

Life-cycle Consumption and Household Savings: Role of Demographics and Durables

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Introduction

- Canonical life-cycle model: Individuals should smooth consumption over their lifetime.
- Findings from US and other high-income countries easily refutes consumption smoothing.
 - Consumption tends to exhibit a clear “hump-shaped” profile.
 - Cannot easily be explained by demographics. Large literature looking at alternative explanations.
- Research in low/middle income countries is sparse with the exception of China.
 - Well documented u-shaped savings profile.
 - Consumption is flat but tracks income.

1. Estimate life-cycle profiles

- Consumption and income profiles, and savings rates for households in India
- Compare with that of U.S. households
 - Indian households show slower consumption growth (flat after adjusting for demographics)
 - Comparable income growth: *rising household savings rates.*
- Investigate if results driven by specific sub-groups
 - Heterogeneity by family structure, region, and occupation
 - Similar findings

1. Estimate life-cycle profiles
2. Investigate flat consumption and rising savings rates.
 - Construct a life-cycle profile of durable goods ownership
 - Intentions to purchase major durables predictive of higher savings rate
 - Use event time analysis to capture savings behavior around the time of major purchases.

Consumption and Savings in India: Prior Literature

- Mostly applied micro research focusing on insurance and risk-sharing mechanisms to insure against income shocks in the absence of access to credit and insurance markets (Rosenzweig, 2001).
⇒ *Implying very little life-cycle savings and asset accumulation.*
- Presence of inter-generational households (may not need to save)
- Cultural specifics - Dowry motives, savings in gold.

Consumption and Savings in India: Prior Literature

Limited “micro-founded” Macro-research

- Recent studies on the nature of asset accumulation, e.g.
 1. Badarinsa et al. (2017) - 77% of assets in real estate. Hardly changes through the life-cycle.
 2. Gopalakrishnan et al (2019) - Rainfall shocks and CPHS data to show that households engage in financial savings in the short run and physical assets in the long run.
- Hnatkovska, et al (2012) - Convergence in savings across castes (but using only wage data).

Data & Estimation

1. India: Consumer Pyramids Household Survey

- Longitudinal survey interviewing up to 175,000 households every four months covering 90% of the population.
- Modules on consumption expenditures(monthly), incomes (monthly), indicators for asset and liabilities (ownership, purchases, and intentions) and demographics.
- Our data: 2014 to September, 2019 (i.e. 17 waves= 68 months)
- Has become widely adopted for research - Covid-19 (Malani et al, 2020, Deshpande and Ramachandran), India's demonetization (Chodorow-Reich et al QJE 2020, Chanda and Cook, JMacro 2022), Health status (Patnaik et al, 2021) and numerous other topics.

2. **USA: Panel Study of Income Dynamics**

- Sample of 5000 households in the US, interviewed biennially.
- Include employment, income, wealth, expenditures, health, marriage, childbearing, child development, education.
- Our data: 2005 onwards.

Synthesizing CPHS and PSID

- Construct comparable measures of non-durable expenditures (goods and services).
- Head of Household - Ages 24 to 69.
- For India, expenditures are deflated using state-rural/urban CPI's. For the US, we use the regular CPI.

Comparison: PSID and CPHS (PPP USD)

	CPHS		PSID	
	Mean	Fraction	Mean	Fraction
Age of household head	50.02		47.14	
Annual expenditures	8,476.09		38,388.44	
Annual income	12,216.55		76,665.31	
Food	3,472.57	0.54	7,860.95	0.22
Non mortgage housing	1,473.57	0.21	8,377.49	0.27
Transport	1,869.79	0.03	9,722.70	0.24
Health	176.52	0.02	3,326.08	0.08
Education	279.83	0.03	1,399.44	0.02
Clothing	779.55	0.11	1,554.67	0.04
Recreation	37.88	0.00	2,613.33	0.06
Observations	974442	974442	61005	61005

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Pseudopanel and Semi-parametric Estimation

