14.771 Development Economics: Microeconomic Issues and Policy Models
Fall 2008

Savings

ABHIJIT V. BANERJEE

Why don't the poor save?

- Lack of savings opportunities?
- Data from vegetable vendors in India.
- Simple production function
    - Purchase fruit in the early morning
    - Sell through day
- Basic working capital needs

Fruit Vendor

Photograph of woman selling fruit removed due to copyright restrictions.

Vendors

Table 1-Business Characteristics of sample population			
Detail	Percentage of respondents	Average amount purchased*	Profits per day*
1. One trip a day to the market- normal days	89.7%	Rs. 1075.3 (589.2)	Rs.110.5 (54.7)
2. twice or more trips a day(total amount purchased per day)	8 %	Rs.707.5 (422.6)	Rs.95.6 (46.1)
3. once in two days trip to the market (amount purchased per trip)	2.3%	Rs. 1034.8 (515.8)	Rs.97.2 (44.3)
4. good days a week	98.9%	Rs. 1666.3 (834.3)	Rs. 186.6 (83.4)
5. festival days	91.5%	Rs. 2580.7 (1543.7)	Rs. 318.2 (187.3)

The Use of Savings

Table 4- Usage of savings products	
Savings product	Usage by respondents (in %)
Cash at home	77.5
Cash lent out	5.7
Cash saved with family/friends	1.5
Chit funds	11.2
MFI/SHG	29.2
Bank account	12.8
Gold	74.6

The puzzles: Vendors have debt

Table 3- Meter loans for financing	
1. % of sample size that takes daily loans	69.4%
2. % of sample size that takes daily loans for more than 15 days a month	65.7%
3. average number of days in a month that respondent takes a daily loan for working capital	25.8 days
4. average number of years of taking daily loans	9.5 years
5. average daily interest rate	4.9%
6. % of total meter loan borrowers who borrow from the same moneylender daily	67.7%
7. Average of maximum that can be borrowed as a daily loan	Rs. 4098.6
8. % of meter loan borrowers who feel there is no other way of doing business and the interest is unavoidable	63.8%

Vendors

- Persistent borrowers
- At very high rates (10% per day)
- Stark implication:
  - One less cup of tea a day.
  - In **30 days** will have doubled **income.**
- Significant foregone income

Vendors Problem not unique

- Payday Loans
  - Skiba Tobacman, 18% for loans lasting two weeks
  - People take many loans before defaulting
    - In essence paying the entire amount on their cycle before defaulting
- Many other apparently myopic behaviors
  - Drug adherence

Intertemporal substitution

- Recall basic Euler equation for someone borrowing at rate R

$$u'(c_t) \geq \delta R u'(c_{t+1})$$

- Basic intuition:
  - People can always borrow less and finance out of their own consumption.

Implications of high interest rate

$$u'(c_t) \geq R\delta u'(c_{t+1})$$

- Discount future heavily (δ low) *or*
- Future marginal utility large relative to today
  - Consumption growth large
    - u'(c_{t+1}) low so c_{t+1} high
    - Note: this is stronger than saying that marginal product of capital is high.
      - Some existing studies suggest this as well.
  - Particularly sensible for transitory shocks (e.g. health).
    - But examples span even working capital uses (e.g. crop finance)

Understanding Poverty

■ To fit these facts current models must assume

Poor are very myopic
or
Poor cannot cut back consumption

or

Poor are quickly becoming non poor
Or
Poor do not understand compound interest

Testing these Hypotheses

- Experiment (Karlan-Mullainathan)
  - Buyout the debt
  - Provide literacy

		Financial Literacy	
		No	Yes
Debt Buyout	No	1/4	1/4
	Yes	1/4	1/4

Interventions

- **Buyout**
  - Give a cash grant enough for individuals to buyout their debt
  - Working capital on a good day (gotten from the baseline survey). As high as 3000Rs.
- **Training**
  - Half day class where we:
    - Worked out how much they've spent in total on interest rate
    - Benefits of cutting down: illustration
    - Discussed what they could have done with the money
    - Brainstorm on ways to cut down

Sites

- Philippines: Follow up surveys occur
  - 2 weeks
  - 6 weeks
  - 10 weeks
- India: Follow up surveys occur
  - 3 months
  - 6 months
  - 12 months

