Lectures in Growth and Development

(M. Ghatak, LSE, 2018)

Ec428

Persistence of Poverty - I. Theory

These notes are not guaranteed to be error free. If you spot one, please let me know.

Also material beginning with ** means optional material

- Is poverty persistent? In particular:
  - Are the poor "stuck" in a trap and need a push to move out of it?
  - Is it a combination of economic fundamentals (productivity, preferences) & slow convergence?

- We already saw evidence of persistence at the country level in Topic 1

Poor Countries Stay Poor

Figure: Estimates of the distribution of countries according to log GDP per capita (PPP-adjusted) in 1960, 1980 and 2000.

- Shift to the left, suggesting overall growth,
- Sticky at the bottom, suggesting persistence of poverty
- & widening inequality across countries

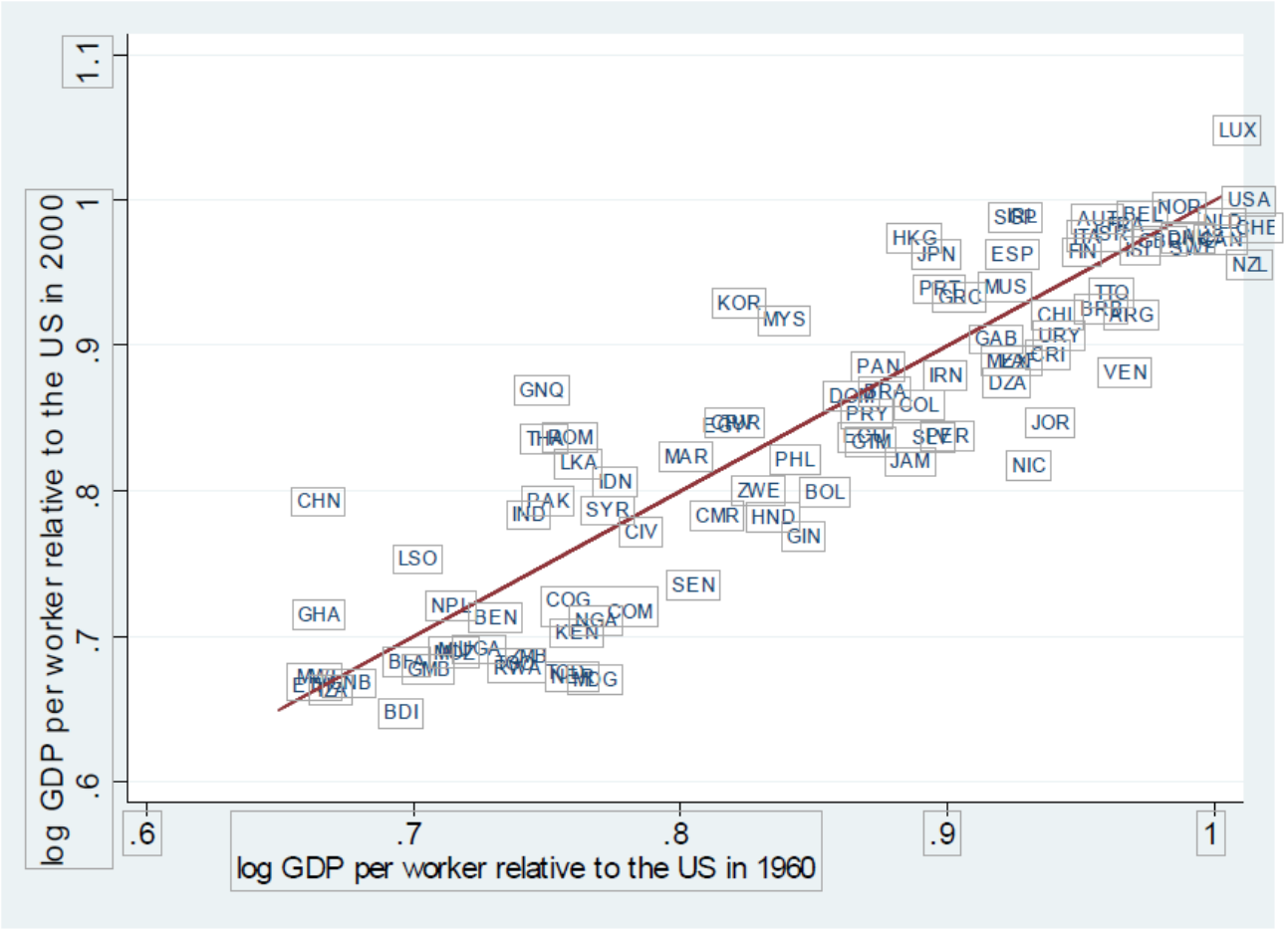
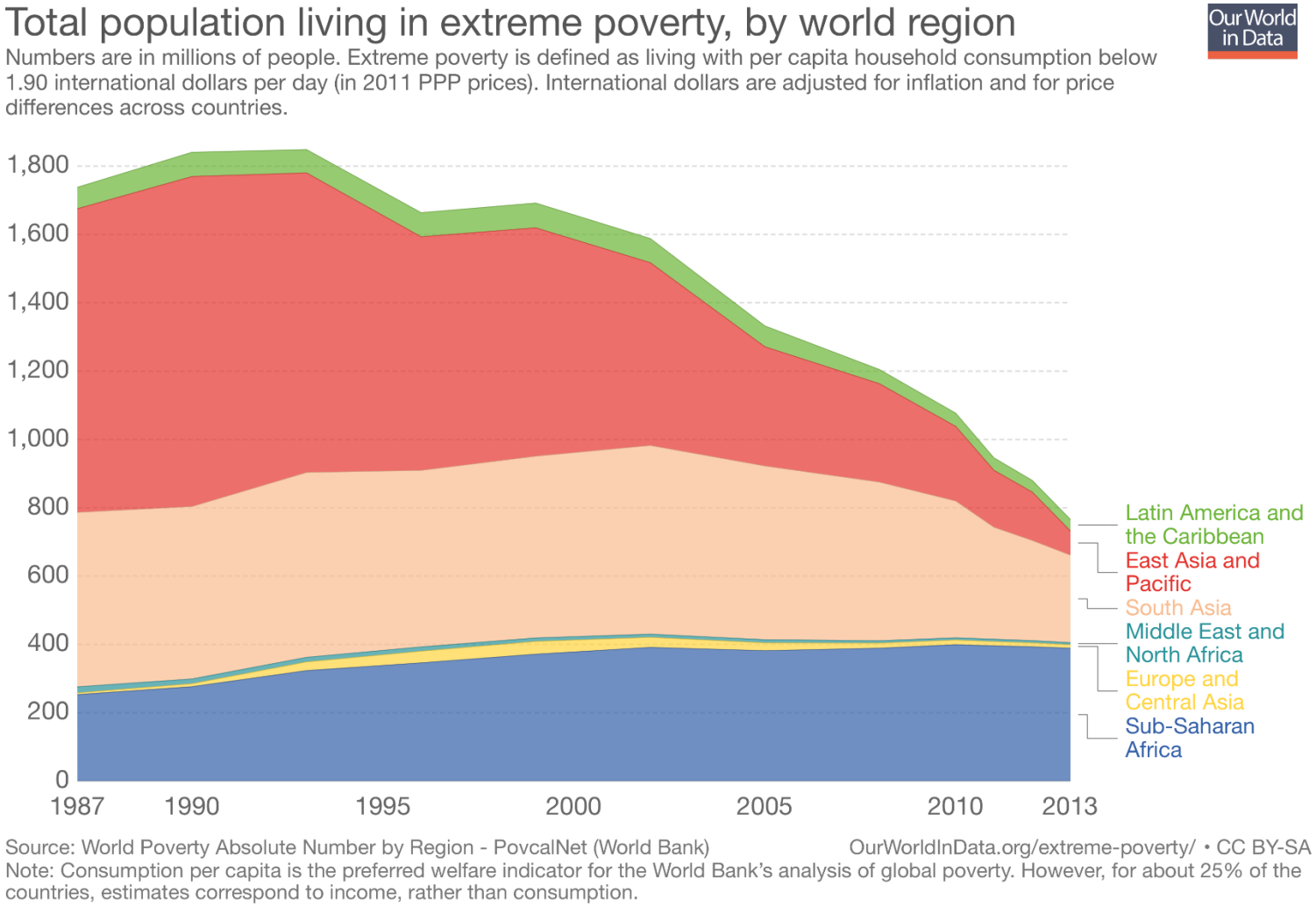


Figure: Log GDP per worker in 1960 and 2000.

Remarkable persistence - absolute improvements, but relative position of countries not changing

But numbers are stable in the poorest regions



- Now apply growth and convergence view to household or individual level
- There is also evidence of persistence at the individual level
- Evidence of limited mobility both in developed and developing countries
- Intragenerational and intergenerational mobility - the first type asks how likely it is that a household in one income quintile will still be in that quintile after a fixed number of years; the second asks how likely is it that the child of a household will grow up to belong in the same quintile that his or her parents did.

- Intra-generational mobility - transition matrices

- Table 1 (from Carrol and Chen, 2016) shows an example of a 10-year transition matrix calculated from 2003 to 2013 for the US.

- The rows are associated with the quintile where a household was in 2003.

- Reading across the row, each cell indicates the fraction of households from that row's quintile that are observed in that column's income quintile in 2013.

- In this case, about 64 percent of households that were in the bottom quintile in 2003 were there in 2013.

- Meanwhile, 1 percent of them had moved up to the top quintile.

Table 1. Transition Matrix of Household Income, 2003–2013

Original quintile (poorest to richest)	Quintile 10 years later				
	1	2	3	4	5
1	**0.64**	0.24	0.08	0.03	0.01
2	0.23	**0.45**	0.24	0.07	0.02
3	0.08	0.20	**0.46**	0.23	0.04
4	0.04	0.07	0.19	**0.54**	0.18
5	0.03	0.04	0.06	0.16	**0.72**

Note: The sum of a row may not equal one due to rounding.
Source: Panel Study of Income Dynamics, 1968–2013.

Source: Carroll and Chen, 2016

https://www.clevelandfed.org/newsroom-and-events/publications/economic-commentary/2016-economic-commentaries/ec-201606-income-inequality-and-mobility.aspx

- Intergenerational earnings elasticity is derived from a regression-to-the-mean model, usually as the least-squares estimate of the coeffificient β in the equation

$$\ln y_{i,t} = \alpha + \beta \ln y_{i,t-1} + \varepsilon_i$$

- y represents permanent earnings for individuals from a particular family indexed by i, across two generations, t and $t - 1$.

- ε represents all other inflfuences on the child's adult earnings not correlated with parental income.

- α captures the trend in average incomes across generations, due, for example, to changes in productivity, international trade, technology, or labor market institutions.

- β indicates the degree to which earnings are "sticky" across generations within the same family, the percentage difference in child earnings for each percentage point difference in parental earnings.

- The higher the value of β, the more that knowing a parent's place in the earnings distribution will tell us about where we can expect the child's place to be; the lower the value, the less stickiness so that a parent's relative earnings are a weak predictor of the child's rung on the earnings ladder of the next generation

- Income inequality is measured as the Gini coefficient, using disposable household income for about 1985 as provided by the OECD.

- Intergenerational economic mobility is measured as the elasticity between paternal earnings and a son's adult earnings, using data on a cohort of children born, roughly speaking, during the early to mid 1960s and measuring their adult outcomes in the mid to late 1990s (Corak, 2013). Permanent earnings are derived by either averaging annual data over several years or by using instrumental variables.

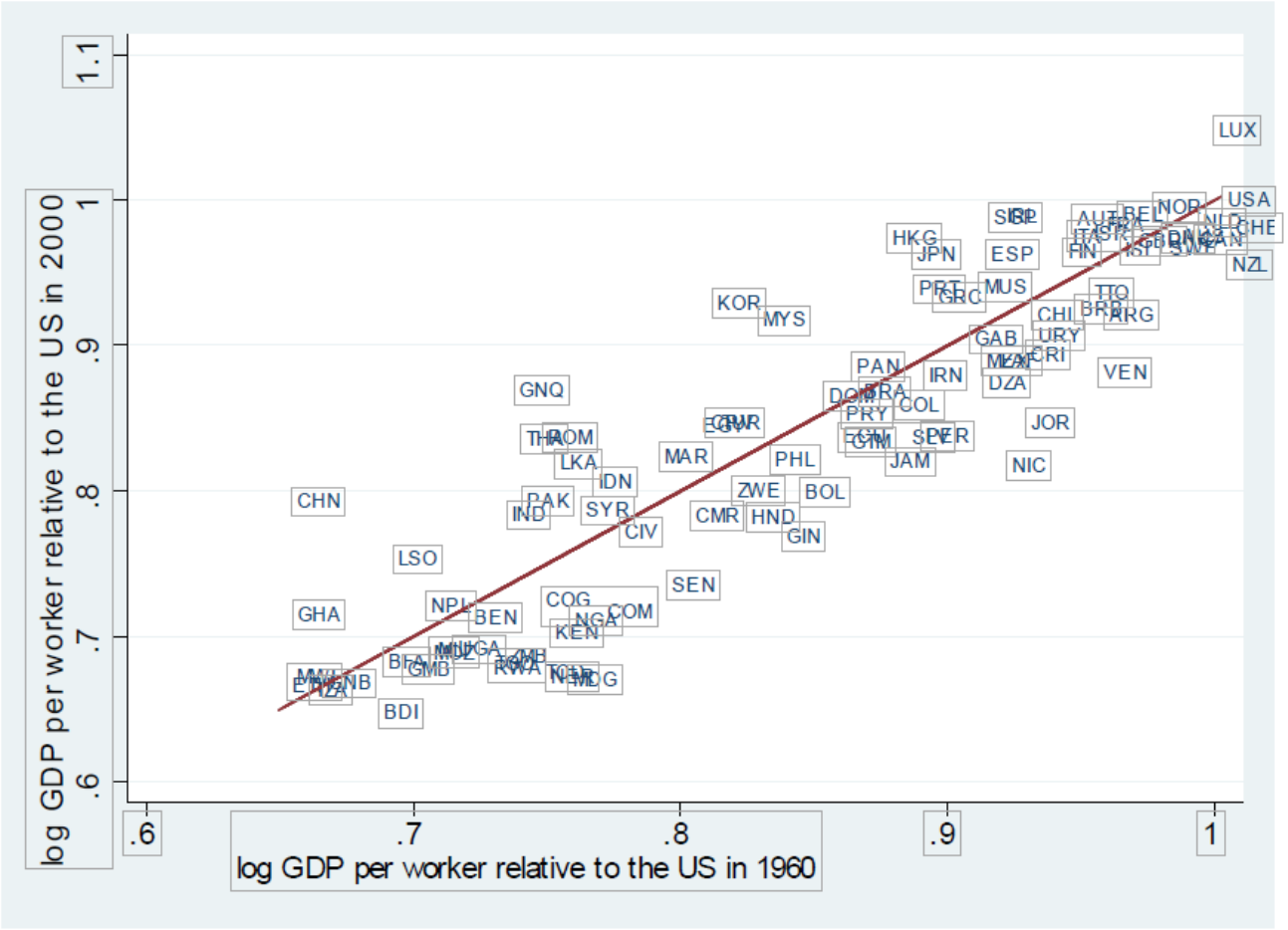
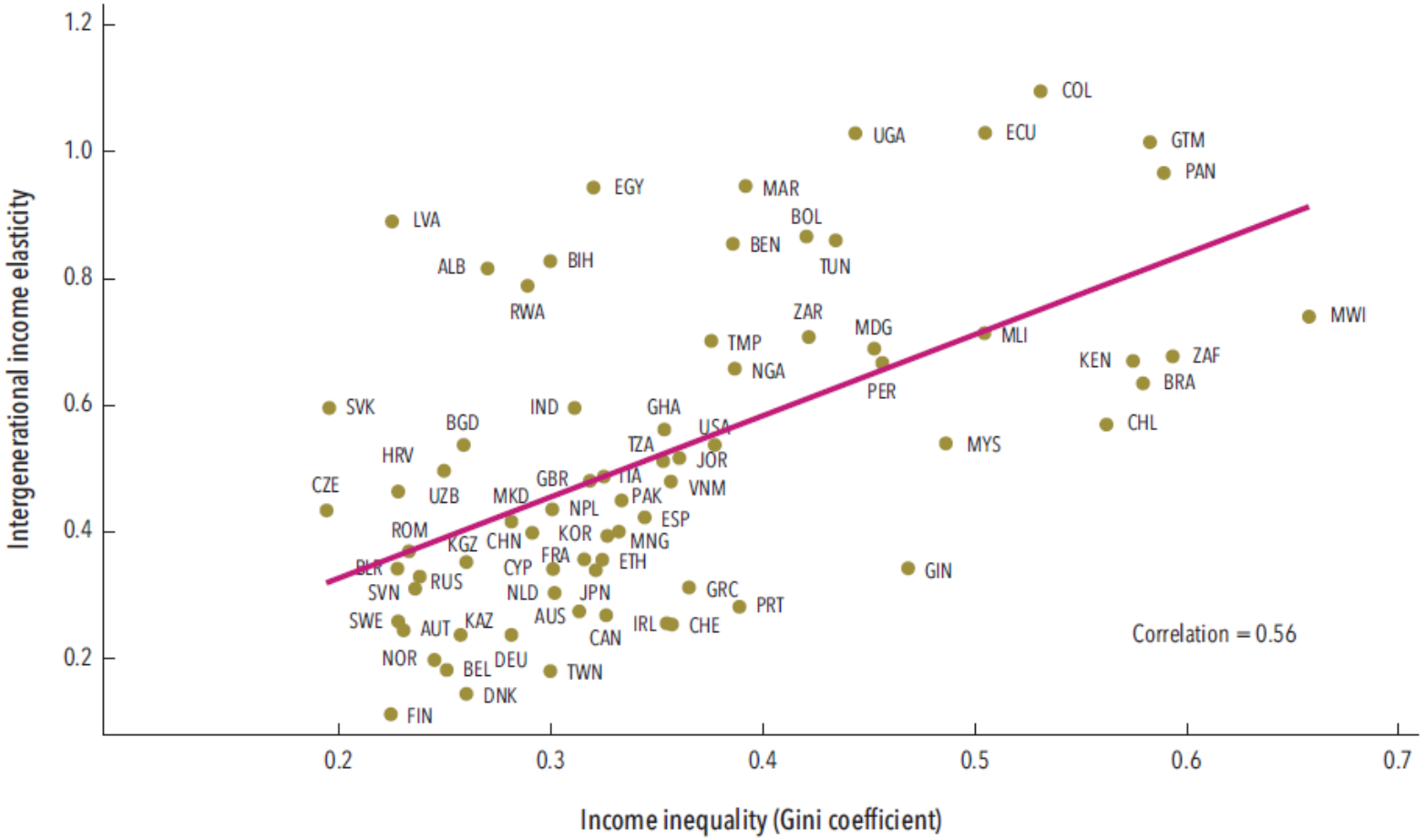


Figure: Log GDP per worker in 1960 and 2000.

Remarkable persistence - absolute improvements, but relative position of countries not changing

FIGURE O.11 Higher relative IGM in income is associated with lower income inequality



Source: Equalchances 2018, compiled from multiple studies; GDIM 2018 (World Bank); World Development Indicators for income inequality.
Note: Higher intergenerational income elasticity indicates lower relative intergenerational mobility (IGM).

Source: https://openknowledge.worldbank.org/handle/10986/28428

- Need to address the "stubborn poverty" problem: a lot of poor people are left behind even as countries grow.

- We need to understand why people stay poor in order to design policies that lift the poorest out of poverty

- How does one reconcile persistent poverty with the convergence view?
  - Is convergence slow?
  - Is it conditional convergence?
  - Is it a poverty trap, and if so, what is the mechanism?

- In this lecture, focus on poverty traps

- In thinking about persistence of poverty as well as that of affluence, we have to grapple with the issue of *persistent inequality* or lack of mobility

- Here we must distinguish between

  - Good inequality: the one that emerges when everyone is given good opportunities. It implies that neither the poor nor the rich are always from the same dynasties.

  - Bad inequality: the one that emerges because the rich are given more opportunities than the poor. It implies that both the poor and the rich are from the same dynasties.