Estimate the following partially linear regression model:

$$\log(c_{it}) = f(\text{age}_{it}) + \alpha_i \text{cohort}_i + \alpha_t \text{time}_t + \epsilon_{it}$$

- Follow Deaton (1985) and Fernandez-Villaverde and Krueger (2007)
- Construct pseudo-panels for each country
- Outcome is weighted sample mean of cohort i at time t

Pseudopanel and Semi-parametric Estimation

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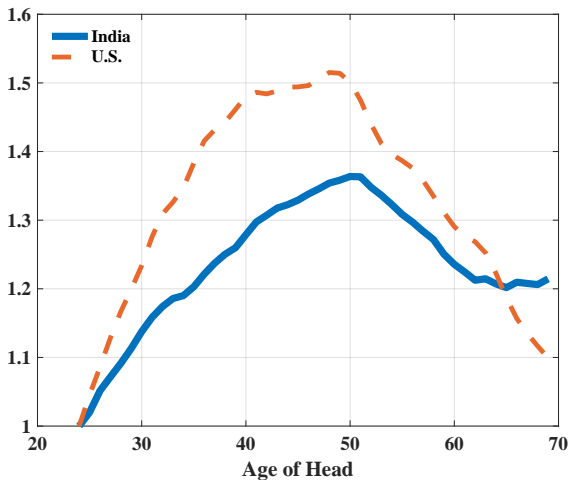
$$\log(c_{it}) = \underbrace{f(\text{age}_{it})}_{\text{non parametric}} + \underbrace{\alpha_i \text{cohort}_i + \alpha_t \text{time}_t}_{\text{parametric}} + \epsilon_{it}$$

- Follow Deaton (1985) and Fernandez-Villaverde and Krueger (2007)
- Construct pseudo-panels for each country
- Outcome is weighted sample mean of cohort i at time t
- Estimation consists of 2 components
 - Parametric part is estimated using ordinary least squares
 - Non-parametric part estimated using a Gaussian kernel weighted local polynomial fit.

Life-cycle profiles: India vs US

Unadjusted Life-cycle Consumption

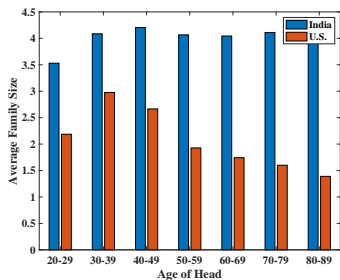
Comparable Categories



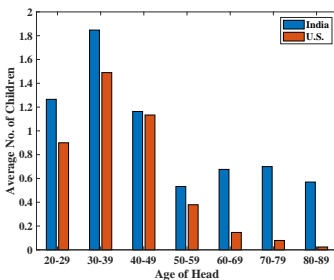
Household Composition

Figure 1: Demographics

(a) Family Size



(b) Children



Notes: Data for the U.S. comes from Panel Study of Income Dynamics (PSID). Children are defined as members living within the same household under the age of 18.

Adjustment for Demographics

$$\log(\tilde{c}_{it}) = f(\text{age}_{it}) + \alpha_i \text{cohort}_i + \alpha_t \text{time}_t + \epsilon_{it}$$

Where:

$$\log(\tilde{c}_{it}) = \log\left(\frac{c_{it}}{n_{it}}\right)$$

Adjustment for Demographics

$$\log(\tilde{c}_{it}) = f(\text{age}_{it}) + \alpha_i \text{cohort}_i + \alpha_t \text{time}_t + \epsilon_{it}$$

Where:

$$\log(\tilde{c}_{it}) = \log\left(\frac{c_{it}}{\underset{\text{Equivalence Scale}}{n_{it}}}\right)$$

