

Assets, shocks and poverty traps in rural Mozambique

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Context: Civil war, agriculture, poverty

- 16 year civil war ended in 1992
- legacy of the war:
 - death and displacement
 - destruction of assets and infrastructure
 - interruption of markets
 - impact on traditional institutions
- 4% annual GDP growth at the macro-level since the end of the war, but debated whether rural livelihoods improved similarly
- 83% of population living in rural areas; small-scale agriculture
- poverty remains high; frequent occurrence of climate shocks

Research Question

What are the (medium-term) welfare dynamics in rural Mozambique?

- Does a poverty trap exist?
- How do shocks and applied coping strategies relate back to observed accumulation dynamics?

Outline of presentation

approach

- conceptual framework
- data
- descriptive evidence
- estimation strategy

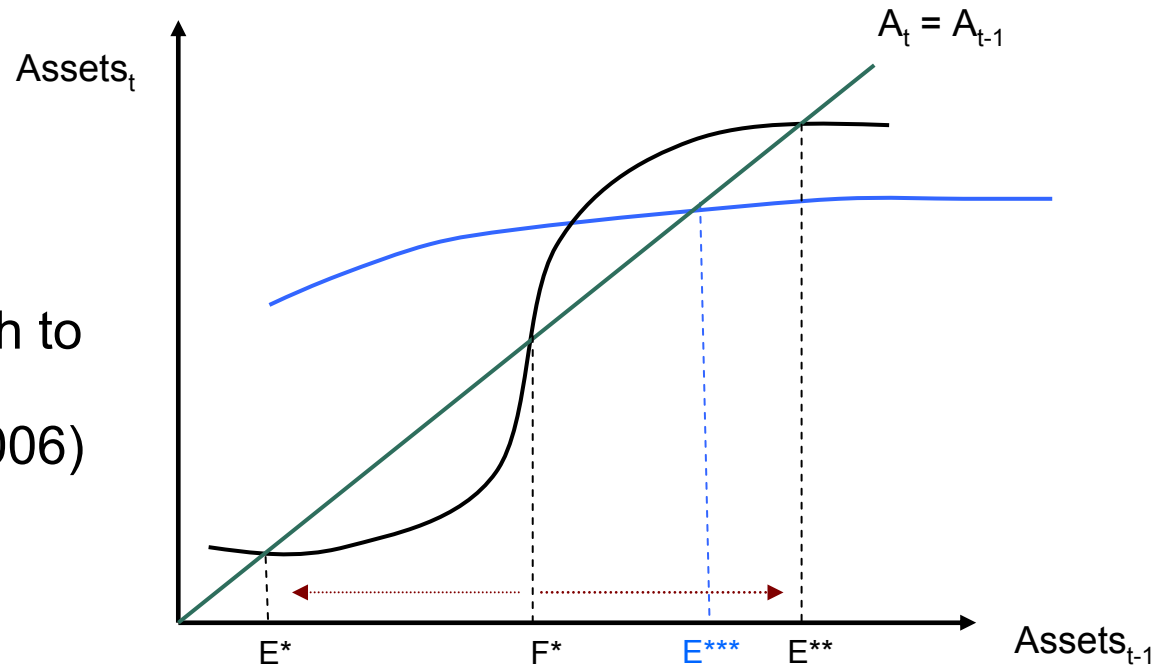
results

- results I: evidence on the poverty-trap hypothesis
- results II: the role of shocks and coping behavior

conclusion

Framework

Asset-based approach to poverty
 (e.g. Carter/Barrett 2006)



Evidence so far:

- multiple equilibria and poverty trap
 (Lybbert et al. 2004, Adato et al. 2006, Barret et al. 2006)
- single stable equilibrium
 (Naschold 2009, Barrett et al. 2006, Antman/McKenzie 2007)
- different techniques employed: (semi-)parametric, non-parametric
- different stock variables: income, consumption, assets