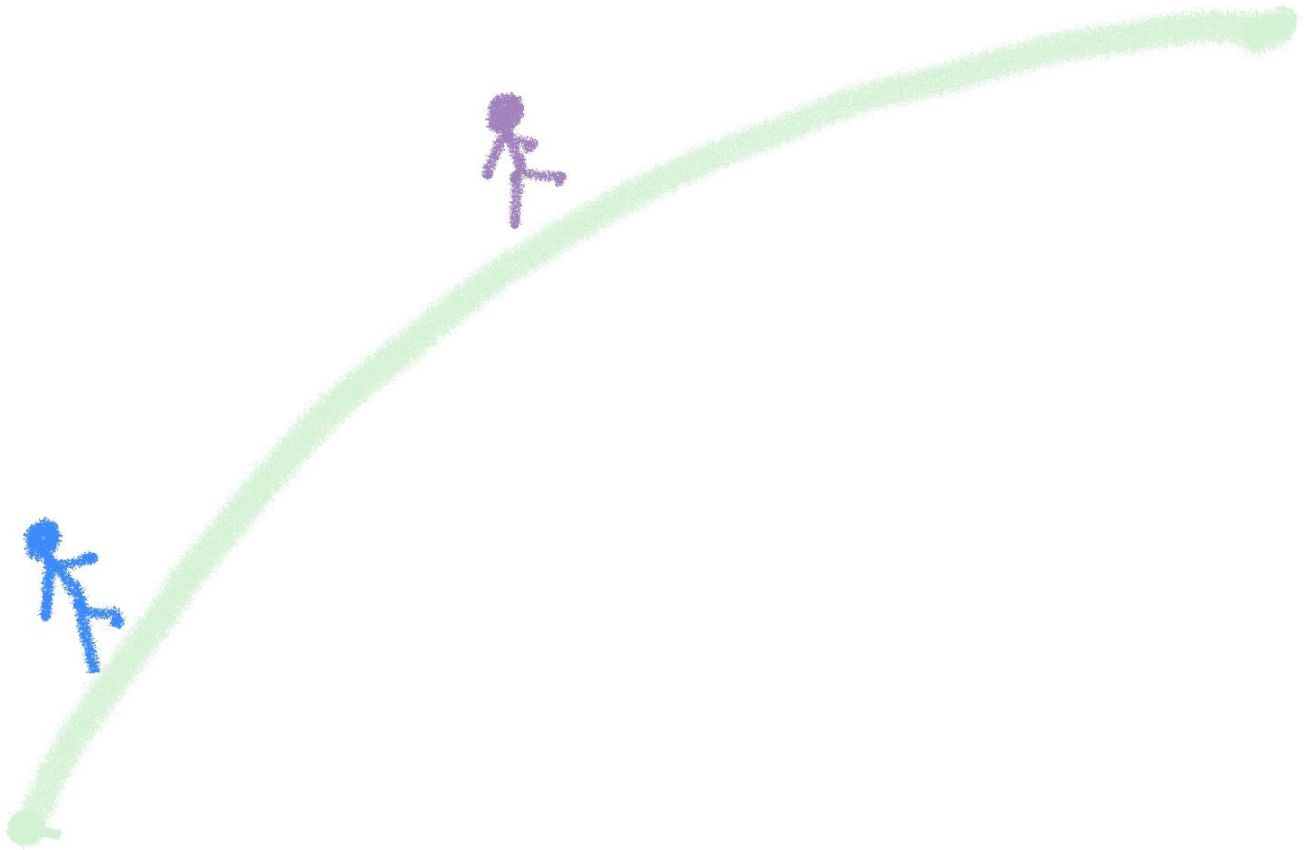
- Also, static vs dynamic notions of egalitarianism - a society where a new-born has a reasonable chance of doing well independent of his/her origins is a good one

- So rather than focus on cross sectional inequality, one should look more at dynamic persistence, either life-cycle or intergenerational

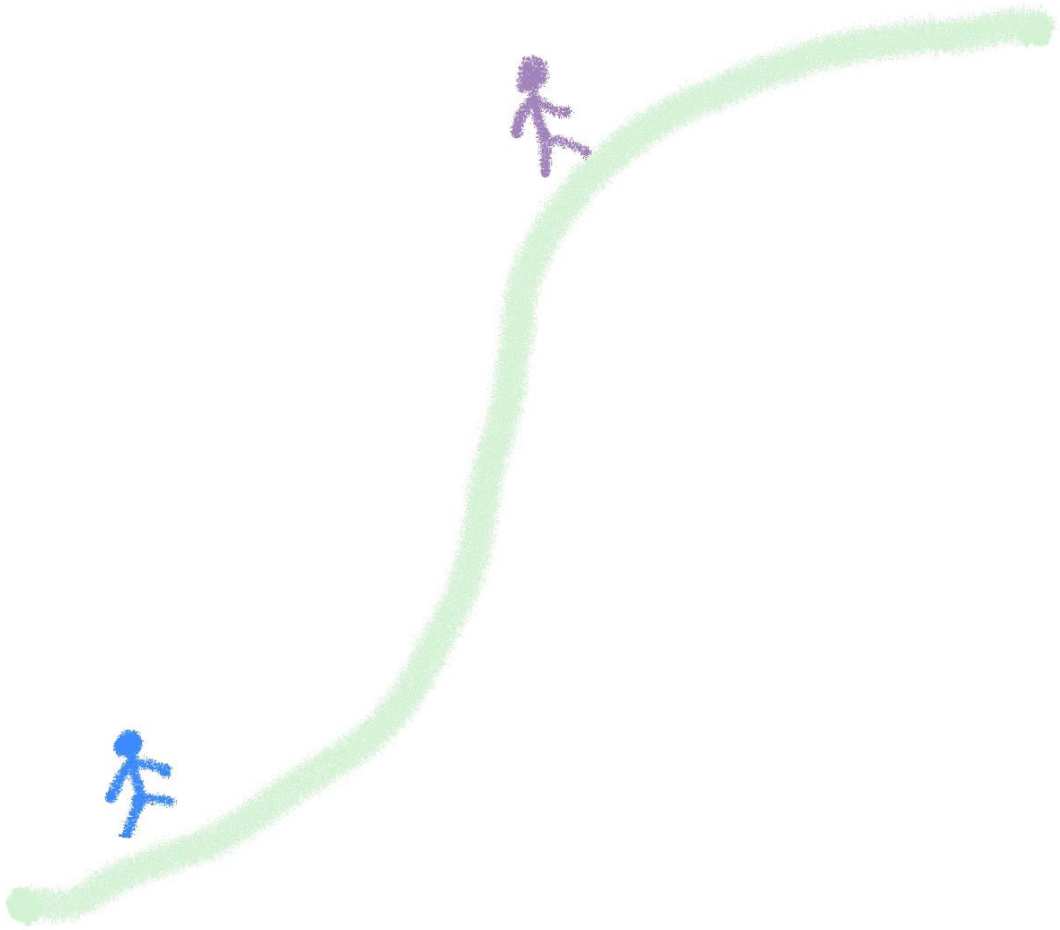
- Generic story of poverty traps - y depends on some choices (likely, constrained) x and then x depends on y through either income effect, or reflecting saving and accumulation

- In Ghatak (2015) I distinguish between two kinds of poverty - "External Frictions" or "Choice under Scarcity" views.

View 1: A hill anyone can climb



View 2 : A steep mountain face



External Frictions View

- The poor is just like the non-poor in terms of their potential (that includes ability, preferences) and they simply operate in an unfavourable environment or with low endowments
  - In terms of a production function $q = Af(x)$ - low x, bad A (conditional convergence)
  - The true A' is worse than potential A
  - There may be poverty traps - if you start poor, you tend to stay poor

- We lump all these together and call them "external frictions" (along with frictions that arise from poor governance, infrastructure etc) that prevent the poor from making the best use of their endowments through exchanges in the marketplace or through technology.

- To the extent this can be fixed by placing a poor individual in a favourable external environment, it will be a transient phenomenon but otherwise the poor may be trapped in poverty.

- In a sense, in this view the phenomenon of poverty, other than being *inequitable*, is also *inefficient*: a combination of individual rationality and market forces should work to utilize any potential gains (e.g., lost income from insufficient investment in human capital) and the question is, what policies will remove the frictions that prevent this from happening.

Behaviour Driven by Scarcity

- A very different view of poverty is, even if there were *no external frictions*, the poor are subject to different pressures and constraints from the non-poor and that drives them into making *choices* that are very different, and more importantly, that can reinforce poverty.

- It is tempting to call this view a "behavioural" view of poverty but we are going to argue that this is a broader phenomenon

- Even if all individuals are rational in the neoclassical sense, choices under extreme scarcity can reinforce the tendency of the poor to stay poor due to *non-homothetic preferences*, or *strong income effects*.

- For example, at very low income levels, subsistence considerations may rule out the feasibility of saving at a reasonable rate, and investing money in health and education to secure a better for future for themselves and their children.

- In this view, poverty is "efficient" and there are no self-correcting mechanisms to be unleashed with suitable supply-side policies

- Either redistribute, or focus on policies that will change behaviour (or, ignore!)

1. Benchmark Model with No Frictions & Homothetic Preferences

1.1 One-Period Model

- Suppose production depends on capital (or some other non-labour input like land) 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 price or rental rate of this input is r

- An individual has an endowment $\overline{k}$

- We can think of k as (physical/human) capital or land or skills

- The profits of this individual are

$$\pi = \max_x Af(k) - rk\,.$$

- Let k^* be the solution

- With perfectly competitive markets his income is:

$$\begin{aligned} y &\equiv \pi + r\overline{k} \\ &= Af(k^*) - rk^* + r\overline{k}. \end{aligned}$$

- This shows that the individual's endowment of k does not matter for *productive efficiency.*

- Through rental or sales (in a one-period model they are equivalent), they adjust to maximize efficiency

- Those who have low endowments, buy, rent in, or borrow, and those who have high endowments, sell, rent out, or lend.

- Of course, an individual's final disposable income reflects endowments.

- With perfect markets and no non-convexities, we have **separation** between productive efficiency and individual economic outcomes.

- To the extent we care about an individual's income falling below some minimum threshold, i.e., poverty, there is a case for redistributive transfers, but they will not have any positive productivity impact on the recipient.

1.2 Infinite Horizon Model

- Introduce dynamics in the one-period model to allow for savings and capital accumulation over time

- Current endowment of the capital stock $\overline{k}$ (equivalent to wealth in this model) is the result of past choices rather than being exogenously given.

- Preferences are homothetic and people save at a constant rate s, as in the Solow model.

- Alternatively, individuals live for one period, pass on a constant fraction s of their wealth as bequests to the next generation.

- Assume individuals 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 $s \equiv \frac{\beta}{1+\beta}$

- y (to be distinguished from q) is total income, including that from inherited assets

- Could alternatively derive it from the behaviour of forward-looking infinitely-lived decision maker under some conditions

- There is a constraint: $b \geq 0$

- Even if capital markets are perfect as such, in most societies negative bequests are not permissible by law and violations of this are considered morally offensive, such as bonded labour.

- This is equivalent to an inter-temporal borrowing constraint: a poor parent cannot borrow on behalf of her child

- Let us focus on the interpretation of x as physical or financial capital k

- Let k_t denote the capital endowment in time t

- Assume capital depreciates fully after use

- Bequests of generation t determines capital endowment in period $t+1$: $b_t = k_{t+1}$

- With perfect capital markets we get

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

- Denoted by red line in the figure below

- Assuming $sr < 1$ we get convergence.

- Convergence is the anti-thesis of poverty traps

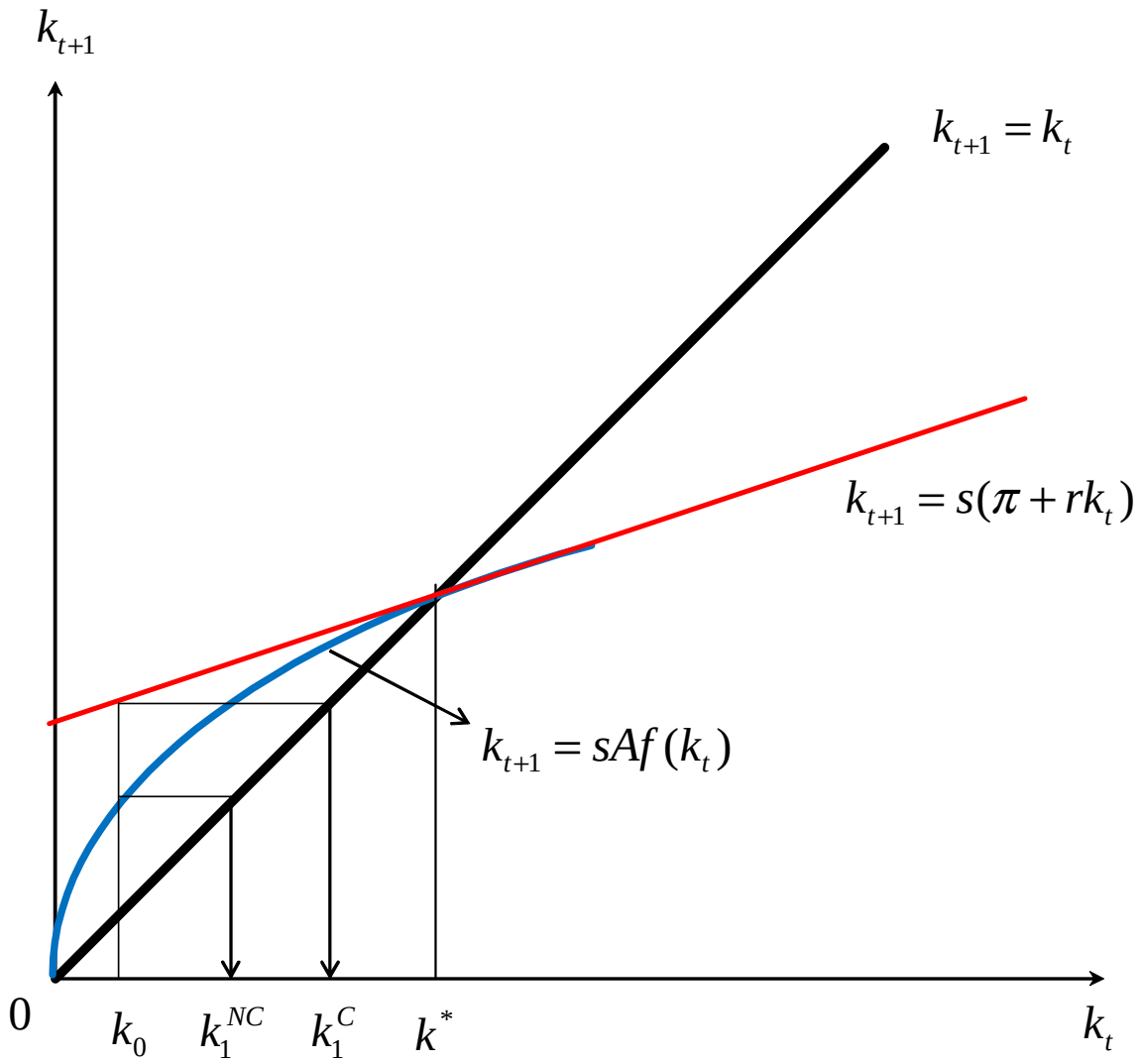


Figure 1: Convergence in the Solow Model

- If the deep parameters are the same (s, A, $f(.)$) then initial endowment of k does not matter in the long-run

- In the short-run initial endowments matter for individual income, but not productive efficiency

- Of course, if these parameters are different then individuals converge to different steady states: **conditional convergence**

Departures from the Solow Model - External Frictions

- Relax various assumptions of the benchmark model to allow the possibility that two individuals who are *identical in all respects except for their initial endowment of capital (or wealth),* k_0, can end up with different levels of incomes and capital stocks in steady state, which is a formal way of describing a poverty trap

- Multiple stable steady states, initial conditions matter, one-shot policies may have long-run effects

2.1 Capital Market Imperfections

- Suppose capital markets are imperfect.

- For expositional simplicity, let us assume that there are no capital markets.
  - Could allow intermediate levels of capital market imperfections, where the amount of capital that an individual can use is some multiple of her initial capital stock, i.e., σk_0 where $\sigma > 1$ (and not too large so that capital market frictions do have bite)
  - Can be generated by one of the standard channels of credit market frictions, such as *ex ante* or *ex post* moral hazard

- In the one-period model the separation result breaks down: output is now $q = Af(\overline{k})$.

- Turning to the infinite-horizon model, the case of no capital markets is equivalent to the standard Solow model where individuals save a constant fraction of their income to accumulate capital over time.

- As we assume capital fully depreciates, the modified transition equation is:

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

- Depicted by blue curve in Figure 1

- We still get convergence- with capital markets convergence is speeded up

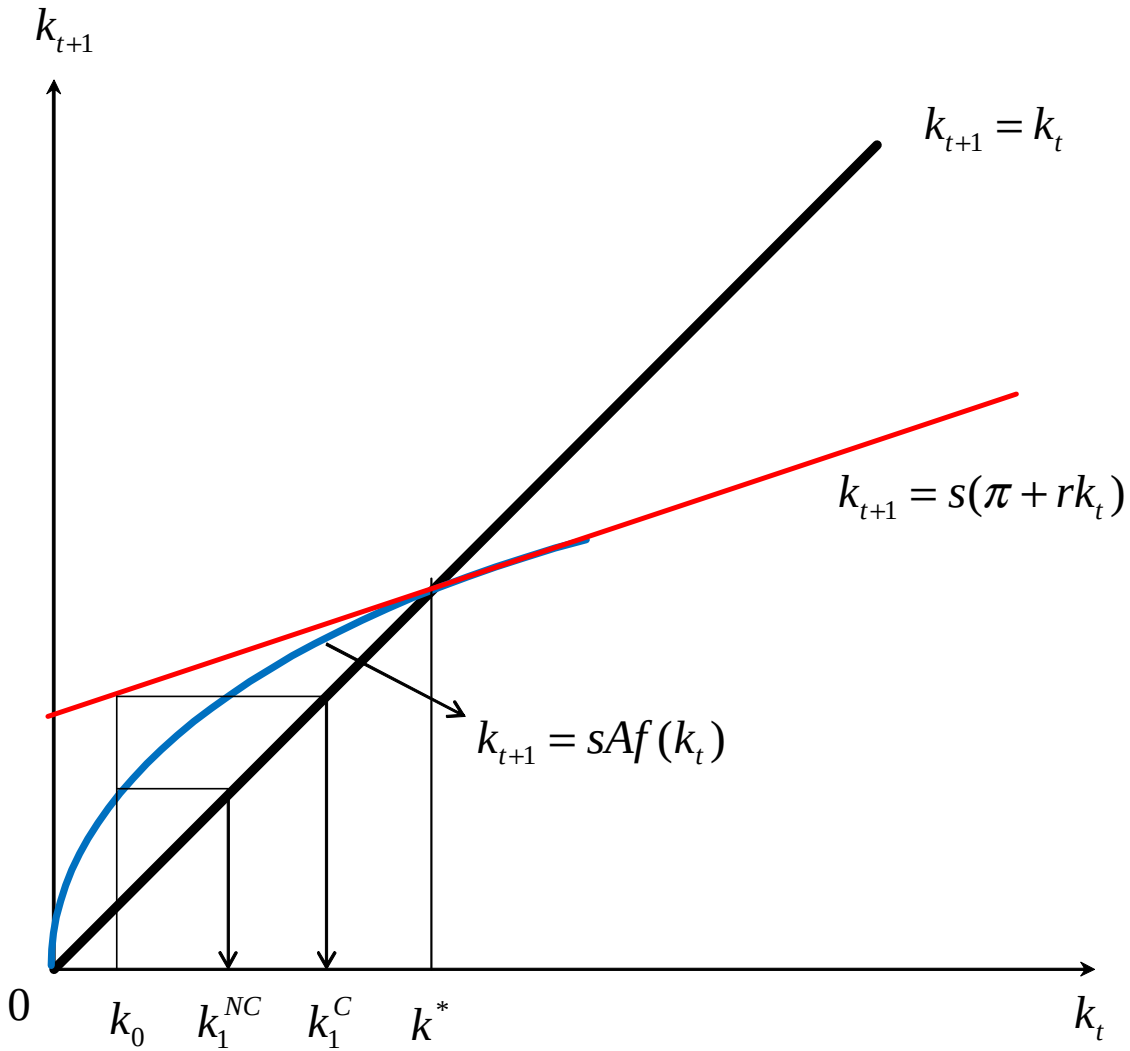


Figure 1: Convergence in the Solow Model

2.2 Non-convexities - in the Production Technology

- For example, let us introduce set-up costs
- $y = Af(k)$ for $k \geq \underline{k}$, $= \underline{w} > 0$ 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)

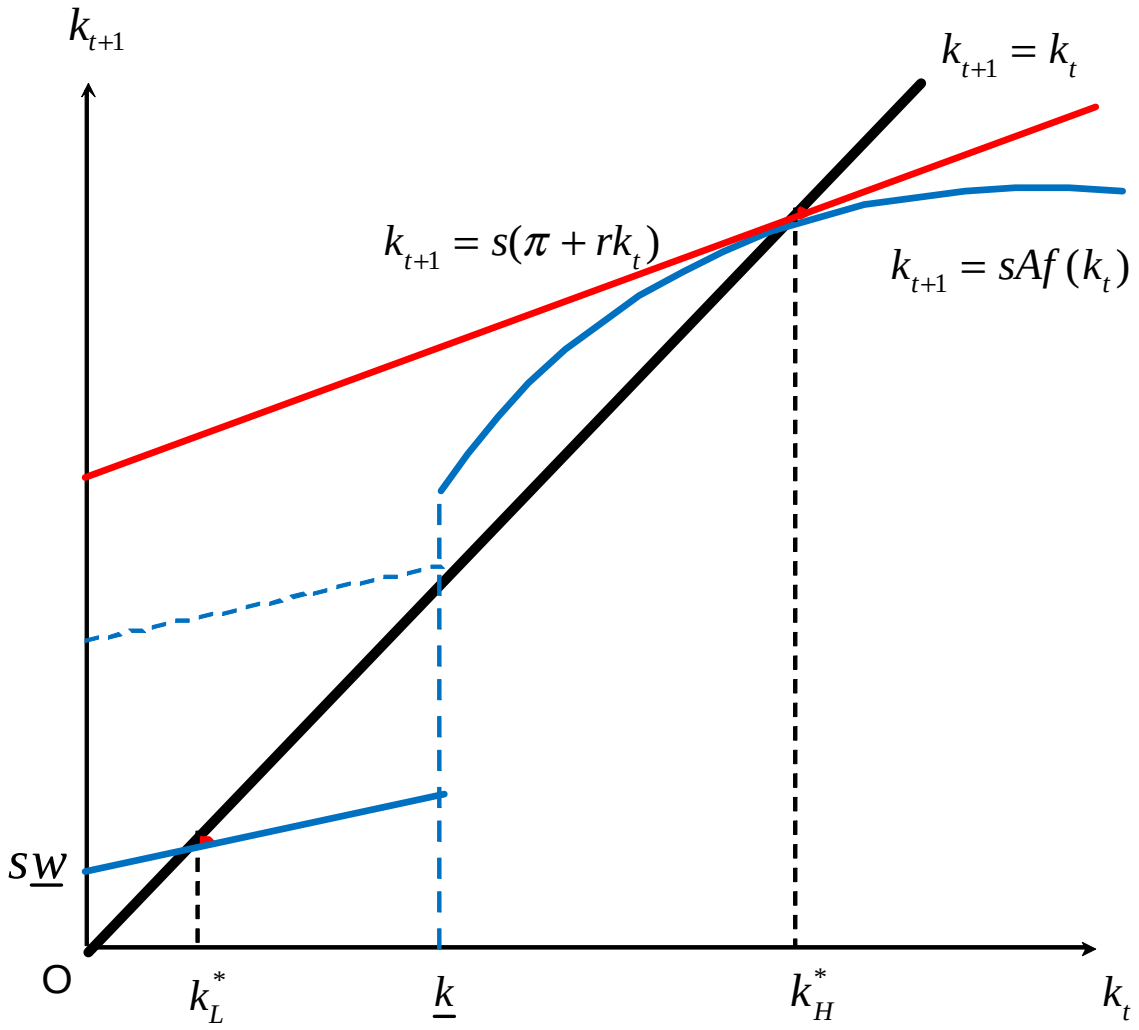


Figure 2: Non-convergence in the Solow Model

- With perfect capital markets, it is possible to borrow $\underline{k}$ or more, and there is no poverty trap.