Equivalence Scale

- OECD adult equivalence scale

$$n_i = (1 + 0.5 * (n_{A_i} - 1) + 0.3 * n_{K_i})$$

- National Research Council (1995)

$$n_i = (n_{A_i} + 0.7 * n_{K_i})^{0.7}$$

Equivalence Scale

- OECD adult equivalence scale

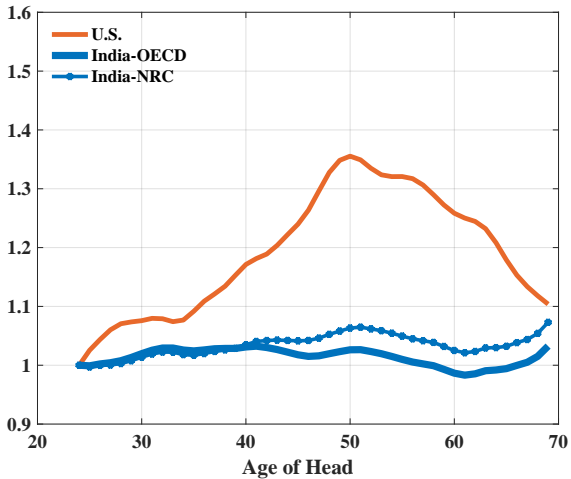
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- National Research Council (1995)

$$n_i = (n_{A_i} + 0.7 * n_{K_i})^{0.7}$$

Family Size	Adults	Children	OECD	NRC
1	1	0	1	1
2	2	0	1.5	1.62
3	2	1	1.8	2.00
4	2	2	2.1	2.35

Adjusted Life-cycle Consumption



Unadjusted vs Adjusted Life-cycle Consumption

Life-cycle Consumption Growth in India and U.S.

Country	Unadjusted		Adjusted	
	Δ^*	Peak Age	Δ^*	Peak Age
India	1.36	50	1.03	69
U.S.	1.50	48	1.34	50

Notes: * Δ refers to the ratio of peak consumption expenditures to age 24 consumption expenditures. Peak age refers to the age at which highest life-cycle consumption is attained.

Unadjusted vs Adjusted Life-cycle Consumption

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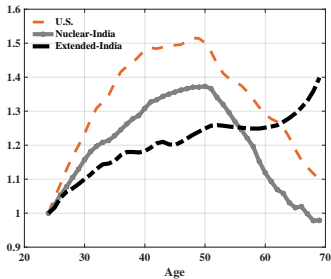
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**Heterogeneity: flat consumption driven by
specific sub-groups?**

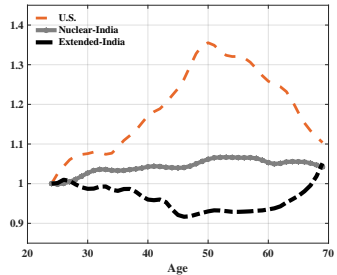
Life-cycle Consumption - by Family Type

Nuclear vs Extended Families

(a) Family Type - Unadjusted



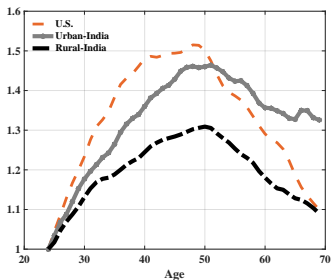
(b) Family Type - Adjusted



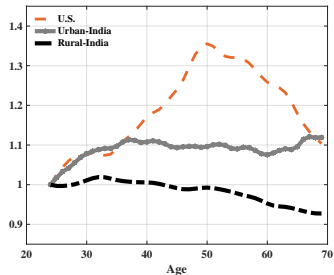
Life-cycle Consumption - by Region

Rural vs Urban Families

(a) Region - Unadjusted

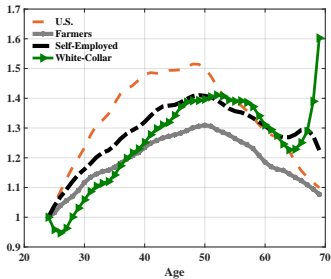


(b) Region - Adjusted

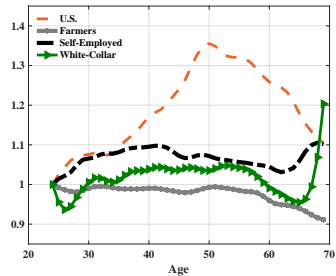


Farmers vs Self-employed vs White-collar

(a) Occupation - Unadjusted



(b) Occupation - Adjusted



Understanding the puzzle

1. Indian households are able to smooth consumption

- Uncertainty about future income coupled with credit constraints imply consumption should not be smooth.
- Are young households borrowing to smooth consumption?

