

The existence of Poverty Traps: Old Question - New Answer. Evidence from Rural Mexico

George Washington University Seminar

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Plan

- 1 Introduction
- 2 The Data
- 3 Evidence of Poverty Traps
- 4 Conclusion

Motivation

- Poverty associated with informational/market failures that affect the poor more severely
- Poverty traps as a major cause of persistent inequality and a serious limitation to growth
- Panel of poor rural HH in Mexico for the last decade
 - Identify their potential for asset accumulation
- But, poverty traps may hinder this process

Micro-based Literature

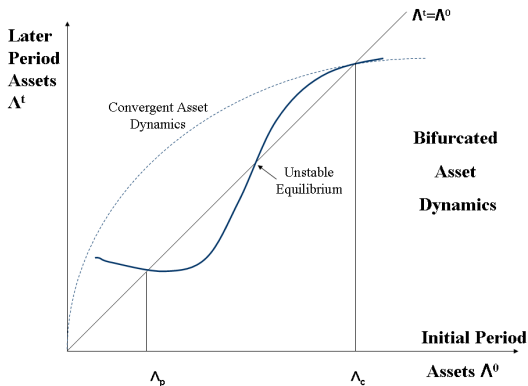
- Credit constraints prevent the poor from starting up investment projects or accumulating human capital
- The initial wealth distribution plays a determinant role in the development path (Banerjee-Newman, 1993) (Piketty, 1997; Aghion-Bolton, 1997)
- Here, partial equilibrium accumulation dynamics: Galor-Zeira (1993) where dynasties accumulate (human capital) independently from one another and may fall into poverty traps
- On the other hand.... Macro-based poverty traps: aggregate non-convexities and aggregate coordination failures

Empirical Evidence on Poverty Traps: what we know so far

- Bifurcated asset dynamics in South Africa (Adato, Carter, May 2006)
 - Qualitative data: social capital & networks
- Long term Effects of Short term Shocks (Carter, Little, Moguees 2007)
 - Honduras & Ethiopia
 - In the wake of environmental shocks
 - Adopt costly coping strategies
- Asset or consumption smoothing in rural Zimbabwe (Hoddinott, 2006)
 - Temporary income shocks & permanent consequences across and within HH
 - Impact of shocks by levels of asset holdings and by individual level

Multiple vs. Single Equilibrium Asset Growth Paths

- Threshold below which unable to accumulate assets
- Converge to a low asset/low income equilibrium
- Large positive shocks or an improvement in the returns



The existence of a poverty trap

- Poverty trap arises when:
 - ① Locally increasing returns over a range of levels of asset
 - ② Presence of a market failure: high rates of return for Mexican Microenterprises but severe capital constraints (Mckenzie and Woodruff, 2006)
- If diminishing marginal returns over all levels \rightarrow dynamic path as a globally concave curve
 - If this growth regime holds \rightarrow only one equilibrium exists

My contribution

- Empirical test for poverty traps, through several empirical strategies
 - Non-parametric and parametric
 - Calculation of the stable and unstable equilibrium
- Find differences in dynamic paths by exploring heterogeneity across households
 - Divide low-ability poor and high-ability poor

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The data

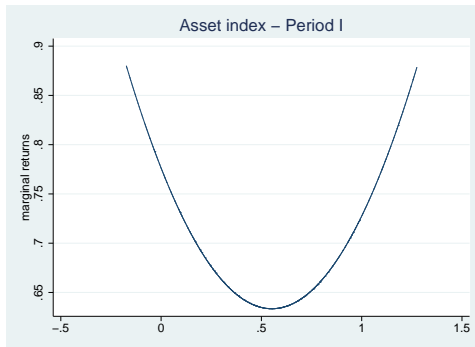
- New data available from a panel of poor HH in rural Mexico
 - 10% random sample of poor rural localities
 - Representative of the extreme rural poor
 - Panel of 3 time observations, 1996 to 2006
 - Around 4,400 households from 190 rural localities

