Behavioral Foundations of Microcredit:
Experimental and Survey Evidence From Rural India

CERGE-EI

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Michal Bauer (Charles University and IZA)
Julie Chytilová (Charles University)
Jonathan Morduch (NYU)

Motivation

- Saving and the poor
  - Strong incentives: small-business investments, precautionary savings
  - Scope for saving without getting less nutrition

- Strategies to overcome difficulties to save
  - Limit liquid home saving (Mullainathan 2005)
  - Rotating credit and saving associations (Gugerty 2007), lock boxes
  - Deposit collectors and money guards (Rutherford 2000)

- Saving constraints, demand for commitment and time inconsistent preferences (Ashraf, Karlan and Yin 2006, Dupas and Robinson 2009)

Microcredit as a way out of poverty?

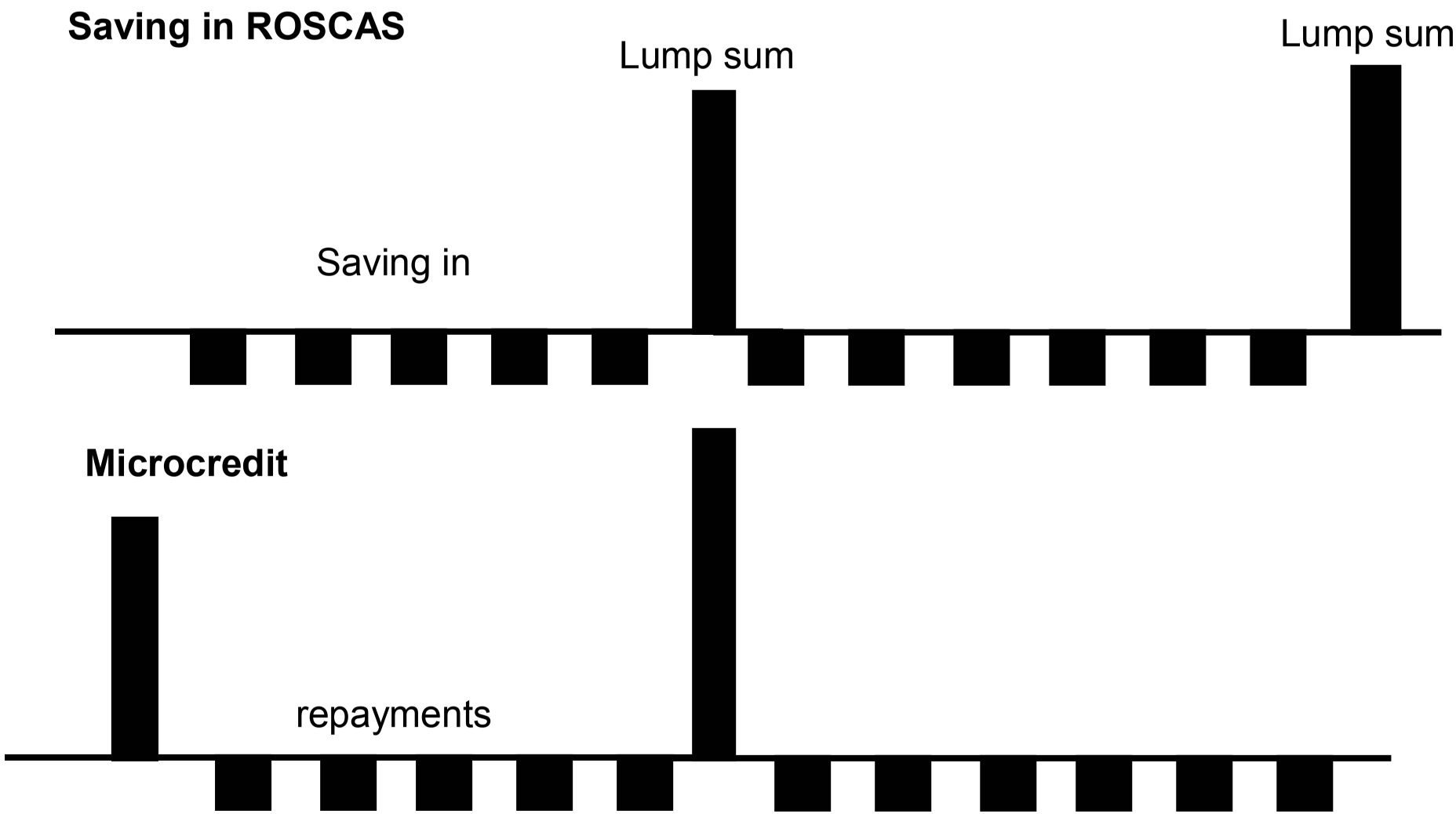
End of year	Number of reporting institutions	Total number of clients reached (millions)	Number of "poorest" clients reported (millions)
1997	618	14	8
1998	925	21	12
1999	1 065	24	14
2000	1 567	31	19
2002	2 572	68	42
2006	3 316	133	93