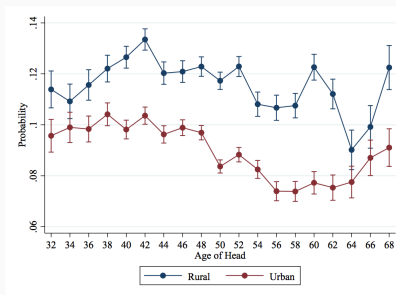
Theories: Are young households borrowing to smooth consumption?

- **Highly unlikely:** Debt to asset ratio is much higher in the US ($\approx 4\%$ vs 15%)

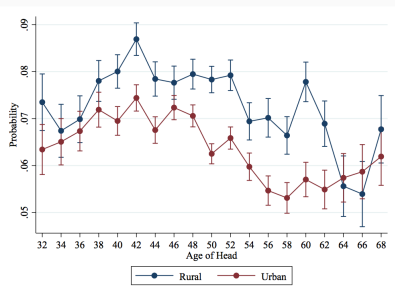
Borrowings

Theories: Are young households borrowing to smooth consumption?

(a) Borrowing for consumption



(b) Borrowings from shops

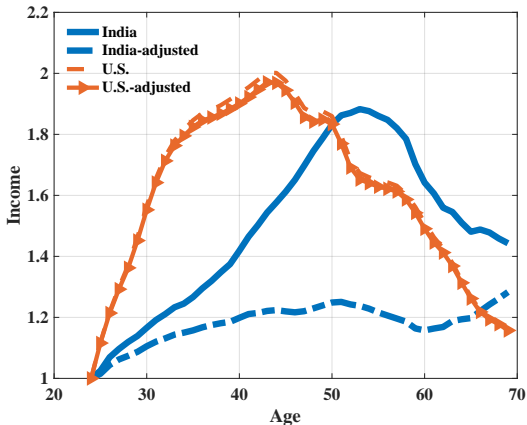


Theories

1. ~~Indian households are able to smooth consumption~~
2. Households are severely borrowing constrained, consuming their income every period, which in turn exhibits no growth

Income

Unadjusted vs Adjusted



Adjusted: Household Income divided by the number of working adults

Important facts about life-cycle income

- Growth is comparable to that of the US.
- High income growth is true for all sub-groups (Extended: 60%; Urban: 220%)
- Most of the growth comes from labor-force participation (i.e. the extensive margin) and not productivity growth
- This dichotomy is also true for subgroups. Even for urban India, half of the growth is from participation.

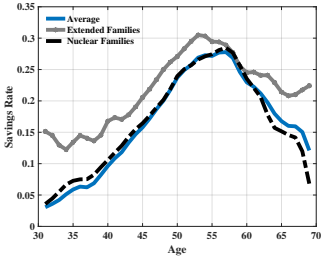
Theories

1. Indian households are able to smooth consumption
2. Households are severely borrowing constrained, consuming their income every period, which in turn exhibits no growth
3. Financial market frictions combined with lumpy investments in physical assets and durable goods means the need to save is greater, depressing non-durable consumption.