Data and variables of interest

Trabalho de Inquérito Agrícola household panel survey

- nationally representative for rural households (<50 ha land)
- 2 panel waves (2002 & 2005), N=4,104
- income components: crop production, livestock, wage work, self-employment, remittances
- carefully measured asset variables: productive capital, human capital, non-productive capital
- Sample attrition
 - 16,4%
 - Diagnostic tests: some indication that attrition bias cannot be ignored
 - Inverse probability weights (from probit regression on attrition variable) included in analysis

Descriptive statistics: Income mobility

Table 1: Mobility Across Quintiles of Income/pAE (in percent)

		Income per adult equivalent (2005)					Total
		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	
Income per adult equivalent (2002)	Quintile 1	0.33	0.26	0.19	0.13	0.06	1
	Quintile 2	0.24	0.25	0.24	0.16	0.08	1
	Quintile 3	0.18	0.25	0.24	0.21	0.09	1
	Quintile 4	0.13	0.21	0.24	0.26	0.12	1
	Quintile 5	0.12	0.13	0.18	0.25	0.30	1
	Total	0.21	0.22	0.22	0.20	0.13	

N=4104

Estimation procedure

(1) Define livelihood measure with poverty lines

- food poverty lines for 6 rural regions (other sources)
- construct measure: income as percent of the poverty line

(2) Construct livelihood-weighted asset index

- estimate livelihood as function of assets:

$$\lambda_{it} = \sum_{j=1}^J \beta_j(A_{it}) A_{ijt} + \varepsilon_{it}$$

- calculate asset index from fitted values

Estimation procedure, continued

(3) Assets in the livelihood regression:

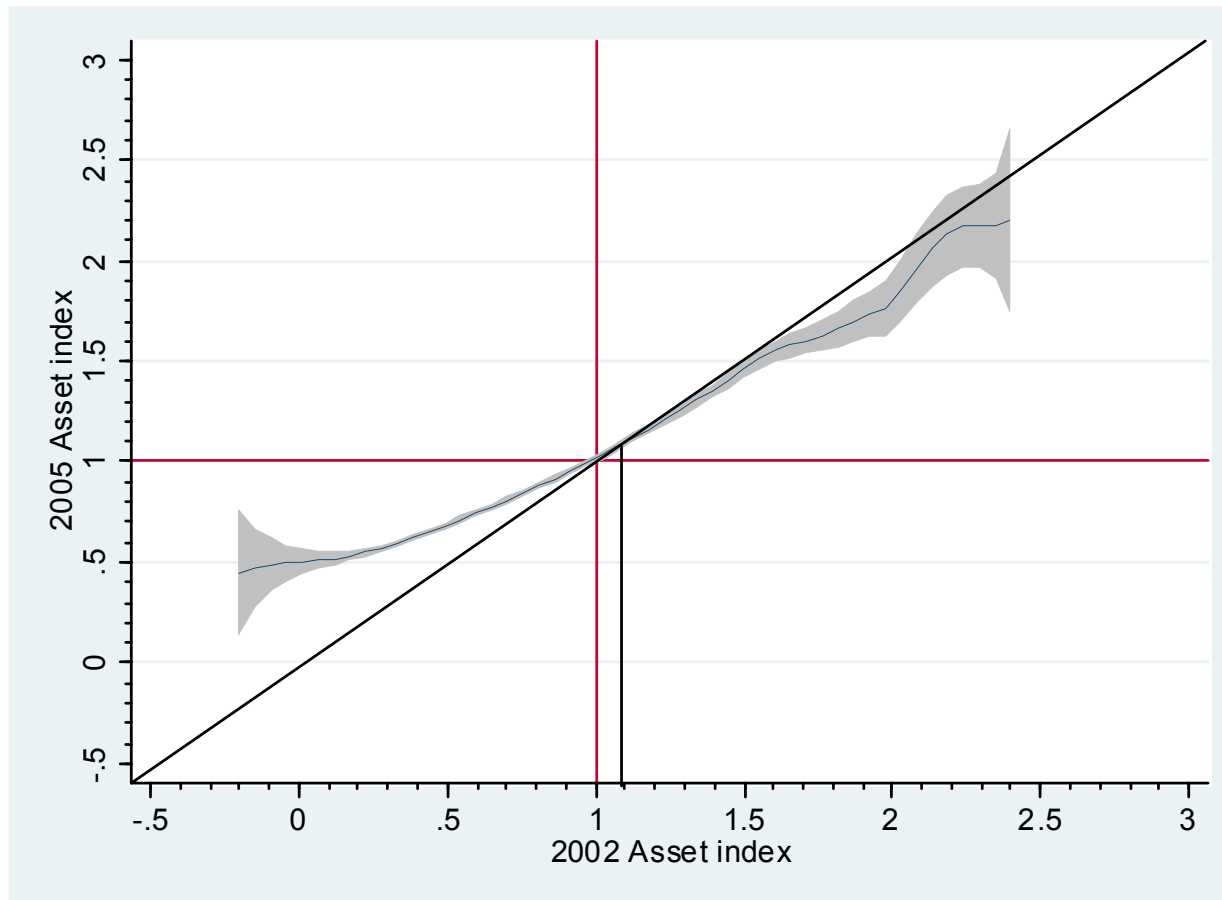
- **Productive assets:** Landsize, number of owned fields, livestock, trees, agricultural tools, bike
- **Human capital:** number of economically active HH-members, level of education, health status, handcraft/processing activities
- **Agricultural expertise:** diversification of crops, membership in agricultural associations, extension information, price information, livestock vaccinated, productivity enhancing inputs
- **Non-productive assets:** radio, table wall material, roofing material, latrine, lantern