Summary Statistics, Baseline					
	Control	Training	Debt pay-off	Both	Total
	(1)	(2)	(3)	(4)	(5)
Panel A: India					
Thandal Loan	0.620	0.640	0.664	0.672	0.649
	(0.031)	(0.030)	(0.030)	(0.030)	(0.015)
Thandal Loan amount	2838.40	3006.80	3303.80	3458.00	3151.75
	(226.31)	(256.11)	(248.63)	(259.63)	(124.06)
Moneylender loan	0.844	0.804	0.780	0.780	0.802
	(0.023)	(0.025)	(0.026)	(0.026)	(0.013)
Moneylender Loan amount	21948.13	18349.64	21633.74	26477.54	22102.26
	(2110.67)	(1616.54)	(1773.82)	(4219.66)	(1324.53)
Buying goods on credit	0.388	0.380	0.416	0.418	0.400
	(0.031)	(0.031)	(0.031)	(0.031)	(0.016)
Amount of goods bought on credit	747.938	677.947	773.269	771.683	744.075
	(57.057)	(65.627)	(64.582)	(55.487)	(30.351)
Coping mechanism when hit by a negative income shock					
Saving	0.032	0.040	0.024	0.028	0.031
	(0.011)	(0.012)	(0.010)	(0.010)	(0.005)
Borrowing from moneylenders	0.160	0.180	0.184	0.220	0.186
	(0.023)	(0.024)	(0.025)	(0.026)	(0.012)
Borrowing from someone	0.348	0.372	0.324	0.376	0.355
	(0.030)	(0.031)	(0.030)	(0.031)	(0.015)
Means other than borrowing	0.192	0.140	0.132	0.156	0.155
	(0.025)	(0.022)	(0.021)	(0.023)	(0.011)
Total household expenditures in the past month	5688.72	5399.84	5543.02	5516.55	5536.94
	(389.56)	(171.98)	(169.48)	(173.83)	(122.46)
Total food expenditures in the past month	2807.20	2424.40	2428.40	2535.60	2548.90
	(364.00)	(69.39)	(70.01)	(68.39)	(95.80)
Number of observations	250	250	250	250	1000

	Control	Training	Debt pay-off	Both	Total
	(1)	(2)	(3)	(4)	(5)
Panel B: Philippines					
Moneylender loan	0.984	0.968	0.984	0.952	0.972
	(0.016)	(0.023)	(0.016)	(0.027)	(0.010)
Moneylender Loan amount	3658.730	3975.806	3661.290	3711.111	3751.200
	(267.46)	(323.47)	(300.22)	(339.06)	(153.63)
Buying goods on credit	0.333	0.258	0.371	0.270	0.308
	(0.06)	(0.06)	(0.06)	(0.06)	(0.03)
Amount of goods bought on credit	232.667	30.081	356.484	264.127	221.060
	(130.01)	(19.42)	(159.04)	(192.89)	(70.79)
Coping mechanism when hit by a negative income shock					
Saving	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Borrowing from moneylenders	0.032	0.032	0.016	0.032	0.028
	(0.022)	(0.023)	(0.016)	(0.022)	(0.010)
Total household expenditures in the past month	7037.576	7505.524	6012.747	6951.414	6877.756
	(470.68)	(577.11)	(452.18)	(483.02)	(249.73)
Total food expenditures in the past month	4259.690	4297.629	3488.032	4467.582	4130.117
	(327.83)	(227.90)	(269.89)	(315.61)	(145.41)
Number of observations	63	62	62	63	250

Results - Borrowing

	Follow up 1 (2 weeks after the intervention)		Follow up 2 (6 weeks after the intervention)		Follow up 3 (10 weeks after the intervention)	
Specificaion:	Probit	OLS	Probit	OLS	Probit	OLS
Dependent variable:	Moneylender	Log (loan amount)	Moneylender	Log (loan amount)	Moneylender	Log (loan amount)
	(1)	(2)	(3)	(4)	(5)	(6)
Post x Pay off	-0.332***	-0.275*	-0.302**	-0.368**	-0.201*	-0.340**
	(0.126)	(0.164)	(0.122)	(0.151)	(0.112)	(0.149)
Post x Training	0.042	-0.130	0.009	-0.109	0.044	-0.166
	(0.055)	(0.153)	(0.068)	(0.143)	(0.065)	(0.145)
Observations	500	417	500	412	500	404
R-squared	0.323	0.045	0.314	0.06	0.271	0.057
Dep.var.mean	0.834	8.160	0.824	8.167	0.808	8.158

