Australian National University

EE468: Integrated Public Economics, Development and Political Economics

Lecture 3: Poverty traps and welfare dynamics

21 February 2014

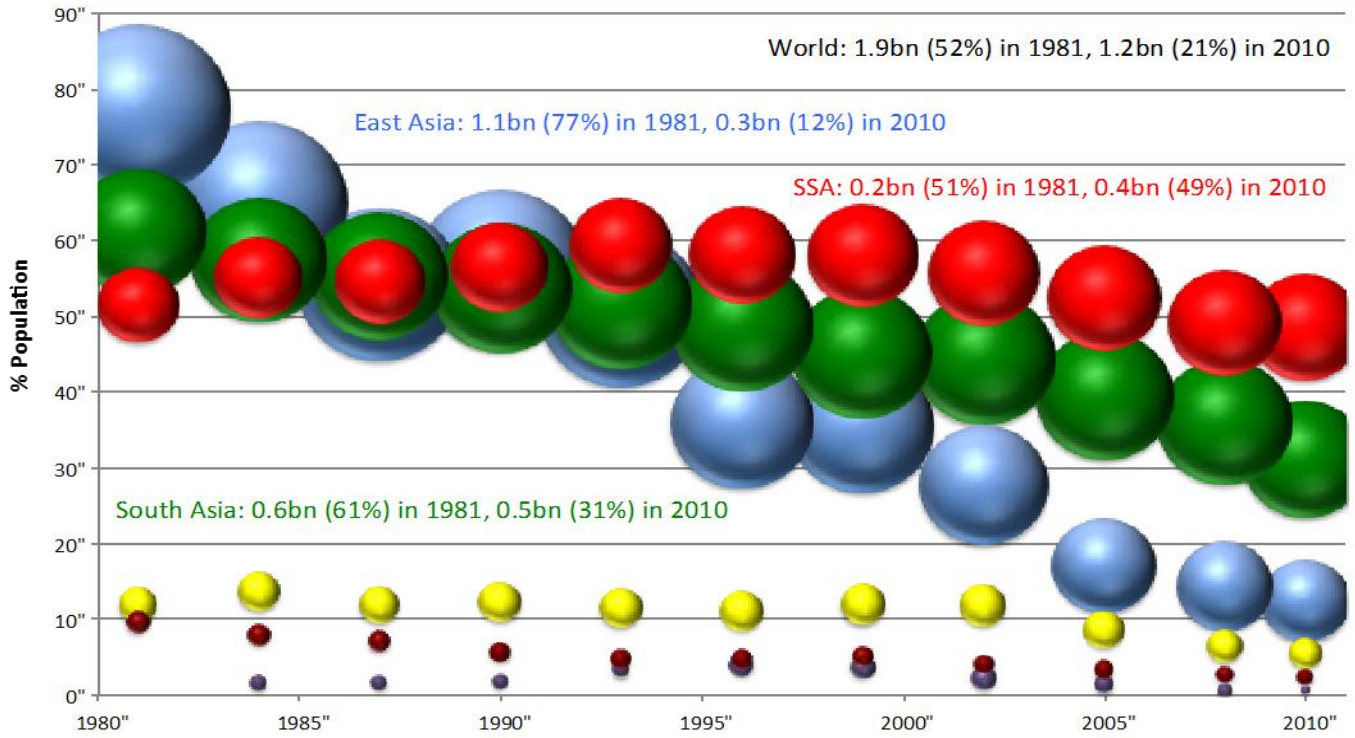
Sommarat Chantarat (sommarat.chantarat@anu.edu.au

Outline

- How do we explain poverty trap theoretically?
- Policy implications in the presence of poverty trap
- How to test existence of poverty trap empirically?

Motivating evidence

- Widespread evidence of persistent poverty at the country/economy level



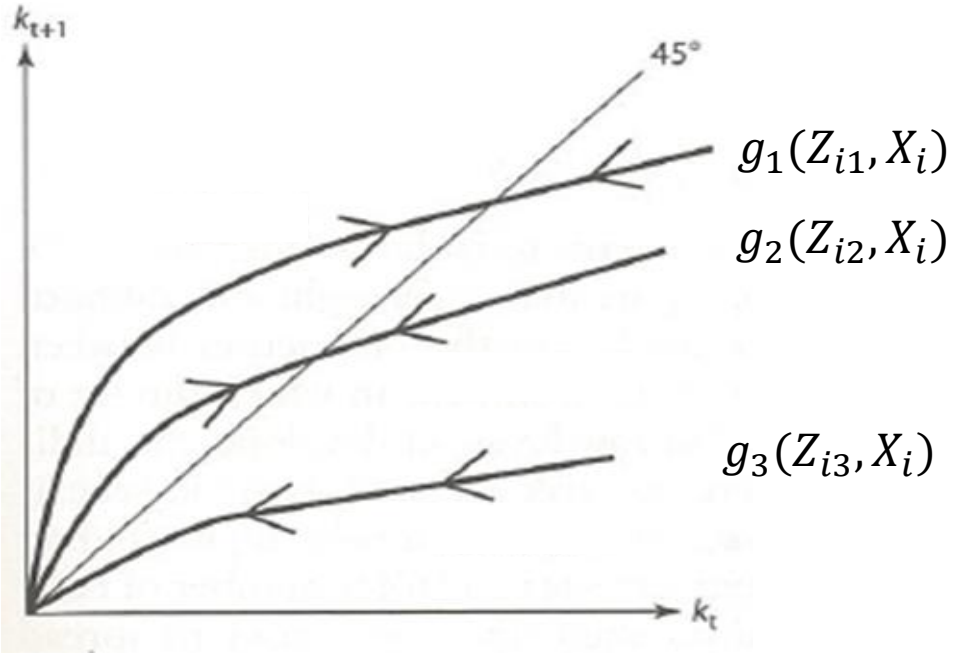
- Increasing evidence that poverty tend to persist among many poor communities and households, intergeneration transmission of poverty
- Why are people trapped in poverty? What to do? → Appropriate policies rely on understanding of the mechanisms that reinforce persistent poverty

Some theories of poverty trap

- Poverty traps have been modeled theoretically first in macro-growth theory
  - Neoclassical convergence theory → Under complete market and DRS, poorer nations will catch up with the richer nations over time (Solow 1957)
  - Empirical evidence rejects this hypothesis showing large divergence in development outcomes using cross-country data (Pritchett 1997)
- Two competing theories of poverty trap
  - Club convergence (conditional convergence)
    - Some imputable characteristics could lead an economy to low-level poverty equilibrium in the long run
  - Threshold-based multiple equilibria poverty trap
    - Multiple equilibria of well being exist, an economy needs to reach minimum threshold in order to converge to high level equilibrium
    - Initial capital endowment matters to expected growth
    - Temporary shock can cause permanent impacts to development
- Policy interventions vary depending on the mechanisms that cause poverty trap

Some theories of poverty trap – Club convergence

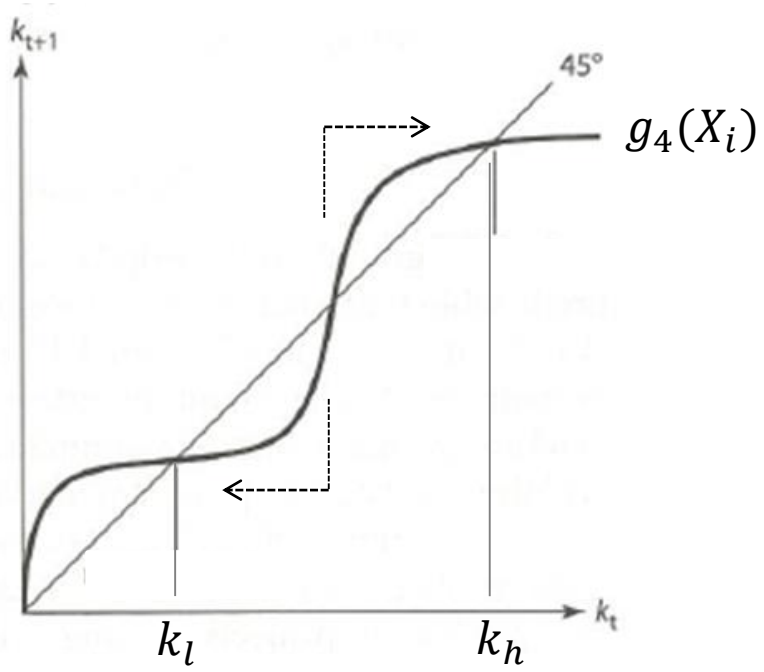
- Groups of countries, economies and households that share similar imputable characteristics Z_i tend to converge to the same long-run well being (Baumol 1986, DeLong 1988).
- Z_i could represent institutional phenomena (Acemoglu et al 2001), physical geography (Jalan and Ravallion 2002), agro-ecological, natural resource or market conditions that affect accumulation and return to productive capital



- Policy response → Need to identify and address these immutable characteristics, e.g., Z_{i3} , that could trap some group of economies into the path leading to long-run poverty equilibrium
- What might be good example of Z_{i3} ? Land-lock, remote economies? Minority groups? Communities prone to shocks?

Some theories of poverty trap – Multiple equilibria

- Both high and low level of long-term equilibria could exist in the same growth path. Whether a country reaches high level or remains trapped at low level depend on whether it begins above or is able to boost itself over minimum capital threshold (Azariadis and Drazen 1990)
- Technology exhibits locally increasing return due to scale to economy or required lumpy investment for development (e.g., minimum capital, skilled-labor, etc.)