Daley-Harris (2007)

Motivation ctd.

- Characteristic features of microcredit contract
  - Group liability, dynamic incentives, regular, fixed and frequent installments
- Microcredit and asymmetric information
  - Adverse selection, moral hazard
- Microcredit loan as a disciplined (though costly) way to *save?*
  - Textbook loan contract: the principle and interest are paid after profits are reaped
  - Microcredit contract: installments start to be collected immediately at the beginning of a loan – before any profits can be reaped

Microcredit borrowing and saving



This study

- Data
  - Series of “lab experiments” in the field to elicit time discounting and attitude to risk among 573 villagers in 18 villages of rural Karnataka, India
  - Individual survey on economic and financial lives

- Major findings
  - Women in hyperbolic group save less in total levels, tend to hold a larger share of their overall savings outside their home
  - Women in hyperbolic group are more likely to borrow, in particular from the local microcredit institution

Related literature

- Theoretical concepts of time inconsistent preferences: Ainslie (1992), Phelps and Pollack (1968), Laibson (1997), O'Donoghue and Rabin (1999)

- Lab experiments on time discounting: Frederick, Loewenstein, O'Donoghue (2002), Anderson, et al. (2005), Benhabib, Bisin and Schotter (2005)

- Microfinance and behavioral economics: Armendáriz and Morduch (2005), Rutherford (2000), Mullainathan (2005), Ashraf, et al. (2006), Field and Pande (2007), Basu (2007)

- Experiments in the field to help explain outside behavior: Binswanger (1980), Liu (2007), Karlan (2005), Tanaka, Camerer and Nguyen (2007), Ashraf, Karlan and Yin (2006)