(4) Estimation of asset dynamics:

- non-parametric techniques (bivariate relationship)
- parametric techniques (including controls, shocks, coping variables)

Results I : Non-parametric regression of asset dynamics

(4) Bivariate regression: $A_{it} = f(A_{it-1}) + \varepsilon_{it}$



Results II: Parametric regressions

(4) Multivariate regression:

$$\Delta A_i = \beta_1 A_{it-1} + \beta_2 A_{it-1}^2 + \beta_3 A_{it-1}^3 + \beta_4 A_{it-1}^4 + \beta_5 H_i + \beta_6 C + \beta_7 \Theta_i(A_{it-1}, K, L, F) + \varepsilon_i$$

Determinants of asset growth

- Initial assets and its fourth degree polynomial at the baseline period
- Household baseline characteristics
- Community baseline characteristics
- 2004/2005 severe drought as a covariate income shock
- Drought is allowed to vary with credit market access (K), labor market conditions (L) and availability of unused land for farming in community (F)

Extension

- Including coping strategies applied by a sub-sample that suffered food insecurity
- Reduction of asset base; asset-neutral strategies

Results II: Parametric regressions (OLS)

	(1)		(2)		(3)	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
ASSETS02	-0.46	(-16.18)***	-0.31	(-4.43)***	-0.51	(-9.86)***
ASSETS02^2	0.25	(4.66)***	0.27	(5.04)***	0.35	(4.31)***
ASSETS02^3	0.01	(0.09)	-0.02	(-0.26)	0.19	(1.26)
ASSETS02^4	-0.06	(-0.77)	-0.05	(-0.63)	-0.26	(-2.33)**
AGEHEAD	-0.00	(-0.42)	-0.00	(-0.33)	0.00	(1.36)
AGEHEAD2	0.00	(0.32)	0.00	(0.30)	-0.00	(-0.80)
FHEAD	-0.06	(-4.80)***	-0.06	(-5.09)***	-0.06	(-3.75)***
HHSIZE	0.00	(1.73)*	0.00	(1.66)*	0.00	(0.41)
BORN	-0.02	(-1.05)	-0.02	(-1.05)	-0.04	(-1.50)
IRRIG	0.06	(8.89)***	0.05	(8.77)***	0.07	(6.58)***
NEWCROPINDEX	0.05	(5.51)***	0.04	(5.34)***	0.04	(3.79)***