- Big push theory (Murphy et al. 1989): without coordinated push past some threshold, the economy may fail to industrialize to reach non-poor stage
- Policy response → coordinated investment of necessary capital for industrialization, e.g., SEA story
- Capital endowment matters to the expected growth
- Temporary shock can cause permanent impacts to development

Explaining poverty trap at household level

- **An asset-based approach**: a household's asset A_{it} (physical, human, natural capital) and their dynamics are used to measure their long-term prospect!
  - The common welfare indicator y_{it} (household income or consumption) is largely stochastic: $y_{it} = f(A_{it}) + \varepsilon_{it}$
  - Changes in y_{it} from one period to the next thus could result from transitory shock ε_{it} → might not imply anything about their long-run prospect
  - Changes in A_{it} represent structural changes to current and future y_{it}
- **Poverty traps at household level can be explained from both theories**:
  - Club convergence: Some immutable characteristics Z_i (ability, preference, gender, race, geography, discrimination, inherited social connections, etc.) could cause conditional convergence toward poverty trap
  - Threshold-based multiple equilibria: Controlling for some characteristics X_i, household's long-run equilibrium could depend on their asset endowment A_{it} relative to some critical dynamic asset threshold A^*

Household's intertemporal problem

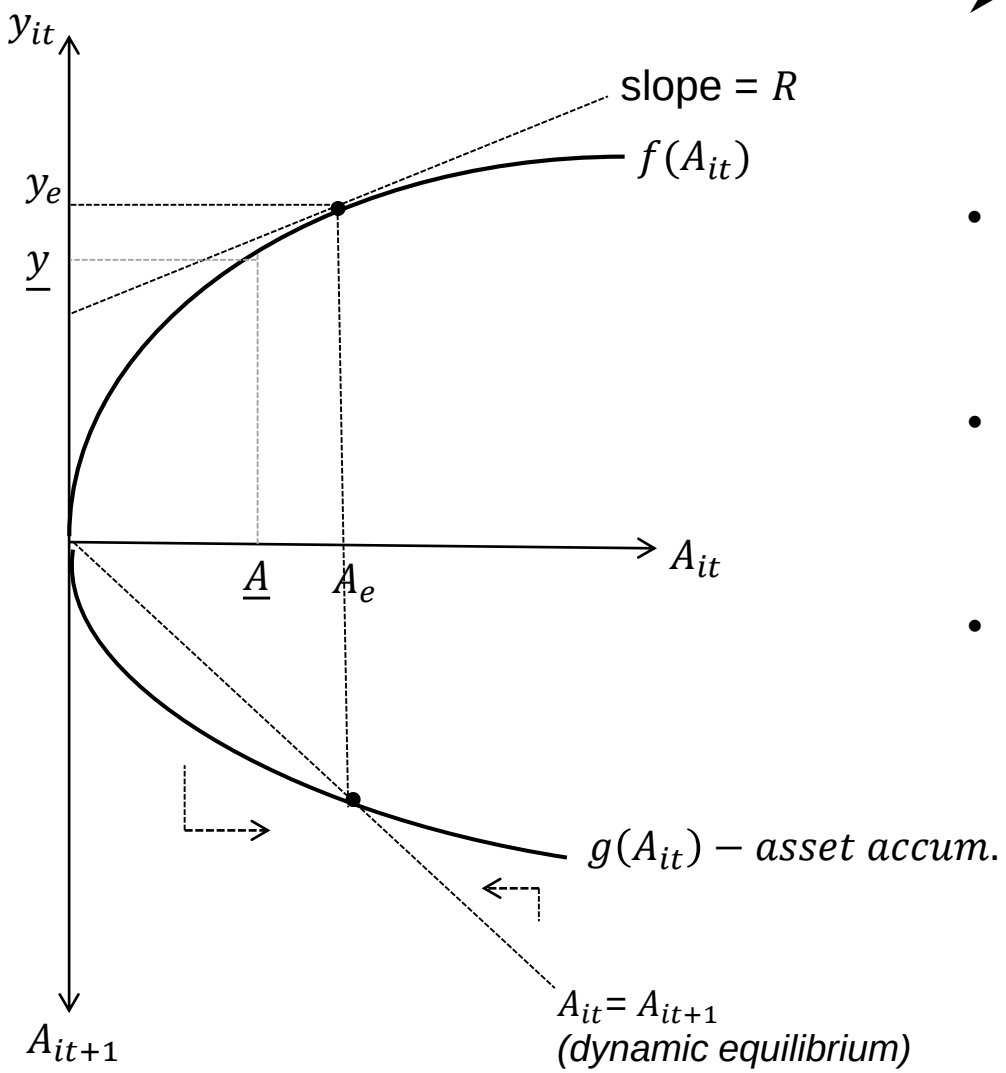
- Household maximises expected lifetime utility by choosing lifetime series of consumption $c_i = \{c_{i1,\ldots,}c_{iT,..}\}$ and asset investment $A_i = \{A_{i1,\ldots,}A_{iT,..}\}$:

$$\max_{c_i, A_i} \; E_0 \sum_{t=0}^{\infty} \delta^t U(c_{it})$$

subject to
$$c_{it} + s_{it} = \mathrm{f}(A_{it}) - (1 + \mathrm{r}) b_{it-1}$$
$$A_{it+1} = (1 - \tau) A_{it} + (1 + r) s_{it} + b_{it}$$

- δ is the annual rate that HH discounts their future
- HH derives income each period from $\mathrm{f}(A_{it})$, concave (DRS) and differentiable
- After paying off the last period's debt, they then choose to consume and save
- Their next period asset A_{it+1} is then determined from A_{it} depreciated at the rate τ and from return on their saving s_{it} at the rate of return r
- There is no constraint on borrowing (complete financial market) → HH can expand their capital by taking additional loan b_{it}, which they then have to pay back using the next period's income

Household's intertemporal problem



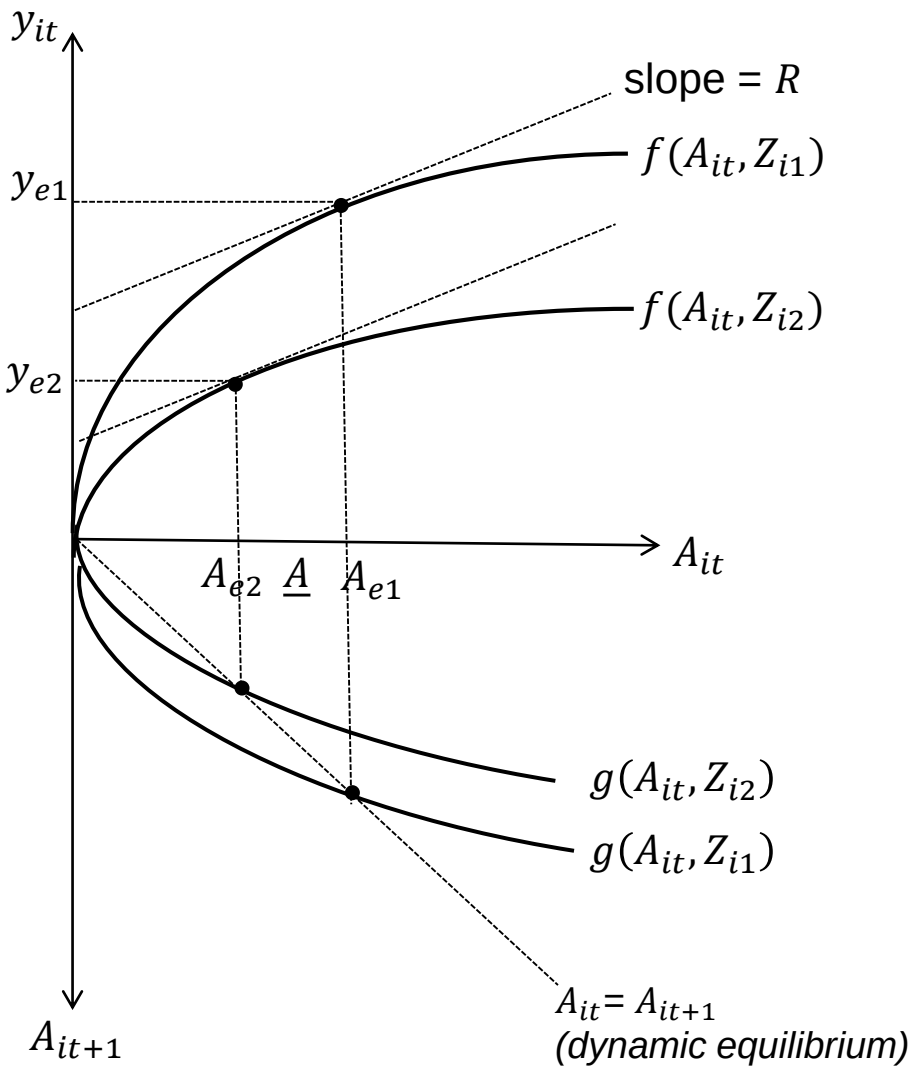
- With complete financial market that allows HH to borrow and so transfer resources across periods:

- In the steady state (L-R equilibrium) → $f'(A_{it}) = R$ where R is some marginal rate of return on asset
- And so with DRS, all HHs will over time converge to this L-R stable equilibrium wealth A_e (equivalent to income y_e)
- If $\underline{A}$ is an asset poverty line (equivalent to income poverty line $\underline{y}$)

→ We should expect all HHs to gradually converge to this non-poor equilibrium $A_e > \underline{A}$ without intervention

No poverty trap!