Results - Borrowing

Specification	Followup 1 (3 months)			
	probit	OLS	probit	OLS
Dependent Variable	Thandal loan	Log(thandal loan amount)	Moneylender loan	Log(Moneylender loan)
	(1)	(3)	(2)	(4)
Post x Training	-0.038	-0.288	0.045	-0.030
	(0.045)	(0.367)	(0.030)	(0.285)
Post x Debt pay off	-0.103**	-0.856**	-0.027	-0.370
	(0.045)	(0.367)	(0.038)	(0.285)
Observations	2000	2000	2000	2000
R-squared	0.013	0.01	0.165	0.19
Dep.Var.Mean	0.591	4.905	0.830	7.506

Results-Borrowing

	Followup 2			
Specification	probit	OLS	probit	OLS
Dependent Variable	Thandal loan	Log(thandal loan amount)	Moneylender loan	Log(Moneylender loan)
	(5)	(7)	(6)	(8)
Post x Training	-0.015	-0.119	0.068*	0.075
	(0.047)	(0.334)	(0.040)	(0.284)
Post x Debt pay off	-0.021	-0.263	-0.015	-0.142
	(0.047)	(0.334)	(0.047)	(0.284)
Observations	2000	2000	2000	2000
R-squared	0.121	0.17	0.281	0.47
Dep.Var.Mean	0.449	3.649	0.729	6.472

Thandal Loans

Dependent Variable	Followup 1 only		Followup 2 only	
	Bought goods on credit	amount bought on credit	Bought goods on credit	amount bought on credit
	(1)	(2)	(3)	(4)
Post	-0.154***	-42.159	-0.205***	-96.898***
	(0.023)	(32.192)	(0.025)	(30.019)
Post x Training	-0.012	11.198	-0.003	12.407
	(0.028)	(34.848)	(0.030)	(33.826)
Post x Debt pay off	-0.078***	-106.116***	-0.034	-65.613*
	(0.028)	(34.874)	(0.030)	(33.839)
Observations	1940	2000	1922	2000
R-squared	0.185	0.057	0.200	0.070
Dep.Var Mean	0.301	244.86	0.295	229.598

How are people slipping?

- What drives the long term fall?
- In India we see the biggest fall
- There is some *very preliminary* evidence
  - Question: How did you cope with shocks last month?

What does this tell us

- Cannot be physical inability to save
- Cannot be that much impatience
  - At 10% per day, 1 dollar today is worth less than 1/50 of cent in 3 months
  - Also they buy durables, marry their daughters
  - It could all be borrowing but why do they repay? After all the future credit is worth nothing to them
  - How do they manage to remain in a ROSCA year after year?.

What does this tell us

- Probably not a lack of understanding
- Particular kind of self-control problem?
- Can we learn something from how they fall back?

Results – Coping With Shocks by..

Dependent Variable	Followup 1 only			
	Savings	Loan	Any Loan	Savings or Non-Loan Source
	(1)	(2)	(3)	(4)
Post x Training	-0.027	-0.033	-0.055	0.002
	(0.020)	(0.035)	(0.042)	(0.036)
Post x Debt pay off	0.074**	-0.081**	-0.060	0.083**
	(0.034)	(0.033)	(0.042)	(0.040)
Observations	2000	2000	2000	2000
R-squared	0.078	0.010	0.005	0.015
Dep.Var.Mean	0.081	0.220	0.375	0.195

Results- Coping with Shocks by…

Specification	Followup 2 only			
Dependent Variable	Savings	Loan	Any Loan	Savings or Non-Loan Source
	(5)	(6)	(7)	(8)
Post x Training	-0.016	-0.058*	-0.050	0.005
	(0.018)	(0.034)	(0.042)	(0.032)
Post x Debt pay off	0.019	-0.035	0.011	0.043
	(0.024)	(0.036)	(0.044)	(0.035)
Observations	2000	2000	2000	2000
R-squared	0.035	0.011	0.003	0.002
Dep.Var.Mean	0.058	0.226	0.381	0.150