Exponential and hyperbolic discounting

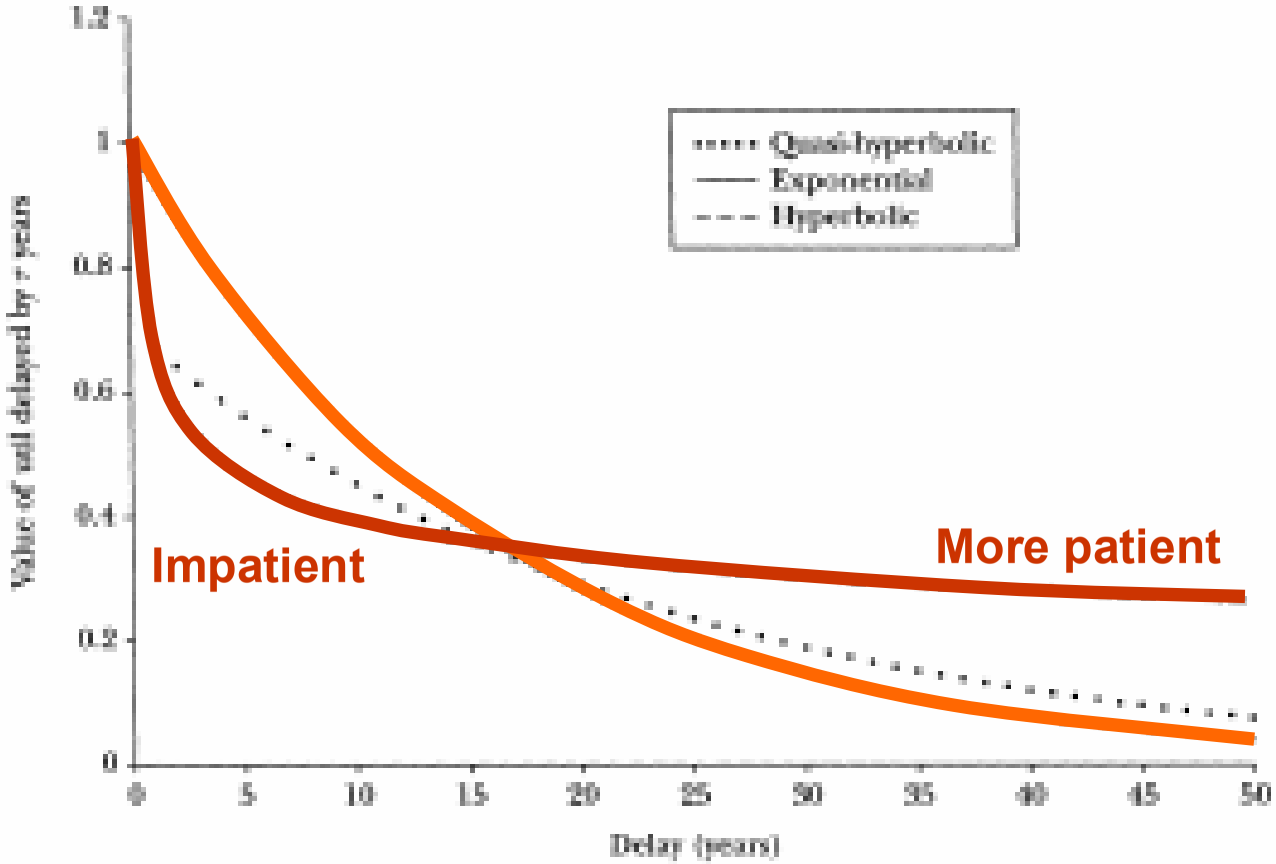
- Exponential discounting
  - Discount factor is: $D(t)= \delta^{t}$: $1, \delta^{1}, \delta^{2}, \delta^{3}, \ldots, \delta^{T}$.
  - No time inconsistency
  - All that matters is size of δ and distance between *t* and *t'*.

- Hyperbolic discounting
  - $D(t)=1/t$ (Ainslie 1992)
  - D(t): $1, \beta\delta^{1}, \beta\delta^{2}, \beta\delta^{3}, \ldots, \beta\delta^{T}$ (Phelps and Pollack 1968, Laibson 1997)

Value of util delayed by *t* years

Angeletos, Laibson, Repetto, Tobacman, Weinberg, *Journal of Economic Perspectives*, Summer 2001, p. 51

Figure 1
Discount Functions



Exponential: δ^t, with $\delta = 0.948$; hyperbolic: $(1 + \alpha t)^{-\gamma/\alpha}$, with $\alpha = 4$ and $\gamma = 1$; and quasi-hyperbolic: $\{1, \beta\delta, \beta\delta^2, \beta\delta^3, \ldots\}$, with $\beta = 0.7$ and $\delta = 0.957$.

Many names, one concept

- Interests vs passions (Smith)
- Controlled vs Automatic (Schneider & Shiffrin, 1977; Benhabib & Bisin, 2004)
- Cold vs Hot (Metcalfe and Mischel, 1979)
- System 2 vs System 1 (Frederick and Kahneman, 2002)
- Deliberative vs Impulsive (Frederick, 2002)
- Conscious vs Unconscious (Damasio, Bem)
- Planner vs Doer (Shefrin and Thaler, 1981)
- Patient vs Myopic (Fudenburg and Levine, 2006)
- Abstract vs Visceral (Loewenstein & O'Donoghue 2006; Bernheim & Rangel, 2003)
- PFC & parietal cortex vs Mesolimbic dopamine (McClure et al, 2004)