Household's intertemporal problem – Club convergence



- With some intrinsic characteristics Z_{i2} (ability, remoteness, discriminated minority group, geographic, etc.) that suppress return to asset relative to that of Z_{i1} :
- HH's L-R convergence will be differ conditional on Z_i
- Those with Z_{i2} will converge to low-level poverty trap $A_{e2} < \underline{A}$ → addressing the constrained characteristics Z_{i2} will thus be critical in lifting them out of poverty

Club convergence poverty trap exists! (e.g., geographic poverty trap)

Household's intertemporal problem

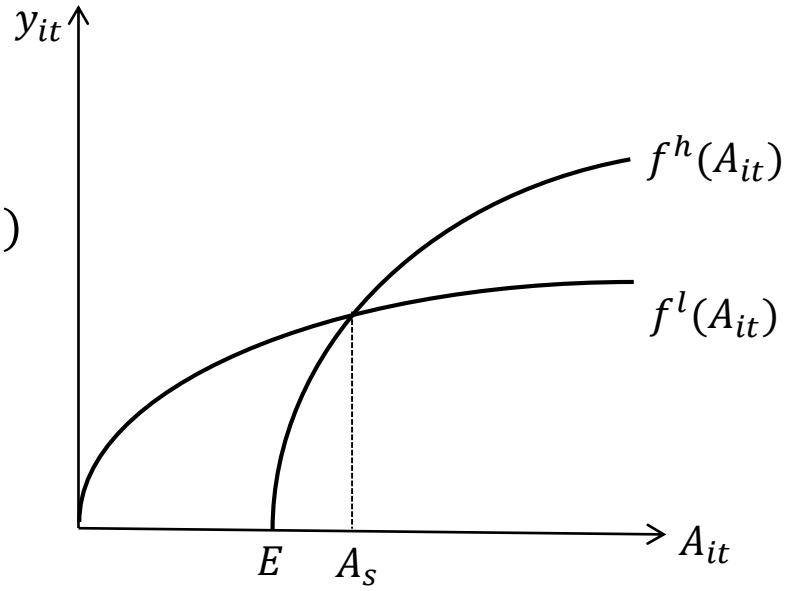
➢ When production technology exhibits locally increasing return to scale

- Suppose, there are two available production technologies: the high and low return (high Vs. low yield crop, skilled Vs. non-skilled job, etc.) and there is fixed cost E in adopting high-return technology

$$f^l(A_{it}) = \propto_l A_{it}^{\gamma_l}$$

$$f^h(A_{it}) = \propto_h A_{it}^{\gamma_h} - \mathrm{E}$$

where $f^l(\cdot)$ and $f^h(\cdot)$ concave, $f'^h(\cdot) > f'^l(\cdot)$



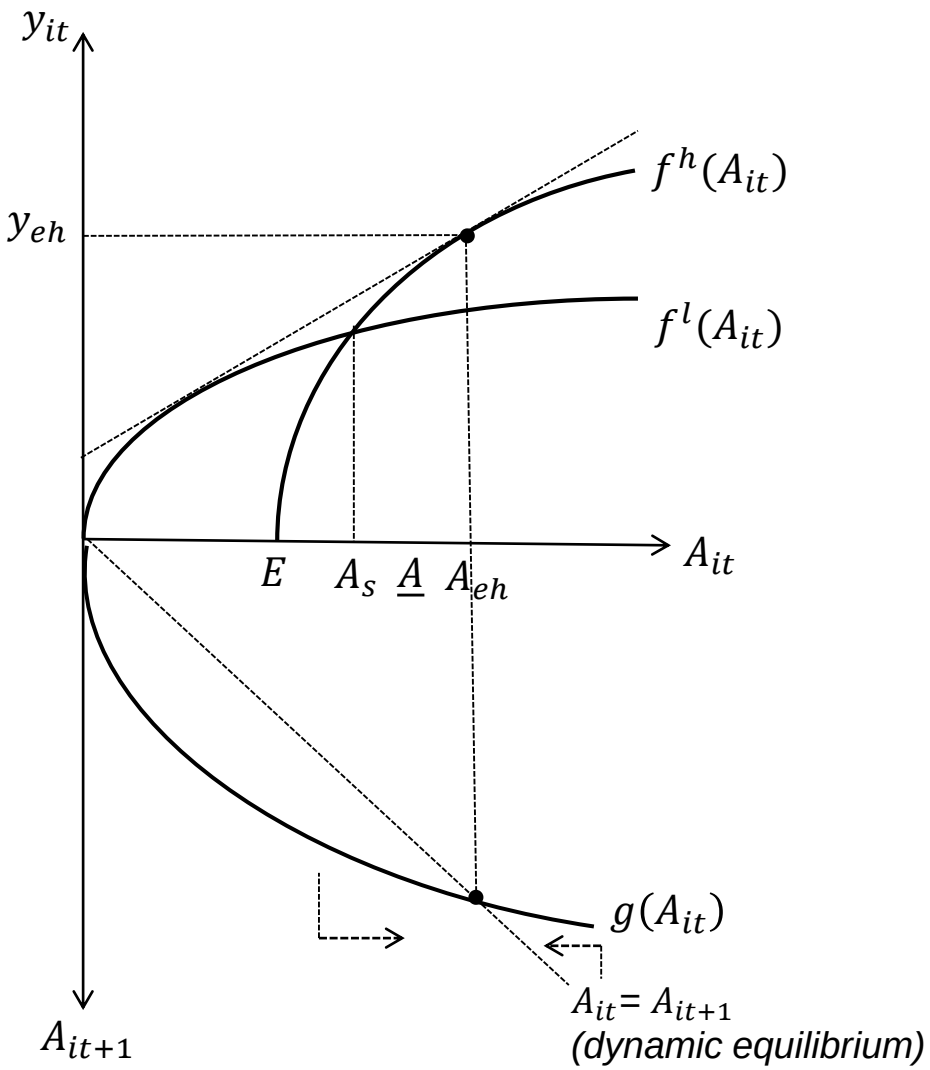
- This production function is thus given by

$$\mathrm{f}(A_{it}) = max\{f^l(A_{it}), f^h(A_{it})\}$$

$$= \begin{cases} f^l(A_{it}) & \text{if } A_{it} < A_s \\ f^h(A_{it}) & \text{if } A_{it} \geq A_s \end{cases}$$

- This production thus has locally increasing return in the neighborhood of A_s
- What could be examples of settings with locally increasing return production?

Household's intertemporal problem



- With locally increasing return production $f(A_{it}) = max\{f^l(A_{it}), f^h(A_{it})\}$ but financial markets are still complete to allow HH to borrow across periods:

- HH problem is still to

$$\max_{c_i, A_i} \; E_0 \sum_{t=0}^{\infty} \delta^t U(c_{it})$$

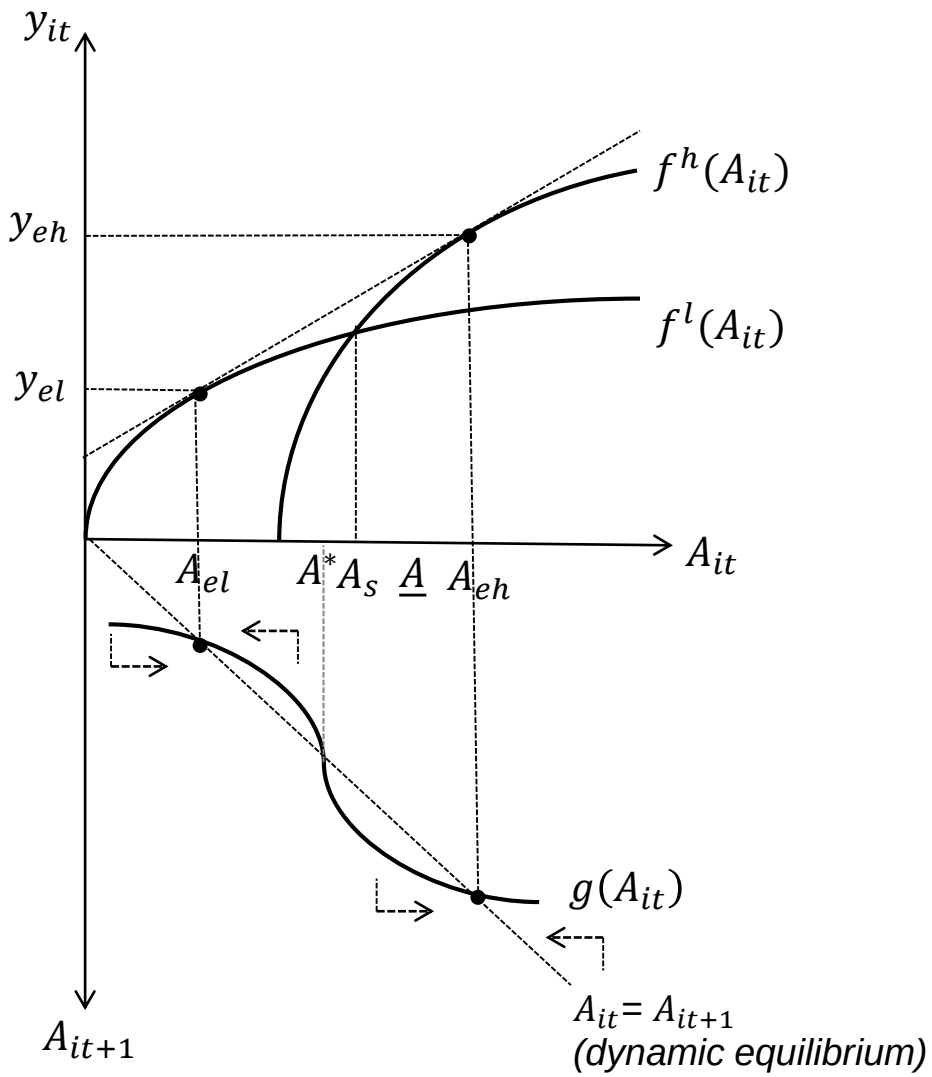
sjt. $c_{it} + s_{it} = f(A_{it}) - (1 + r) b_{it-1}$

$$A_{it+1} = (1 - \tau) A_{it} + (1 + r) s_{it} + b_{it}$$

- Those with $A_{it} < A_s$ will borrow in order to maximise profit by producing $f^h(A_{it})$
- And so over time, all HHs will still converge to the non-poor equilibrium $A_{eh} > \underline{A}$ without any further intervention

No poverty trap!

