Why Are Older Women Missing in India? The Age Profile of Bargaining Power and Poverty

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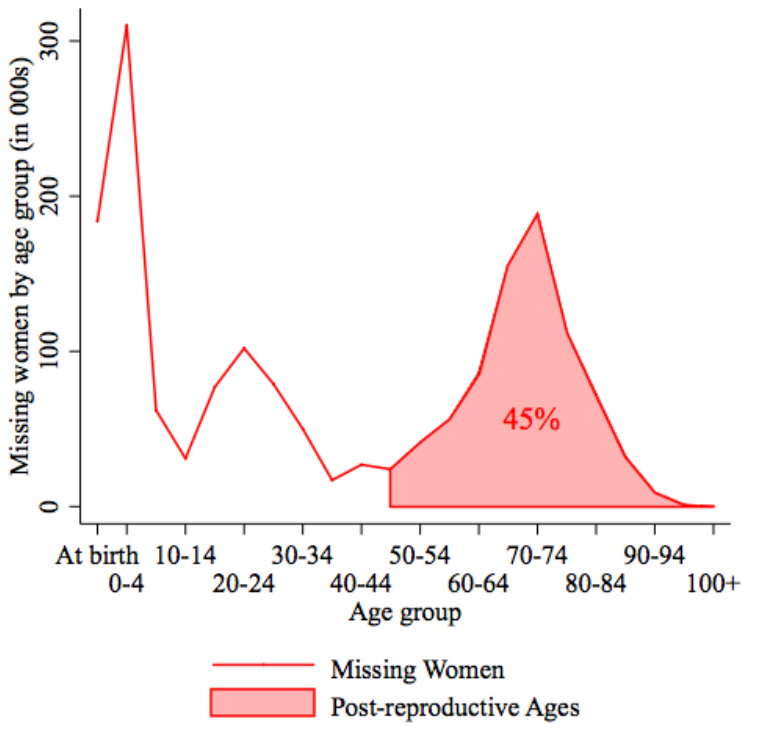
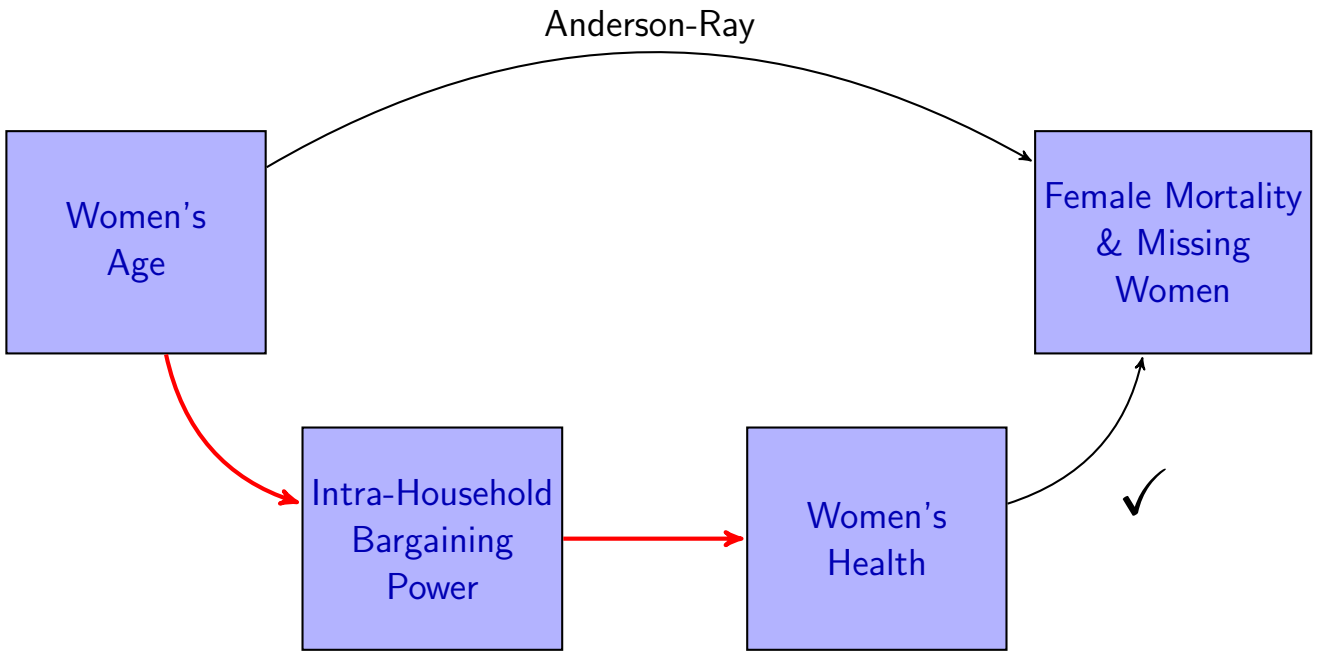
Missing Women in India

- Excess female mortality in India persists beyond childhood (Anderson-Ray, 2010, 2012, 2015)
- 45% of missing women in India are of **post-reproductive ages (45+)**
- 0.9% of women over 45 are missing (800,000 in year 2000)



Missing Women By 5-year Age Group
(Anderson-Ray, 2010)

Why Are Older Women Missing?