Modeling myopia

- Two periods in most examples
- Two types of index goods: *x* and *z*
  - x consumption: no time inconsistency
  - z consumption: only present selves like it
- Instantaneous utility in each period *u(x) + v(z)*
- Period 1's decision utility:

$$u(x^1) + v(z^1) + \delta u(x^2)$$

- Income each period y^t and initial wealth w^0
- Production function *f()*. Sometimes for simplicity will just assume rate of return *R*

Generalized Euler Equation

- Traditional Euler Equation:

$$u'(c_t) = \delta f'(w_t) u'(c_{t+1})$$

- Generalized Euler Equation

$$u'(c_t) = \delta f'(w_t) u'(c_{t+1})[1 - z'(c_{t+1})]$$

- Temptation tax:
  - Every dollar transferred into the future is "taxed" by temptations; future selves will waste some of it.

Poverty and Myopia

- Two forms of "myopia": δ and z'(w)
- Original puzzle
  - Third explanation: myopia in the form of high z'(w).
- Why is this different?
  - Because z'(w) can vary systematically with w
  - Individuals can control *the value of z'(w)* they face and hence the tax.
  - All our results come from this.

The shape of temptation

- Two important cases:
  - z'(c) constant (Non Declining temptation)
    - Rich and poor face similar time inconsistency problems
    - Includes case of z'(c) = 0
  - z'(c) declining
    - Rich face less time inconsistency problems

What does this framework give us?

- Demand for commitment: not just by some "cold" self: Size effect
  - Ashraf, Karlan and Zin ("Tying Odysseus to the Mast")
  - ROSCA participation
    - Anderson and Baland think its spouse control
  - Microfinance participation
  - Excess purchase of durables
- Aspiration effect: when the future looks better people might save more
- Lack of buffer stocks against income risk
  - Rosenzweig-Wolpin

Rosenzweig-Wolpin

- Bullocks: draught animal in India: Usually a pair of them used for tilling land
- They jointly estimate a linear production function: f
  - Farm profits = A. #bullocks + B. pump + C. #bullocks.pump + village-year dummy+ e
- And a Stone-Geary utility function
- Assume that the shock is realized before farm inputs are put in: separability
- Using The ICRISAT panel. 30 farmers, 9 years