	% below the PL
Period I	76
Period II	78
Period III	66

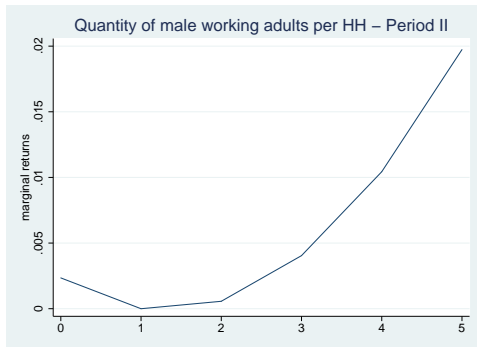
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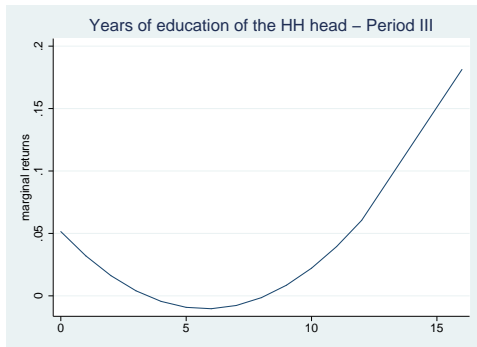
Marginal Returns: asset index



Marginal Returns: labor force



Marginal Returns: education



Empirical investigation of the welfare dynamics

- Uni-dimensional measure requiring:
 - ① Either complete knowledge of the market value of each asset,
 - ② or the construction of an asset index with two possible strategies:
 - Factor Analysis
 - Regression analysis (monthly per capita income of 47 US\$)

Empirical Strategy I : Factor Analysis

- Asset index using factor analysis
 - ① Maintain initial weights to the following years
- Three categories:
 - HH durables (ownership of radios, TV, refrigerator, gas stove, washing machine and vehicules)
 - Housing quality (irrigation to land, electricity earthfloor, roof weak, animals, owned house, use of agricultural land)
 - Stock of human capital (years of education of the hh head)

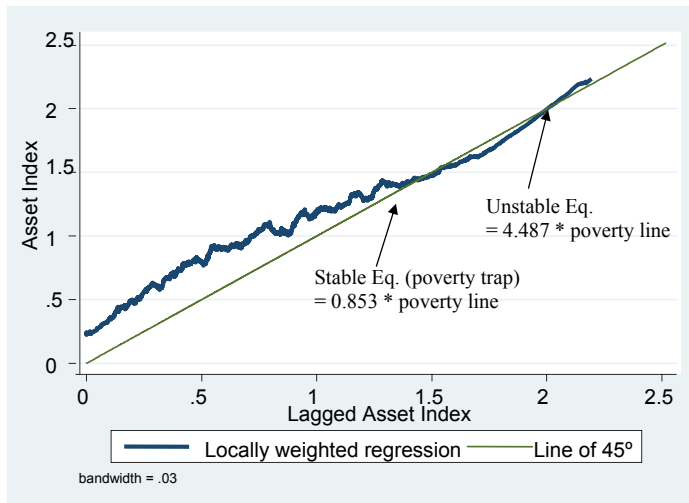
Empirical Strategy II : Regression Analysis

- Prices often unknown or difficult to determine, methodology used by Adato et al. (2004); McKenzie (2005).
- HH income regressed on HH's assets, its square and cube, along with interactions
- HH asset index is the HH income predicted

$$y_{i,t} = \beta_0 + \beta_1 \mathbf{x}_{i,t} + e_{i,t}$$

- $y_{i,t}$ the per-capita income by HH
- $\mathbf{x}_{i,t}$ a vector of HH characteristics

Non-parametric Estimation of Asset Dynamics 1997-2006



Key findings

- HH can be converging to:
 - ① The poverty trap equilibrium (if asset index < 1.39 or 0,8 PLUs = a monthly per capita income of 38 US\$)
 - ② Towards the stable equilibrium or the *low* equilibrium (if $1.39 < \text{asset index} < 2.1$)
 - ③ To a higher equilibrium (if asset index > 2.1 or 4,4 PLUs = a monthly per capita income of 199 US\$)