FIRM	0.02	(0.86)	0.02	(0.72)	-0.01	(-0.21)
MARKET	0.02	(1.33)	0.02	(1.45)	0.01	(0.37)
ELECTR1	0.07	(4.43)***	0.07	(4.16)***	0.06	(2.30)**
PAVEDROADa	0.02	(1.21)	0.02	(1.27)	0.03	(1.13)
CROPINDEXC	0.00	(0.21)	0.00	(0.25)	-0.00	(-0.60)
AGRO1	0.28	(19.38)***	0.11	(1.79)*	0.28	(16.11)***
AGRO2	-0.01	(-0.12)	-0.02	(-0.39)	0.16	(1.88)*
IDATE	-0.00	(-2.04)**	-0.00	(-2.07)**		
DROUGHT	0.03	(1.81)*	0.02	(0.89)		
ASSETS02 [†]			-0.17	(-2.61)***		
CREDIT [†]			0.10	(3.70)***		
LABORPROP [†]			0.13	(2.57)**		
LANDAV [†]			-0.02	(-1.13)		
COPEa reduced quality meals					-0.02	(-0.93)
COPEb reduced number meals					-0.04	(-1.93)*
COPEc incr. income activities					0.04	(2.73)***
COPEd consumption of seeds					0.01	(0.32)
COPEe sold goods and livest.					0.06	(2.47)**
Constant	0.32	(2.76)***	0.23	(2.17)**	0.06	(0.94)
Observations	3,858		3,858		1,604	
R-squared	0.28		0.28		0.35	

Conclusion

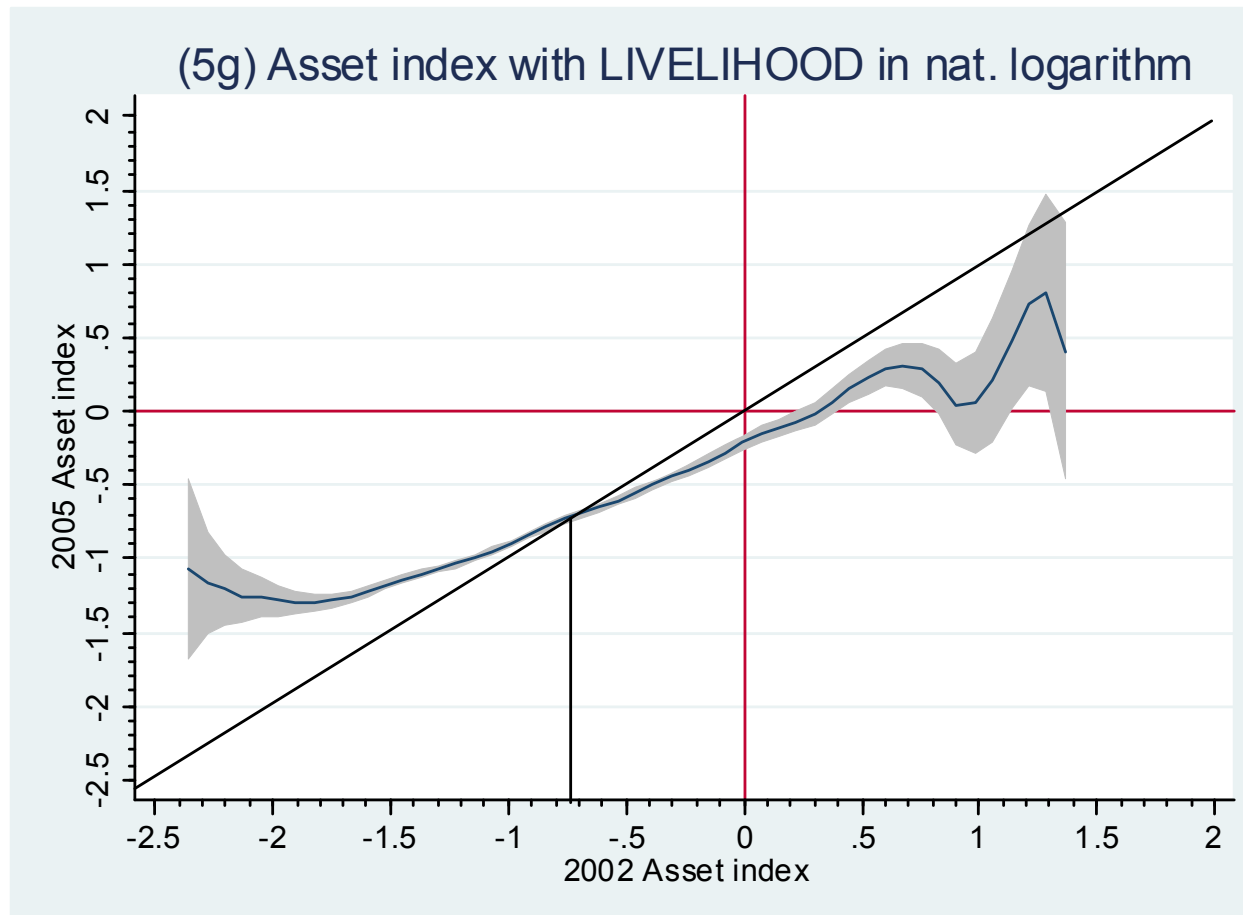
- No evidence for existence of a poverty trap, but one stable equilibrium at low income levels
- Significant impact of drought in the short term, helps explaining single equilibrium
- Different shock coping strategies applied at different points in the wealth distribution
- Potential reasons for relative stagnation of rural population
 - (a) data problems and econometric challenges
 - short time span, problematic income data, limited predictive power of productive assets
 - (c) low productivity in rural areas
 - selection of better-off households into migration to urban areas since early post-war period → rural farm-based economy as such trapped in poverty?
 - Difference to other findings in SSA: civil war might have amplified impact of unfavorable economic conditions in rural Mozambique