- However, non-convexities and absence of capital market is necessary for poverty traps, not sufficient

- Or, if s or $\underline{w}$ or r are high enough, then can save your way out of the poverty trap

2.2 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 (similarly, for A, which captures complementary inputs such as skills or infrastructure)

- Will get poverty traps without any technological non-convexities.

Friction-driven Poverty Traps - Take Away Points

- First, no single friction is sufficient to trap individuals in poverty
  - Whether it is capital market frictions or restrictions on inter-temporal resource allocation as implied by the constraint that bequests have to be non-negative, we would require some other departure from the standard framework (e.g., non-convexities)
  - That is why the fact that some studies fail to find any direct evidence of lumpiness of investments *or* find that microfinance loans have not been effective in reducing poverty significantly, *alone* is not sufficient to conclude that there is limited empirical support in favour of poverty traps (as Kraay and McKenzie, 2014 argue).

- Second, if capital is the only input or all other inputs have perfect rental or sales markets so that capital is, in effect, a "sufficient" input (for example, in the presence of cash-in-advance constraints), then capital market frictions or restrictions on inter-temporal resource allocation are *necessary* for friction-driven poverty traps to emerge independent of any other frictions.

- Third, if inputs other than capital are needed for production (such as human capital or land) and these markets are subject to imperfections that cannot be overcome via the capital market, then direct intervention in the market of this input would be warranted.

3. Departures from Benchmark Model - Non-homothetic Preferences

- When preferences are non-homothetic, then one can have poverty traps that are driven by income effects only.

- The main idea is there is no external friction that can be potentially fixed to help people get out of a poverty trap.

- People are trapped in poverty because insufficient endowments (we focus on money, but it could alternatively be time or attention span) and not exogenous frictions that prevent them from making best use of their endowments through exchange in the marketplace.

- We avoid calling this class of poverty traps "behavioural" poverty traps because it may be confused with those arising from behavioural biases *only* (e.g., loss aversion, hyperbolic discounting).

- That is certainly a possible channel, but it is possible to generate these kinds of poverty traps with standard preferences as well, as the model below indicates (e.g., Banerjee and Mullainathan, 2010, and Bernheim, Ray, and Yeltekin, 2013).

- We call them scarcity driven poverty traps instead

Modifying the Benchmark Model

- Output is given by $q = Af(k)$ and that capital markets are perfect, and so the income of an individual is

$$y_t = \pi + rk_t$$

where

$$\pi = \max_k Af(k) - rk.$$

- Suppose there are no external frictions whatsoever, barring bequests being non-negative

- As before, let us assume agents derive utility from consumption c and from bequest b.

- In addition, we allow individuals to consume a luxury good z.

- The utility function is given by:

$$U(c, b) = \log c + \beta \log (b + B) + \gamma \log(z + Z)$$

- $B > 0$, $Z > 0$, $\beta \in [0, 1]$, and $\gamma \in [0, 1]$.

- We assume that the marginal utility of bequests at $b = 0$ is higher than the marginal utility of luxury goods when $z = 0$.:

$$\frac{\beta}{B} > \frac{\gamma}{Z}.$$

- We can think of c as basic consumption, b as money passed on to children, and z, a luxury good (durables, a vacation) which is not essential for survival but is consumed as income goes up.

- Our assumption ensures that for low levels of income, all income is spent on c, for moderate levels of income it is split between c and b, and finally, for high levels of income it is split between c, b, and z.

- Total income at time t is

$$y_t = \pi + rk_t$$

- As before, $k_{t+1} = b_t$.

- The budget constraint is

$$c_t + b_t + z_t = \pi + rk_t.$$

- It is straightforward to derive that there will be two income thresholds, $\underline{y}$ and $\overline{y}$, and corresponding thresholds for capital

$$\begin{aligned} \underline{k} &\equiv \frac{B - \beta\pi}{\beta r} \\ \overline{k} &\equiv \frac{(1+\beta)\, Z - \gamma B - \gamma\pi}{\gamma r} \end{aligned}$$

- We can show that

$$\overline{k} > \underline{k}$$

- Follows from our assumption

$$\frac{\beta}{B} > \frac{\gamma}{Z}.$$

- Using the fact that $b_t = k_{t+1}$, we will have:

$$\begin{aligned} k_{t+1} &= 0 \text{ for } k \leq \underline{k} \\ &= \frac{\beta}{1+\beta}(rk_t + \pi) - \frac{B}{1+\beta} \text{ for } \underline{k} \leq k \leq \overline{k} \\ &= \frac{\beta}{1+\beta+\gamma}(rk_t + \pi) - \frac{(1+\gamma)B - \beta Z}{1+\beta+\gamma} \text{ for } k_t \geq \overline{k}. \end{aligned}$$

- Depicted in Figure 4

- Again, we need specific parameter conditions for poverty traps to arise on top of having a transition equation of this (kinked S-shaped) kind

- We assume that $\frac{\beta}{1+\beta}r > 1 > \frac{\beta}{1+\beta+\gamma}r$ and $B - \beta\pi > 0$ (which is likely in economies with low productivity, namely, a low level of A) to generate a poverty trap.

- The first pair of inequalities refer to slopes of the two upward sloping components of the transition equation and the second refers to $\underline{k} > 0$

- In particular, families that start poor (capital stock less than $\underline{k}$) don't save at all and therefore, have a steady state capital stock of 0, those who start with more than $\underline{k}$ grow rapidly up to the point where the saving rate falls (as luxury consumption kicks in) and they converge to a high capital stock (k^*)

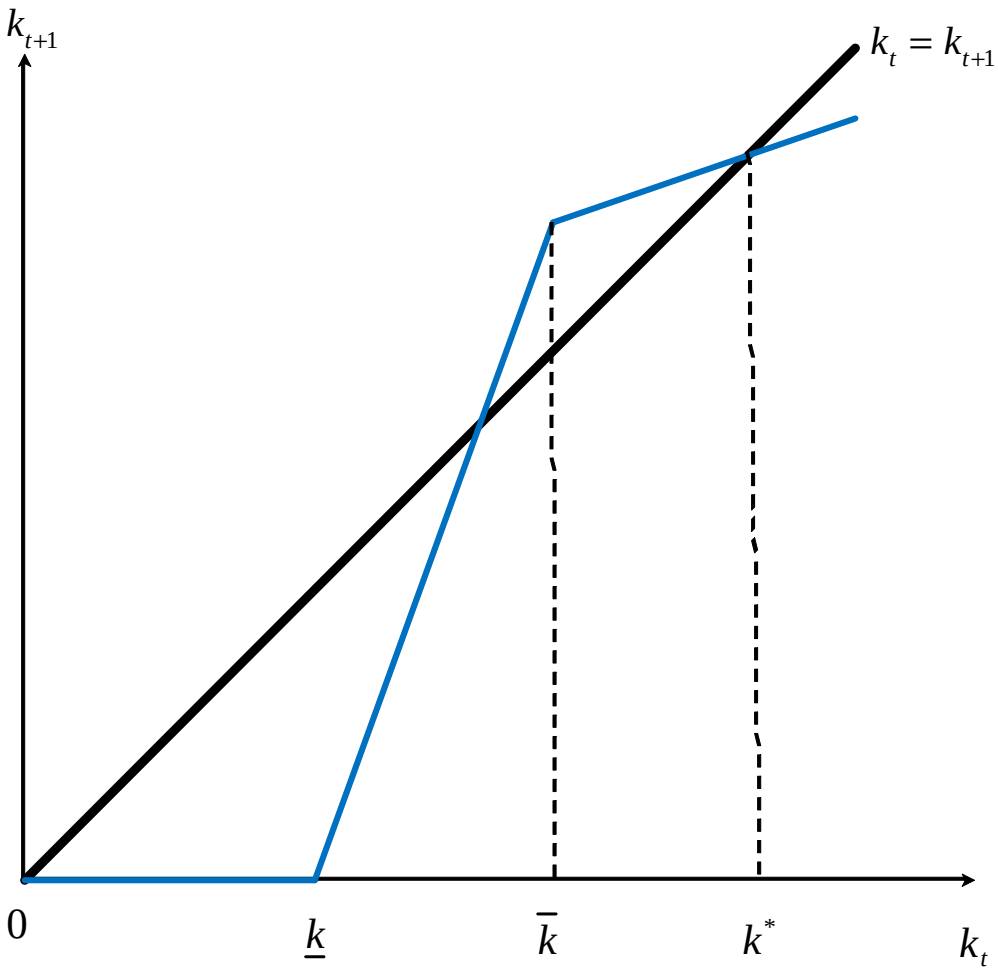


Figure 4: Income effects & poverty traps

- The sources for these kinds of poverty traps that emerge if choices are non-homothetic in income, can be more general than in the specific channel developed above.

- For example, the scarce resource in question may be time or attention span or cognitive capacity rather than physical or financial capital.

- It is possible to extend the scarcity channel to consider how it interacts with insufficient intergenerational altruism, as well as various behavioural biases.

- Interpreting b broadly as any investment in the productive capacity or welfare of children, suppose society puts a greater weight (say, $\hat{\beta}$) on the welfare of children (or, in the case of gender bias, a greater weight on the welfare of female children) than parents do (namely, β) where $\hat{\beta} > \beta$.

- Given the income effect identified under the scarcity channel, we can readily see that the gap between the socially optimal level of investment and what will be chosen by parents will be larger, the poorer are the parents.

- Similarly, we can allow individuals to have behavioural biases in addition to the channel of limited time or attention span

- Has to be that not that only the poor are subject to these kinds of biases, but that low incomes exacerbate these biases, or, their negative consequences.

- Introduce an inessential consumption good (e.g., tobacco or alcohol) v and add the term $\delta \log(v + V)$ (where $\delta \in [0, 1]$ and $V > 0$) to the utility function and make the assumption $\frac{\delta}{V} > \frac{\beta}{B}$.

- This is similar to what Banerjee and Mullainathan (2010) call a temptation good.

- By a familiar argument, individuals will spend all their income on c for very low levels of k, but now they will spend some of their income on v as k crosses a threshold, and only for a higher threshold they will choose a positive value of b.

- Earlier, a cash transfer to increase the financial resources of a poor family above $\underline{k}$ would be sufficient to help them escape the poverty trap but now, there is an intermediate range of k such that an unconditional cash transfer will partly get frittered away on v

Take Away Message - Scarcity-Driven Poverty Traps

- First, poverty traps can exist even without any external frictions due to the operation of strong income effects in the behaviour of individuals.

- Second, as the root cause of scarcity-driven poverty is scarcity, the most obvious policy implication is a lump-sum transfer to the poor but if there are external frictions to fix (say, in capital markets or in health or education) then these can go together, but there are likely to be strong complementarities between these kinds of policies

- Third, to the extent there are grounds for a paternalistic intervention, because the preferences of the individual is different from that of the policymaker (which can be due to behavioural biases or insufficient intergenerational altruism or gender bias), unconditional lump sum transfers may not be the most efficient form of intervention and there may be a case for other policy instruments (e.g., conditional cash transfers).

Appendix

1. Derivation of Transition Equation for Non-Homothetic Case

- Maximize

$$U(c, b) = \log c + \beta \log (b + B) + \gamma \log(z + Z)$$

subject to

$$c + b + z = y$$

- The first-order conditions (FOCs) for an interior optimum are

$$\begin{aligned} \frac{1}{c} &= \lambda \\ \frac{\beta}{b+B} &= \lambda \\ \frac{\gamma}{z+Z} &= \lambda \end{aligned}$$

  Suppose all of them hold. Then

$$\begin{aligned} \beta c &= b+B \\ \gamma c &= z+Z \end{aligned}$$

  Substituting in the budget constraint

$$c + (\beta c - B) + (\gamma c - Z) = y$$

or,

$$c = \frac{y}{1+\beta+\gamma} + \frac{B+Z}{1+\beta+\gamma}$$

- Accordingly

$$\begin{aligned} b &= \beta c - B \\ &= \frac{\beta}{1+\beta+\gamma} y + \frac{\beta}{1+\beta+\gamma}(B+Z) - B \\ &= \frac{\beta}{1+\beta+\gamma} y - \frac{(1+\gamma)B - \beta Z}{1+\beta+\gamma} \end{aligned}$$

- And

$$\begin{aligned} z &= \gamma c - Z \\ &= \frac{\gamma}{1+\beta+\gamma} y + \frac{\gamma}{1+\beta+\gamma}\left(B+Z\right) - Z \\ &= \frac{\gamma}{1+\beta+\gamma} y - \frac{\left(1+\beta\right) Z - \gamma B}{1+\beta+\gamma}. \end{aligned}$$

- We know that if $b = 0$ then z must be zero, as evaluated at $b = 0$ and $z = 0$ by assumption:

$$\frac{\beta}{b+B} > \frac{\gamma}{z+Z}$$

- First consider $z = 0$.

- Now the FOCs are

$$\begin{aligned} \frac{1}{c} &= \lambda \\ \frac{\beta}{b+B} &= \lambda \end{aligned}$$

- Suppose both hold. Then

$$\beta c = b + B$$

- Substituting in the budget constraint

$$c + (\beta c - B) = y$$

- This yields

$$c = \frac{1}{1+\beta} y + \frac{B}{1+\beta}.$$

- Therefore

$$\begin{aligned} b &= \beta c - B \\ &= \frac{\beta}{1+\beta} y + \frac{\beta B}{1+\beta} - B \\ &= \frac{\beta}{1+\beta} y - \frac{1}{1+\beta} B. \end{aligned}$$

- We check for the non-negativity constraint.

- $b = 0$ if

$$y \leq \frac{B}{\beta}.$$

- Since $y = \pi + rk$ this gives the condition

$$k \leq \underline{k} \equiv \frac{B - \beta\pi}{\beta r}.$$

- Now consider the case where $b > 0$ but $z = 0$

- This will happen if

$$y \leq \frac{(1+\beta)\, Z - \gamma B}{\gamma}$$

- Notice that

$$\frac{B}{\beta} < \frac{(1+\beta)\,Z - \gamma B}{\gamma}$$

as

$$\begin{aligned} \gamma B &< \beta\,(1+\beta)\,Z - \beta\gamma B \\ \text{or, } \gamma\,(1+\beta)\,B &< \beta\,(1+\beta)\,Z \\ \text{or, } \frac{\beta}{B} &> \frac{\gamma}{Z}. \end{aligned}$$

- Once again, as $y = \pi + rk$ we get the relevant threshold for k

$$k \leq \overline{k} \equiv \frac{(1+\beta)\,Z - \gamma B - \gamma\pi}{\gamma r}$$

2. Restrictions on Inter-Temporal Transfers (Not required reading)

- There is a sense in which we are assuming an inter-temporal capital market imperfection when discussing technological non-convexities in physical or human capital.

- Since saving out of income does help accumulate h or k, in principle, individuals could be forward looking, and as capital markets are being assumed to be perfect, they should be able to borrow and/or save at temporarily high rates to get over the hump at $\hat{h}$

- Suppose individuals live for two periods, and x must be invested in the current period to be of productive use in the next period.

- In the current period, individuals are endowed with an exogenous level of capital x_0 and rental markets are not useful given the lagged nature of the production process.

- Therefore, current output is $q_0 = Af(x_0)$ and the next period output is $q_1 = Af(x)$ where x is chosen by the individual.

- We can view x as physical or human capital, although the particular lag structure suggests human capital to be a better example.

- Individuals value present and future consumption c_0 and c_1 and the utility function is

$$\log c_0 + \beta \log c_1.$$

- We could interpret c_1 as the consumption of next generation, in which case savings should be interpreted as bequests.

- The intertemporal budget constraint in this two period model is

$$c_0 + \frac{c_1}{r} + x \leq q_0 + \frac{q_1(x)}{r}.$$

- The budget constraint can be written as

$$c_0 + \frac{c_1}{r} \leq q_0 + \frac{q_1(x)}{r} - x$$

- It follows immediately that independent of their preferences over present and future consumption, individuals will choose x to maximize their lifetime resources.

- The optimality condition in the choice of x is

$$Af'(x) = r.$$

- The result holds even if the production technology is non-convex with respect to x.

- Suppose investment is a binary decision $x \in \{0, 1\}$ and the cost of investment is normalized to 1.

- Without investment, output is q_0 but with investment, it is $q_0 + \triangle$.

- This is similar to the model with human capital that we saw above - so long as $\triangle > r$ individuals would undertake the investment.

- To the extent bequests are required to be non-negative, this puts a constraint on inter-temporal resource allocation which is separate from what is usually meant by capital market frictions.

- Even if capital markets are perfect as such, in most societies negative bequests are not permissible by law and violations of this are considered morally offensive, such as bonded labour.

- Coupled with other frictions (e.g., non-convexities in the production technology), this can lead to poverty traps.

- This is an extension of the **separation** result mentioned in the core-model to a two-period setting - with perfect markets, individual preferences or endowments should not affect the efficiency of resource allocation

- You can separate redistributive considerations from efficiency considerations

- Also, implicitly assumes that consumption decisions (c_0 or c_1) do not affect $q_1(x)$ - if it does, then separation breaks down.

- In the above model, let $q_1(x)$ be $q_1(x, c_1)$ instead (interpretation - efficiency wages)

- Immediately, initial wealth will matter for x as it affects c_1 and c_2

3. Fully Forward-Looking Preferences (Not required reading)

- A reasonable question to ask is, rather than having warm-glow type preferences where parents care about the bequests they pass on to their children, suppose they cared about the utility of their children (Barro-Becker altruistic preferences)

- By a standard recursive argument becomes equivalent to an individual maximizing the present discounted value of the utility stream of current and future generations in a forward-looking way.

- To the extent unless present consumption exceeds a certain level, individuals fail to put any weight on the utility of the next generation, the possibility of no bequests at low levels of income will continue to hold.

- There are several ways of modelling this, e.g., follow Uzawa (1968) where the poor are assumed to discount the future too heavily.

- Alternatively, one could introduce a probability of survival from period to period that depends on consumption, and only when consumption exceeds some minimum level, it takes the value of 1 (Chakrabarty, 2012).

- Suppose the individual maximizes

$$\sum_{t=0}^{\infty} \beta^t \ln(c_t)$$

subject to

$$a_{t+1} = (1+r)(a_t + y - c_t).$$

- The Euler equation is

$$\frac{c_{t+1}}{c_t} = \beta(1+r).$$

- If β is less than $\frac{1}{1+r}$ then he will run down his assets, with falling consumption levels, and will eventually just consume at the subsistence level

- If β is greater than $\frac{1}{1+r}$ then he will accumulate assets, with rising consumption levels

- If β depends on c we can readily see the possibility of multiple steady-states.

Persistence of Poverty - II. Evidence

Can the poor do better jobs when given the chance?

- Study by Bandiera, Burgess et al QJE 2017
- Sample over 21k households in1309 villages in rural Bangladesh
- 6% of population defined as ultra-poor (does not even qualify for microcredit)
- The poorest women in **randomly chosen villages** receive a large asset (a cow) with some training

- All ultra-poor in these villages get assigned to treatment or control
- Survey all ultra-poor and near-poor, plus 10% sample of upper and middle class
- 4000 beneficiaries engaged solely in casual labor at baseline
- Asset transfer of approximately $560 in PPP in 2007
- Near doubling of baseline wealth for the ultra-poor
- Surveyed again in 2009, 2011, and 2014

Economic Lives of the Poor

- Labor is the sole endowment of the poor → we need to understand what determines earnings

- Earnings = wage X hours worked + earnings from self-employment

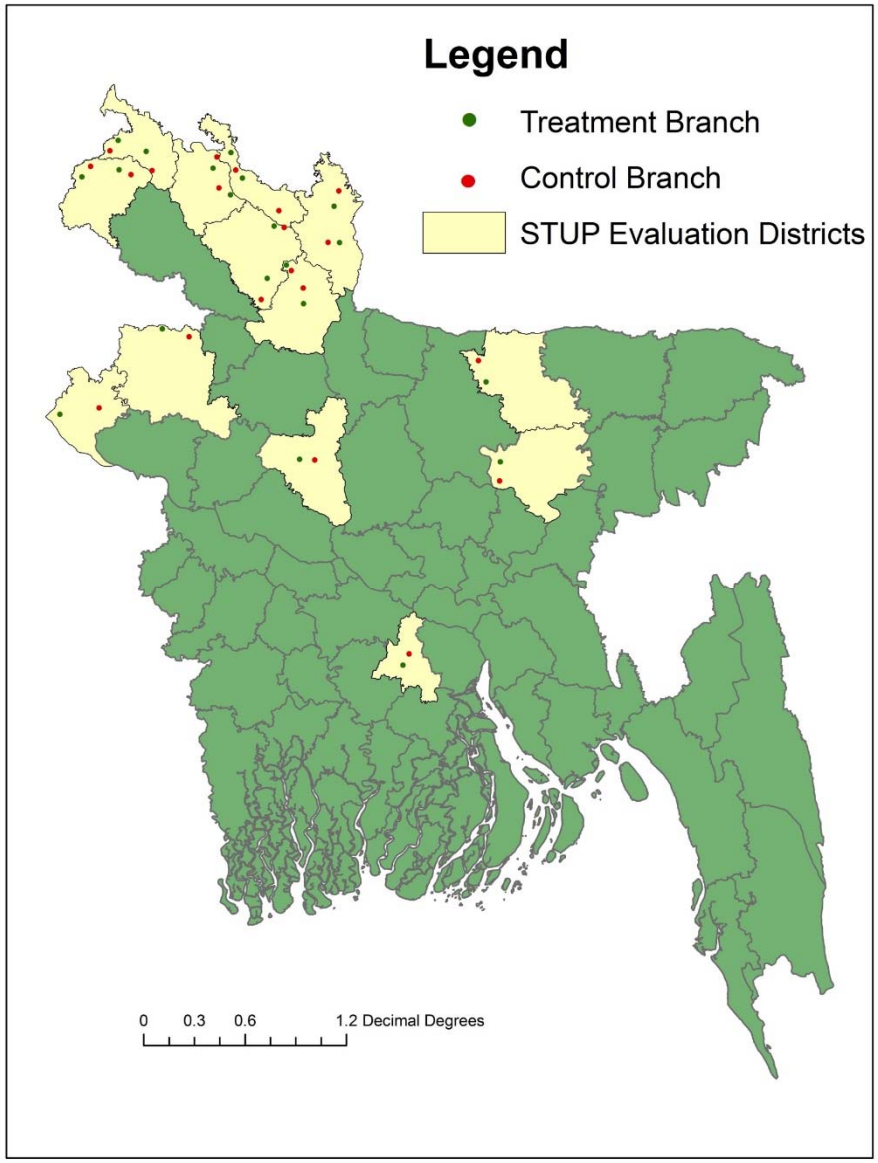
- This comes down to occupational choice, returns to self-employment, the wage rate, seasonality of jobs etc
  - constraints due to market frictions and/or lumpiness of these assets

    or

  - productivity and sorting?