Location of the study

Self-help groups (SHG)

- Major source of microcredit in India (2.92 milion SHGs, 41 milion members).
- 10-25 members in one SHG, endogenously formed, sometimes facilitated by NGOs. Compulsory savings with tight withdrawal rules
- SHGs permitted to obtain loans from commercial banks (NABARD linkage program)
- SHG borrowing: group liability interest rate varies, weekly fixed repayments during group meetings

Sample

Socioeconomic characteristics

Table 2: Sample vs. Karnataka (means and standard deviations)

	Total	Men	Women	Honavar	Haliyal	Karnataka*
Age (years)	36.8	38.1	35.5	36.8	36.9	36.3
	(11.8)	(12.1)	(11.3)	(11.1)	(12.4)	
Education	4.3	5.0	3.5	6.0	2.5	4.2
	(4.4)	(4.7)	(4.1)	(4.5)	(3.7)	
Illiterate	0.40	0.34	0.45	0.20	0.59	0.43
	(0.49)	(0.47)	(0.50)	(0.40)	(0.49)	
Married	0.79	0.80	0.78	0.73	0.84	0.67
	(0.410)	(0.40)	(0.42)	(0.45)	(0.36)	
Farmer	0.70	0.74	0.66	0.63	0.77	0.75**
	(0.46)	(0.44)	(0.47)	(0.48)	(0.42)	
Sample size	544	274	270	274	270	

**Source: Indian Census 2001: data for the Karnataka population above 15. ** only rural population*

Eliciting discount rates

Table 3: Payoffs (A)

	Panel A (current discount rate)		
	Tomorrow	After three months	
Choice	**Earlier reward**	**Delayed reward**	
1	250	265	
2	250	280	
3	250	300	
4	250	330	**Relatively Impatient**
5	250	375	

Eliciting discount rates

Table 3: Payoffs (A)

	Panel A (current discount rate)		
Choice	Tomorrow **Earlier reward**	After three months **Delayed reward**	
1	250	265	
2	250	280	**Relatively Patient**
3	250	300	
4	250	330	
5	250	375	

Eliciting discount rates

Table 3: Payoffs (B)

	Panel B (future discount rate)	
	In one year	In one year and three months
Choice	**Earlier reward**	**Delayed reward**
1	250	265
2	250	280
3	250	300
4	250	330
5	250	375

Eliciting attitudes toward risk

Table 4: Payoffs

Prospect	Bad luck payoff p = 50%		Good luck payoff p = 50%	
	mean			**s.d./mean**
1	**250**	250	250	**0**
2	**350**	225	475	**.51**
3	**400**	200	600	**.71**
4	**450**	150	750	**.94**
5	**500**	50	950	**1.27**
6	**500**	0	1000	**1.41**

Table 7: Discount rates and observable characteristics (probits, marginal effects)

Dependent variable	Current discount rate			Future discount rate		
	All	Male	Female	All	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-0.070			-0.095		
	(0.033)**			(0.031)***		
Age	-0.013	-0.019	-0.007	-0.009	-0.017	-0.001
	(0.007)*	(0.013)	(0.010)	(0.006)	(0.007)**	(0.008)
$(Age)^2$	1.5e-04	2.2e-04	7.7e-05	8.4e-05	1.7e-04	-3.6e-06
	(8.0e-05)*	(1.4e-04)	(1.2e-04)	(6.0e-05)	(7.6e-05)**	9.4e-05
Education	-0.013	-0.018	-0.007	-0.015	-0.022	-0.007
	(0.003)***	(0.004)***	(0.005)	(0.003)***	(0.003)***	(0.005)
Wealth	8.5e-04	2.2e-05	0.004	0.002	0.006	5.5e-04
	(0.006)	(0.009)	(0.007)	(0.005)	(0.007)	(0.008)
Income in June < income in Sept	-0.011	-0.041	0.018	-0.020	-0.051	0.012
	(0.024)	(0.031)	(0.028)	(0.023)	(0.028)*	(0.029)
Farmer	-0.008	-0.035	0.017	-0.021	-0.029	-0.012
	(0.019)	(0.028)	(0.032)	(0.017)	(0.027)	(0.024)
Negative shock from harvest	0.032	0.036	0.032	0.045	0.035	0.056
	(0.027)	(0.028)	(0.041)	(0.028)	(0.036)	(0.036)
Married	0.032	0.048	0.042	0.031	0.076	0.005
	(0.035)	(0.073)	(0.065)	(0.041)	(0.062)	(0.061)
Household head	-7.4e-05	-0.020	0.034	-0.014	-0.036	-0.022
	(0.032)	(0.042)	(0.070)	(0.037)	(0.056)	(0.063)
Constant	0.547	0.717	0.306	0.483	0.693	0.201
	(0.117)***	(0.217)***	(0.150)*	(0.079)***	(0.111)***	(0.102)*
Observations	538	272	266	538	272	266
R-squared	0.09	0.15	0.03	0.11	0.17	0.04

