What would have happened in a different environment
 - General equilibrium effects (Buera, Kaboski, Shin 2014 find that the effect of microfinance in raising wages may be at least as important as its direct effect)

Theory Allows us to do Welfare Analysis

- Suppose you find programme X (say, AIDS awareness) causes outcome Y (use of contraception)
- Once we know this, can we assume that this programme will be implemented?
- For that we need to do a cost-benefit analysis
- But that requires a normative framework where the cost of funds, the benefit to the target group, are all taken into account