Study site: Bangladesh

Lack of demand for casual wage labor, higher grain prices, extreme poverty and food insecurity



Poverty at baseline

- 40 BRAC branches, 1309 villages in the poorest areas of the 13 poorest districts
- PRA yields ranking of all HHs in four or five wealth bins
- BRAC chooses TUP eligibles from bottom bins $\Rightarrow$ "ultra-poor" (eligible) "near poor", "middle class" and "upper class"
- Survey all poor (eligible and not) + 10% of others (21k total)

TUP targets the poorest women (but most are poor)

	(1) Ultra-Poor	(2) Near-Poor	(3) Middle Class	(4) Upper Class
Share of population in this wealth class	.061	.219	.585	.135
Primary female is illiterate	.929	.832	.736	.489
Household is below the $1.25 a day poverty line	.530	.493	.373	.121
Consumption Expenditure (per adult equivalent)	627.8	645.1	759.5	1234.2
Household Assets [USD]	36.5	68.1	279.9	1663.4
Household savings [USD]	7.9	22.1	84.5	481.9
Household receives loans	.191	.393	.498	.433
Household gives loans	.012	.018	.030	.067
Business assets (excl. livestock and land) [USD]	22.9	54.4	286.1	1569.8

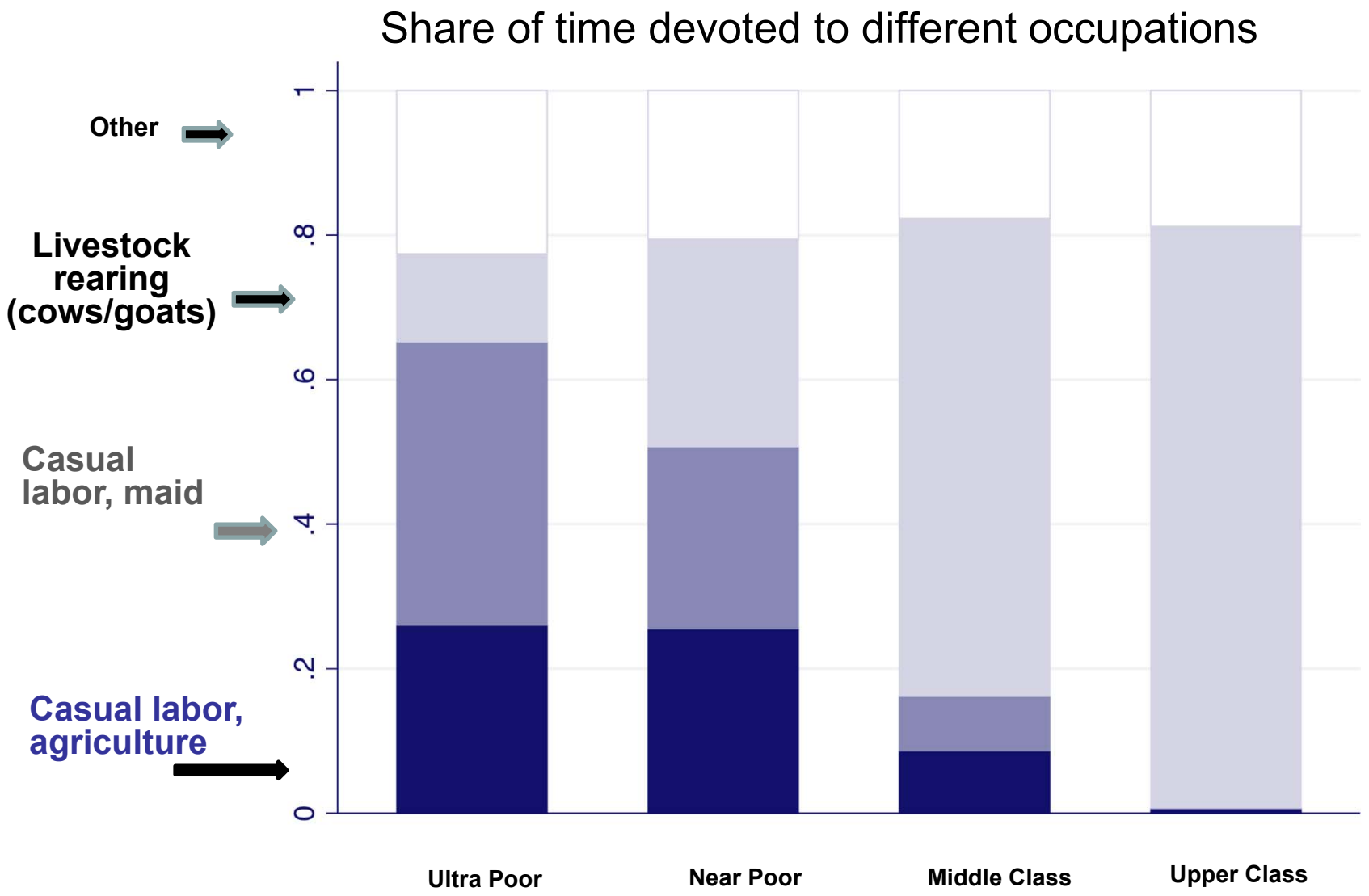
The poorest women have fewer productive assets

	(1) Ultra-Poor	(2) Near-Poor	(3) Middle Class	(4) Upper Class
Value of cows [USD]	33.8	120.2	633.8	1559.1
Value of goats [USD]	7.97	12.8	39.8	71.3
Household rents cows for rearing	.070	.148	.118	.030
Household rents goats for rearing	.111	.157	.102	.021
Household owns land	.066	.107	.487	.911
Value of land owned [USD]	200.0	491.2	6789.6	40125.1
Household rents land for cultivation	.060	.143	.276	.168

Poverty and labor market choices at baseline

- Survey all poor + 10% of others (21k total) to collect information on all income generating activities of each member during the previous year
  - yearly data to fully capture the labor allocated to irregular/seasonal casual jobs
- Focus on primary women as these are targeted by the program
- Four facts

The poor do casual labor, the rich only livestock rearing



Casual labor pays less per hour and is available on fewer days

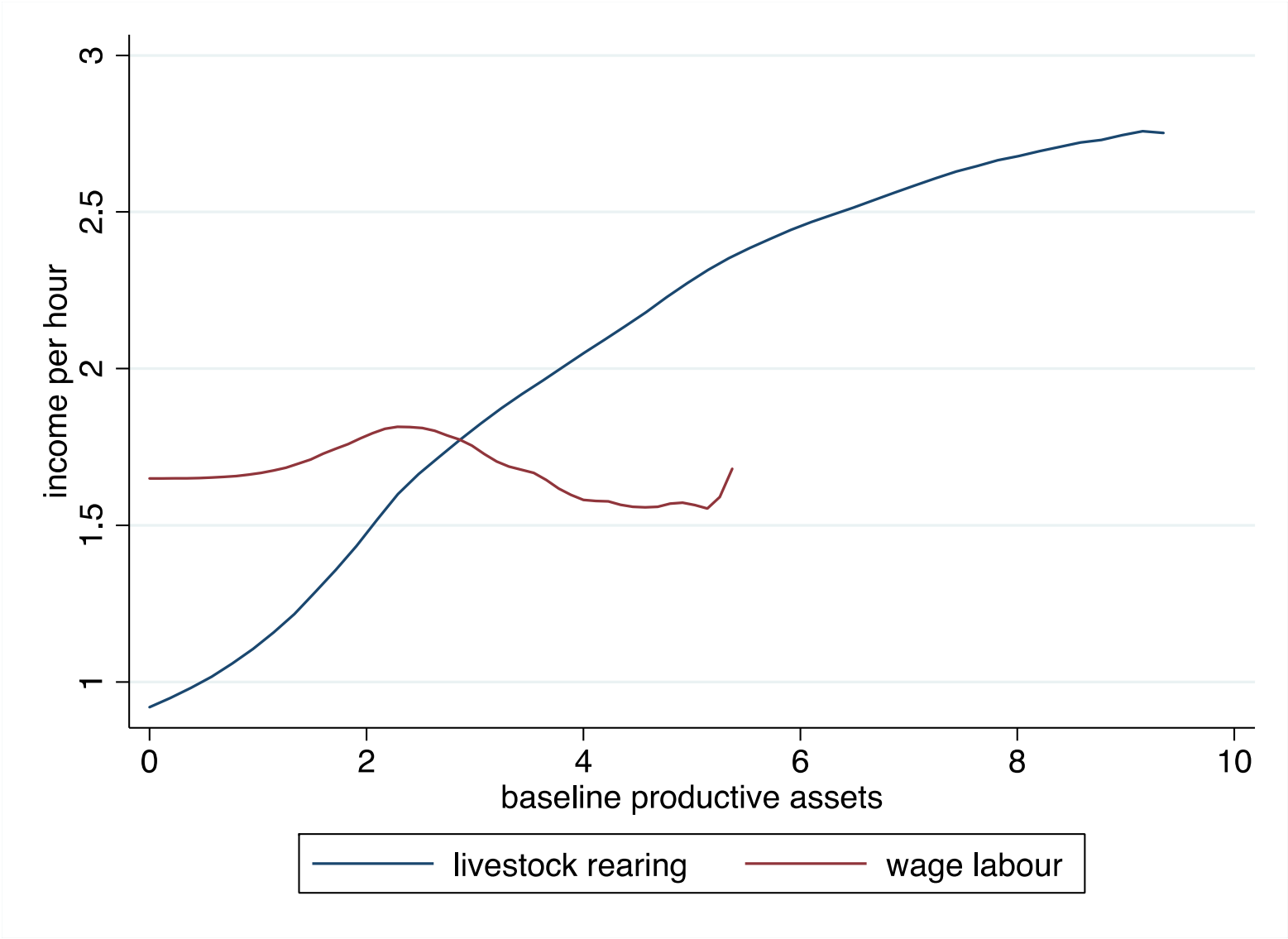
Village Level Statistics, Measured Pre-Intervention

Means, standard deviation in parentheses

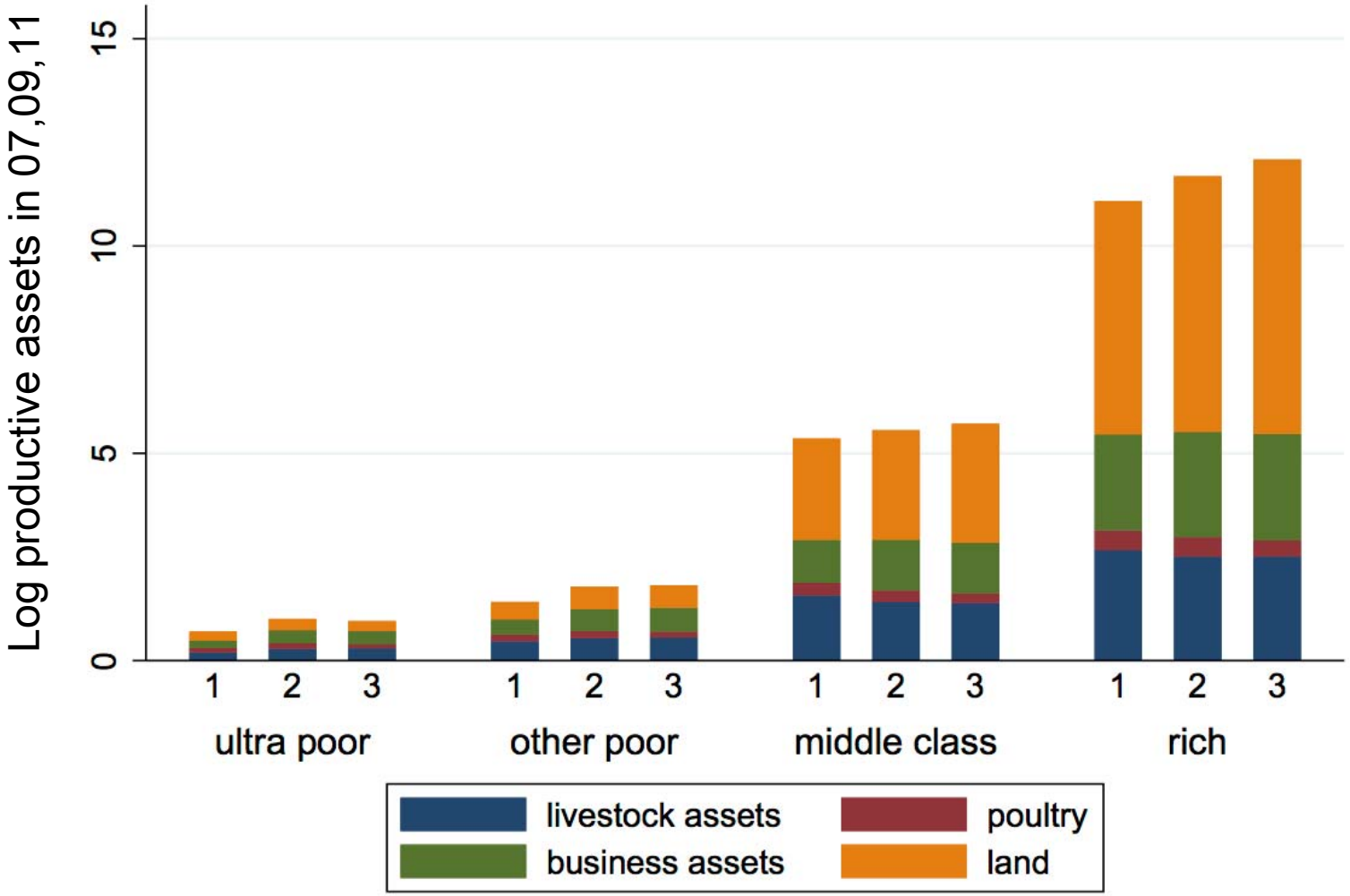
	Casual Wage Labor		Self Employment		
	(1) Agriculture	(2) Domestic Maid	(3) Livestock Rearing [Cows, Goats]	(4) t-test [Col 1 = Col 3]	(5) t-test [Col 2 = Col 3]
Days per year	127	167	334	[.000]	[.000]
	(65.9)	(89.5)	(41.2)		
Hours per day	7.62	7.04	1.83	[.000]	[.000]
	(1.15)	(1.74)	(.771)		
Hourly earnings [USD]	.344	.268	.719	[.000]	[.000]
	(.102)	(.109)	(.779)		

Notes: All statistics are constructed at the village level, using baseline data from both treatment and control villages. The number of villages is 1309. In Column 3, livestock comprises cows and/or goats. To reduce sensitivity to outliers, the hours per day and hourly earnings variables are computed by first taking the median value for each activity in a village, and then averaging these across all villages. Columns 4 and 5 report p-values on a t-test of the equality of some of these outcomes between the two forms of casual wage labor (agriculture and domestic maid work) and livestock rearing. All monetary amounts are PPP-adjusted USD terms, set at 2007 prices and deflated using CPI published by Bangladesh Bank. In 2007, 1USD=18.46TK PPP.

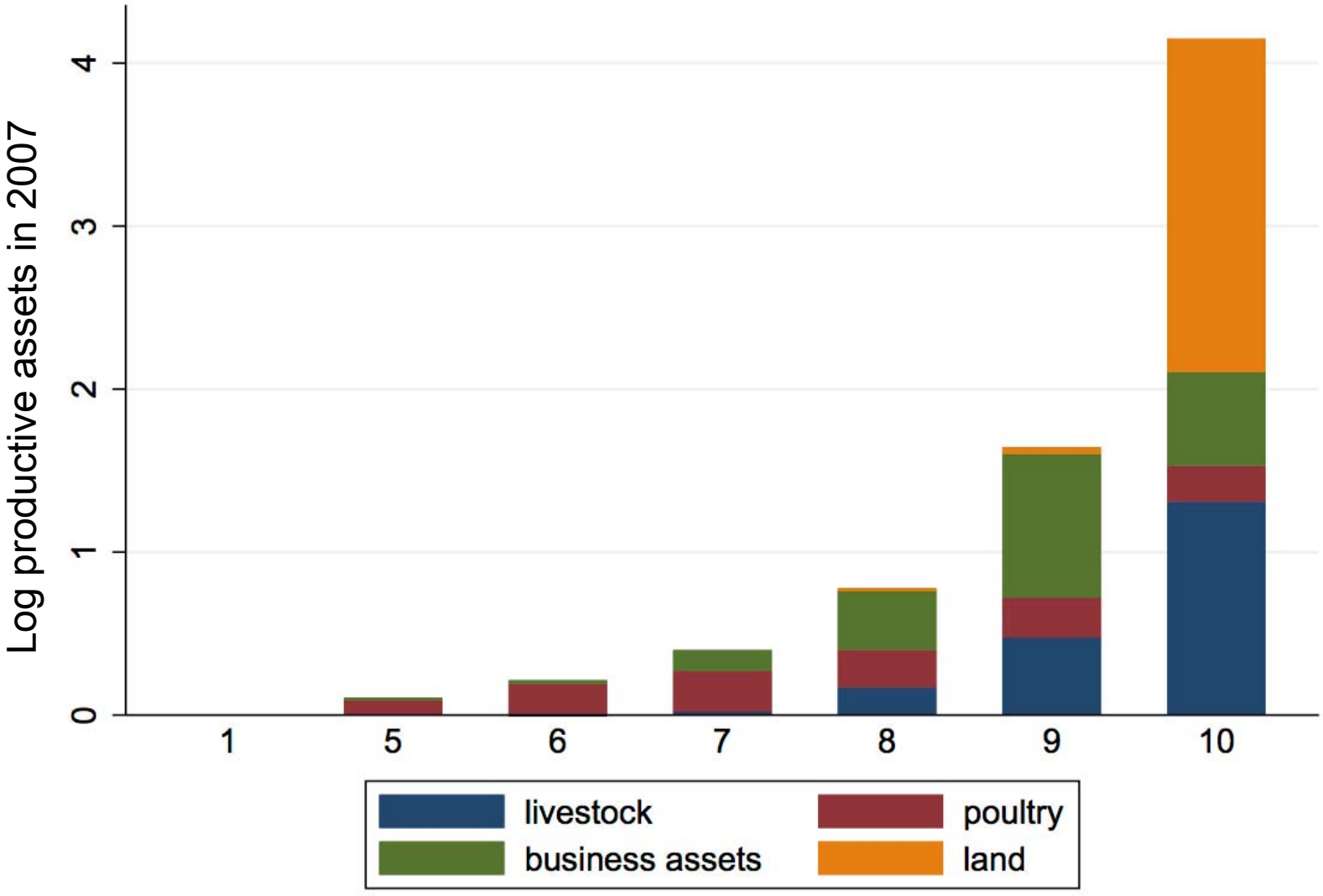
Wage earnings are flat, livestock earnings increasing



The poor have fewer assets and don't accumulate over time



Composition of assets at baseline by decile – ultra poor



Snapshot

- Wage labor is uncertain, seasonal and pays less per hour
- Occupation correlated with ownership of productive assets (k): livestock, business assets (rickshaws, boats, sheds, agricultural machinery etc.) and land
- Asset holdings stable through time

Targeting the Ultra Poor

- Eligible: poor women, identified by the communities, verified by BRAC employees
  - On avge, 6 women per community (7% of HHs) are eligible
- Asset menu: livestock, small crafts, small retail..
- Commit to retain it for 2 years, free to sell after that
- Almost all choose a livestock combination
- Value of transfer (9500TK= 140USD)
  - 1X yearly PCE; 2X yearly earnings; 9X savings
- Asset specific training - intensive over first year

Evaluation strategy

- Randomise the programme roll-out across 40 BRAC branch offices (1309 communities) in the poorest areas of the country –stratified by subdistrict
  - 20 treated in 2007, 20 in 2011
  - matched pair randomisation
- Randomise at the branch rather than community level to minimise contamination

Evaluation strategy

- Beneficiaries selected in both treatment and control communities
- Beneficiaries + all other poor + a sample of other wealth classes surveyed in 07,09, 11, 14
- Final sample: 6732 eligible beneficiaries & 16,297 HHs from other classes

Can the poor do better when given the chance?

- four years later after the asset transfer programme…

The program changes labor allocation..