Thank you!

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Bivariate regression: $A_{it} = f(A_{it-1}) + \epsilon_{it}$

graph in log scale



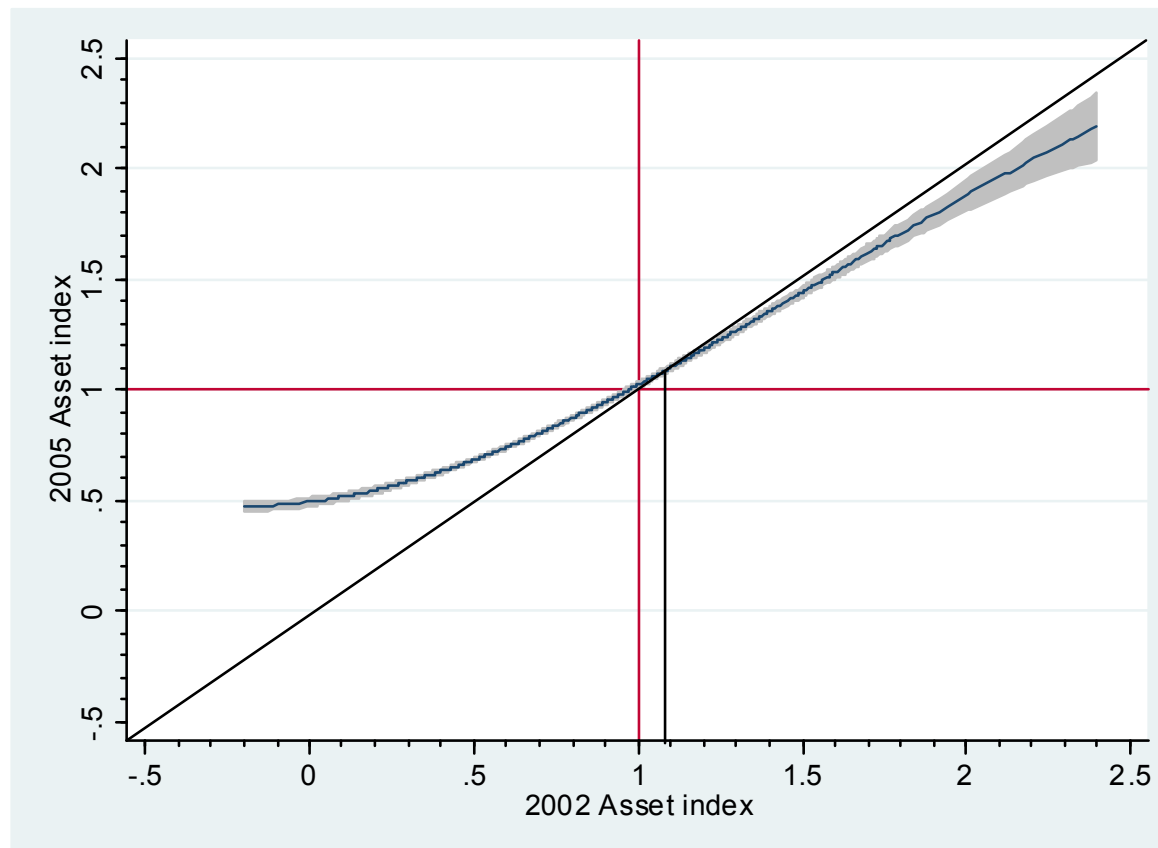
Descriptive statistics: Poverty profile

	Population share (in %)		Mean household income per adult equiv. (in MZN)*		Poverty headcount (P ₀) (in %)		Poverty gap (P ₁) (in %)		
	2002	2005	2002	2005	2002	2005	2002	2005	
All households (N=4,021)	1	1	2,256	2,722	0.80	0.76	0.49	0.48	
Household cultivates large area of land per adult	no	0.81	0.66	1,911	2,229	0.83	0.79	0.53	0.52
	yes	0.19	0.34	3,739	3,611	0.65	0.70	0.35	0.38
Household owns livestock	no	0.23	0.31	2,012	2,288	0.81	0.80	0.54	0.52
	yes	0.77	0.69	2,324	2,866	0.79	0.74	0.48	0.46
Household owns bike	no	0.76	0.68	2,063	2,646	0.83	0.79	0.53	0.51
	yes	0.24	0.32	2,883	2,788	0.71	0.70	0.37	0.41