Discount rates

Table 8: Responses to time preference questions

FUTURE

CURRENT (Patient)	.03	.06	.16	.26	.41	.60
.03	23	1	1	0	0	2
.06	7	8	1	0	1	0
.16	5	3	8	1	1	0
.26	3	1	2	2	1	1
.41	1	1	0	1	1	0
.60	6	0	2	0	0	16

Exponential 58%

Weakly hyperbolic 13%

Strongly hyperbolic 19%

Impatient later, Patient now 10%

Impatient

Eliciting discount rates
Methodology

- One-year shift of the time frame to avoid effects seasonal fluctuations of income or regular celebrations

- No current income option (front end delay method) to avoid confounds due to lower credibility and transaction costs of future payments

- Financial incentives
  - 20% chance to be paid (Rs. 250 is app. a weekly wage)
  - Cash certificates for future payments signed by NGO chief, village leader and authors

Table 9: Hyperbolic preferences and observable characteristics (probits, marginal effects)

	Strongly hyperbolic			Weakly hyperbolic			Patient now, impatient in future		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	all	male	female	all	male	female	all	male	female
Female	0.052			0.007			-0.058		
	(0.063)			(0.050)			(0.034)*		
Education	-0.000	0.003	-0.003	0.003	0.004	0.001	-0.001	-0.004	0.002
	(0.006)	(0.008)	(0.010)	(0.004)	(0.005)	(0.006)	(0.004)	(0.006)	(0.009)
Attitude to risk	-0.002	0.011	-0.018	0.010	0.016	0.006	0.001	0.014	-0.015
	(0.012)	(0.016)	(0.017)	(0.012)	(0.016)	(0.020)	(0.007)	(0.011)	(0.011)
Age	-0.010	-0.004	-0.020	0.014	0.007	0.021	0.007	0.011	0.000
	(0.008)	(0.013)	(0.013)	(0.009)	(0.013)	(0.017)	(0.006)	(0.010)	(0.014)
(Age)2	0.000	0.000	0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Married	0.028	-0.028	0.140	-0.081	-0.038	-0.144	0.033	-0.121	
	(0.032)	(0.117)	(0.051)***	(0.069)	(0.077)	(0.112)	(0.033)	(0.098)	
Household head	0.070	0.041	0.299	-0.035	-0.018	-0.075	-0.047	0.044	
	(0.059)	(0.082)	(0.157)*	(0.047)	(0.092)	(0.051)	(0.036)	(0.047)	
Wealth	-0.006	-0.012	0.002	0.002	0.005	-0.002	-0.010	-0.001	-0.029
	(0.013)	(0.019)	(0.015)	(0.008)	(0.010)	(0.012)	(0.005)*	(0.010)	(0.008)***
Relative income	-0.002	-0.044	0.045	0.023	0.035	0.012	-0.020	-0.050	-0.001
	(0.034)	(0.051)	(0.036)	(0.035)	(0.050)	(0.051)	(0.024)	(0.037)	(0.044)
Farmer	0.061	0.045	0.078	-0.062	-0.052	-0.078	-0.006	0.002	-0.029
	(0.046)	(0.056)	(0.066)	(0.031)**	(0.045)	(0.037)**	(0.030)	(0.049)	(0.042)
Negative shock from harvest	-0.052	-0.051	-0.057	0.030	0.035	0.028	-0.008	-0.000	-0.030
	(0.044)	(0.064)	(0.064)	(0.038)	(0.046)	(0.054)	(0.024)	(0.040)	(0.032)
Observations	538	272	266	538	272	266	538	272	203