Labor Supply (hours)	Livestock	Agriculture	Maid
Program impact after 2 years	488***	-42.3	-57.4
	(30.7)	(53.0)	(42.9)
Program impact after 4 years	415***	-46.2	-117**
	(38.9)	(42.7)	(45.0)
Baseline mean	115	269	325
Four year impact: % change	361%	-17.1%	-36.1%
Two year impact = Four year impact	.111	.930	.125
Adjusted R-squared	.335	.184	.067
Number of ultra-poor women	6732	6732	6732
Number of observations (clusters)	20196 (40)	20196 (40)	20196 (40)

Labor supply, earnings, expenditures ⇑

	All Labor Activities		Net Earnings	Consumption and Poverty	
	(1) Total Hours Worked	(2) Total Days Worked in the Past Year	(3) Net Annual Earnings	(4) Household Expenditures	(5) Below Poverty Line
Program impact after 2 years	341***	72.4***	1267**	763	-.051
	(67.9)	(10.0)	(543)	(498)	(.046)
Program impact after 4 years	206***	61.1***	1646***	1034***	-.084**
	(73.0)	(12.5)	(541)	(374)	(.038)
Baseline mean	916	247	4463	11677	.525
Four year impact: % change	22.4%	25.0%	36.9%	8.77%	-7.84%
Adjusted R-squared	.072	.069	.079	.046	.035
Number of ultra-poor women	6732	6732	6732	6732	6732
Number of observations (clusters)	20196 (40)	20196 (40)	20196 (40)	18882(40)	18882(40)

..and a 37% increase in total earnings

Earnings	All three activities
	(1) Earnings
Program impact after 2 years	62.286**
	(30.17)
Program impact after 4 years	87.761***
	(28.58)
Baseline mean	242
Four year impact: % change	37%
Two year impact = Four year impact [p-value]	.455
Adjusted R-squared	0.088
Number of observations (clusters)	20135 (40)

Consumption expenditures ⇑

	Poverty and Consumption		
	(1) Below Poverty Line	(2) Consumption Expenditure (per adult equivalent)	(3) Value of Household Assets
Program impact after 2 years	-.051	30.19	6.86
	(.046)	(25.34)	(7.26)
Program impact after 4 years	-.084**	62.62***	39.65***
	(.038)	(20.82)	(9.08)
Baseline mean	.556	628.67	36.14
Four year impact: % change	-15%	10%	110%
Two year impact = Four year impact [p-value]	.379	.111	.000
Adjusted R-squared	.032	.044	.082
Number of ultra-poor women	6732	6732	6732
Observations (clusters)	18882 (40)	18838 (40)	20196 (40)

- gains larger after 4Y

Savings and investment

	Savings		Livestock, Land and Business Assets					
	(1) Household Cash Savings	(3) Household Assets	(4) Value of Cows	(5) Value of Goats	(6) Rents Land	(7) Owns Land	(8) Value of Land owned	(9) Value of Other Business Assets
Program impact after 2 years	983***	254	9200***	656***	.069***	.005	735	476***
	(90.6)	(160)	(427)	(86.3)	(.020)	(.011)	(1389)	(140)
Program impact after 4 years	1051***	880***	10097***	489***	.110***	.026*	7094**	1196***
	(78.4)	(164)	(865)	(93.1)	(.022)	(.012)	(2605)	(220)
Baseline mean [Tk]	121	817	666	125	.058	.068	3221	423
Mean value of assets transfer	-		8566	736	-	-	-	-
Four year impact: % change (net of transfer)	+869%	+107%	+937%	-197%	+190%	+38.2%	+220%	+282%
Four year impact = Initial transfer [p-value]	-		.085	.000	-	-	-	-
Two year impact = Four year impact [p-value]	.530	.009	.194	.015	.054	.005	.002	.000

Cows stocks & business assets increase..

	(1) Value of Cows	(2) Value of Goats	(3) Value of Other Business Assets
Program impact after 2 years	484.65***	28.11***	23.84***
	(19.46)	(3.77)	(6.85)
Program impact after 4 years	539.66***	20.57***	64.76***
	(45.16)	(4.12)	(11.91)
Baseline mean	36.07	6.50	22.92
Mean value of assets transfer from program	464.03	39.9	-
Four year impact: % change (net of transfer if positive)	208%	-298%	283%
Two year impact = Four year impact [p-value]	.148	.004	.000
Adjusted R-squared	0.390	0.109	0.066
Number of ultra-poor women	6732	6732	6732
Observations (clusters)	20182 (40)	20072 (40)	20195 (40)

- accumulation of business assets accelerates over time

..and so does access to land

	(1) Rents Land	(2) Owns Land	(3) Value of Land owned
Program impact after 2 years	.069***	.005	39.80
	(.020)	(.011)	(75.23)
Program impact after 4 years	.110***	.026*	326.98**
	(.022)	(.012)	(131.27)
Baseline mean	.058	.068	174.50
Mean value of assets transfer from program	-	-	-
Four year impact: % change (net of transfer if positive)	190%	38.2%	187%
Two year impact = Four year impact [p-value]	.054	.005	.002
Adjusted R-squared	.077	.034	0.019
Number of ultra-poor women	6732	6732	6732
Observations (clusters)	20196 (40)	20196 (40)	20195 (40)

- access to land increases over time

Summing up

- By “revealed preference” we learn that the poor had idle capacity at baseline
- Program sets the poor on an upward trajectory
- Contrary to workfare, the effects outlive the programme
- Was it worth it?

A poverty trap?

- Using the estimates of earnings the rate of return is 22%
- But the program is expensive: $560 --GDP pc $541
- Cost more than one year worth of consumption and cannot be bought in pieces → poor talented people cannot afford them
- Large transfer allows them to escape the trap
- But for some it is not enough & they fall back
- What determines this - initial endowment level?

Conditional convergence vs Poverty Trap?

- Capital markets may be absent but people can accumulate and there are no non-convexities.
- The problem is, A is low and training can increase it.
- And, a capital grant will speed up accumulation. ·
- How do we separate this from view that there are non-convexities and then even if A is not shifted, a capital grant will help individual get out of poverty trap?
- So, both these alternative interpretations of BBDGRS are possible.

- Also, income effects
- Suppose due to non-homothetic utility functions, saving rates are increasing in income
- Then if you give capital grants and incomes go up, people could be saving at a higher rate
- This itself would help break out of poverty trap
- Gives a third interpretation of BBDGRS

- The findings support other mechanisms that are not directly captured by our theoretical framework

- For example, the training component of this program not only involved initial training but also regular visits by livestock specialists and program officers of the NGO that undertook the program over a two-year period after the transfer to cover the life cycle of livestock.

- One could argue that to the extent the poor are subject to behavioural biases, these visits may have helped them overcome these in addition to the stated goal of helping them overcome their limited experience of dealing with livestock.

- What would be the effect of alternative policies?

- The choice of a given policy reflects a researcher's implicit priors about what is the binding constraint or scarce input in a given setting.

- For example, a village that lacks a road that connects it to the market will not benefit much from other interventions.

- This highlights the importance of having a method of diagnosing what are the key frictions in a given setting, and in particular, what is the most binding constraint.

- In the BRAC study, it could well be that learning about one's own comparative advantage in various occupations was an important binding constraint ·

- From that point of view, giving everyone livestock may not have been a good idea as not everyone may be equally good at it

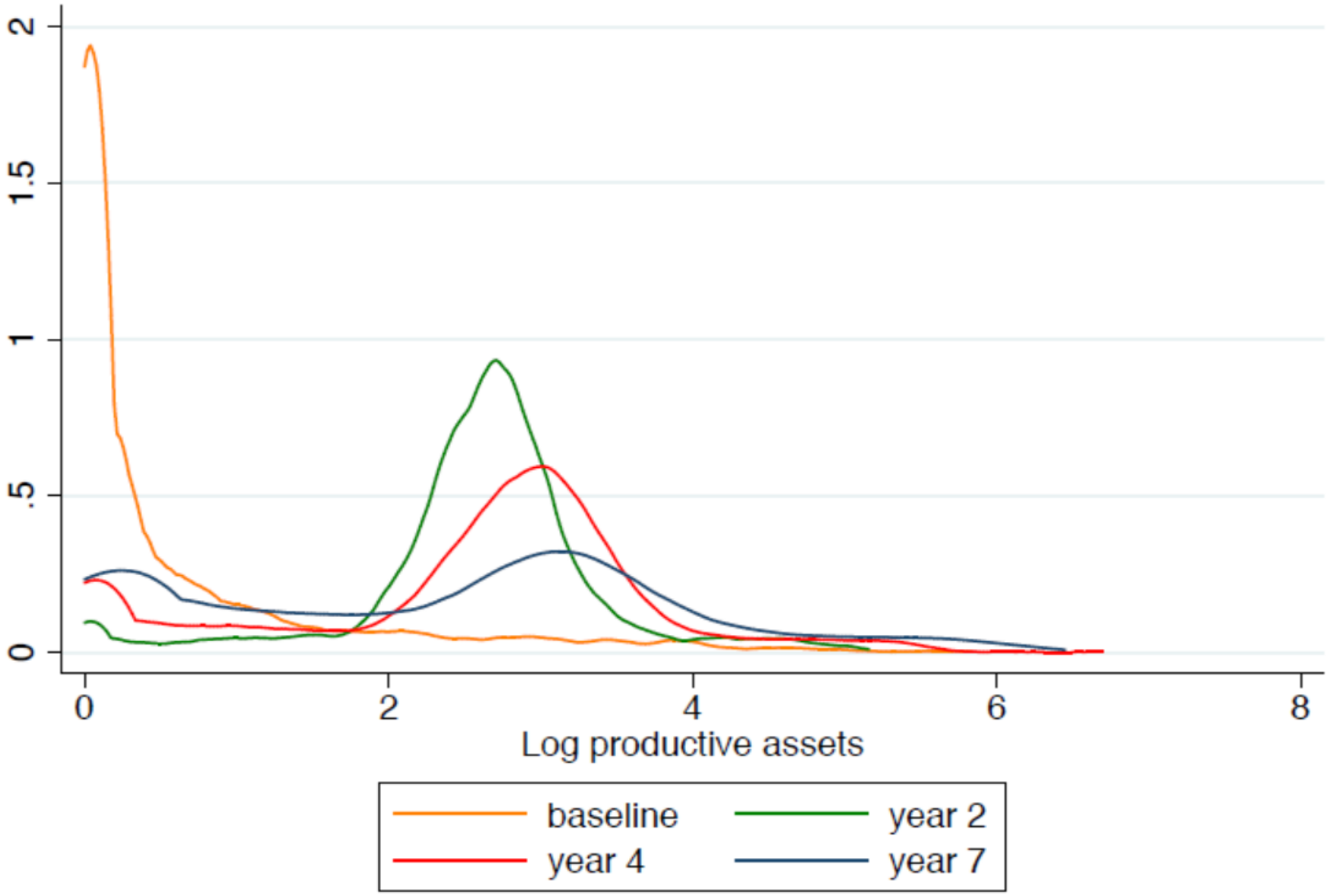
- Cash could have helped, but still would not have overcome the "learning about one's own type" problem
- Training ties down people to one task and so perhaps a broader mentoring approach could be useful

- Very compelling evidence on poverty traps
- Is it the size or the kind of transfer that make it work?
- In particular, is it the combination of assets and training that works?
- If access to capital is the binding constraint, an equivalent transfer of cash or access to credit in suitable terms might have worked too.

Beyond the mean - Heterogeneity

- ATE = average treatment effects
- Intuitive summary measure but could be hiding heterogeneous effects
  - 100% of T gets ATE
  - 50% gets 2 ATE, 50% get 0
  - 25% gets 4 ATE, 75% get 0
  - …
- We want to know this!

Preliminary evidence: some beneficiaries go back



Dynamics

- Heterogeneity in asset accumulation behavior
- What explains that?
- In a poverty trap world, initial endowment should play a key role

Ongoing work "Why do People Stay Poor?" (Balboni, Bandiera, Burgess, Ghatak, Heil)

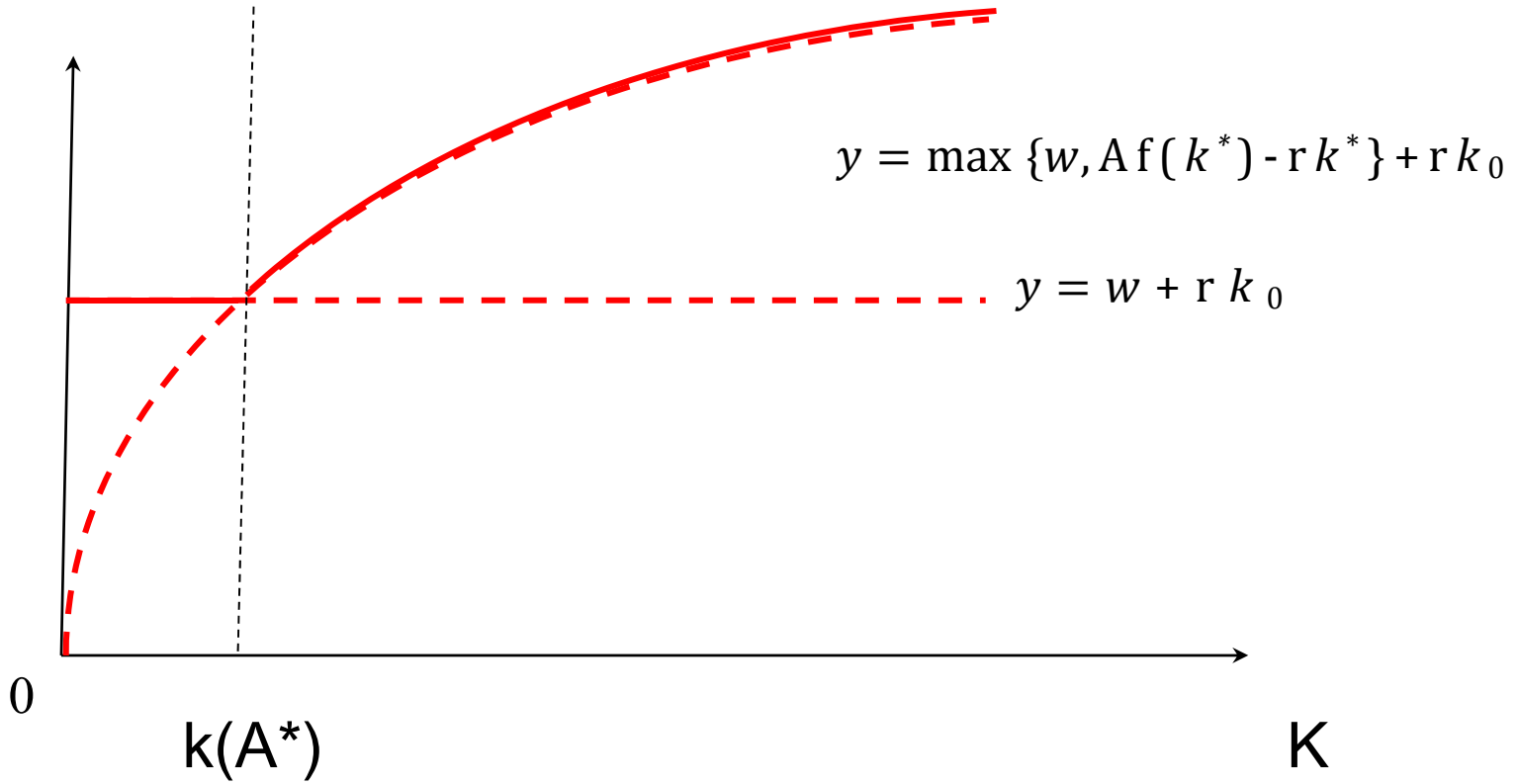
1. Use theory to illustrate how response to exogenous shock to endowments can be used to test between the two views of poverty
2. Implement test using RCT in Bangladesh (Bandiera et al., QJE 2017) tracking 21k HHs across wealth distribution over 7 years
3. Inform the design of policies for poverty reduction

Theoretical Framework

Occupational choice

- Each person i is born with one unit of time, wealth endowment E_i and talent A_i for self-employment
  - 1 is wage labor, pays w
  - 2 is livestock rearing, requires capital K and yields $A_i f(K)$
- Assume occupational choice is discrete
- Can allow for mixing

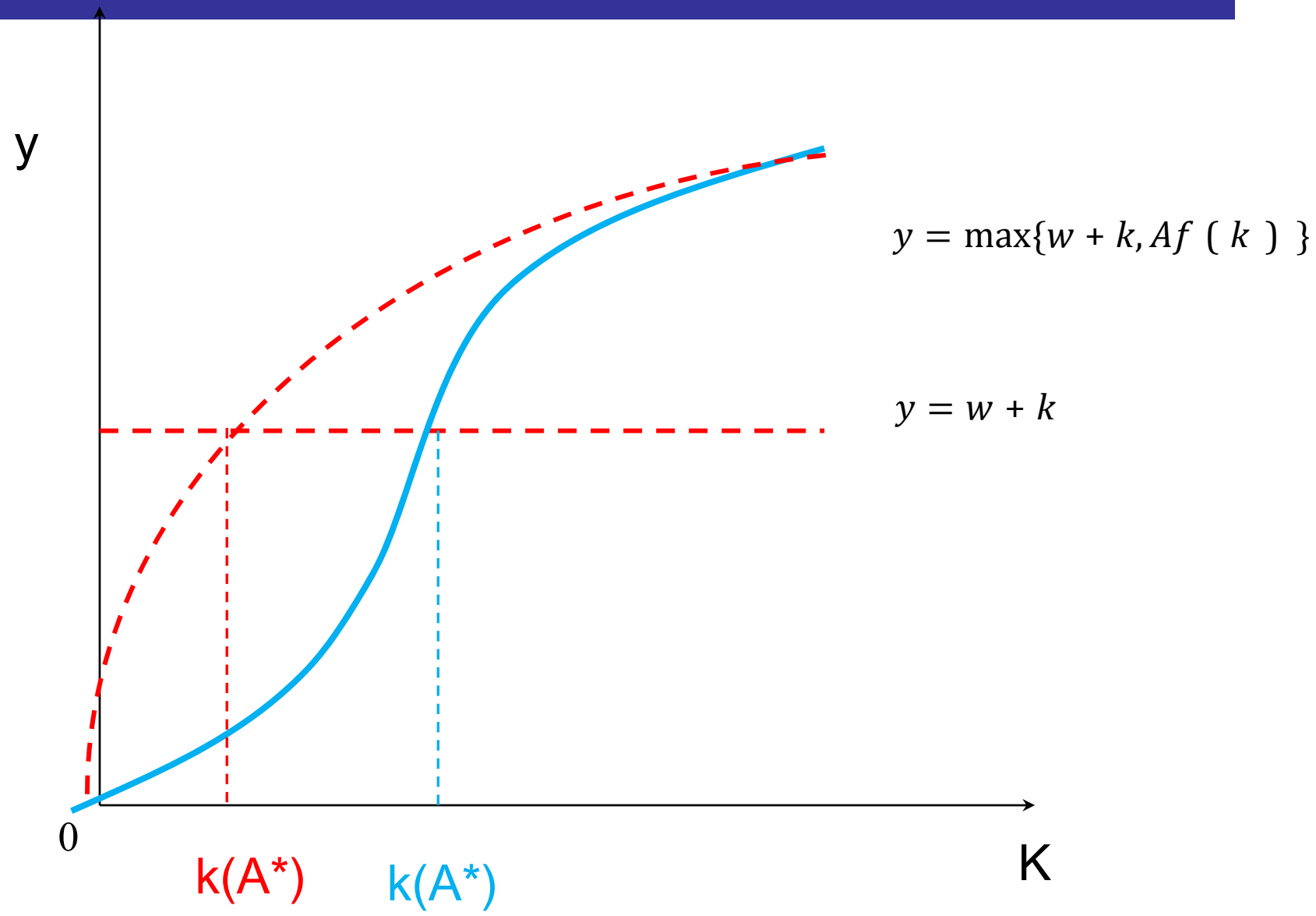
Perfect credit markets + DRS → equal opportunities



No credit markets → poverty trap?