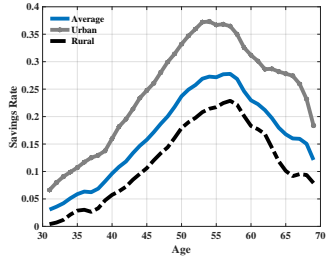
Savings

Fact: Savings Rate increases for all groups over the life cycle

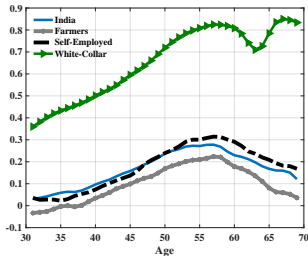
(a) Family Size



(b) Region



(c) Occupation



Observations on Savings Rates

- Recall that our measure of savings is total household income net of total household non-durable consumption expenditures.
- If savings rates are increasing, doesn't that support the standard LCH-PIH story?

That result follows from consumption > income initially.

- Data does not suggest savings narrowly defined as
$$\text{savings} = \text{income} - (\text{durable} + \text{non-durable consumption})$$
is negative.

Theories: Rest of the Paper

1. Indian households are able to smooth consumption
2. Households are severely borrowing constrained, consuming their income every period, which in turn exhibits no growth
3. Demand for lumpy physical assets
 - a. Construct the life-cycle profile of a durables ownership index
 - b. Impact of intentions to purchase durables on savings rates
 - c. Savings rates preceding and during the purchase of a durables

a. Durable Goods Ownership Index

- We construct a durable goods index, which attaches higher values to less owned goods (Karmakar and Narayanan, 2020).

$$A_{it} = \sum_{j=1}^J x_{ijt} * \omega_{jt}$$

Where :

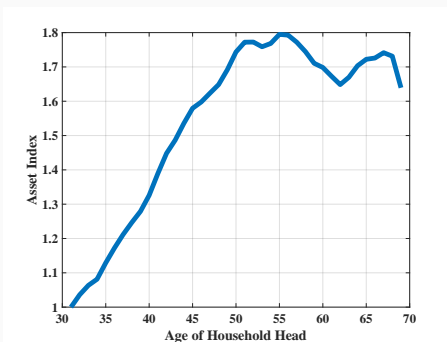
- x_{ijt} :physical count of asset j for household i in wave t
- ω_{jt} : is the relative weight of asset j constructed as follows:

$$\omega_{jt} = \frac{1}{\left[\frac{1}{N} \sum_{i=1}^N I\{x_{ijt} > 0\} * w_{it} \right]}$$

a. Durable Goods Ownership Index

Heterogeneity

Accumulation of Durable Goods Over the Life Cycle of Household Head



Notes: Household durable goods index relative to age 31 (household head) is reported. The durable goods index is constructed using information on the possession of major and minor durable goods such as televisions, cattle, tractors, refrigerators, houses, cars, two-wheelers, electric generators, washing machines and so on.

b. Can Intentions Predict Savings Rate?

CPHS surveys households on “intentions” to purchase major durable goods.

Does the household as a whole or any of its members plan to buy a refrigerator for domestic use in the next 120 days (approximately 4 months)? Yes/ No

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We estimate the following equation:

$$s_{it} = \sum_{j=1}^J \beta^j z_{it}^j + \alpha X_{it} + \epsilon_{it}$$

where s_{it} , z_{it}^j is reported intentions to purchase durable good j by household i at time t , X_{it} is a vector of controls.

b. Can Intentions Predict Savings Rate?

[More](#)

OLS Estimates of Intentions to Purchase Durables on Savings Rate

	(1)	(2)	(3)	(4)
Intend to Buy House	0.0964*** (25.73)	0.0881*** (24.00)	0.0876*** (24.01)	0.0367*** (10.51)
Intend to By Car	0.122*** (44.65)	0.103*** (38.68)	0.101*** (37.87)	0.0275*** (10.80)
Intend to Buy 2-Wheeler	0.0109*** (4.86)	0.00540* (2.45)	0.00477* (2.17)	0.0118*** (5.63)
Intend to Buy Tractor	0.0349*** (5.97)	0.0302*** (5.26)	0.0281*** (4.92)	0.0193*** (3.53)
Intend to Buy Cattle	0.00113 (0.35)	-0.00648* (-2.04)	-0.00597 (-1.89)	0.0130*** (4.29)
Observations	2073080	2073080	2073080	2073080

Column (1) - no controls; (2) - time and cohort; (3)- age polynomials; (4) - education and wealth index.

b. Can Intentions Predict Savings Rate?