Saving

Table 10: Means and standard deviations

	Total	Future discount rate		Time consistency			
		Low	High	Strongly hyperbol.	Weakly hyperbol.	Consist.	Pat. now, impat. in future
Women							
Total savings (Rs. th.)	2.016	2.198	1.691	1.636	2.069	2.305	0.936
	(2.736)	(2.646)	(2.875)	(1.788)	(3.808)	(2.849)	(0.952)
Share of home savings	0.191	0.182	0.208	0.164	0.148	0.194	0.306
(conditional on saving>0)	(0.303)	(0.291)	(0.326)	(0.278)	(0.260)	(0.307)	(0.388)
Men							
Total savings (Rs. th.)	3.113	3.350	2.839	3.221	3.206	3.267	1.967
	(7.154)	(6.375)	(7.979)	(5.148)	(5.093)	(8.539)	(2.682)
Share of home savings	0.479	0.442	0.527	0.440	0.375	0.500	0.546
(conditional on saving>0)	(0.407)	(0.399)	(0.415)	(0.432)	(0.353)	(0.414)	(0.376)

Borrowing

Table 10: Means and standard deviations

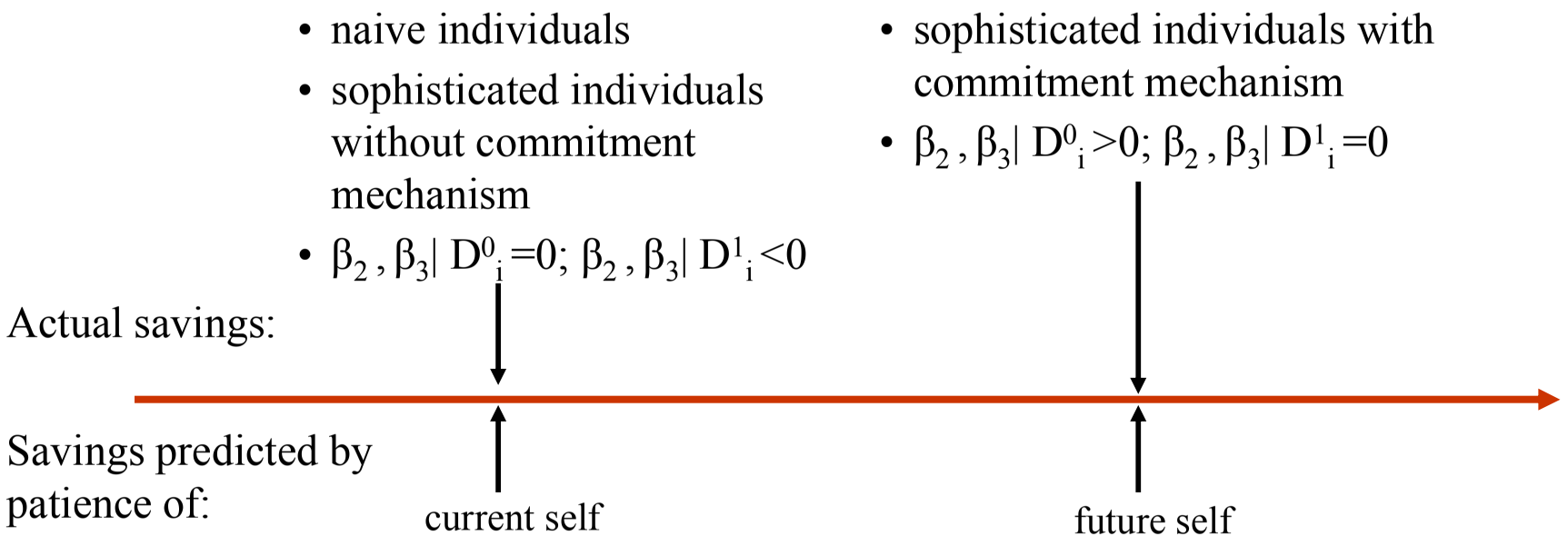
	Total	Future discount rate		Time consistency			
		Low	High	Strongly hyperbol.	Weakly hyperbol.	Consist.	Pat. now, impat. in future
Women							
Loan	0.641	0.688	0.557	0.768	0.632	0.621	0.478
	(0.481)	(0.465)	(0.499)	(0.426)	(0.489)	(0.487)	(0.511)
SHG loan	0.426	0.457	0.371	0.607	0.447	0.359	0.391
	(0.495)	(0.500)	(0.486)	(0.493)	(0.504)	(0.481)	(0.499)
Men							
Loan	0.555	0.585	0.520	0.654	0.559	0.541	0.448
	(0.498)	(0.494)	(0.502)	(0.480)	(0.504)	(0.500)	(0.506)
SHG loan	0.139	0.163	0.110	0.173	0.059	0.157	0.069
	(0.346)	(0.371)	(0.314)	(0.382)	(0.239)	(0.365)	(0.258)