Household's intertemporal problem – Multiple equilibria



- With locally increasing return production and missing financial markets
- HH problem with borrowing constraint:

$$\max_{c_i, A_i} \; E_0 \sum_{t=0}^{\infty} \delta^t U(c_{it})$$

sjt. $c_{it} + s_{it} = \mathrm{f}(A_{it})$

$$A_{it+1} = (1-\tau)A_{it} + (1+r)s_{it}$$

- Since HH can only afford to expand their asset through autarkic saving, those with A_{it} closed to A_s will manage to accumulate enough asset to produce at $f^h(A_{it})$ but others with too small A_{it} will have to produce at $f^l(A_{it})$

Multiple equilibria poverty trap exists with critical asset threshold A^*

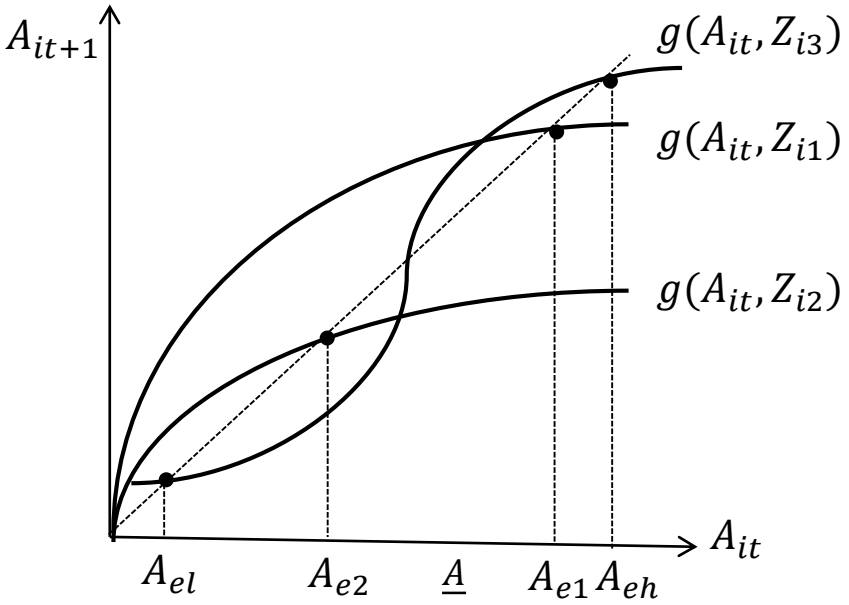
$$A_e = \begin{cases} A_{eh} \text{ (non−poor eq) if } A_{it} \geq A^* \\ A_{el} \text{ (poverty trap) if } A_{it} < A^* \end{cases}$$

Household's intertemporal problem – Multiple equilibria

- In sum, locally increasing return is not necessary nor sufficient to create multiple equilibria poverty trap
  - With perfect financial market, household will borrow, adopt high return technology and converge to high level equilibrium
- When financial markets are missing, locally increasing return could result in poverty trap. What might be other causes of locally increasing return production?
  - Fixed, sunk cost of technology (physical capital)
  - Skills or nutrition necessary for high skilled job (human capital)
  - Biophysical conditions necessary for high-yield cropping (natural resource)
  - High return technology is also risky → poor's low-risk low-return technology
- Other common forms of multiple-equilibria poverty traps
  - Nutrition-based poverty trap (Dasgupta and Ray 1993)
  - Human capital investment poverty trap (Banerjee and Ray 1993)
  - Natural resource degradation poverty trap (Marenya and Barrett 2009)
  - Behavioral poverty trap (endogenous preference induced by causes of trap)

Extension of multiple equilibria model

- Club convergence and multiple equilibria poverty traps can co-exist!



- With asset poverty line $\underline{A} > A_{e2}$, poverty trap could result from
  - Some immutable characteristics Z_{i2} that trapped HHs in A_{e2}
  - Low initial asset $A_{it} < A^*$ that trapped households in A_{el}

.

- Modeling threshold-based multiple equilibria poverty trap with A^* is not trivial
  - Immutable characteristics Z_i both cause conditional convergence to a single poverty trap as well as be endogenous to initial asset in multiple-equilibria poverty trap

Extension of multiple equilibria model

- When characteristics Z_i both cause conditional convergence to a single poverty trap and be endogenous to initial asset in multiple-equilibria poverty trap $(A^*(\alpha_i))$

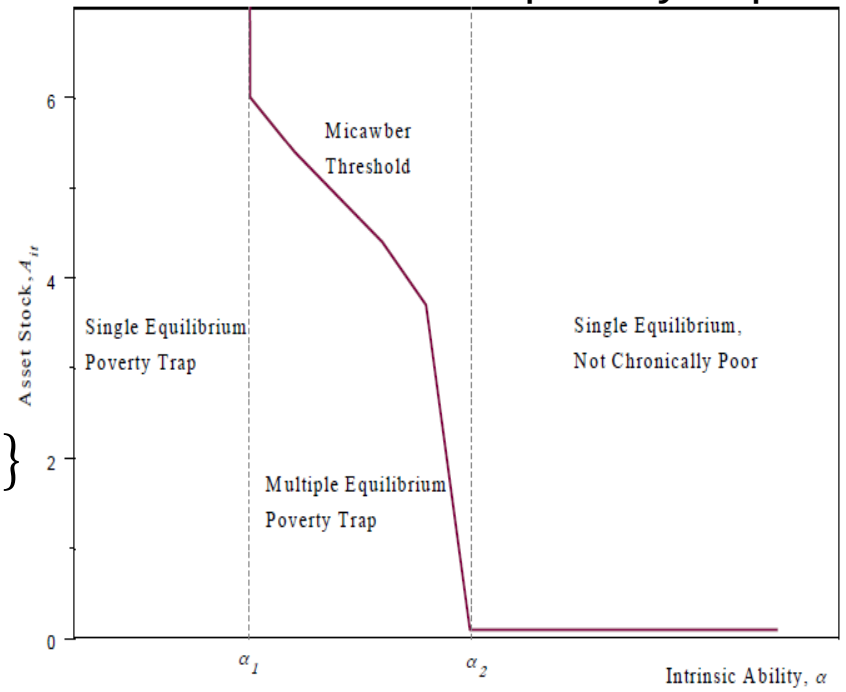
  - Barrett et al. (2011) considers multiple financial markets failures poverty trap with heterogeneous ability α_i
    Household's intertemporal problem

$$\max_{c,A} \; E_0 \sum_{t=0}^{\infty} \delta^t U(c_{it})$$

$$\text{sjt} \quad c_{it} + s_{it} = f(A_{it}, \alpha_i)$$

$$A_{it+1} = (1-\tau)A_{it} + (1+r)s_{it}$$

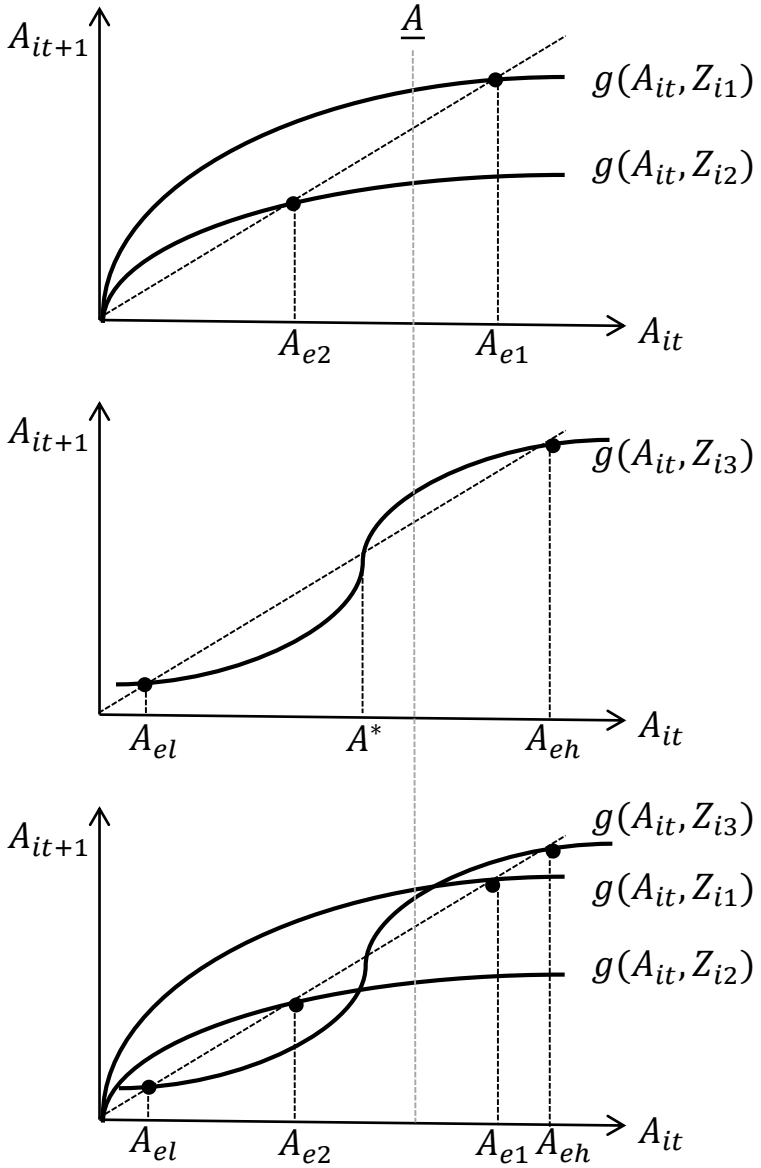
$$f(A_{it}, \alpha_i) = max\{f^l(A_{it}, \alpha_i), f^h(A_{it}, \alpha_i)\}$$



  - Chantarat and Barrett (2012) considers threshold-based poverty trap model with coexistence of both physical and social network capital