- In a model with savings, individuals can save their way out of poverty as small investments at low *K* have high returns
- That is, as long as f(.) is concave, *credit market imperfections cannot generate a trap*

IRS at low K increase the minimum viable scale



No credit markets + IRS → poverty trap

- We now have two groups of people for given talent *A*:

- those for whom $E_i > K(A_i^*)$ → choose optimally
- those for whom $E_i < K(A_i^*)$ → stuck in wage labor

→endowments matter

→some people observed in wage labor actually have $A > A^*$
→ misallocation

Developing a Test for a Pov Trap vs Equal Opp view

- Assume everyone has the same productivity *A*
- Everyone has a given $k_0 \geq 0$
- Everyone is given the same transfer $\Delta > 0$
- Then the transition equation is

$$k_1 = sAf(k_0 + \Delta) + (1 - \delta)(k_0 + \Delta)$$

- We are interested in

$$\Delta_1 \equiv k_1 - (k_0 + \Delta)$$

- Let us define the function

$$g(k_0) = sAf(k_0 + \Delta) - \delta(k_0 + \Delta)$$

- We want to know
  - If $\Delta_1 \equiv g(k_0)$ is positive or negative
  - If Δ_1 is increasing or decreasing in k_0

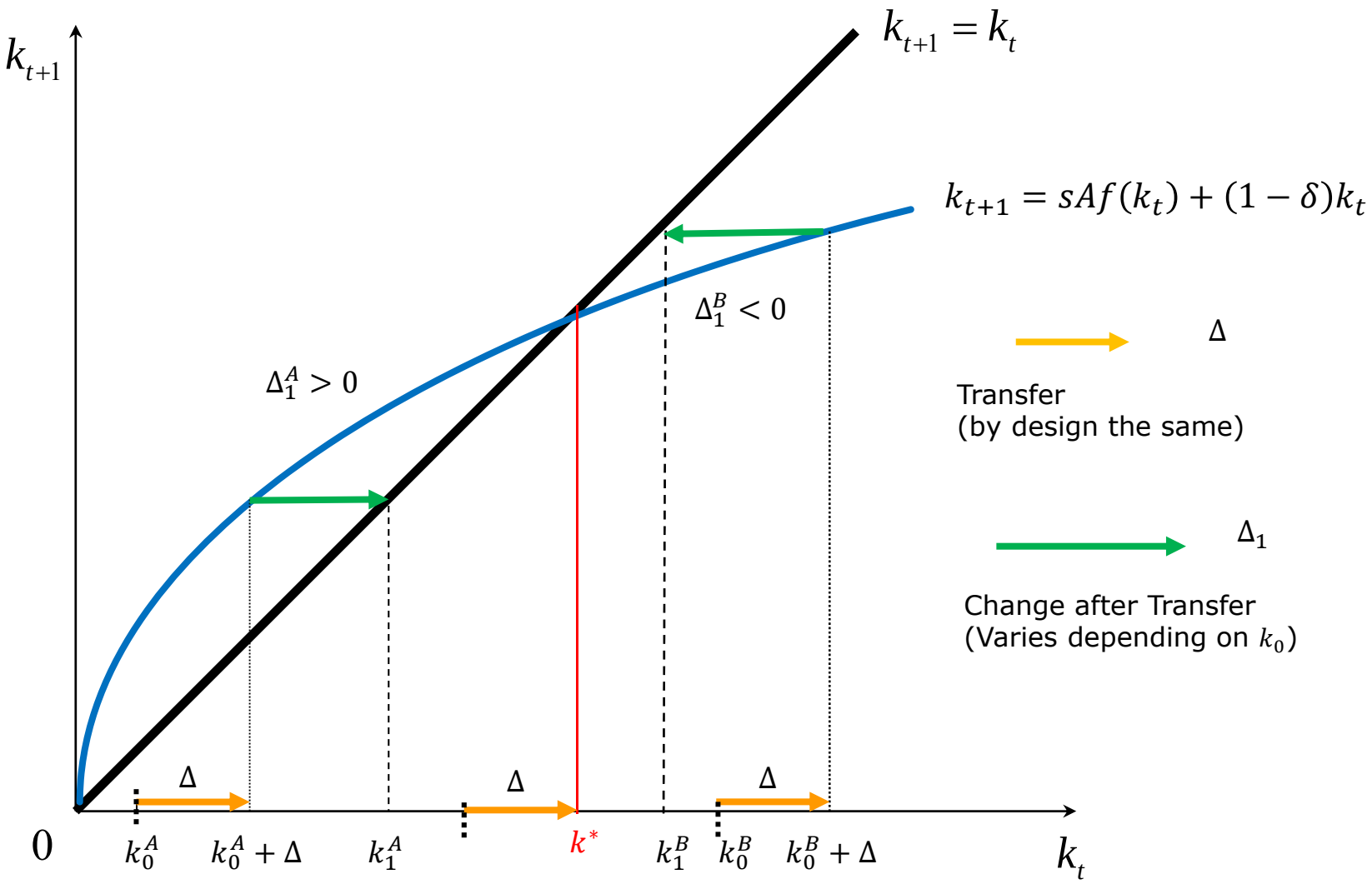
Convergence world

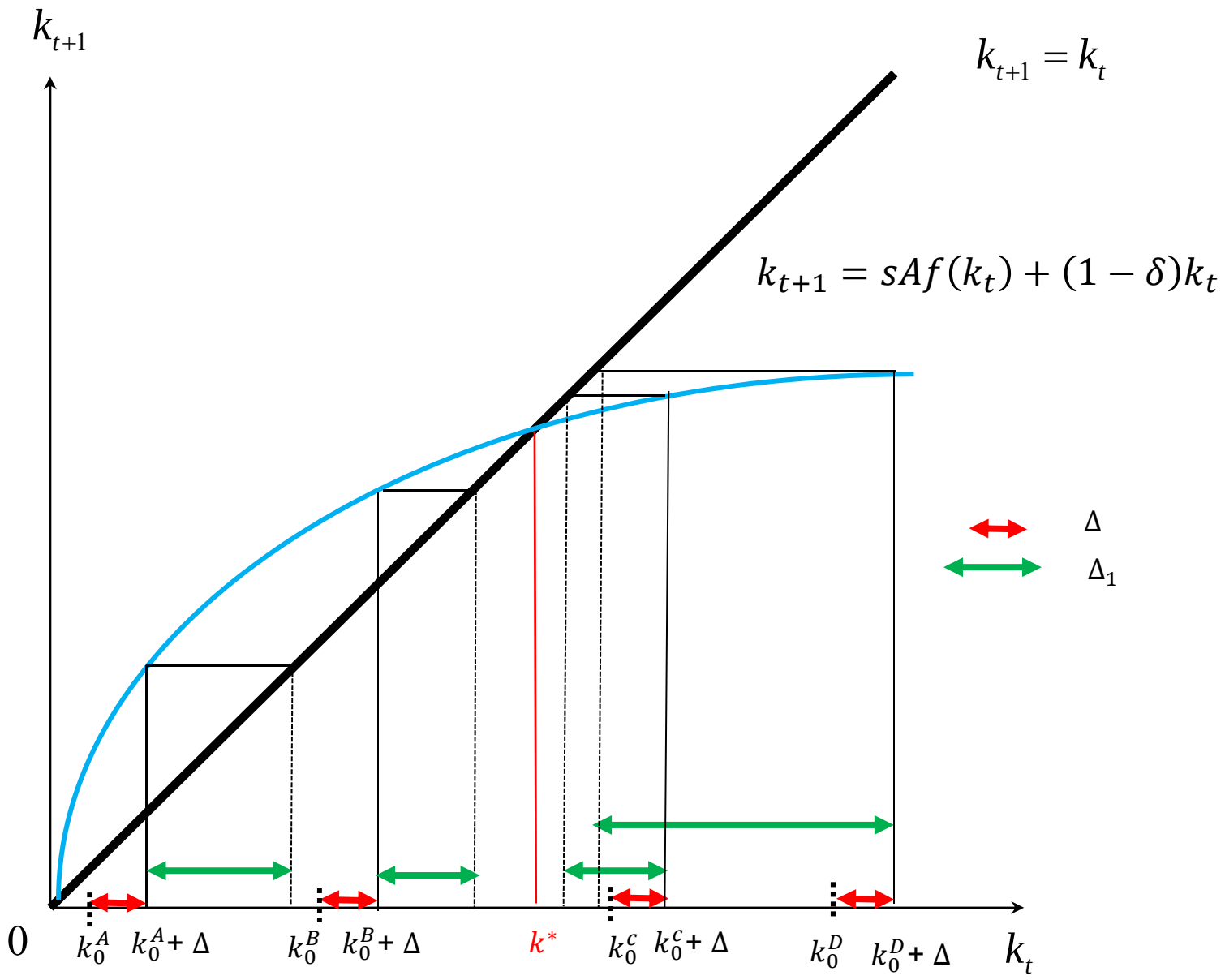
- $g(k_0)$ is strictly concave in k_0
- Depending on the size of Δ one of the following will hold regarding $g(k_0)$:
  - It will first increase, reach a maximum, and then decrease
  - Be decreasing
- It will reach the value 0 at $k_0 = k^*$ (the unique steady state) and after that will become negative

Poverty Trap World

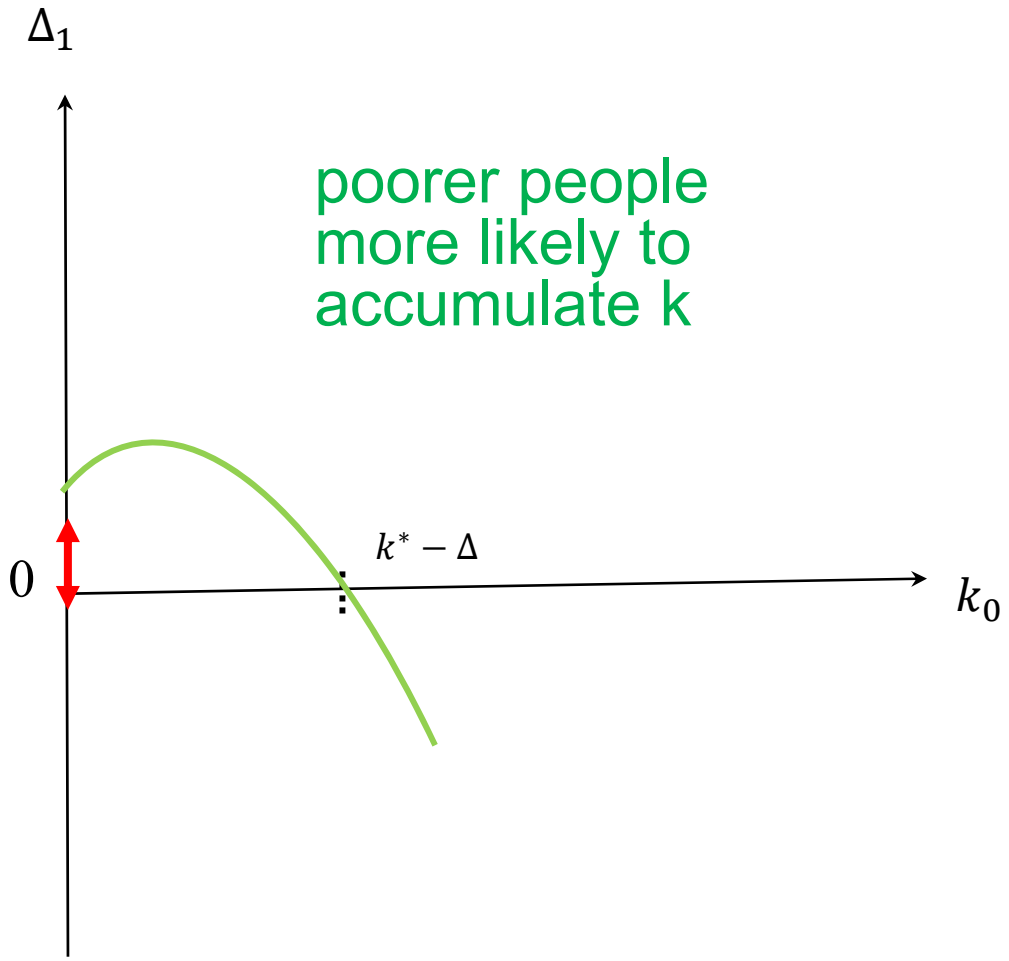
- Let us take the S-shaped production function
- $g(k_0)$ is strictly convex in k_0 for $k_0 \leq \hat{k}$ and strictly concave for $k_0 \geq \hat{k}$
- Also, $g(k_0) < 0$ for $k_0 \leq \hat{k}$
- If the transfer Δ is received for $k_0 = \hat{k} - \Delta$ then the individual reaches the unstable steady state and stays there without further shocks
- However for $k_0 \geq \hat{k}$ the situation is similar to the case of convergence

Response to asset transfer in equal opportunity view



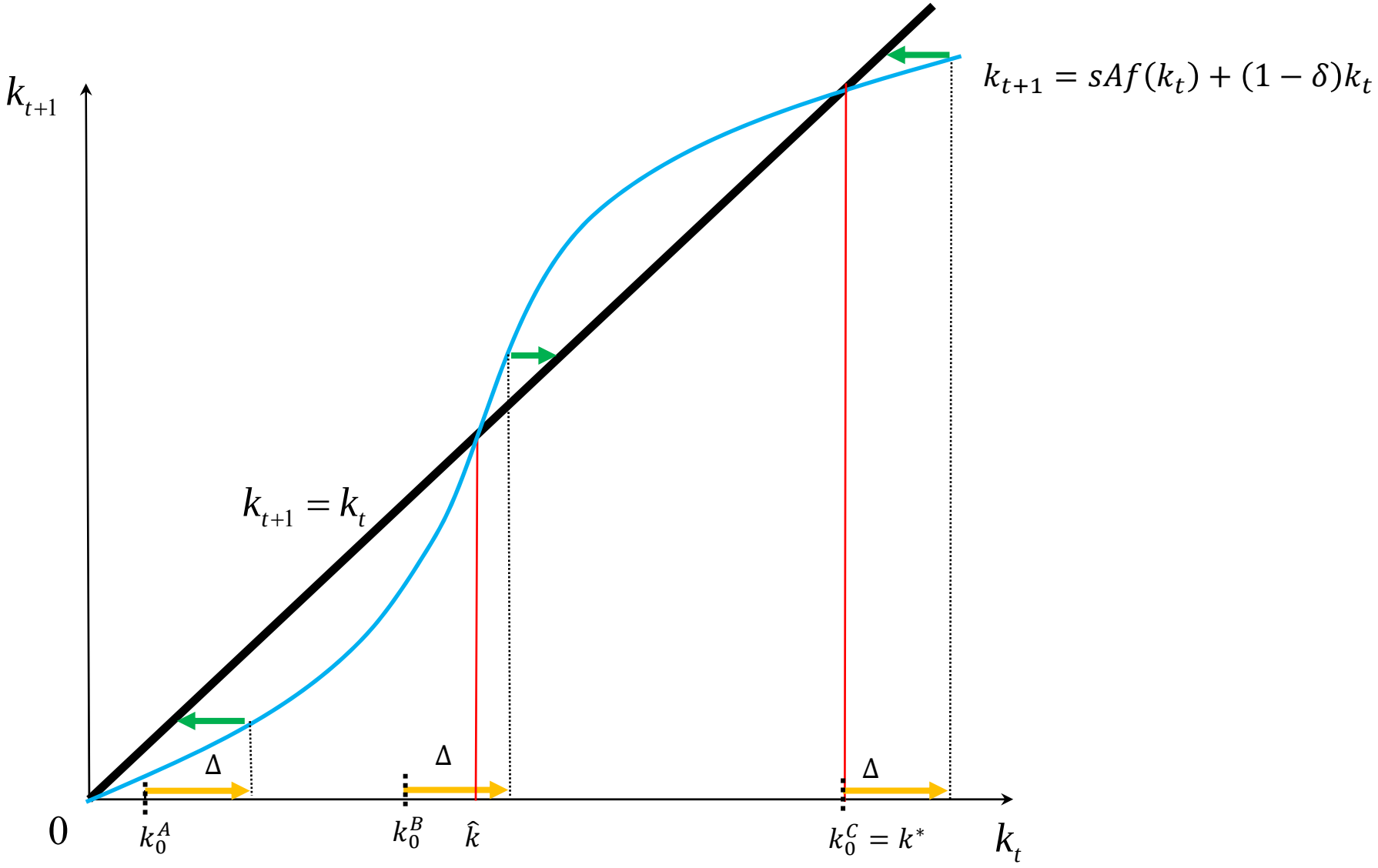


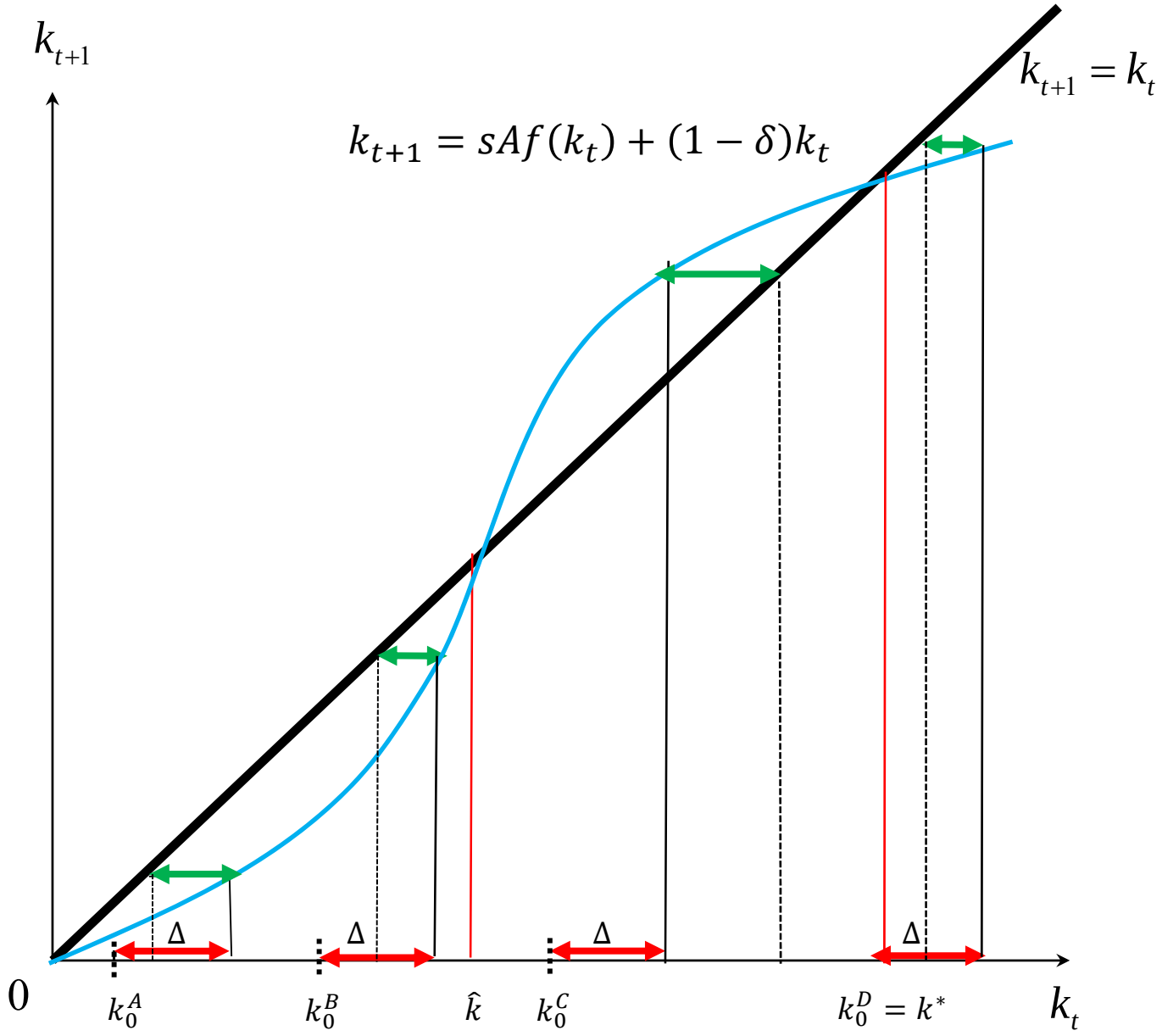
How changes in k depend on k_0



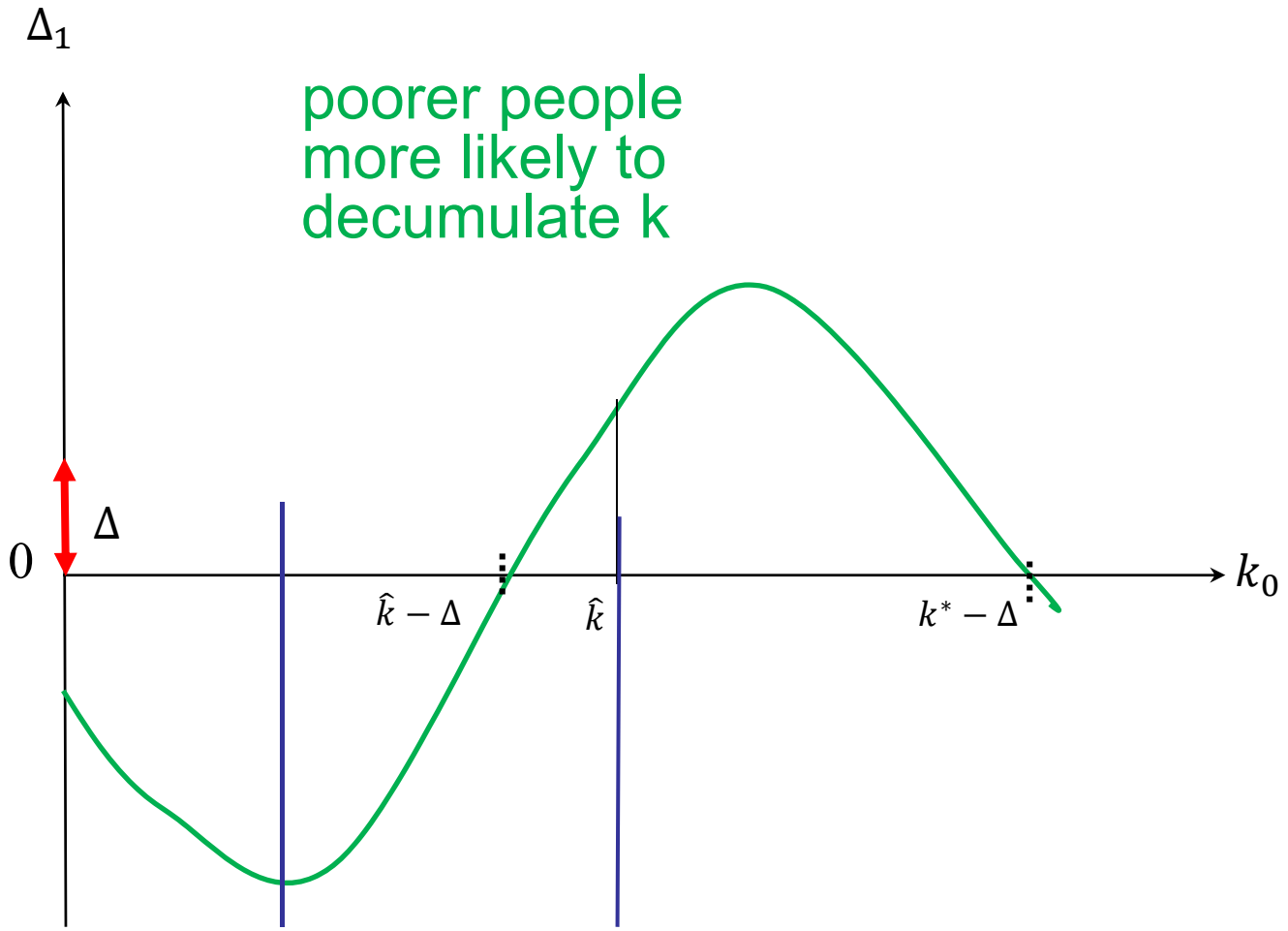
Changes in k plotted against k_0 in Solow world