Conclude

- That bullocks are very profitable—cost 1000 rupees. Yield 1400 rupees more profits (but cost of feeding)
- So are pumps
- Yet 31% have ever owned a pump
- And 10% sold a bullock last year. More sales in bad weather years
- Durables are being used for consumption smoothing.
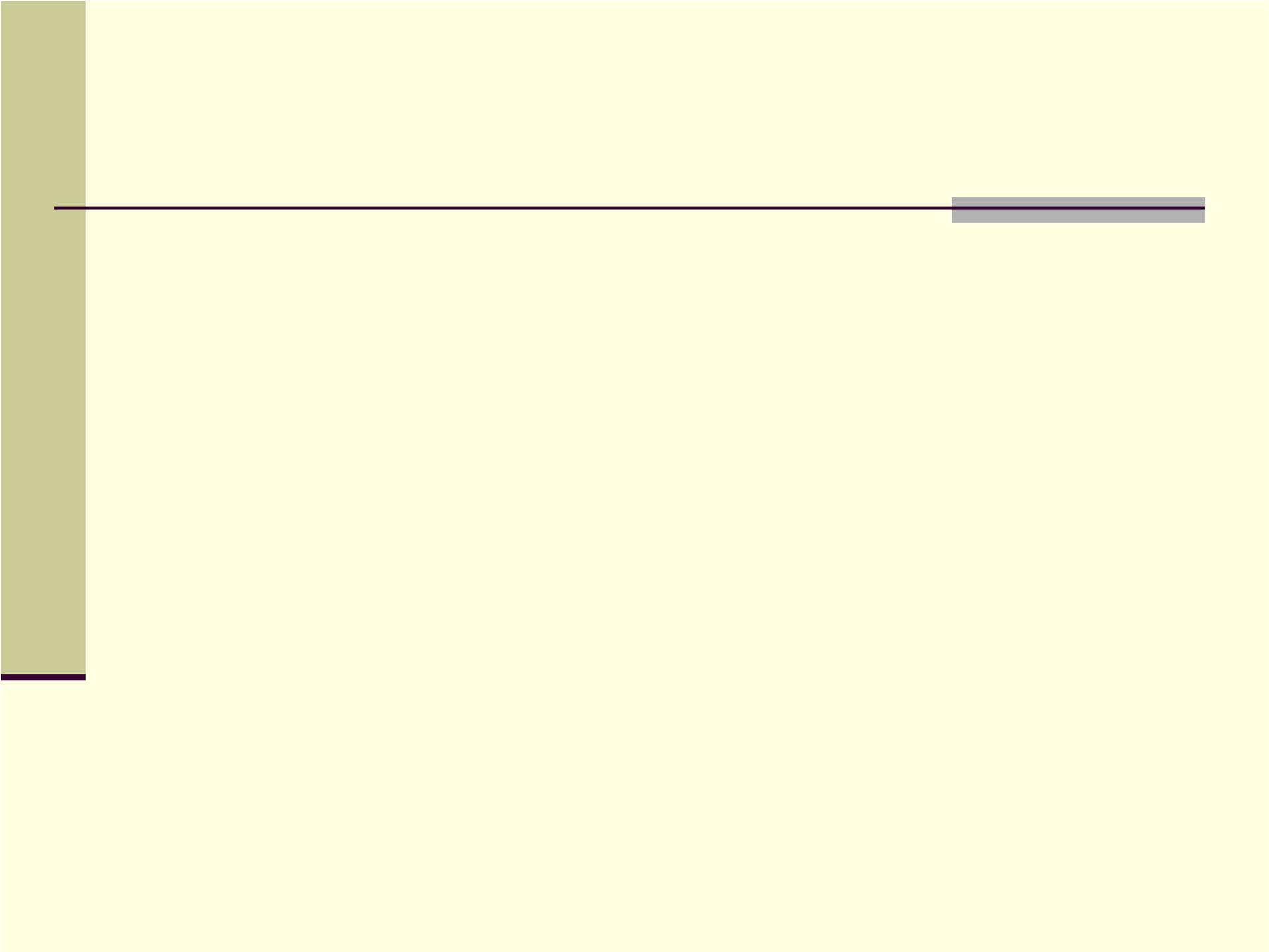
Implications of constant z'

- Useful applied insights
  - No different than applying standard models (e.g. hyperbolic)

Example applications

- **Demand for Commitment**
  - SEED, ROSCAs
- **Purchase of Durables**
  - Suppose durables provide fixed x utility
    - Individuals willingness to pay for durables will be

$$p = \frac{u_d}{u'(c_t)}(1+\delta)$$

    - If discount factors on consumption or investment data assuming a traditional Euler equation, individuals will appear to over-demand durables relative to investments

$$p = \frac{u_d}{u'(c_t)}\left(1 + \frac{\hat{\delta}}{(1 - z'(c_t))}\right)$$

Demand for durables

- By over-investing enough in durables the current decision-maker locks in future x consumption (assuming that durables generate u consumption.

What is a Temptation?

- Demand for commitment devices also tells us potentially what is a x-good?
  - People would only save up (in a commitment device or otherwise) to buy an x-good.

Clients' Specific Savings Goals

	Frequency	Percent
Christmas/Birthday/Celebration/Graduation	97	48.0%
Education	42	20.8%
House/Lot construction and purchase	21	10.4%
Capital for business	20	9.9%
Purchase or maintenance of Machine/Automobile/Appliance	8	4.0%
Agricultural Financing/Investing/Maintenance	4	2.0%
Vacation/Travel	4	2.0%
Personal Needs/Future Expenses	3	1.5%
Did not report reason for saving	2	1.0%
Medical	1	0.5%
Total	202	100.0%
Data-based goals	140	69.3%
Amount-based goals	62	30.7%
Total	202	100.0%
Bought ganansiya box	167	82.7%
Did not buy ganansiya box	35	17.3%
Total	202	100.0%

Figure by MIT OpenCourseWare.