Assets Corresponding to the Cut-Off Levels of the Index:

Variable	Index = 1,39	Index = 2,1
years of education of the hh head	6	16
irrigation to land	1	1
electricity	1	1
earthfloor	0	0
roof weak	0	1
animals	0	0
owned house	1	1
use of agricultural land	0	0
Ownership of:		
refrigerator	0	1
gas stove	1	1
radio	1	1
TV	1	1
washing machine	0	1
vehicules	1	1

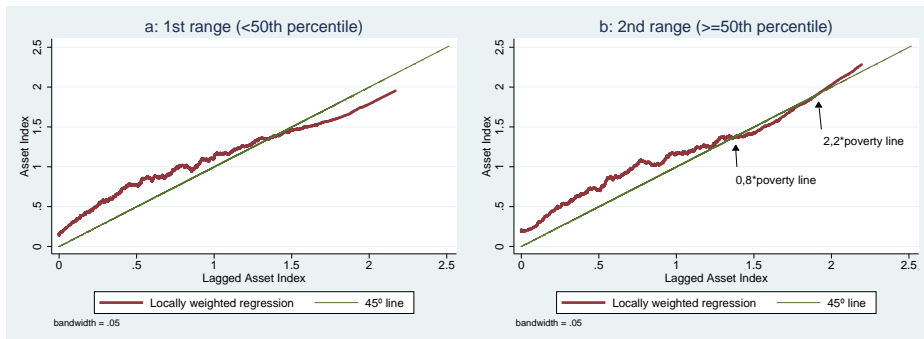
Alternative Strategy: Predict Unobserved Heterogeneity

- A fixed effect in the regression of income on assets is predicted $\hat{\eta}_i$

$$y_{i,t} = \beta_0 + \beta_1 \mathbf{x}_{i,t} + \eta_i + e_{i,t}$$

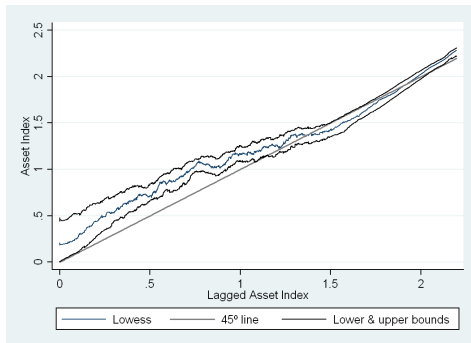
- η_i time-invariant HH level unobserved heterogeneity
- Split the distribution function of the FE in two cut-offs & re-run lowess estimator

Low and High *ability* HH



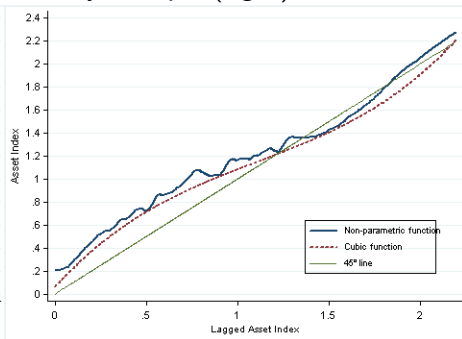
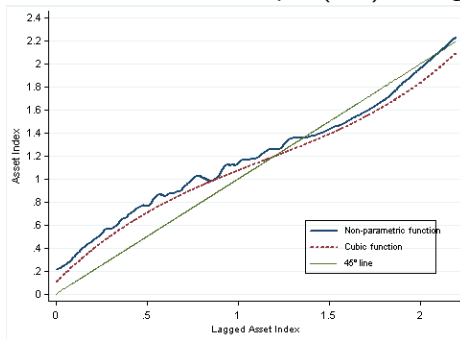
2,2 PLUs corresponds to a monthly per capita income of 98 US\$