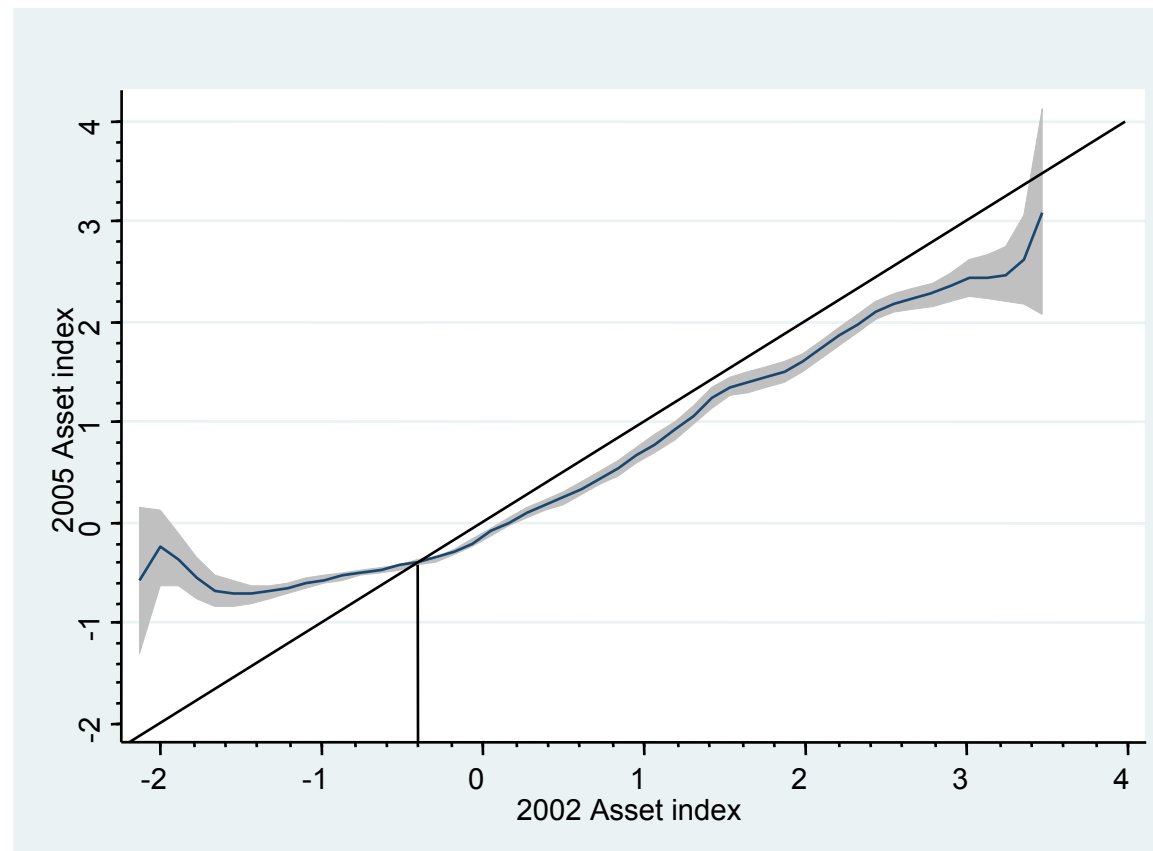
Livelihood regression to derive asset index (fixed effects)

Dependent variable: income per adult equiv. / poverty line					
	Coefficient	t-statistic			
D2005	0.10	(2.70)***			
LANDSIZEAElog	0.04	(1.83)*			
LANDSIZEAE2log	0.02	(2.74)***			
FIELDNUM	0.03	(1.17)	CROPINDEX	0.03	(3.65)***
FIELDNUM2	-0.00	(-0.05)	CROPINDEX2	-0.00	(-0.77)
CASHEWTREEPRODlog	0.00	(0.16)	ASSOC	0.06	(0.81)
CASHEWTREEPROD2log	0.01	(0.98)	EXTINFO	-0.01	(-0.21)
COCOTREElog	0.03	(0.94)	PRICEINFO	0.14	(3.36)***
COCOTREE2log	-0.00	(-0.11)	VAC	-0.05	(-0.49)
GOATNUMlog	0.03	(0.93)	BIKE	0.09	(1.84)*
GOATNUM2log	0.02	(1.64)	RADIO	0.07	(1.57)
CHICKENNUMlog	0.02	(1.22)	TABLE	0.07	(1.40)
CHICKENNUM2log	-0.01	(-0.74)	WALLM	0.18	(1.65)*
LIVESTOCKOtlulog	0.02	(1.21)	ROOFM	0.14	(1.76)*
LIVESTOCKOtlu2log	0.01	(0.36)	LATRIN	0.07	(1.42)
ECONACTNUM	-0.06	(-3.27)***	LANTERN	0.04	(0.94)
CLASHEAD	0.00	(0.07)	Constant	0.35	(1.40)
CLASHEAD2	0.01	(2.68)***	Sigma_u	0.69	
CLASMlog	0.05	(2.13)**	Sigma_e	0.73	
CLASM2log	0.00	(0.61)	Rho	0.47	
HEALTHPROP	-0.10	(-0.50)	Observations	3,978	
CRAFT	0.17	(2.98)***	R-squared	0.14	
TOOLBIG	0.01	(0.34)			
TOOLTRACT	0.08	(0.96)			
INPUT	0.07	(1.10)			