Declining Temptation

- Really where model can be more insightful

- Why might temptations decline?
  - Basic temptations—sugar, fat, addictions—dealt with first
  - Supply: aimed at average income
- Ultimately an empirical question
  - Here, we draw out the consequences.
  - Will talk about direct tests of z' as well

- Why not consider z' increasing?
  - Uninteresting: strong convergence

Demand for Commitment

- This implies that individuals will demand specific types of commitment accounts
  - SEED size-based goals (Ashraf, Karlan and Yin)
  - To explain time-based would need to assume that u'(x) is particularly high relative v'(z) at certain periods.
  - Size element of ROSCAs

Outline

- Attributions of impatience
- Impact of future income
- Poverty trap
- Response to uncertainty
- Investment features
- Role of credit
- Money Lender
- Testing this model

Outline

- **Attributions of impatience**
- Impact of future income
- Poverty trap
- Response to uncertainty
- Investment features
- Role of credit
- Money Lender
- Testing this model

Attributions of Impatience

- Suppose we observe a population of individuals with a distribution of δ and initial wealth which have correlation ρ. All have the same u(x) and v(z).

- Suppose an econometrician estimates on this data a time consistent utility function for total consumption and a distribution of δ

- Estimated discount factor of individual i

$$\delta_i' = \delta_i(1 - z'(c_i))$$

Attributions of Impatience

■ The poor will look more impatient

$$\mathrm{cov}(\hat{\delta}_i, w_i) > \mathrm{cov}(\delta_i, w_i)$$

■ Intuition: Poor face higher z'(c)

  ■ Those with higher z'(c) tend to consume more today.
  ■ As a result the econometrician, who assumes exponential discounting, will attribute that steeper consumption profile to a smaller discount factor.
  ■ But since this effect is bigger for the poor than the rich, the misattribution of greater impatience will be larger for the poor and will induce a positive correlation discount factors and income, even if none existed.

■ The poor face bigger temptations

Outline

- Attributions of impatience
- **Impact of future income**
- Poverty trap
- Response to uncertainty
- Investment features
- Role of credit
- Money Lender
- Testing this model

Future income

■ *Proposition* Assume that second period income, y_2; is deterministic. If temptations are not declining, period 1 consumption increases with period 2 income

$$\frac{dc_1}{dy_2} > 0$$

If temptations are declining then there exist utility functions for which there is a range of y_2, where consumption in period 1 decreases with income in period 2

$$\frac{dc_1}{dy_2} < 0$$

Moreover we will only observe this pattern for people for whom y_1 and y_2 are sufficiently small.

Intuition

- Consider the Euler equation

$$u'(c_2) = \delta f'(y_1 - c_1)u'(c_2)[1 - z'(c_2)]$$

- If consumption today doesn't change with y_2 then right hand side:
  - Goes down because $u'(c_2)$ rises.
  - Could go up if $z'(c_2)$ falls
- With constant temptation first effect implies c_1 must rise.
- With non-constant temptation, there are two effects.

Intuition

- Aspiration effect
  - If the future looks bleak, there is little point in saving.
- This is the core of most of our propositions below

Future Income

- Another intuition: Suppose an individual has a time consistent utility function

$$u(c_1) + \delta u(c_2)$$

But has a strange investment technology

$$\tilde{f}(\bullet) = f(\bullet)[1 - z'(w_2 + y_2)]$$

- Thus an increase in y_2 has two effects:
  - Consumption smoothing as before
  - An increase in the investment efficiency
- This intuition will help us think about several of the examples below.

Outline

- Attributions of impatience
- Impact of future income
- **Poverty trap**
- Response to uncertainty
- Investment features
- Role of credit
- Money Lender
- Testing this model

Poverty Traps

- *Proposition* Suppose there is no uncertainty. Then when temptations are not declining, c_2 is continuous in initial income y_1. When temptations are declining, however, a poverty trap can emerge: for some parameters, there will exist K such that c_2 jumps discontinuously at K. Moreover, $u(x_1) + \delta u(x_2)$ and $u(x_1) + v(z_1) + \delta [u(x_2) + v(z_2)]$ are both discontinuous in y_1.