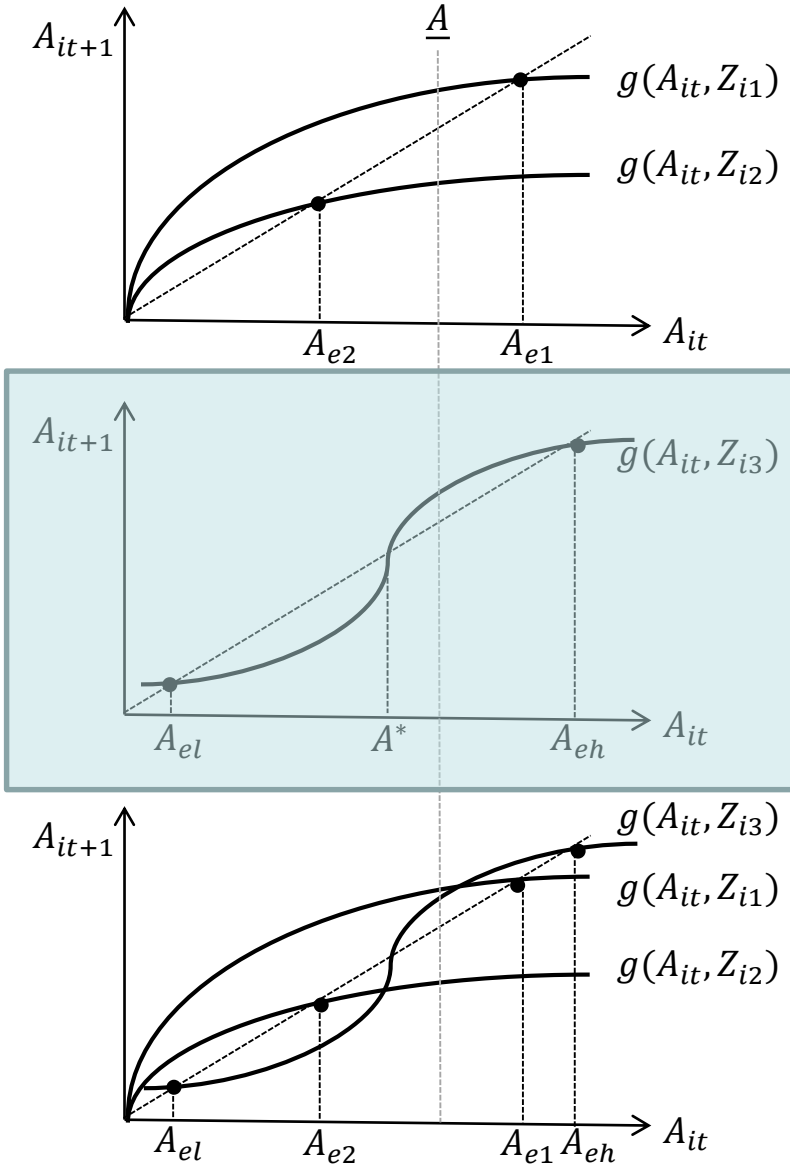
Implications from poverty trap models

- What can we imply from poverty trap models?
  - Initial condition or endowments determine household's expected well being
  - Temporal shocks could have permanent consequence on well being
  - Coexistence of convergence club and multiple equilibria poverty trap → multidimensional sources (and way out) of poverty trap
  - Structural changes (e.g., technological change, economic transition, climate, agro-biological, policy changes) matter to the mechanism and dynamic threshold of poverty traps



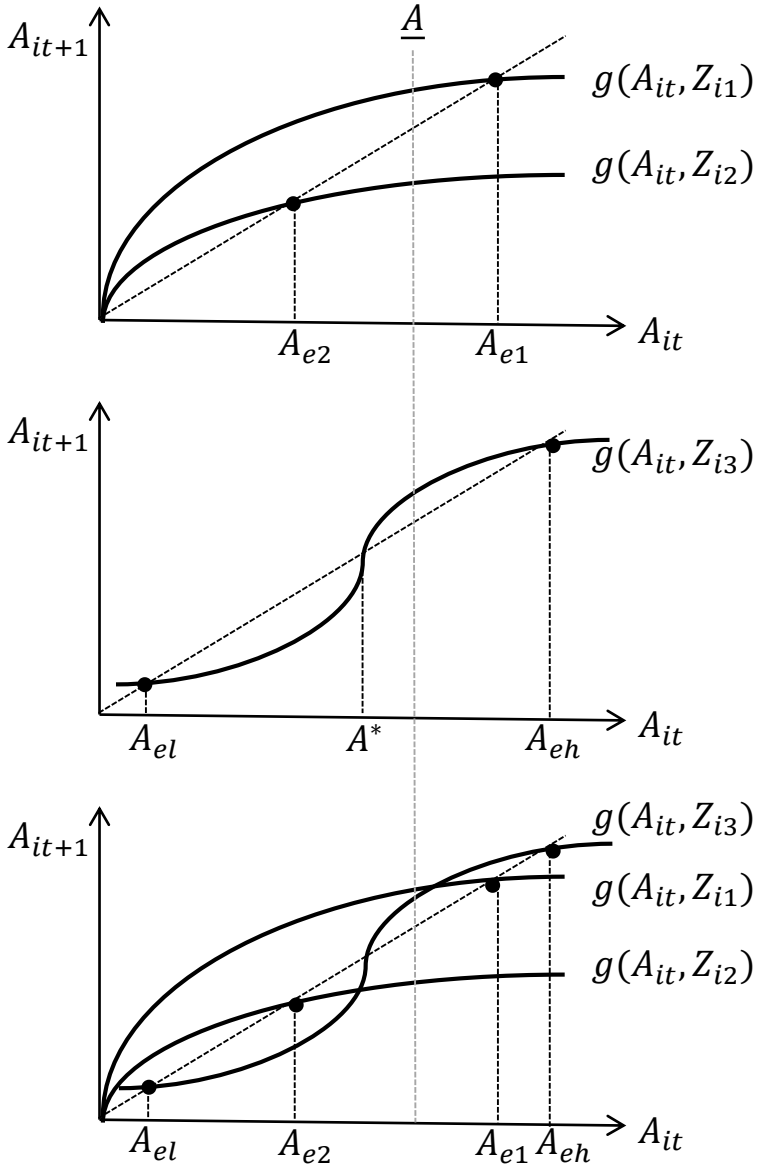
Implications from poverty trap models

- Expected behavior response to shock and intervention under e.g., multiple equilibria poverty trap
  - Asset smoothing around the critical asset threshold in response to shocks
    → Shadow value of asset around A^* is very high
  - Multiplier effects of asset transfer
    → If asset transfers could lift households above A^*
  - Crowding in effect of risk reduction mechanisms
    → If insurance protects households from falling beneath A^*



Implications from poverty trap models

- Heterogeneous interventions and targeting:
  - Asset transfers to lift households with $A_{it} < A^*$ above A^*
  - Social protections to protect households with $A_{it} > A^*$ from falling below A^*
  - Address inferior characteristics Z_{i2} to lift the group's overall dynamic growth path
- Measures of long-term, structural poverty with dynamic asset poverty line A^* or $A^*(\alpha_i)$?
  - $P_\alpha(A^*) = \frac{1}{N}\sum_{i=1}^{q}\left(\frac{A^* - A_{it}}{A^*}\right)$
  - $A^* - A_{it}$ measures asset transfer necessary to enable asset poor to sustainably escape poverty over time
- These require capacity to test poverty trap and identify A^* or $A^*(\alpha_i)$ empirically!



Testing poverty traps empirically

Two main approaches:

- Direct test of the patterns of asset dynamic paths
  - Need panel data that allow us to observe series of assets of households, communities over time
  - Parametrically, semi- or non-parametric regressions
  - Key identification problems
    - How to identify key assets for households or communities of interest?
    - Observables and/or unobservable could be endogenous to initial asset (and mechanism) → need to control for them
    - Those characteristics could also cause conditional convergence with single eq. poverty trap → explore different paths for different observables
- Indirect test of behavior responses only rational with poverty trap
  - Non-experimental data, natural experiments, randomised experiments

Direct test – What assets matters to households?

- Assets are multifaceted: physical capital (productive vs. non-productive), human capital (nutrition, health, education), natural capital (soil, land quality, irrigation)

- Need to construct "asset index" that aggregates these different assets based on their contribution to HH's livelihood

  - Regression approach (other approaches with similar objectives):

    First: $y_{it} = \sum \alpha^j a_{it}^j + \delta_i + \varepsilon_{it}$

    where y_{it} is income or expenditure level relative to poverty line, a_{it}^j are different asset j and δ_i controls for hh-specific fixed effect

    Second: $A_{it} = \hat{y}_{it} = \sum \hat{\alpha}^j a_{it}^j$

    where A_{it} is the asset index (now in poverty line unit) constructed by weighing each asset j by their estimated contribution to HH's income $\hat{\alpha}^j$

  - So the constructed asset index is already in the poverty line unit. Hence, $A_{it} = (<)1$ is associated with level of asset at (below) poverty line

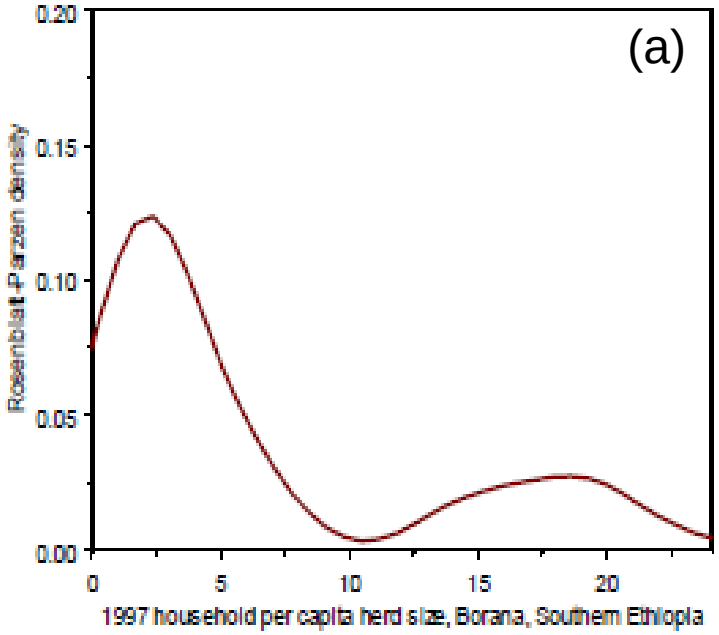
- Overall aggregated index or different indices for different types of capital? (they could have different dynamic paths?)