Response to asset transfer in unequal opportunity view



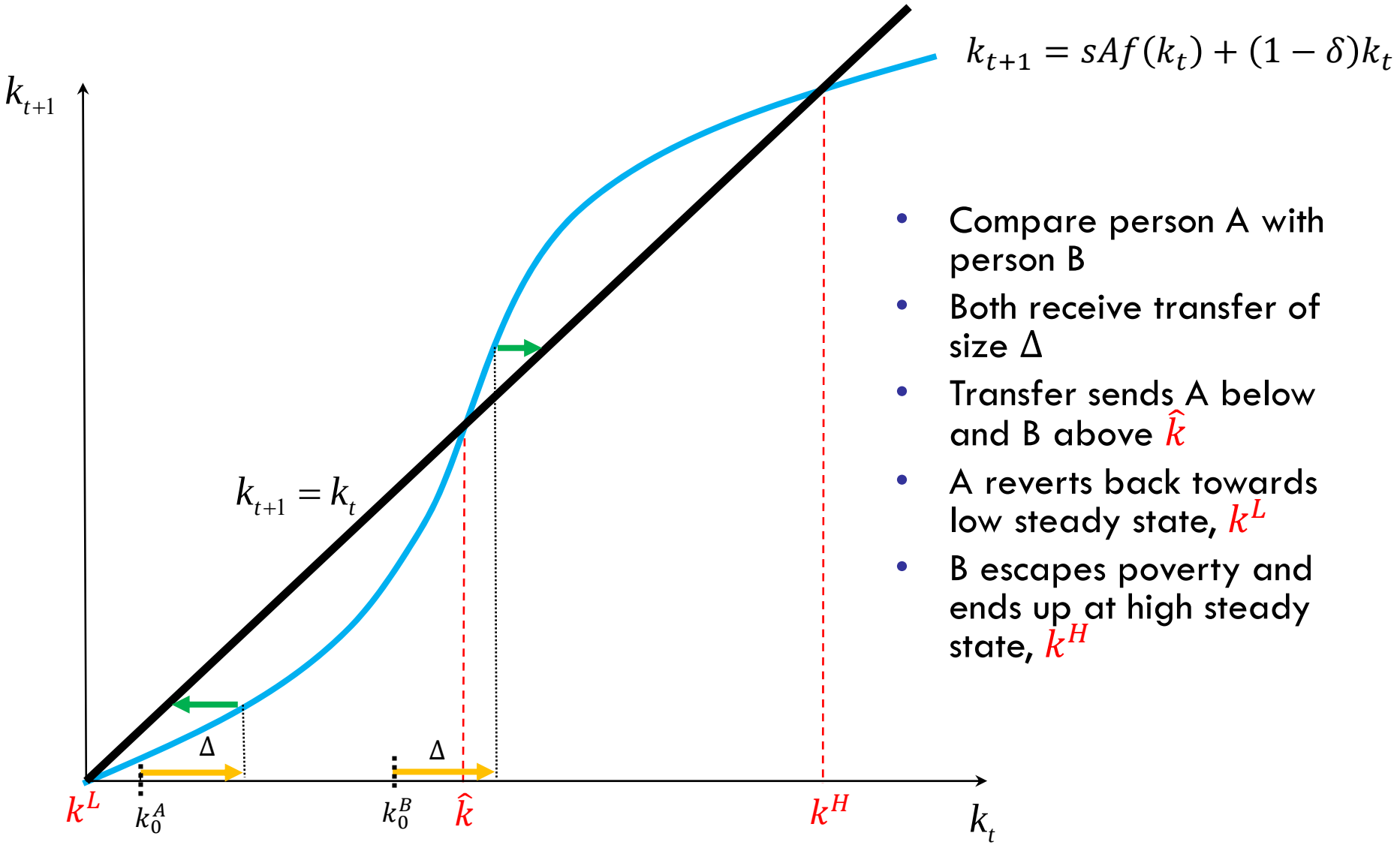


Asset Transfer in Poverty Trap Model



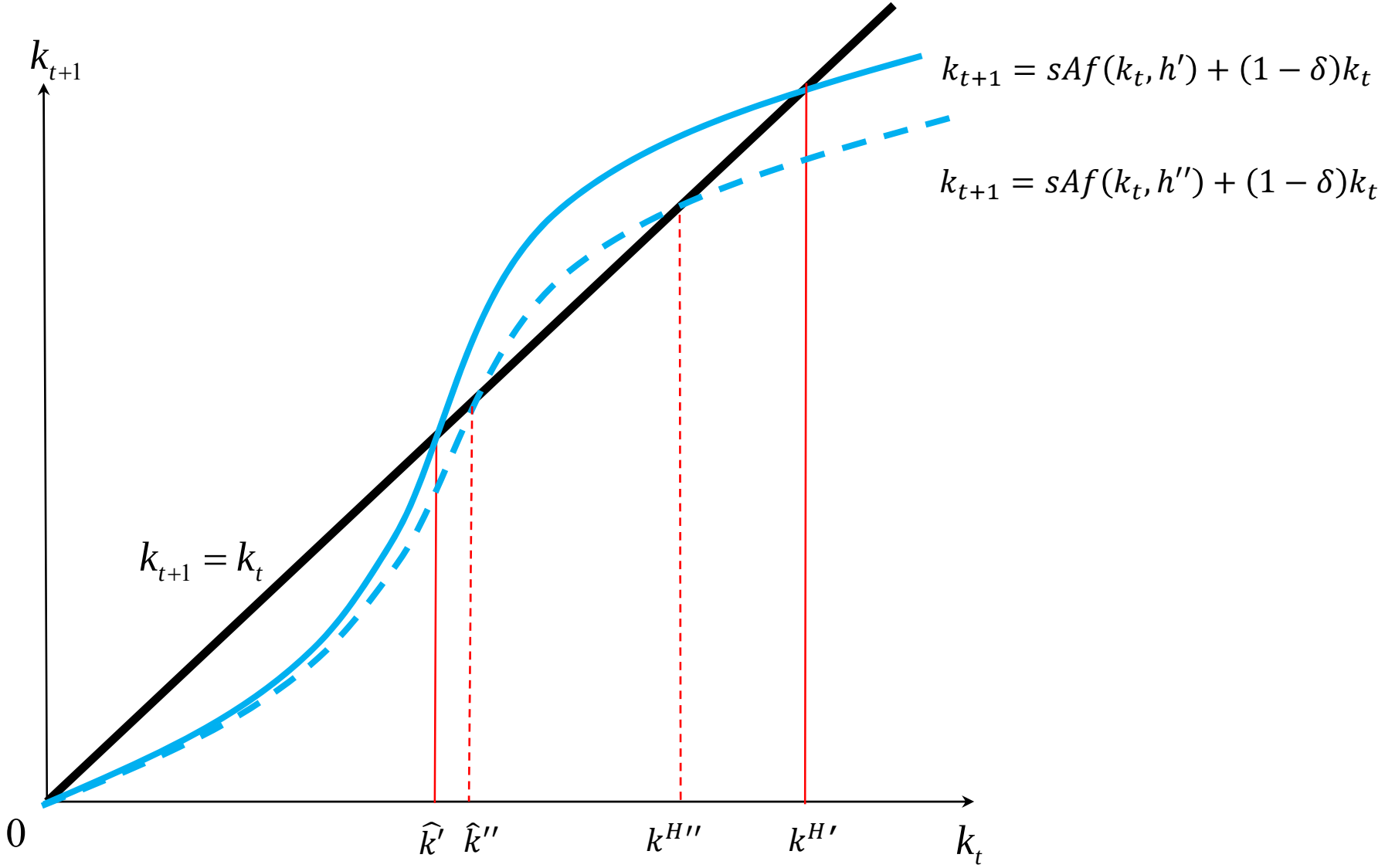
Changes in k plotted against k_0 in Poverty Trap world

We test the joint H0 that (i) there is a threshold and (ii) the program pushes some above and leaves others below



- Compare person A with person B
- Both receive transfer of size Δ
- Transfer sends A below and B above $\hat{k}$
- A reverts back towards low steady state, k^L
- B escapes poverty and ends up at high steady state, k^H

Role of Training? Shifts the threshold down & high s.s. up



Empirical Analysis

We use BRAC's Targeting the Ultrapoor Program

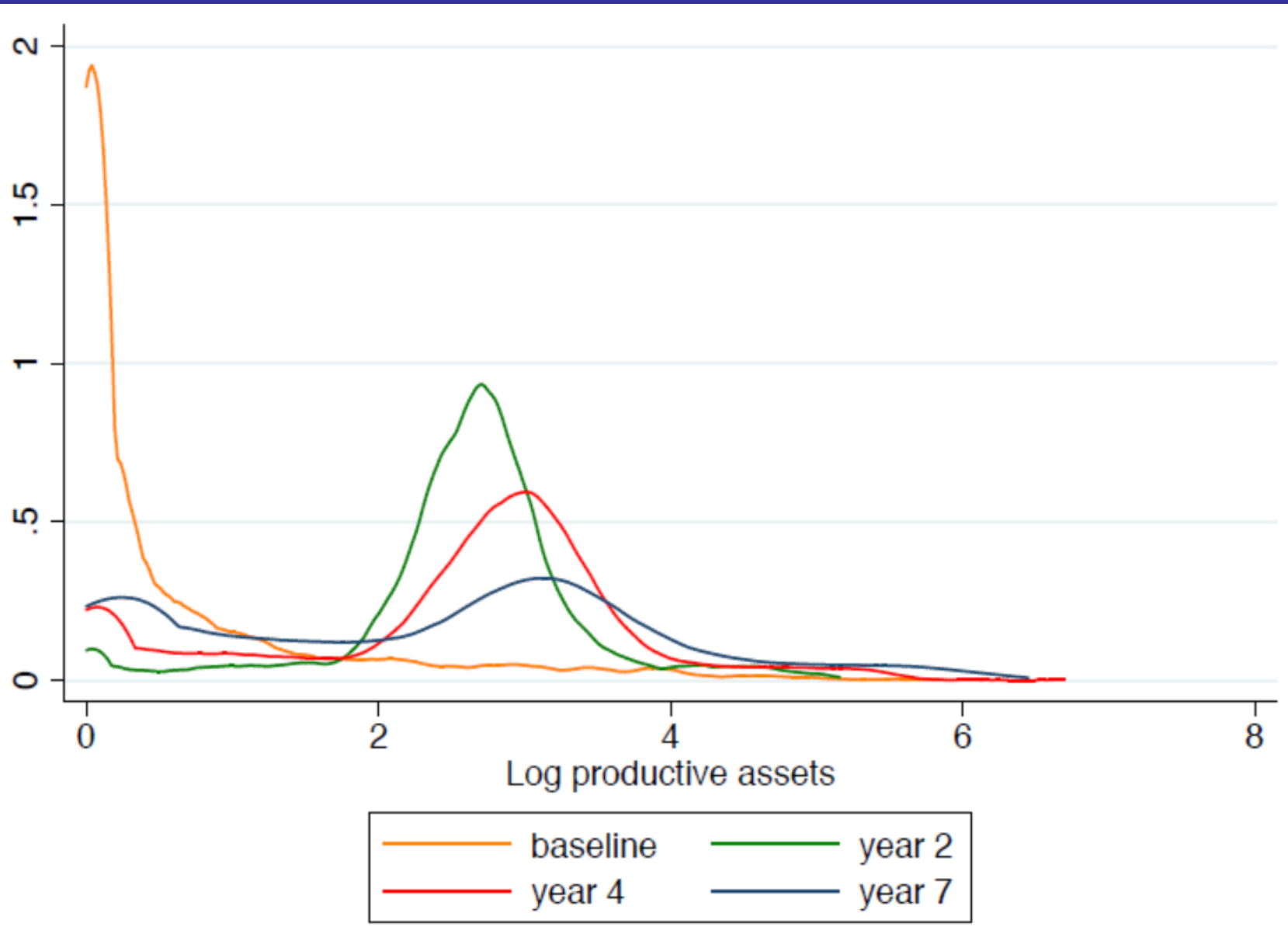
B55

B [12

H13

- K shock: Asset transfer worth 1 year of PCE
- 4k HHs received the program at the same time
- By design all get a package of similar value
- But they start with different assets at baseline

Preliminary evidence: some beneficiaries go back

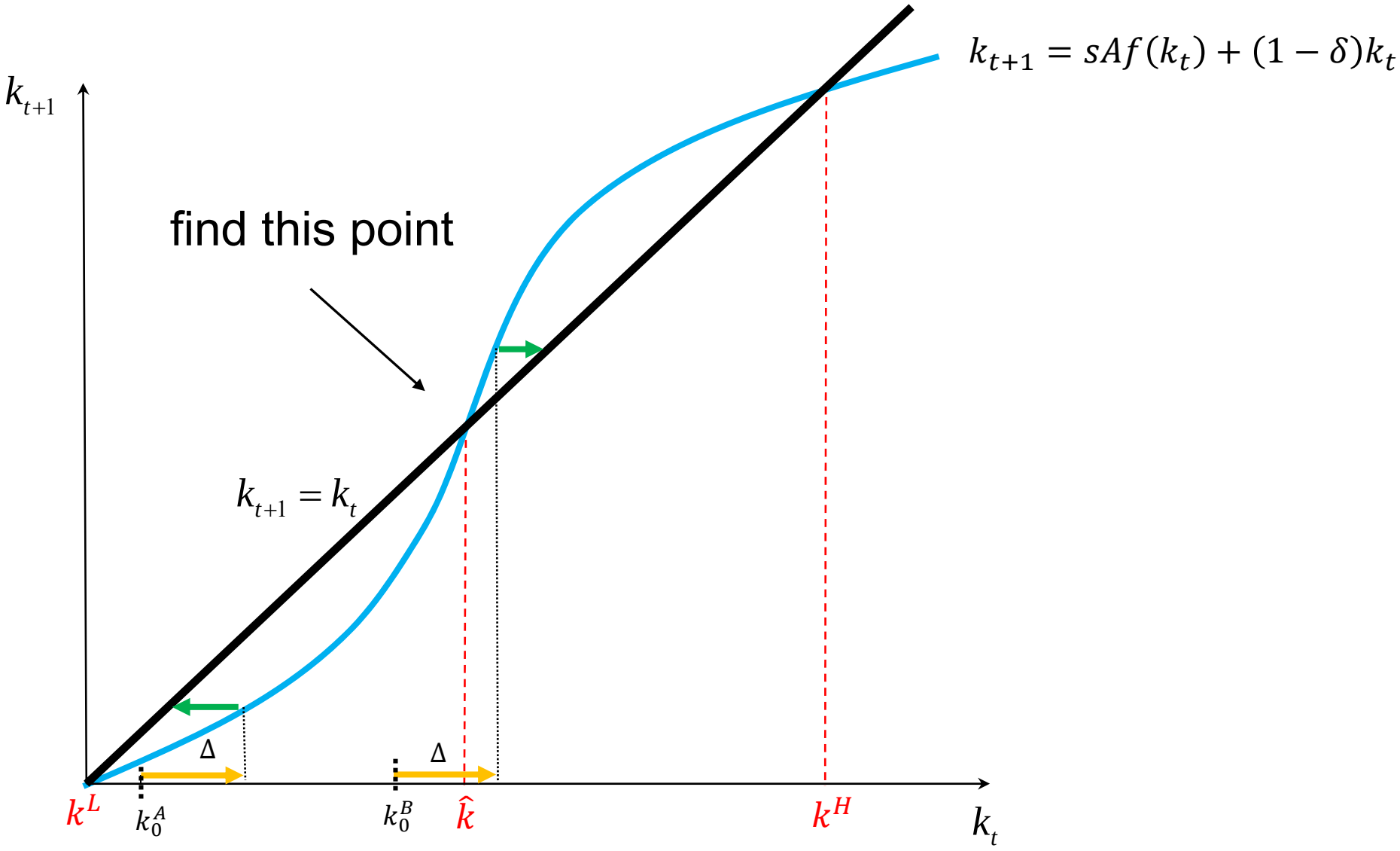


Identifying the threshold

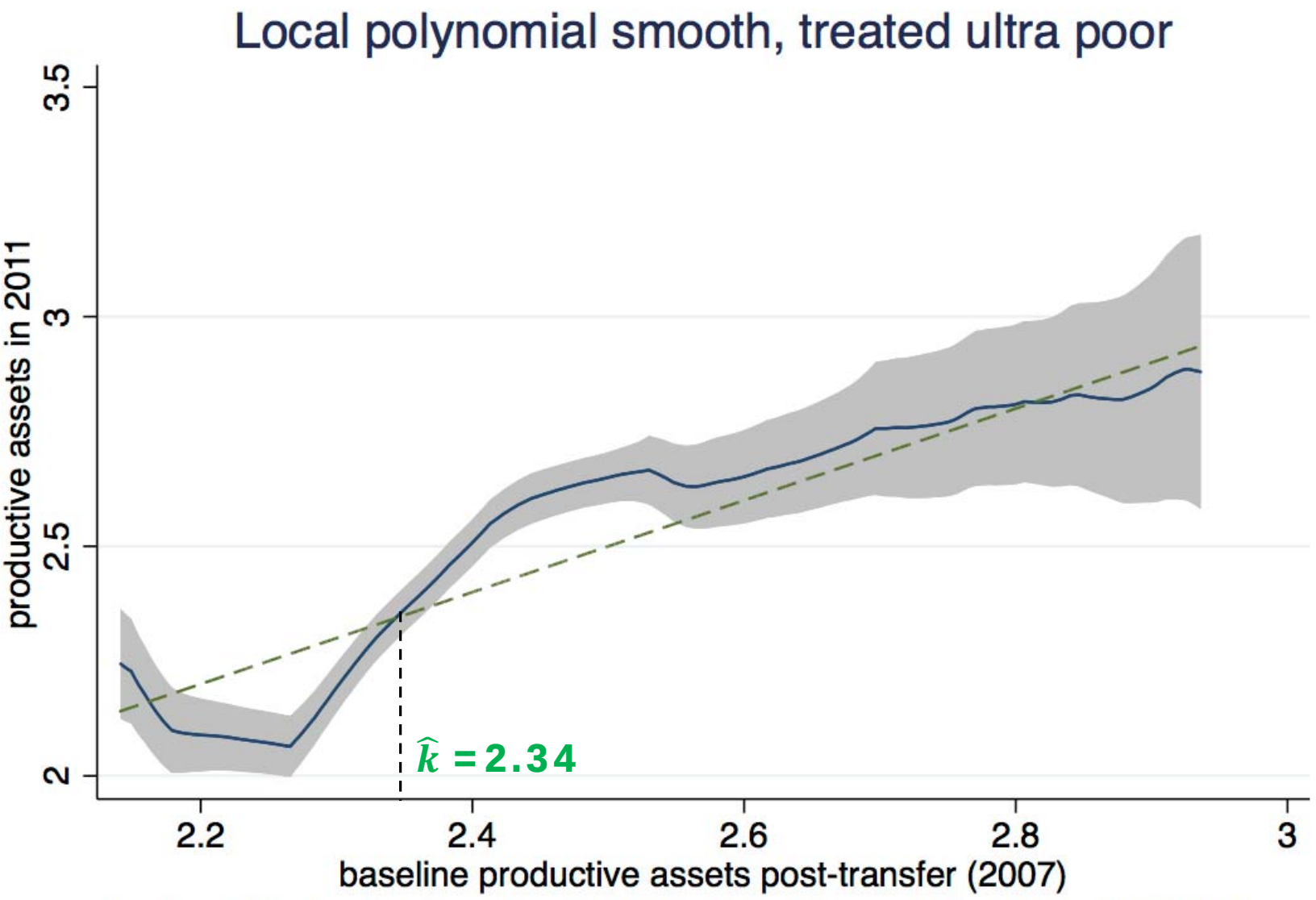
- Level of K such that those below fall back into poverty and those above escape
- This is identified by:
  - estimating the transition equation for K
  - finding the point, if any where it crosses the 45 line from below