- Reported intentions of durable purchases have strong and significant effects on household's savings rate. e.g. intentions to purchase a House increases household's savings rate by 3.67 p.p.; Car: 2.75; Two-wheeler: 1.18; Tractor: 1.93; Cattle: 1.30.
- Results hold for a number of additional durable goods - television sets, washing machines, coolers, power inverters, computers, and refrigerators and also for different household types.

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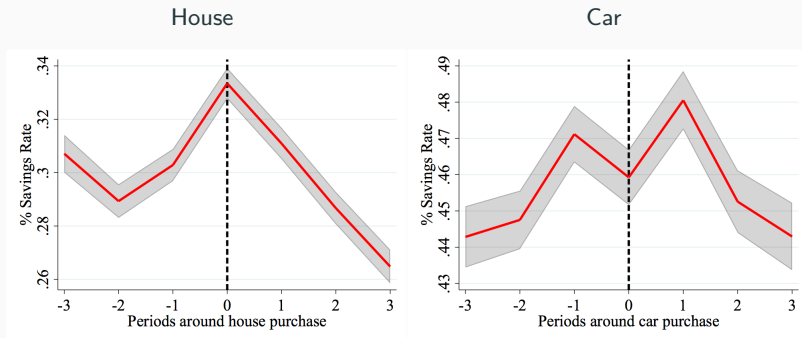
c. Savings Rate around Time of Asset Purchases

$$s_{it} = \beta^j z_{it}^j + \alpha X_{it} + \epsilon_{it}$$

- s_{it} : savings rate of household i at time t
- z_{it}^j : distance (in time) to durable j purchase at time τ
$$z_{it} = \begin{cases} -1 & \text{if } t = \tau - 1 \\ 0 & \text{if } t = \tau \\ +1 & \text{if } t = \tau + 1 \end{cases}$$
- X_{it} : vector of controls

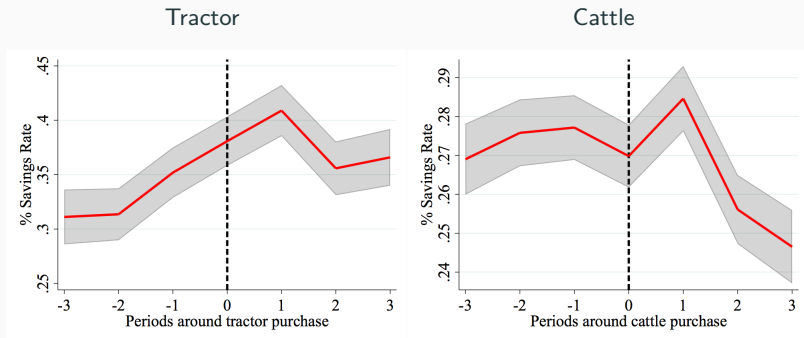
c. Savings Rate around Time of Asset Purchases

Borrowings



Notes: Controls include dummies for calendar time, birth cohort, and a third order age polynomial.

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Robustness

Robustness

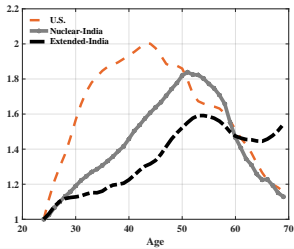
1. Household Head [Link](#)
2. Home Production [Link](#)
3. Alternate Specifications [Link](#)

Conclusion

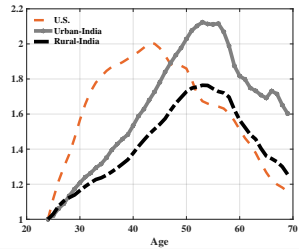
- Unlike the US, Indian households show flat consumption profiles after adjusting for family size
- Rising savings rate implies that households in India do not smooth consumption in the traditional life-cycle-perfect markets sense
- Provide evidence that this behavior is driven by the need to save for lumpy investments