Discounting and financial behavior

Naïve vs. sophisticated individuals

$$Y_i = \alpha + \beta_1 D_i^t + \beta_2 H_i^s + \beta_3 H_i^w + \beta_4 F_i + \beta_5 R_i + \beta_6 X_i + \varepsilon_i$$

- Specification inspired by theory of O'Donohue and Rabin (1999)
- "Naïve" individuals with hyperbolic preferences -> current patience (D^0_i) prevails
- Behavior of "sophisticated" individuals with hyperbolic preferences depends on the availability of suitable disciplining mechanisms



Total Savings

Table 11: OLS

Dependent variable	Total savings (Rs. th.)			
	Female	Male	Female	Male
	(1)	(2)	(3)	(4)
Strongly hyperbolic	-0.422	0.333	-0.933	0.058
	(0.413)	(0.731)	(0.447)*	(0.791)
Weakly hyperbolic	-0.679	-0.618	-0.843	-0.983
	(0.628)	(1.008)	(0.650)	(1.153)
Current discount rate	-1.309	0.479		
	(0.740)*	(1.520)		
Future discount rate			-2.036	-1.622
			(0.882)**	(1.978)
Patient now, impatient in future	-1.165	-0.860	-0.768	-0.727
	(0.438)**	(0.719)	(0.390)*	(0.664)
Observable characteristics	yes	yes	yes	yes
Observations	249	272	249	272
R-squared	0.17	0.24	0.18	0.24

Share of home savings

Table 13: Tobit

Dependent variable	Share of home savings			
	Female	Male	Female	Male
	(1)	(2)	(3)	(4)
Strongly hyperbolic	-0.313	-0.147	-0.089	-0.045
	(0.146)**	(0.124)	(0.079)	(0.108)
Weakly hyperbolic	-0.056	-0.010	-0.003	0.029
	(0.090)	(0.097)	(0.085)	(0.096)
Current discount rate	0.655	0.187		
	(0.235)***	(0.342)		
Future discount rate			0.605	0.358
			(0.265)**	(0.369)
Patient now, impatient in future	0.273	0.061	0.129	-0.022
	(0.123)**	(0.134)	(0.113)	(0.143)
Observable characteristics	yes	yes	yes	yes
Observations	213	227	213	227

Conditional on savings >0

Loan from bank, SHG, moneylender

Table 14: Probits (marginal effects)