- Notice: no increasing returns (or even credit constraints)

Intuition

- Logical consequence of income effect from above.
  - Greater wealth → more to save
  - More to leave behind → Lower $z'(c)$
  - Lower $z'(c)$ → Greater incentive to save

- Another intuition:
  - Investment "technology" becomes more efficient

Interpretation

- Poor are penalized by having more of their money "wasted"
  - Dulls their incentive to save
- Multiple periods exaggerates this trap
  - Better behavior by 3 generates better behavior by 2 which generates better behavior 3
  - Generates a strategic incentive to save:
    - Increase $z'()$ for future selves and they will strategically save to further increase $z'()$.
- Adds nuance to accumulation for lumpy investment
  - At low levels of wealth, accumulation is "leaky" due to temptations

Outline

- Attributions of impatience
- Impact of future income
- Poverty trap
- **Response to uncertainty**
- Investment features
- Role of credit
- Money Lender
- Testing this model

Response to Uncertainty

- Consider now the case where y_2 can be uncertain. We will consider wat happens when uncertainty increases, i.e. the effect of mean preserving spreads of y_2 on c_1.

- Define the indirect utility function

$$w(c) = \max_x u(x) + v(c - x)$$

Response to Uncertainty

- *Proposition* If *w(c)* exhibits prudence and temptations are non-declining, then c_1 decreases with uncertainty in y_2.
  If *w(c)* exhibits prudence and temptations are declining, then there exist situations where c_1 *increases* with uncertainty in y_2.

Intuition

- Back to asset intuition:
  - Uncertainty in y_2 means that investment return has risk: $z'()$ could be low or high. But notice that this risk is badly correlated: pays off most when needed least (high income state)]
- So increased risk:
  - Prudence
  - Higher correlation of investment returns; more risky asset
- Two offsetting effects

Insufficient Buffer Stock Savings

- Very important practical issue:
    - Poor often living on edge
    - Very little buffer stock savings
- Observations
    - In two periods could be practically constrained by range where $z'()$ is actually increasing (starvation)
    - In multiple periods effect is magnified
    - A hidden effect: for those who are near poverty trap threshold, uncertainty can be very good

Example: Payday Loans

- US poor often borrow at very high rates for payday loans
- Note that the problem may not be taking out the loan
  - Faced with shock that could have large consequences, taking loan may be sensible
  - Key problem is lack of saving in the past that brought them to the point where they need a payday loan

Outline

- Attributions of impatience
- Impact of future income
- Poverty trap
- Response to uncertainty
- **Investment features**
- Role of credit
- Money Lender
- Testing this model

Investments

- What does this model imply about the types of investments people will undertake?
- To answer this we consider the following thought experiment.
    - Define a linear investment technology to be defined by $H = (R,s,S)$, where this technology allows an individual to invest any amount between s and S at a linear return R.
    - We will consider someone who has access to H on top of the standard technology
    - Suppose he undertakes some investment in H.
    - Suppose an identical person has access to $H' = (R',s',S')$ and the standard technology
    - What conditions determine whether he will undertake some investment in H' ?

Investments

Proposition If temptations are not declining, then investing in H implies investing in H' as long as $R' \geq R$ and $s \geq s'$. In other words minimum scale and returns summarize the investment decision.

If temptations are declining, then there exist situations where this is not true if $S \geq S'$. In this case, *maximum scale* also determines investment

High Return Investments

- **Aspiration effects**
  - Unless an investment has a big (in level) change, it doesn't matter.
- **Effectively creates minimum scale even in linear investments**
- **Potentially helps explain high return investments which are *divisible* but are not undertaken**
  - Fertilizer (Duflo, Johnson, Kremer)
  - Stocking (Lee, Kremer and Robinson)

Outline

- Attributions of impatience
- Impact of future income
- Poverty trap
- Response to uncertainty
- Investment features
- **Role of credit**
- Money Lender
- Testing this model

Credit

- In all self-control models credit can potentially be very bad
  - Can exaggerate self-control problem
- To understand this, we introduce artifice of *0* period self
  - Does not consume
  - Maximizes $u(x_1) + \delta\, u(x_2)$
- He chooses whether or not to allow a particular credit option.

Credit

- We will consider the following thought experiment.
    - Define a credit technology to be $C = (R,s,S)$, where an individual can borrow any amount between s and S at a linear cost R.
    - Zero period self has the choice of whether or not to add access to C for period 1 on top of the existing technology
    - Suppose zero allows C.
    - Consider an identical person where 0 must decide whether to allow access to $C' = (R',s',S')$ on top of the existing technology
    - What conditions determine whether zero will allow C'?