- Historically, two major sources- National Accounts and National Sample Surveys of Consumption Expenditures.
 - Well documented divergence between the two.
 - Last NSSO survey was 2011. In any case, did not measure income.
- Private Savings in National Acct Statistics does not actually reflect household savings (See Pandey and Patnaik, 2019)

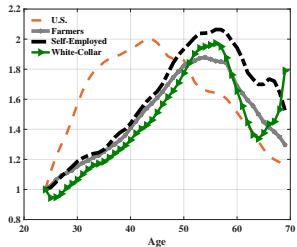
(a) Family Type



(b) Region



(c) Region

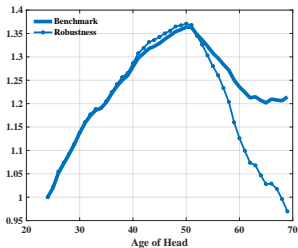


- Designate the highest earner as the household head
- Large overlap between reported head and financial head

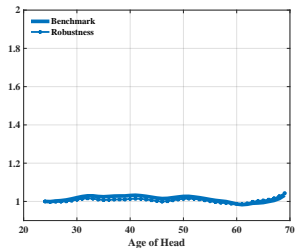
Share of Households With Heads as Primary Earning Members

	Avg.	Urban	Rural	Ext.	Nuc.	Farmer	Self-Emp.	White-Collar
Share	0.78	0.76	0.78	0.50	0.88	0.81	0.85	0.90

(a) Unadjusted



(b) Adjusted



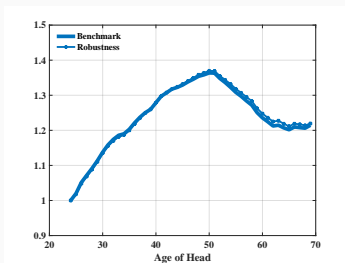
Notes: This robustness exercise drops all households where the head is not the primary earning member.

Table 1: Estimated Annual Value of Home Production
By Region Type

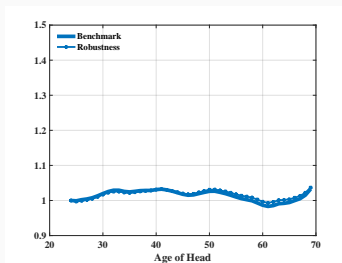
(in USD PPP)	Home Production		Non Durable Expenditures	
	Mean	Std. Dev.	Mean	Std. Dev.
Average	158.14	647.85	5945.14	3269.56
Urban	36.59	343.84	7381.07	4039.94
Rural	216.22	743.88	5258.96	2557.93

Notes: Home production here refers to the imputed value of agricultural and commercial goods produced for self-consumption.

(a) Unadjusted



(b) Adjusted



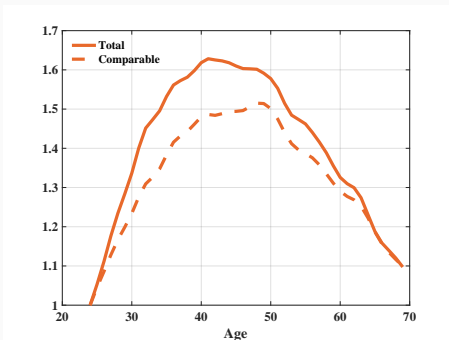
Notes: This robustness exercise adds estimates of home production to household consumption expenditures.

Life-Cycle Consumption Growth in India Under Alternate Specifications

Spec.	Unadjusted		Adjusted	
	Δ^*	Peak Age	Δ^*	Peak Age
Third order polynomial	1.33	48	1.04	37
Fourth order polynomial	1.34	47	1.04	41
Nonparametric	1.36	50	1.03	41

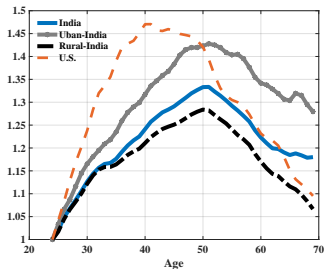
Notes: Δ^* refers to the ratio of peak consumption expenditures to age 24 consumption expenditures. Peak age refers to the age at which highest life-cycle consumption is attained.