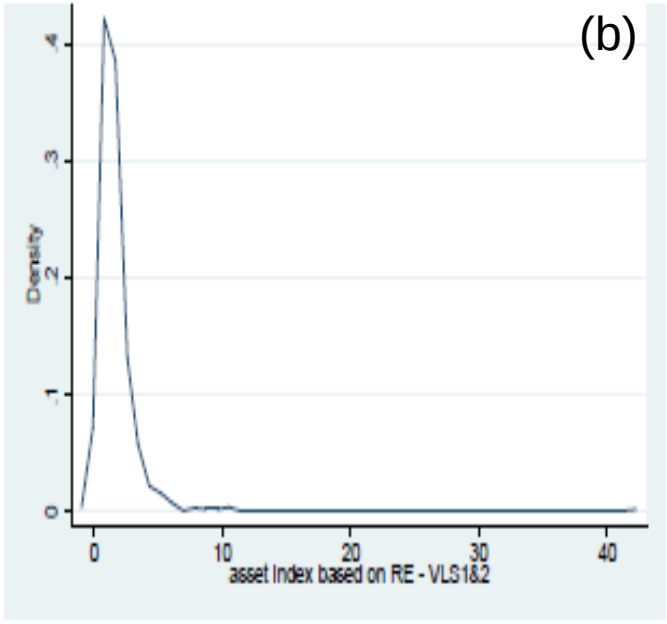
Direct test: Can we just learn from descriptive distribution?

- Nonparametric density estimations of cross sectional, panel data on asset

(a) Lybbert et al. 2004: panel herd data of 55 hhs over 17 years

(b) Naschold 2008: panel data on asset index of hhs in India





- These only provide indirect signal! Depend on underlying stochastic process of the system. Not necessary for the existence of poverty trap, nor sufficient to poverty existence and type of poverty traps!

Direct test – Estimation of asset dynamic paths

- **Parametric regression**: estimate simple linear model with exact specification – higher order polynomial of asset (to capture non-linearity):

$$A_{it} = \beta_1 A_{it-l} + \beta_2 A_{it-l}^2 + \beta_3 A_{it-l}^3 + \beta_4 A_{it-l}^4 + \delta_i + \delta_t + \gamma Z_{it} + \varepsilon_{it}$$

A_{it-l} is the lagged l of asset index, δ_i contorls for unobserved heterogeneities, δ_t controls for time-specific effect, Z_{it} other time-varying characteristics

Testing poverty trap: plot out the estimated relationship, estimated equilibria

Pro: With large enough sample →can control for unobserved heterogeneity

Con: data around the threshold could be small → hard to pick up nonlinearity!

- **Semi- or non-parametric regression**: use spline regression, LOWESS, kernel, and other smoothers to estimate flexible specification guided directly by data

$$A_{it} = g(A_{it-l}) + \gamma Z_{it} + \varepsilon_{it}$$ where $g(\cdot)$ is some non-linear function

Pro: More flexible form, easily pick up non-linear nature of asset dynamics

Con: Required sample size grows exponentially with number of regressors →could fail to control for observed/unobserved heterogeneities

- **Use both methods to arrive at robust results**

Giesbert et al (2012) in homogenous rural Mozambique

- First, constructing asset index (in poverty line unit) from various types of assets

Components of the comprehensive asset index[b,c]			
Landsize	Size of land cultivated by household with annual crops and fallow land per adult equivalent, in hectares	0.43	0.51
Fields	Number of fields	2.46	2.24
Goats*	Number of goats	1.58	1.54
Chicken*	Number of chicken	7.14	4.37
Livestock*	Number of other livestock, in tropical livestock units	0.50	0.55
Cashew trees*	Number of productive cashew trees	9.07	6.67
Coco trees*	Number of coco trees	4.96	6.08
Animal traction*	Household uses animal traction (oxen, donkey, plouw, or oxcart) (d)	0.11	0.09
Large tools*	Household uses large agricultural tools (mill, thresher, or oil press) (d)	0.54	0.61
Fertilizers*	Household uses productivity-enhancing inputs (chemical fertilizer, pesticides, or dung) (d)	0.13	0.09
Vaccination	Household had its livestock vaccinated (d)	0.04	0.04
Extension information	Household receives information on agricultural extension services (d)	0.13	0.15
Price information	Household receives price information (d)	0.34	0.40
Crop variety	Number of crop types grown by household	8.26	7.04
Cotton	Household grows cotton (d)	0.07	0.06
Tobacco	Household grows tobacco (d)	0.03	0.03

Giesbert et al (2012) in homogenous rural Mozambique

- First, constructing asset index (in poverty line unit) from various assets

Components of the comprehensive asset index[b,c]

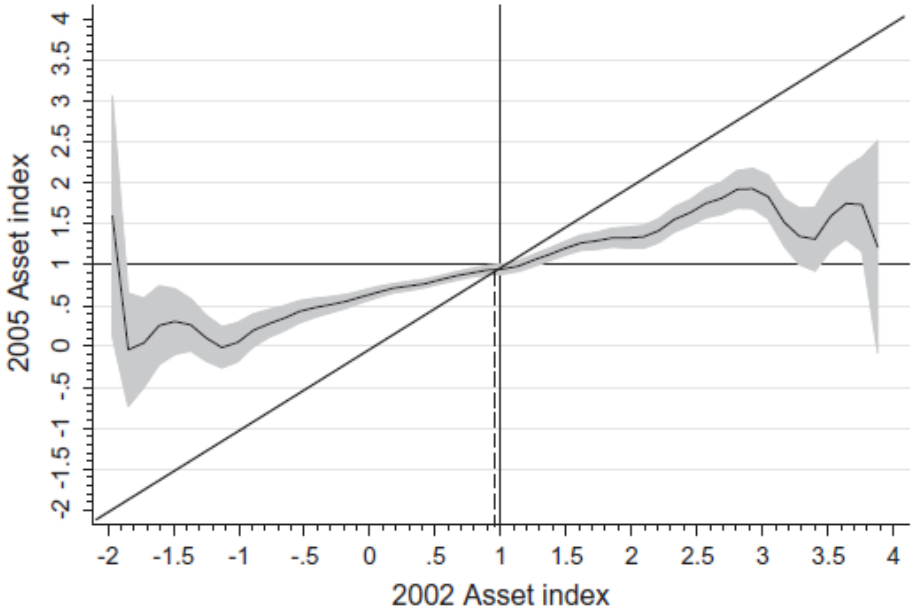
Economically active members	Number of economically active household members	2.31	2.40
Education of HH head	Number of classes completed by head of household	2.22	2.61
Education of HH members	Number of classes completed by other household members, per person	1.58	2.08
Health status	Proportion of healthy household members	0.98	0.95
Craft	Household engages in handcraft or agro-processing activities (d)	0.15	0.16
Nonfarm wage	At least one member has regular nonfarm wage work (d)	0.10	0.14
Membership in association	At least one household member is member of an association (d)	0.03	0.06
Bike*	Household owns a bike (d)	0.23	0.30
Radio*	Household owns radio (d)	0.49	0.53
Table*	Household owns table (d)	0.29	0.34
High-quality wall	Wall of homestead is of high-quality material (d)	0.05	0.06
High-quality roof	Roof of homestead is of high-quality material (d)	0.12	0.15
Latrine	Household has latrine (d)	0.37	0.41
Lantern*	Household owns lantern (d)	0.54	0.46

Giesbert et al (2012) in homogenous rural Mozambique

- Non-parametric estimation (local polynomial regression) of asset dynamic paths

$A_{it} = g(A_{it-l}) + \varepsilon_{it}$ overall and by group characteristics Z_i

Nonparametric estimation of the asset recursion



Nonparametric regression differentiated by groups of households

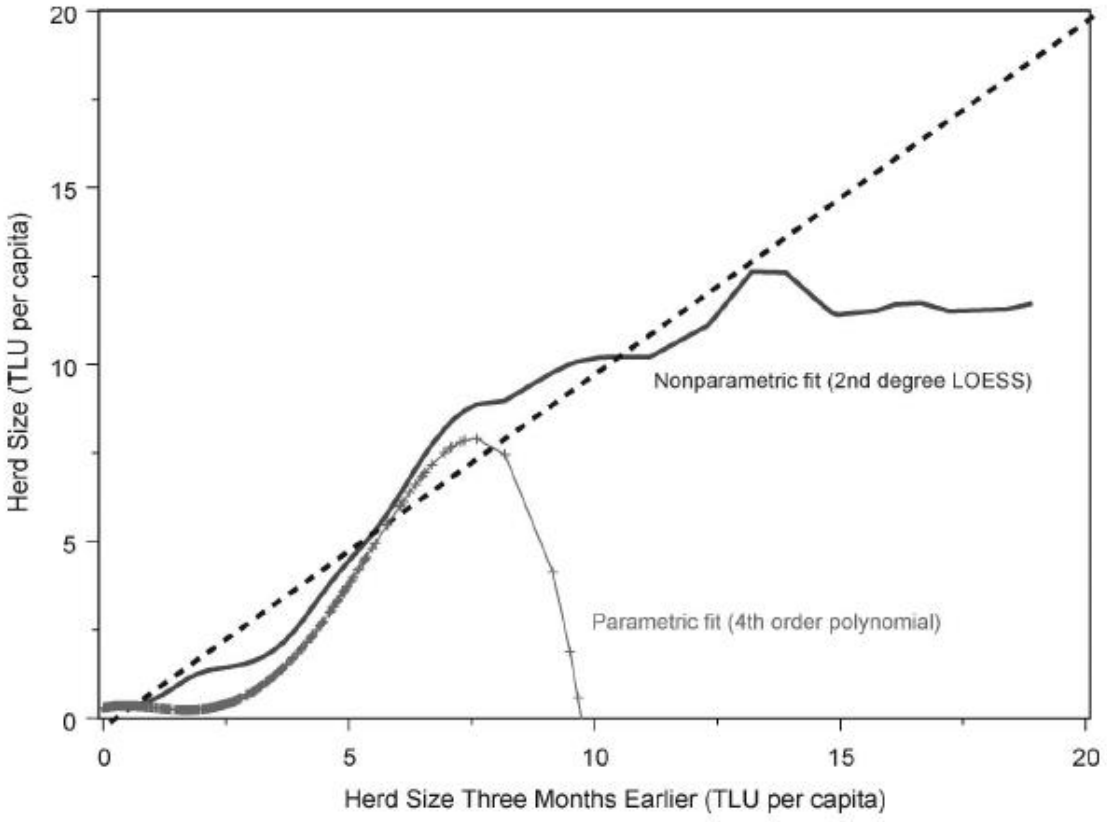
	Mean
Whole sample, nonparametric regression	0.95
Male-headed household	0.95
Female-headed household	0.85
Head or spouse born in community	0.85
Head and spouse born elsewhere	1.15
Head has no education	0.85
Head has primary education	1
Head has secondary education	1.2
Household lives in a district that experienced less than average rainfall in the season 2004/2005	0.95
Household lives in a district that experienced above average rainfall in the season 2004/2005	0.99

→ Overall, HHs tend to converge to single eq. level <1 (slightly below poverty line)

→ Evidence of conditional convergence with lower eq. among female headed HH, local head, HH with no-edu head, HH in below-avg rainfall!