Credit

Proposition If temptations are not declining, then allowing C implies allowing C' as long as $R' = R$ and $S \geq S'$ and $s \geq s'$. In other words he might want to place a cap on the maximum loan available.

If temptations are declining, then there exist situations where this is not true. This occurs when $s < s'$. In other words, zero period self will want to place a *floor* on the minimum loan available

Intuition

- Constant temptations ➜ fear is overborrowing
  - Don't want 1 to take too much.
- Declining temptations ➜ At higher levels, may be more willing to invest.
  - Hence bigger loan may be good
  - And may even want to impose floors
    - Small amounts wasted. When that option is not there, big amount can be invested.
  - Note: Could get same effect if there is constant temptation and lumpy investments.

Implications

- Credit cards

- Micro-finance loans

- Can have different implications for self-control and temptations.

Outline

- Attributions of impatience
- Impact of future income
- Poverty trap
- Response to uncertainty
- Investment features
- Role of credit
- **Money Lender**
- Testing this model

Money Lenders

- Old argument (Bhaduri) on how money lenders can trap individuals in poverty
    - Prevent them from adopting high return investments
    - Why? If the individual gets wealthier he may rely on money lender less
- Problems
    - Coasian: simply charge higher rate for the investment
    - Conceptual: Why would the person borrow less if wealthier

Money Lenders

- Investment decision
  - An amount to be invested in 0.
    - Zero period self only invests, no consumption. Maximizes $u(x_1) + \delta\, u(x_2)$
  - A second unobservable investment in period 1.
  - Payoff R in period 2 if both investments made.
- Money lender sets interest rate
  - Two rates: R_0 and R_1.
- Define R'_1 to be the rate charged by the money lender when this investment is not available.
- Suppose that at $R_0 = R_1 = R'_1$ both periods would invest.

Money Lenders

Proposition When temptations are non-declining, both periods would continue to invest though the money lender will charge rates above R'_1

If temptations are declining, however, then there exist parameter values where the investment does not take place.

Note: this occurs even though the investment can be made more attractive because of declining temptation.

Money lender problem

- Money lender faces trade-off
  - Financing investment raises total pie
  - Financing investment can increase wealth and thereby decrease desire to borrow
- Increasing interest rates to offset the second effect (the Coasian solution) will
  - Make period 2 self poorer
  - And hence may make period 1 self less likely to invest.
- Gains from trade not fully exploited because period 1 not fully able to commit

Implications

- Related to literature on debt traps
- Creates interesting income dynamics in economies with monopolistic credit
  - Vast majority of money lenders

Outline

- Attributions of impatience
- Impact of future income
- Poverty trap
- Response to uncertainty
- Investment features
- Role of credit
- Money lender
- **Testing this model**

Testing the assumption

- Multiple goods indexed by *i*
  - Each provides x_i and z_i units of non-temptation and temptation goods.
- Make an offer of 1 unit of good *i* today vs. *k* units tomorrow
  - Note would need non-fungibility to do this exercise
    - Always the case ($10 today vs. $15 tomorrow when you have $100 in your pocket).
- Allows us to estimate good specific discount factor: $\hat{d}_i$

Implcations

- Low discount factor goods should have steeper Engel curves
  - Put differently: dollar-weighted average discount factors rise with income

Testing Impatience

- Estimate discount factors as above for money as well as goods known to be high *x* good *j*.
- We predict that

$$\frac{\hat{d}_m}{\hat{d}_i} < 1 = \frac{\hat{d}_m}{\hat{\overline{d}}_i}$$

and that this ratio increases with income.

Psychologically Richer Alternatives

- Same behaviors; different interpretations
  - Rich are fallible; poor are equally fallible
  - Attention is just greater on fallibility of rich

- Different challenges; same basic psychology
  - Will work through one model carefully

- **Different challenges; different psychology**
  - Mullainathan-Shafir

Example from mental accounting

- Imagine that a friend goes to buy an appliance priced at $100($500/$1000). Although the store's prices are good, the clerk informs your friend that a store 45 minutes away offers the same item on sale for $50 less. Would you advise your friend to travel to the other store to save $50 on the $100($500/$1000) expense?

(Crystal Hall)

Percent traveling to save $50

	$100	$500	$1000
HI ($N = 76$)	54	39	17
LI ($N = 47$)	76	73	87