Unadjusted Life-Cycle Consumption in the U.S.

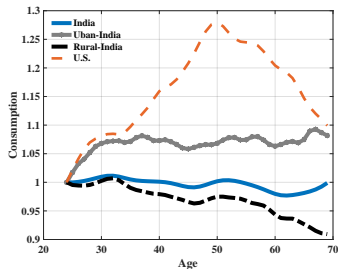


Comparable categories includes 1) food 2) transportation 3) education 4) childcare 5) health care 6) clothing 7) household repairs and furnishing 8) trips and recreational activities 9) housing related to rent, utility, telephone and internet. Total consumption includes, in addition to comparable categories, mortgage, property taxes and home owner's insurance.

(a) Unadjusted



(b) Adjusted



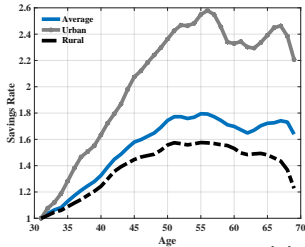
Do Intentions Predict Actual Purchases ?

	(1)	(2)	(3)	(4)
	Bought House	Bought Car	Bought tractor	Bought Cattle
Intend to Buy House in Previous Wave	0.693***			
Intend to Buy House 2 Waves Back	0.248***			
Intend to Buy Car in Previous Wave		0.535***		
Intend to Buy Car 2 Waves Back		0.464***		
Intend to Buy Tractor in Previous Wave			0.727***	
Intend to Buy Tractor 2 Waves Back			0.455***	
Intend to Buy Cattle in Previous Wave				0.657***
Intend to Buy Cattle 2 Waves Back				0.348***
Observations	1705700	1705700	1705700	1705700

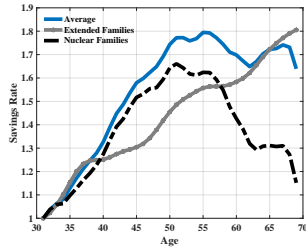
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Accumulation of Durable Goods Over the Life Cycle

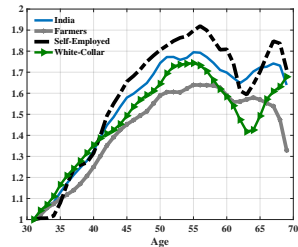
(a) By Region



(b) By Family

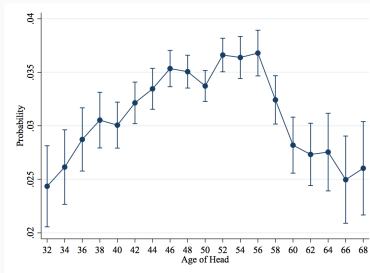


(c) By Occupation

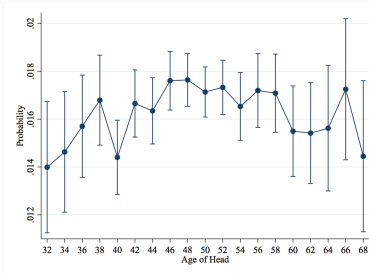


Borrowing For Home and Durable Purchases

(a) House



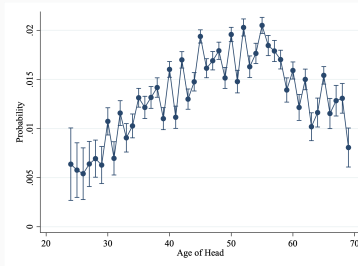
(b) Consumer Durables



Installment Payments For Home and Durable Purchases

Back

(a) House



(b) Consumer Durables