Confidence Intervals

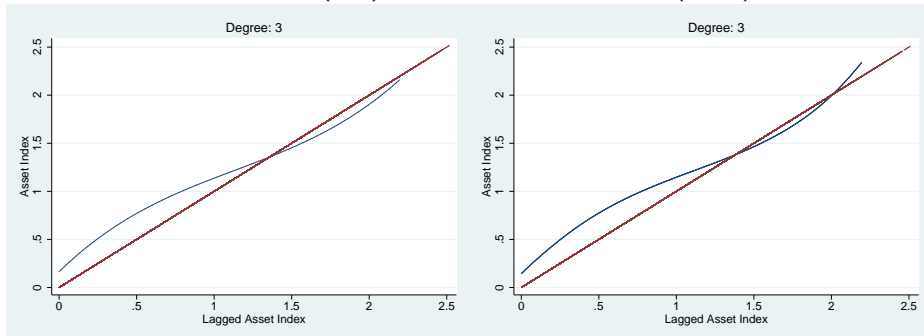


Linear Partial Regressions

Full Sample (left) & *High-ability* Sample (right)

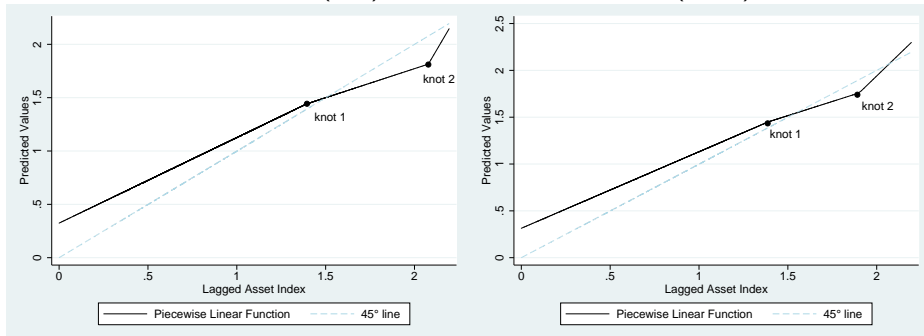


Kernel-weighted Local Polynomial Smooth

Full Sample (left) & *High-ability* Sample (right)

Spline Regressions

Full Sample (left) & *High-ability* Sample (right)



Nonlinear Asset Dynamics - parametric strategy

Generating process of the asset position is:

$$A_{i,t}^* = \beta_0 + \beta_1 A_{i,t-1}^* + \beta_2 (A_{i,t-1}^*)^2 + \beta_3 (A_{i,t-1}^*)^3 + \alpha_i + \mu_{i,t} \quad (1)$$

If the asset index map is over the 45° line,
non convexities doesn't imply PT.

Condition that the derivative:

$$g_i(A_{i,t-1}^*)|_{A_{i,t}^*=A_{i,t-1}^*} > 1 \quad (2)$$

Must be evaluated in the roots of the equation (1)

GMM Estimation of equation (1)

Three specifications (linear, quadratic and cubic):

β_1	-0.133 (-2.74)***	-1.006 (-11.12)***	-0.671 (-7.39)***
β_2		0.927 (14.60)***	0.791 (5.38)***
β_3			-0.092 (-1.09)***
Observations	8,730	8,730	8,730

The map of assets cuts the line of 45° from below

Lineal specification		Quadratic specification		Cubic specification	
Solution (1)	Derivative (2)	Solution (1)	Derivative (2)	Solution (1)	Derivative (2)
0.74	-0.133	1.53	1.824	2.19	1.459

(1) Solution of equation (1).

(2) Derivative of the polynomial evaluated in the solution.