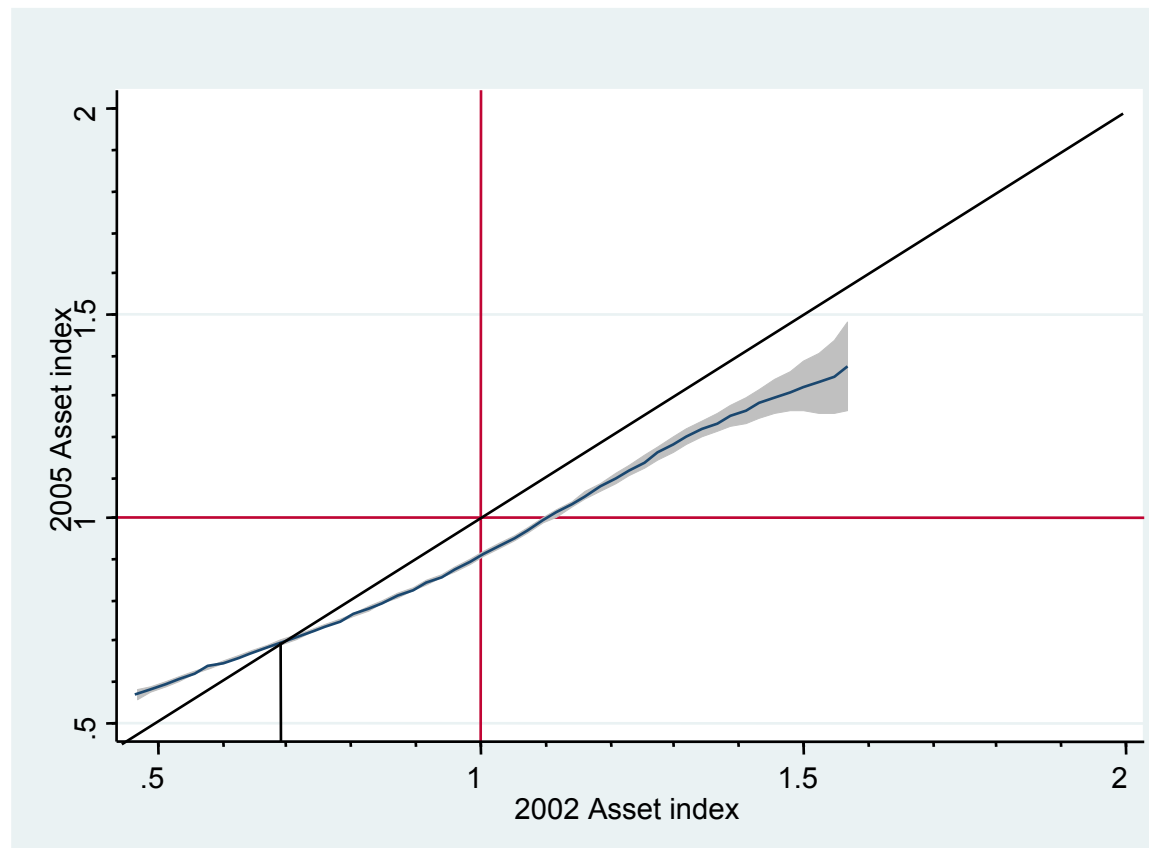
Robustness test I: parametric OLS regression with fourth order polynomial of 2002 asset index)



Robustness test II: Asset index through principal component analysis



Robustness test III: Asset index based on assets with high degree of liquidity



Results I: Non-parametric regressions differentiated by groups of households

	Location of equilibrium		
	Mean	Lower 95% confidence interval bound	Upper 95% confidence interval bound
Whole sample, non-parametric regression	1.11	1.02	1.3
Whole sample, parametric regression	1.12	1.05	1.23
Male head of household	1.1	1	1.22
Female head of household	0.98	0.88	1.18
Head has no education	0.92	0.84	1
Head has primary education	1.04	0.97	1.13
Head has secondary education	1.65	1.3	1.78
No access to credit	1.04	0.97	1.21
Access to credit	1.28	1.18	1.44