Dependent variable	Loan			
	Female (1)	Male (2)	Female (3)	Male (4)
Strongly hyperbolic	0.203 (0.075)***	0.142 (0.074)*	0.085 (0.086)	0.168 (0.078)**
Weakly hyperbolic	-0.007 (0.082)	0.071 (0.060)	-0.050 (0.085)	0.100 (0.060)*
Current discount rate	-0.340 (0.133)**	-0.021 (0.147)		
Future discount rate			-0.514 (0.188)***	0.149 (0.164)
Patient now, impatient in future	-0.246 (0.120)**	-0.070 (0.123)	-0.143 (0.107)	-0.087 (0.130)
Observable characteristics	yes	yes	yes	yes
Observations	249	272	249	272

Loan from SHG

Table 15: Probits (marginal effects)

Dependent variable	SHG loan			
	Whole sample		Conditional on having a loan	
	Female	Female	Female	Female
	(1)	(3)	(5)	(7)
Strongly hyperbolic	0.364	0.225	0.285	0.212
	(0.082)***	(0.088)**	(0.081)***	(0.085)**
Weakly hyperbolic	0.064	0.019	0.070	0.041
	(0.087)	(0.085)	(0.104)	(0.108)
Current discount rate	-0.365		-0.270	
	(0.145)**		(0.147)*	
Future discount rate		-0.596		-0.397
		(0.201)***		(0.205)*
Patient now, impatient in future	-0.046	0.073	0.236	0.255
	(0.113)	(0.112)	(0.073)***	(0.068)***
Observable characteristics	yes	yes	yes	yes
Observations	249	249	159	159

Robustness checks

- Intra-household conflict and demand for commitment
- Non-parametric treatment of discount rate and risk aversion
- Village-level fixed effects
- Pooled hyperbolics

Robustness checks

	Panel A: Savings behavior							
	Total savings (Rs. th.)				Share of home savings			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	female	male	female	male	female	male	female	male
Strongly hyperbolic	-0.161	0.387	-0.845	0.211	-0.166	-0.104	0.051	-0.025
	(0.486)	(1.185)	(0.447)*	(1.198)	(0.095)*	(0.132)	(0.082)	(0.127)
Weakly hyperbolic	-0.331	-1.299	-0.363	-0.990	0.080	0.064	0.095	-0.019
	(0.607)	(1.599)	(0.554)	(1.349)	(0.115)	(0.171)	(0.103)	(0.145)
	Panel B: Borrowing behavior							
	Loan				SHG loan (whole sample)			
	(9)	(10)		(11)	(12)	(13)	(14)	(14)
Strongly hyperbolic	0.301	0.189	0.124	0.221	0.460	0.056	0.217	0.015
	(0.079)***	(0.094)**	(0.099)	(0.093)**	(0.099)***	(0.054)	(0.109)**	(0.042)
Weakly hyperbolic	0.014	0.164	-0.084	0.150	0.055	-0.040	-0.081	-0.064
	(0.137)	(0.126)	(0.129)	(0.105)	(0.150)	(0.035)	(0.130)	(0.022)***
					SHG loan (only borrowers)			
					(15)	(16)	(17)	(18)
Strongly hyperbolic					0.319	0.046	0.205	-0.056
					(0.084)***	(0.109)	(0.105)*	(0.072)
Weakly hyperbolic					0.077	-0.136	-0.135	-0.175
					(0.161)	(0.074)*	(0.210)	(0.050)***
Current discount rate (non-parametric)	yes	yes	no	no	yes	yes	no	no
Future discount rate (non-parametric)	no	no	yes	yes	no	no	yes	yes
Risk aversion (non-parametric)	yes	yes	yes	yes	yes	yes	yes	yes
Observable charact.	yes	yes	yes	yes	yes	yes	yes	yes
Village fixed effects	yes	yes	yes	yes	yes	yes	yes	yes

Conclusions

- Women with hyperbolic preferences have difficulties to save, save less at home and are more likely to borrow from microfinance institutions
- Alternative view on microcredit: disciplined way to “save”
- Explanation of several universal features of microcredit contracts: regular repayment schedule, frequent payments during group meetings
- Lab experiments in the field can be informative about actual behavior outside of the lab