Barrett et al. (2006) in homogenous communities in Kenya

- Construct aggregate livestock unit (TLU) as key asset index
- Parametric: $A_{it} = \beta_1 A_{it-l} + \beta_2 A_{it-l}^2 + \beta_3 A_{it-l}^3 + \beta_4 A_{it-l}^4 + \delta_i + \delta_t + \gamma Z_{it} + \varepsilon_{it}$
- Non-parametric estimation with kernel smoother: $A_{it} = g(A_{it-l}) + \varepsilon_{it}$



- Multiple-equilibria poverty trap evidenced in both approaches
- Those with livestock wealth < 6 TLU tend to converge to the low-level poverty eq. at 1 TLU
- Parametric estimation didn't capture the converge for the non-poor … potentially due to thin data availability!

McKay and Perge (2013) in largely heterogeneous settings

- Parametric: $\Delta A_{it} = \beta_1 A_{it-l} + \beta_2 A_{it-l}^2 + \beta_3 A_{it-l}^3 + \beta_4 A_{it-l}^4 + \delta_i + \delta_t + \gamma Z_{it} + \varepsilon_{it}$

Table 5. Parametric regressions: fourth degree polynomial of asset change over lagged asset index

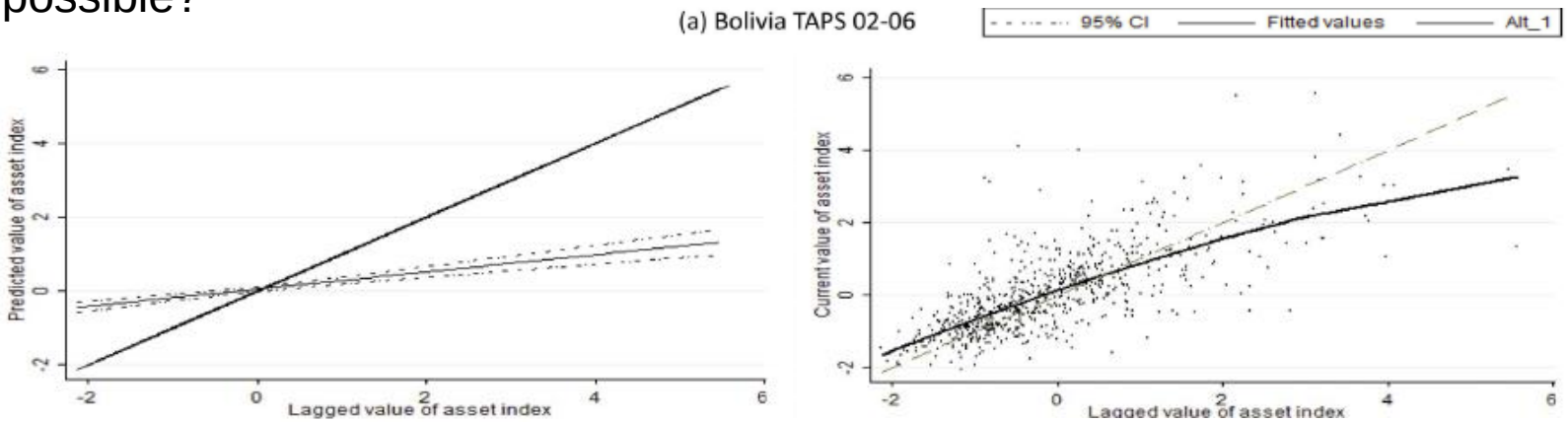
	Bolivia TAPS 02-06	Kagera KHDS 91-94	Kagera KHDS 91-04	KwaZulu Natal KIDS 93-98	Uganda UNHS 92-99	Peru 02-06	Vietnam VHLSS 02-04
Lagged AI	−1.071***	−1.114***	−0.706***	−0.658***	−0.234***	−0.347***	−0.528***
	(0.08)	(0.031)	(0.062)	(0.065)	(0.0602)	(0.0241)	(0.020)
Squared lagged AI	0.0528	0.018	−0.0074	−0.108	0.047	−0.0032	0.184***
	(0.04)	(0.018)	(0.030)	(0.078)	(0.034)	(0.013)	(0.033)
Cubic lagged AI	−0.00366	−0.012**	−0.012	0.067**	−0.019	−0.028***	−0.120***
	(0.02)	(0.005)	(0.018)	(0.027)	(0.023)	(0.0077)	(0.022)
Fourth degree lagged AI	−0.00155 (0)	0.0013***	0.0017	−0.0053**	0.003	0.0060***	0.0142***
		(0.0004)	(0.0027)	(0.0024)	(0.0072)	(0.0021)	(0.0037)
Age hh head	0.0449**	−0.012	−0.025***	0.010	0.0102	0.006	0.0101**
	(0.02)	(0.04)	(0.0058)	(0.0144)	(0.011)	(0.006)	(0.0044)
Squared age hh head	−0.000449** (0)	0.00016	0.00024***	−4.6e-05	−7.4e-05	−0.00011*	−0.00012***
		(0.0003)	(6.8e-05)	(0.00013)	(0.0001)	(6.0e-05)	(4.0e-05)
Household (hh) size	0.280***	0.104***	0.131***	0.055***	0.067***	0.0534***	0.0413***
	(0.03)	(0.012)	(0.0133)	(0.0079)	(0.0083)	(0.0057)	(0.0052)
Education hh head	0.02	0.0504***	0.0474***				
	(0.03)	(0.013)	(0.0066)				
Dependency ratio		−0.281*	−0.108	0.143		−0.781***	
		(0.148)	(0.168)	(0.173)		(0.0515)	
Constant	−2.902***	−0.720	−0.708***	−0.848**	−0.408	0.248*	−0.586***
	(0.58)	(0.647)	(0.136)	(0.407)	(0.295)	(0.148)	(0.117)
Observations	580	2132	598	1062	1070	3943	4092
Number of hhid	176	742				2096	
Fixed-effect/OLS	Fixed-effect	Fixed-effect	OLS	OLS	OLS	Fixed-effect	OLS

Notes: Standard errors in parentheses ***p < 0.01, ** p < 0.05, {*} p < 0.1. These regressions were all estimated including dummy variables for each wave set (minder terms); these coefficients are not reported here for conciseness.

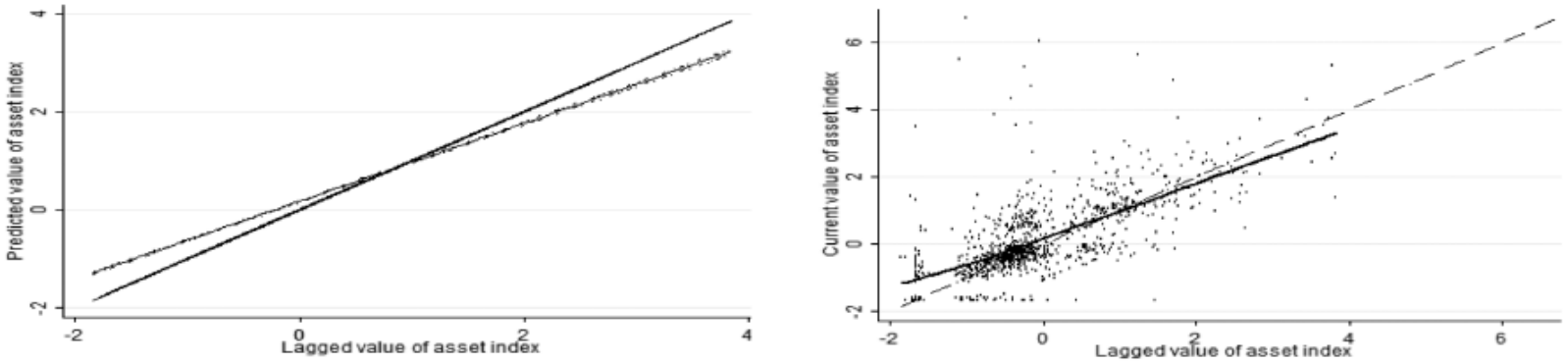
McKay and Perge (2013) in largely heterogeneous settings

- Both plots of parametric and non-parametric (LOWESS) estimations both results in comparable single poverty trap eq. → these HHs all tend to be trapped?
- Are settings too spatiotemporal heterogeneous? Conditional convergence possible?

(a) Bolivia TAPS 02-06



(e) Uganda UNHS 92-99



What can we learn from these existing literatures?

- Different estimation techniques could lead to slightly different results
  - → Using different techniques for robustness check!

- Single eq. trap found with largely aggregated asset index in largely heterogeneous settings while nice multiple-eq trap found in specific asset in well-confined homogenous settings (e.g., pastoral communities in N. Kenya)

  - → Different growth paths for different group characteristics? (exploring how immutable characteristics cause conditional convergence toward poverty more directly)

  - → Different growth paths for different "type" of asset (physical vs. human vs. natural capital) … they can have different growth paths, more specific policy implications can also be made

  - → Different growth paths for different time period? (changes in market and non-market conditions over time could alter growth paths and mechanisms)

  Testing the source and patterns of poverty trap directly could be challenging!