Plan

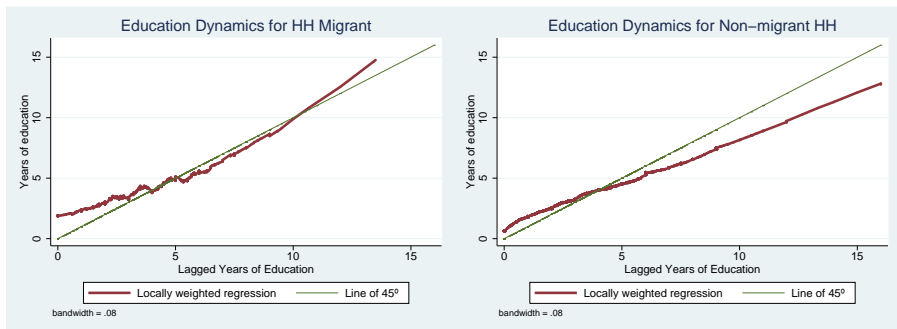
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Concluding remarks

- Empirical evidence of multiple equilibria
 - Substantial minimum level of asset holdings is necessary to escape from the low equilibrium
 - Heterogeneity across HH: *intrinsic characteristics* results: a particular intervention to change the fundamentals
- Results
 - Stable equilibrium around a low level of 80% PL
 - Second equilibrium: we suggest that the HH will converge to the higher equilibrium (slope >1)

Thank you!

HH Years of Education Dynamics, by type of HH



Basic Regressions: Assets

$$A_{it} = \alpha_1 A_{i,t-1} + \alpha_2 A_{i,t-1}^2 + \alpha_3 A_{i,t-1}^3 + \alpha_4 A_{i,t-1}^4 \quad (3)$$

VARIABLES	(1) Animals	(2) Land
Lag	0.510*** (0.0413)	0.242*** (0.0661)
Lag (squared)	-0.0600*** (0.0146)	-0.00747** (0.00319)
Lag (cubic)	0.00278** (0.00122)	6.98e-05* (3.80e-05)
Lag (4th degree)	-4.45e-05 (2.88e-05)	-1.94e-07 (1.19e-07)
Constant	0.274*** (0.0116)	2.119*** (0.199)
Observations	8730	8730
R ²	0.092	0.071

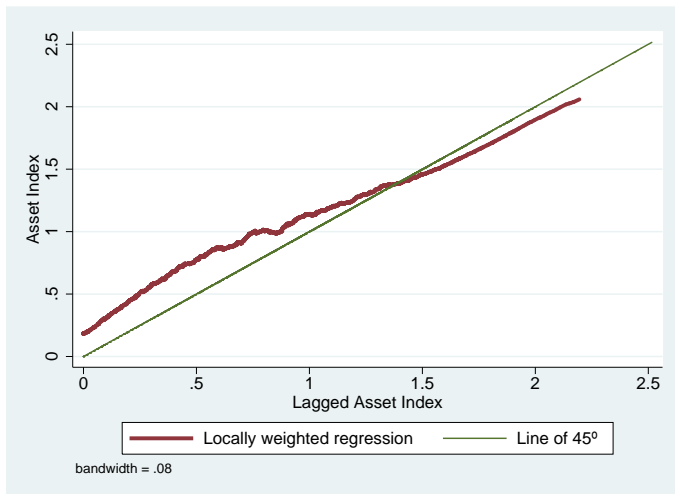
*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses

Asset Dynamics for HH with Migrants

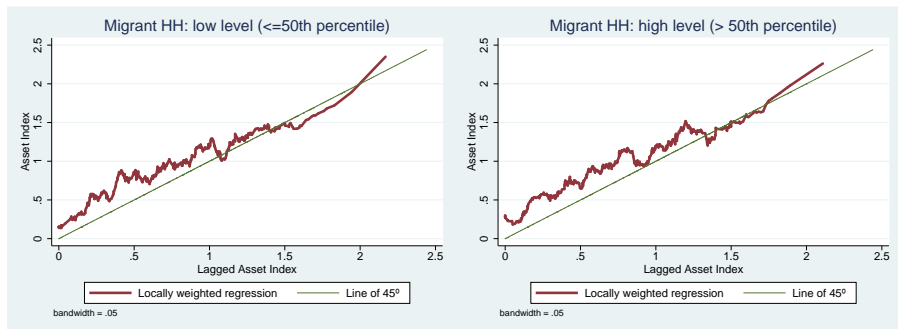


Remittance income corresponds to 0,72 PLUs

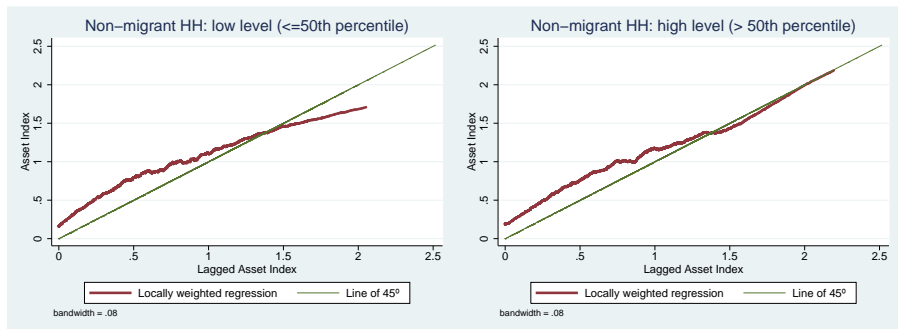
Asset Dynamics for HH without Migrants



Asset Dynamics for HH with Migrants, by level of ability

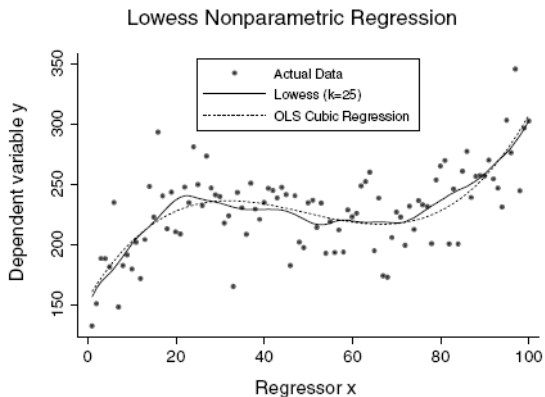


Asset Dynamics for HH without Migrants, by level of ability



Nonparametric regression curve using Lowess, as well as an OLS cubic regression curve

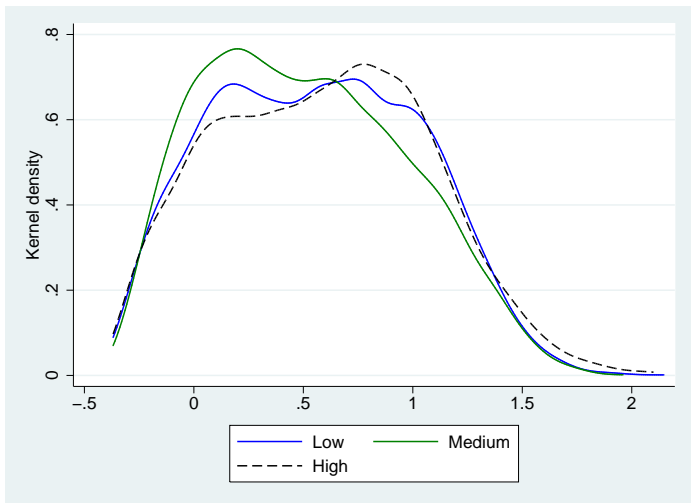
(A. Colin Cameron and Pravin K. Trivedi; Microeconometrics - Methods and applications)



Three-wave-average incomes and their compositions, by wave 1 hh type

	All	Head indigenous	Female head	Work adults per hh > 2	Head age 65+	Hh diversif. > 2
Total hh income	21,245.17	17,564.39	15,244.07	27,894.59	15,653.60	28,638.77
<i>Source as % of hh inc.:</i>						
Agricultural	34.4	34.8	25.2	36.0	30.1	30.5
Non-agricultural	28.4	25.1	30.1	29.1	20.7	35.6
Self-employment	13.2	17.5	15.0	12.2	15.1	13.7
Transfers	15.7	12.0	22.1	15.4	25.8	9.3
Other	8.3	10.6	7.7	7.3	8.3	10.8

Asset index by level of ability



Years of education of the HH head by level of ability