- Note: this estimates an average threshold

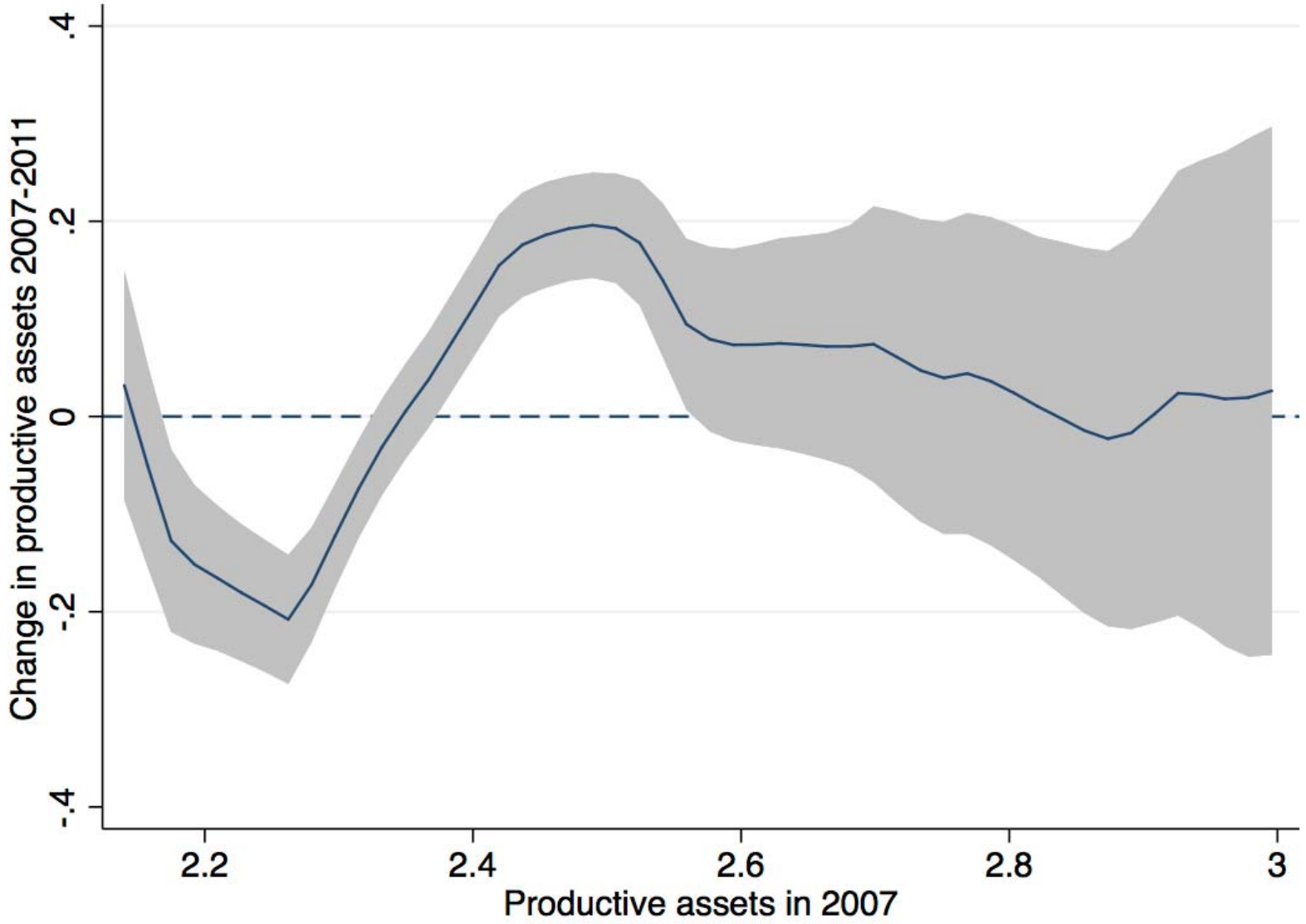
The transition equation



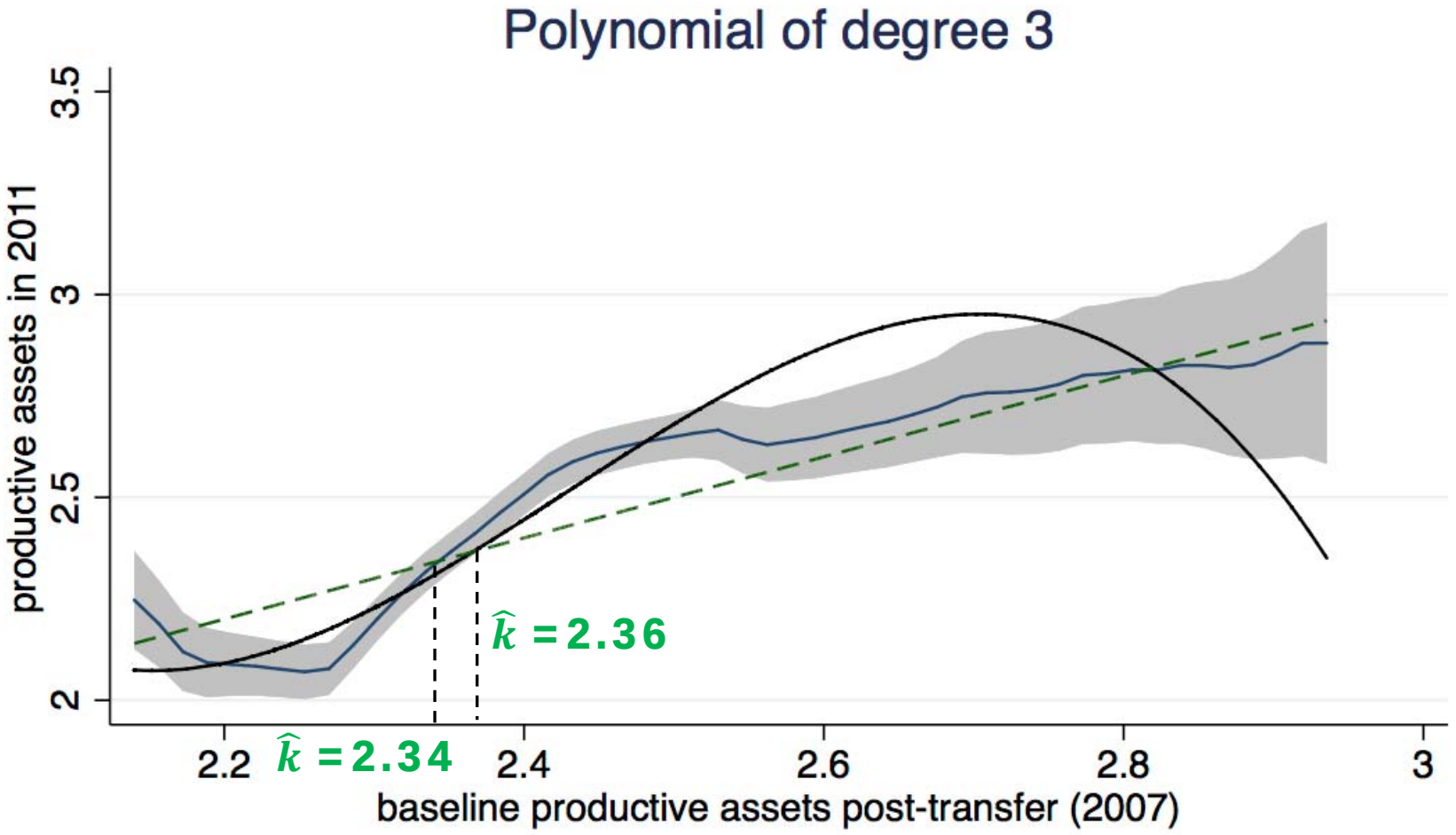
Non-parametric Identification of Transition Equation- Level



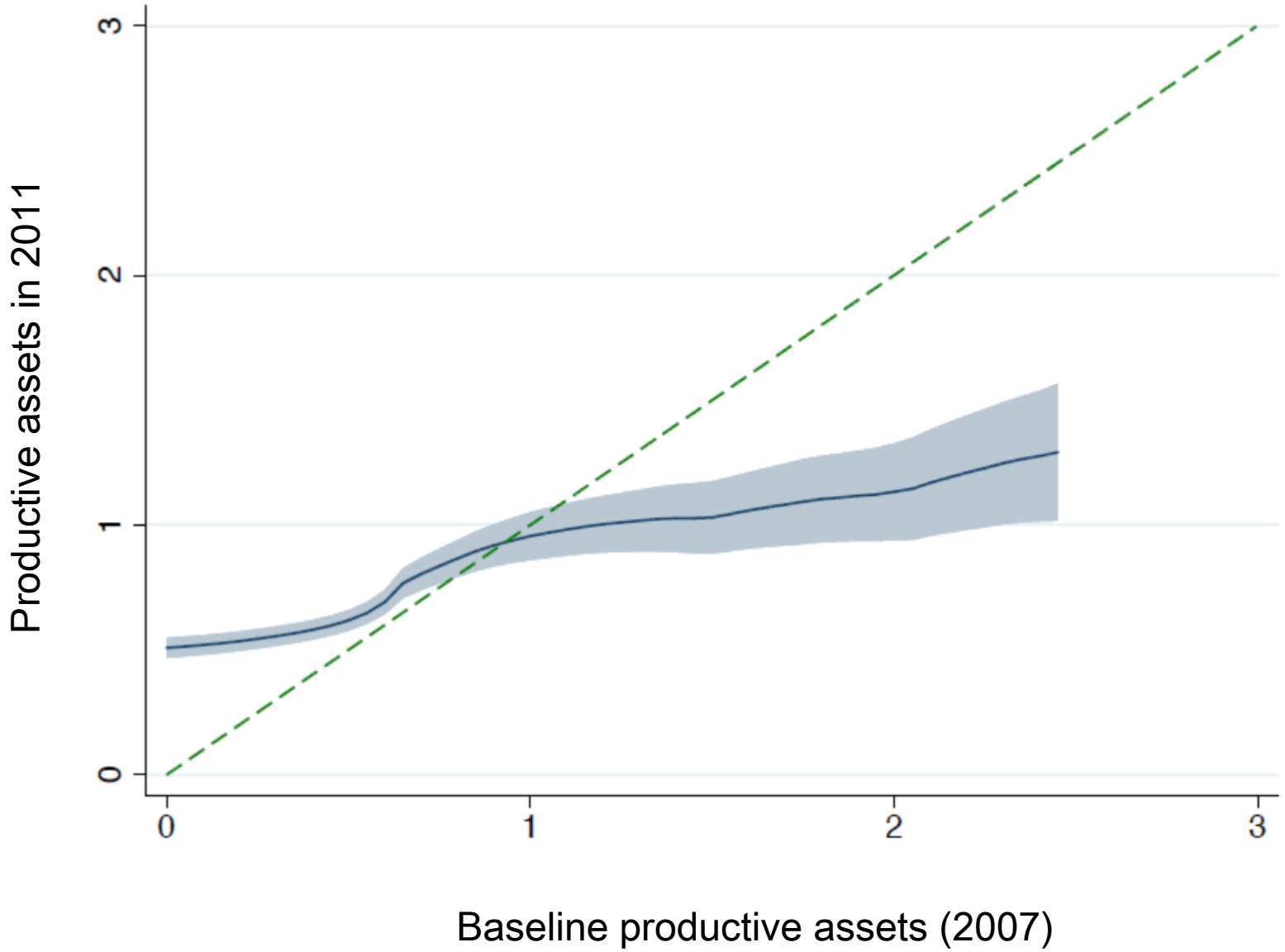
Response to asset transfer in data – Change



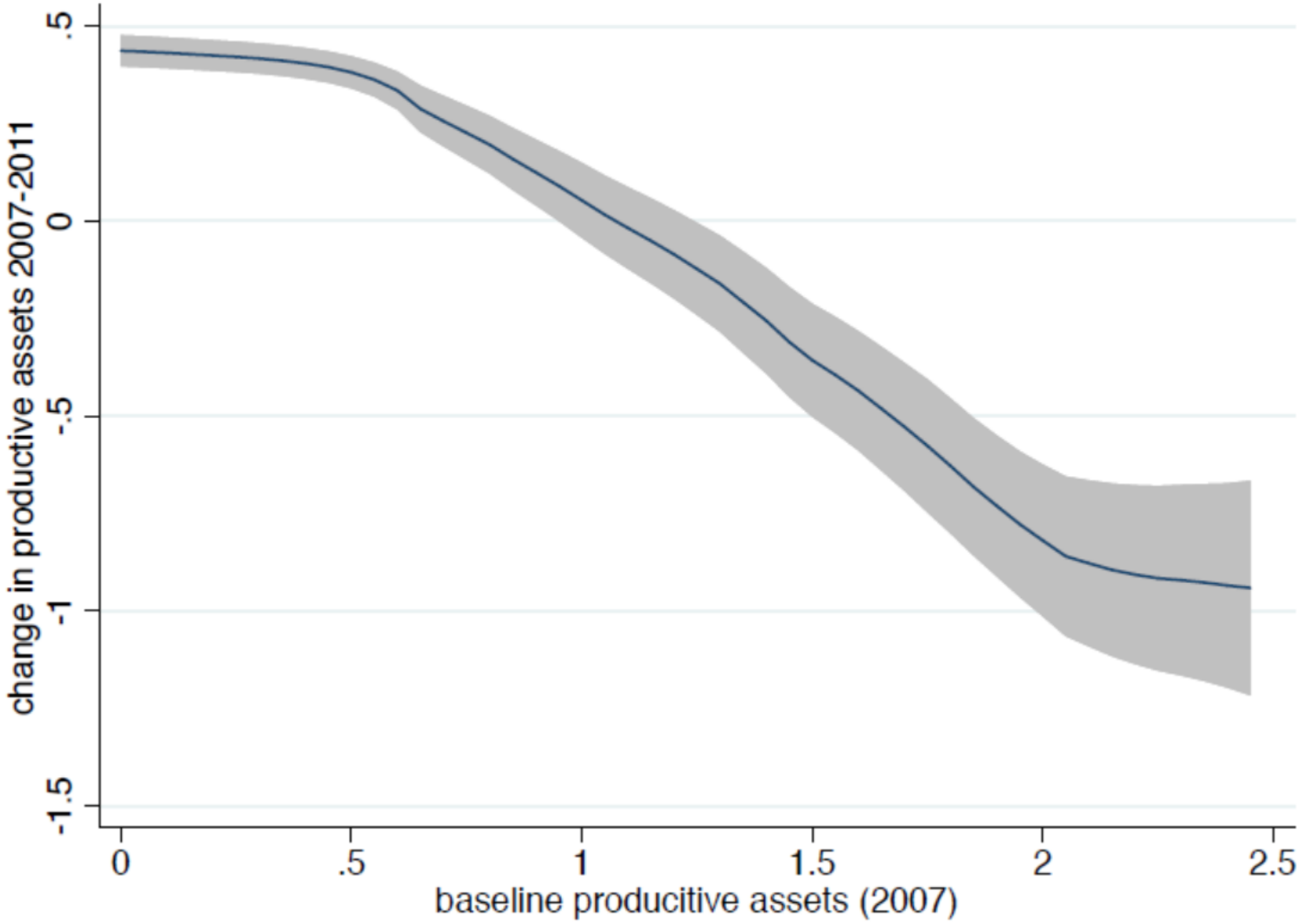
Parametric identification



Transition equation for control group



Change in capital as function of baseline capital - control group



What do we learn from this exercise? 1

- Does the pattern we see in treatment identify a poverty trap as opposed to being driven by shocks that would have occurred anyway?

- Without looking at controls we cannot say whether the fact that people below $\hat{k}$ lose k whilst those above accumulate more is due to the fact that $\hat{k}$ is an unstable SS or rather to the fact that a negative (positive) shock hit all the people with $k < \hat{k}$ or $k > \hat{k}$).

- But when we look at controls we see precisely the opposite pattern.

What do we learn from this exercise? 2

- Note that this does not imply that controls live in a Solow world.
- Rather, we observe them around the stable SS, hence the pattern of mean reversion that is consistent with Solow.
- In other words we cannot identify poverty traps from controls because by definition $\hat{k}$ is unstable so we never observe people around it.

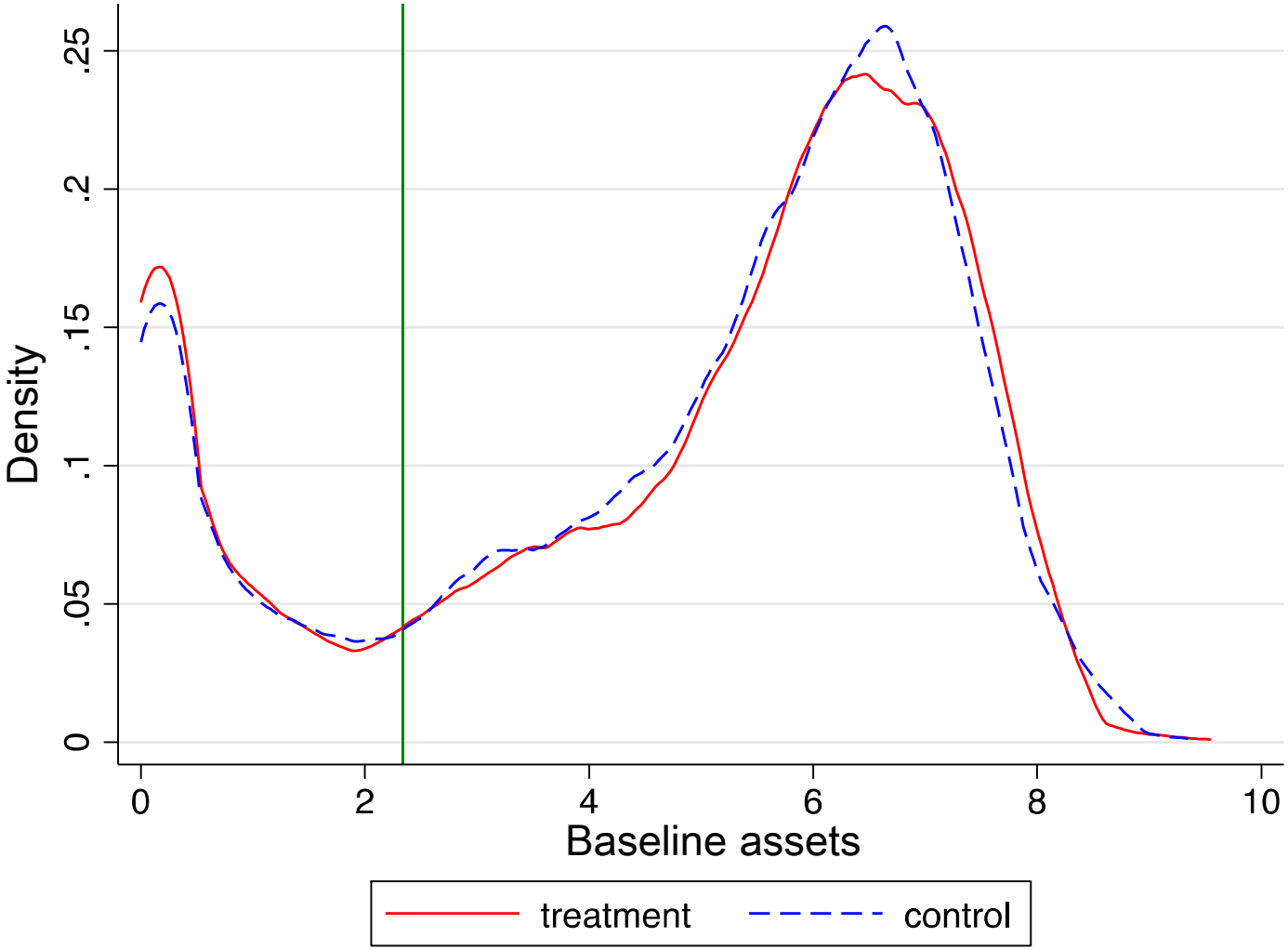
Further Implications of the poverty trap argument

Suppose $\hat{k}$ is an unstable steady state

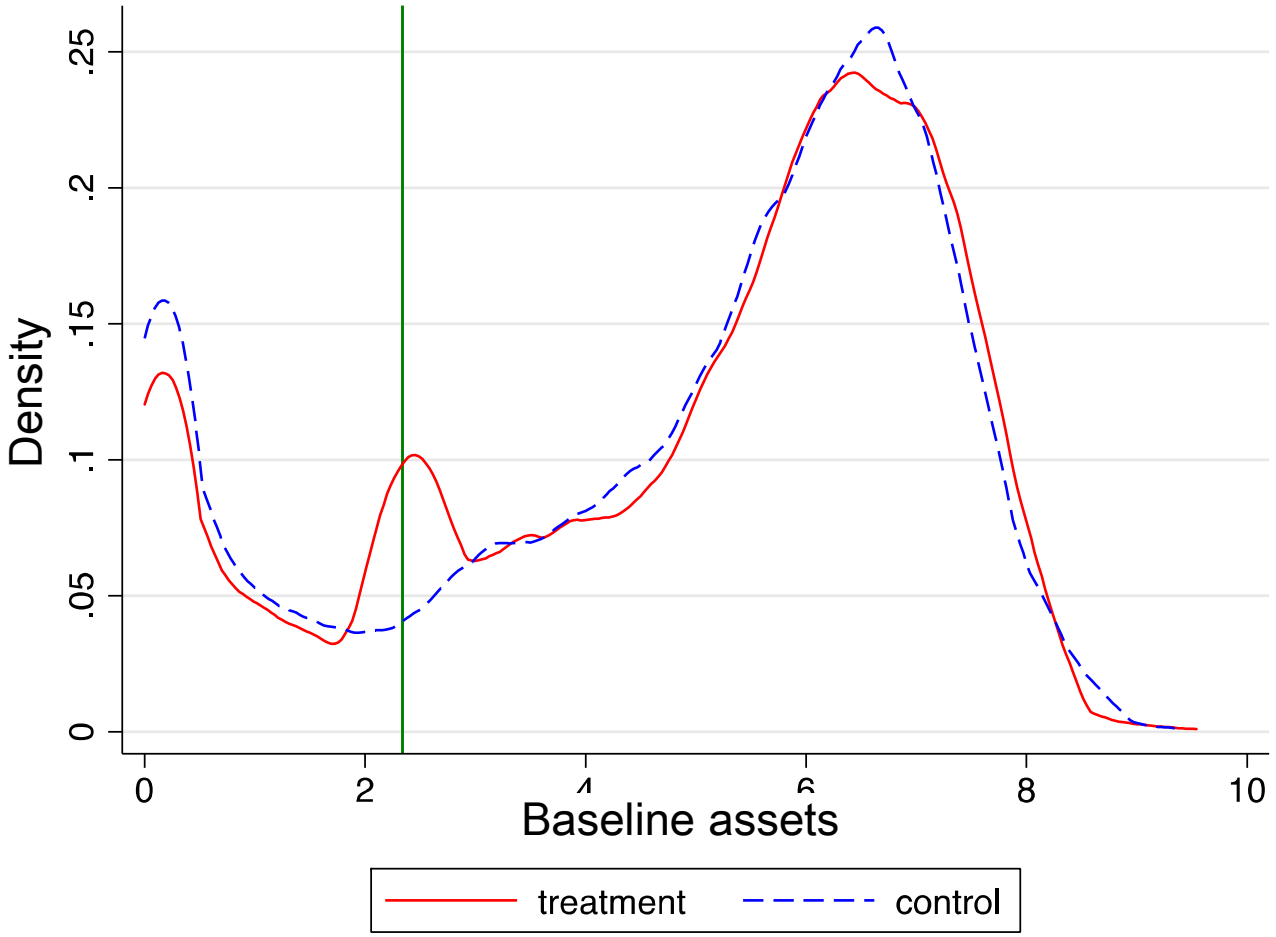
1. In equilibrium there should be no-one around it: people are either at the low or at the high SS

2. People brought by the program to the left of $\hat{k}$ should lose assets, those to the right should accumulate

At **baseline** the distribution of assets is bi-modal and density around the threshold is low



After 2 years, some of the ultra-poor have crossed $\hat{k}$



After 4 years, more of the ultra-poor have crossed $\hat{k}$