Indirect test – Behavior responses with poverty trap

- Estimated behavior responses that could be rational only in the presence of poverty trap serve as an indirect test of existence of poverty trap

- **Using (non-experimental) panel data**

  Ex) Asset smoothing behavior around critical threshold

  - Carter and Lybbert (2012) – panel households in Burkina Faso
  - Hoddinott (2006) – panel households in Zimbabwe

- **Using natural experiment data**

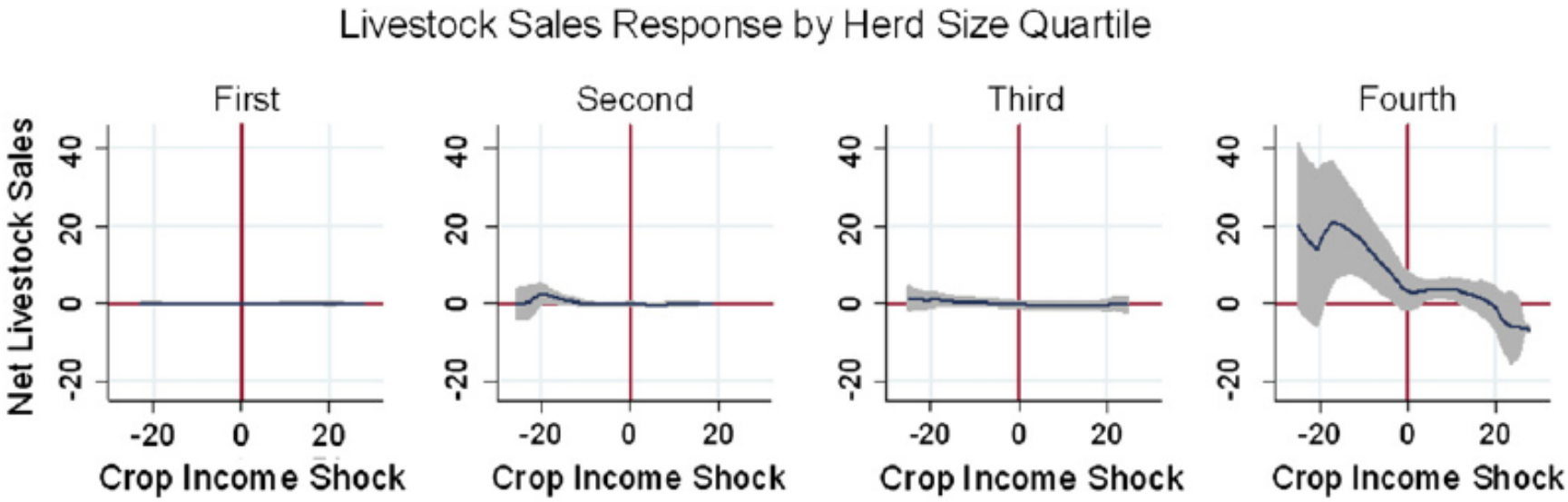
  - Keswell and Carter (2011) found multiplier effects of S. African land reform
  - Carter et al. (2007) found long-term welfare losses from natural disasters

- **Using randomised experiment**

  - Barrett et al. (2013), Carter et al. (2012), Chantarat et al. (2011) conducted randomised experiment to study multiplier impacts of extending credit and insurance to vulnerable pastoral HHs in Kenya

Carter and Lybbert (2012) – Asset smoothing with trap

- In rural Burkina Faso, livestock is the key asset, which HHs also use to buffer shocks in order to smooth consumption → livestock sale to cope with shocks
- If threshold-based poverty trap exists with a critical threshold L^*, then we should expect those below L^* to try to smooth their livestock asset and NOT sale them off to cope with shocks
- Rough evidence → the poor tend not to use livestock sale to cope with negative shocks



Carter and Lybbert (2012) – Asset smoothing with trap

- A threshold estimation to identify L^* that splits sample into 2 livstk sale regimes

$$Netlivestoksale_{it} = \begin{cases} \beta_1^h y_{it}^P + \beta_2^h y_{it}^T + \beta_3^h y_{it}^U + \varepsilon_{it} & if\ L \geq L^* \\ \beta_1^l y_{it}^P + \beta_2^l y_{it}^T + \beta_3^l y_{it}^U + \varepsilon_{it} & if\ L < L^* \end{cases}$$

  - If threshold-based poverty trap exists with a critical threshold L^* → we should see evidence of asset smoothing for those with $L < L^*$ → Ha: $\beta_2^h < \beta_2^l < 0$

	Net Livestock Sales ('000 CFA)					
	Pooled		Below L^*		Above L^*	
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
Without Household Fixed Effects (L^*=15.5 TLU)						
Permanent income ('000 CFA)	-0.11	-0.08	-0.038	-0.032	-0.57	-0.6
	(0.002)	(0.004)	(0.029)	(0.019)	(0.017)	(0.014)
Transitory income	-0.12		-0.026		-0.89	
	(0.063)		(0.22)		(0.005)	
Transitory + Unexplained		-0.16		-0.033		-0.94
		(0.027)		(0.11)		(0.009)
Unexplained income	-0.21		-0.041		-1.03	
	(0.024)		(0.081)		(0.11)	
Constant	4.3	3.48	0.54	0.38	23.5	24.2
	(0.000)	(0.001)	(0.21)	(0.22)	(0.000)	(0.001)
Observations	371	371	313	313	58	58
R^2	0.03	0.02	0.04	0.03	0.11	0.11

Confirming evidence of asset smoothing for those with livestock below the estimated $L^* = 15.5$

Livestock sale explains up to 94% of income shocks among those with $L > L^*$

Carter et al. (2007) – Long-term effect of shocks with trap

- If a threshold-based poverty trap exists, Hurricane Mitch in Honduras could place long-term effect if it knocked HH's asset to the level below A^*
- A threshold estimation to find A^* that splits sample into 2 post-Mitch growth regime:

$$postMitch\ asset\ growth_i = \begin{cases} \beta_1^h A_{ipostMitch} + \beta_2^h Z_i + \varepsilon_{it} & if\ A_{ipostMitch} \geq A^* \\ \beta_1^l A_{ipostMitch} + \beta_2^l Z_i + \varepsilon_{it} & if\ A_{ipostMitch} < A^* \end{cases}$$

Table 4. *Threshold poverty trap estimates—Honduras*

Explanatory variables	Low regime $A_s < 244$	High regime $A_s > 244$
Core growth & convergence		
Post-shock initial assets, A_s (log)	−0.65**	−0.04**
Asset loss		
Housing loss	−1.46**	−0.10
Mediating factors		
Labor market access, L	0.27	0.01
Capital market access, K	−1.19**	0.11**
Demographic & other controls		
Age of household head	−0.01	0.02
Squared age of head	0.00	−0.00
Post-Mitch inheritance (equals 1 if received)	1.95**	0.48
Constant	6.41**	0.23
Provincial dummies	Included	Included
Observations	43	727
R^2	0.62	0.22
Threshold interval estimate (95% interval)	235–249**	

Carter et al. (2007) – Long-term effect of shocks with trap

- For those with post-Mitch asset below the estimated threshold $A^* = \$244$, their asset growth decline sharply toward zero at the potential low-level eq. of \$225, while those who end up above A^* tend to enjoy stabilize growth!

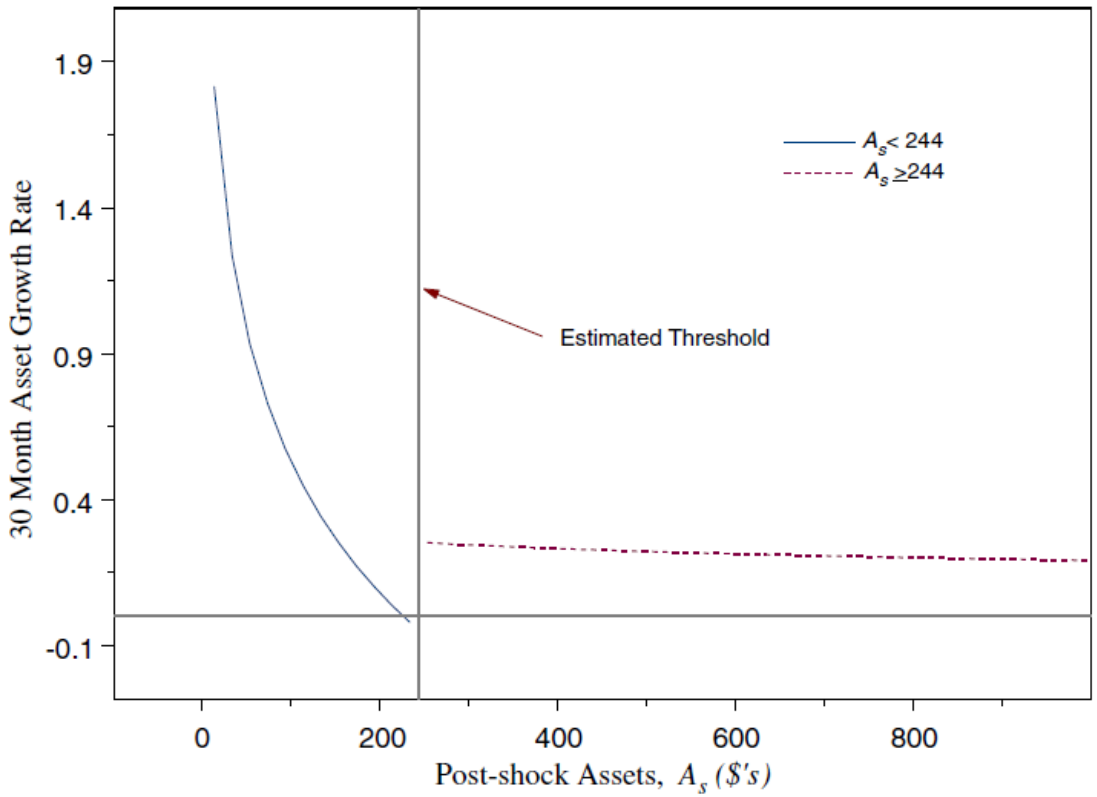


Figure 3. *Post-Mitch poverty trap—Honduras.*