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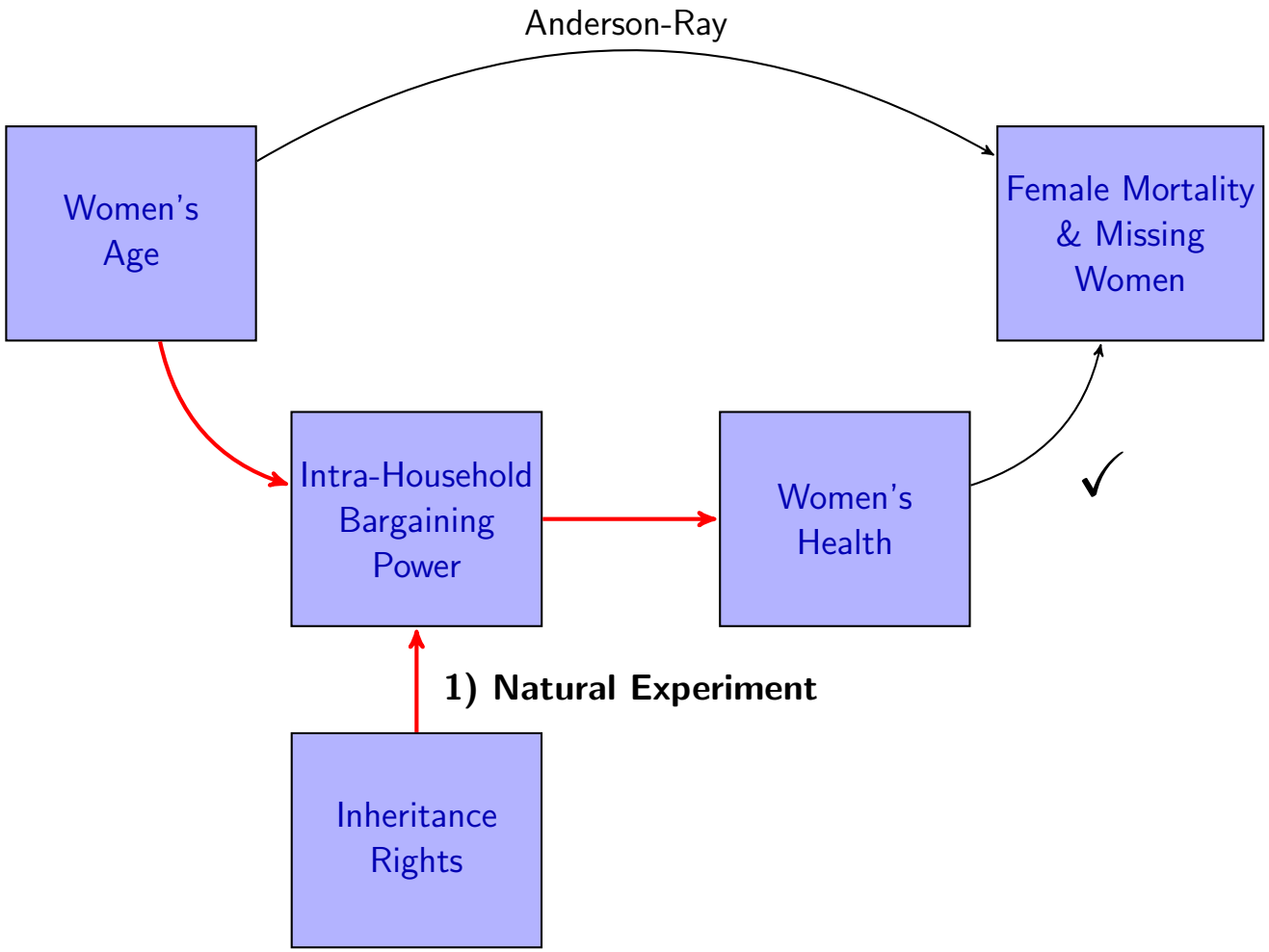

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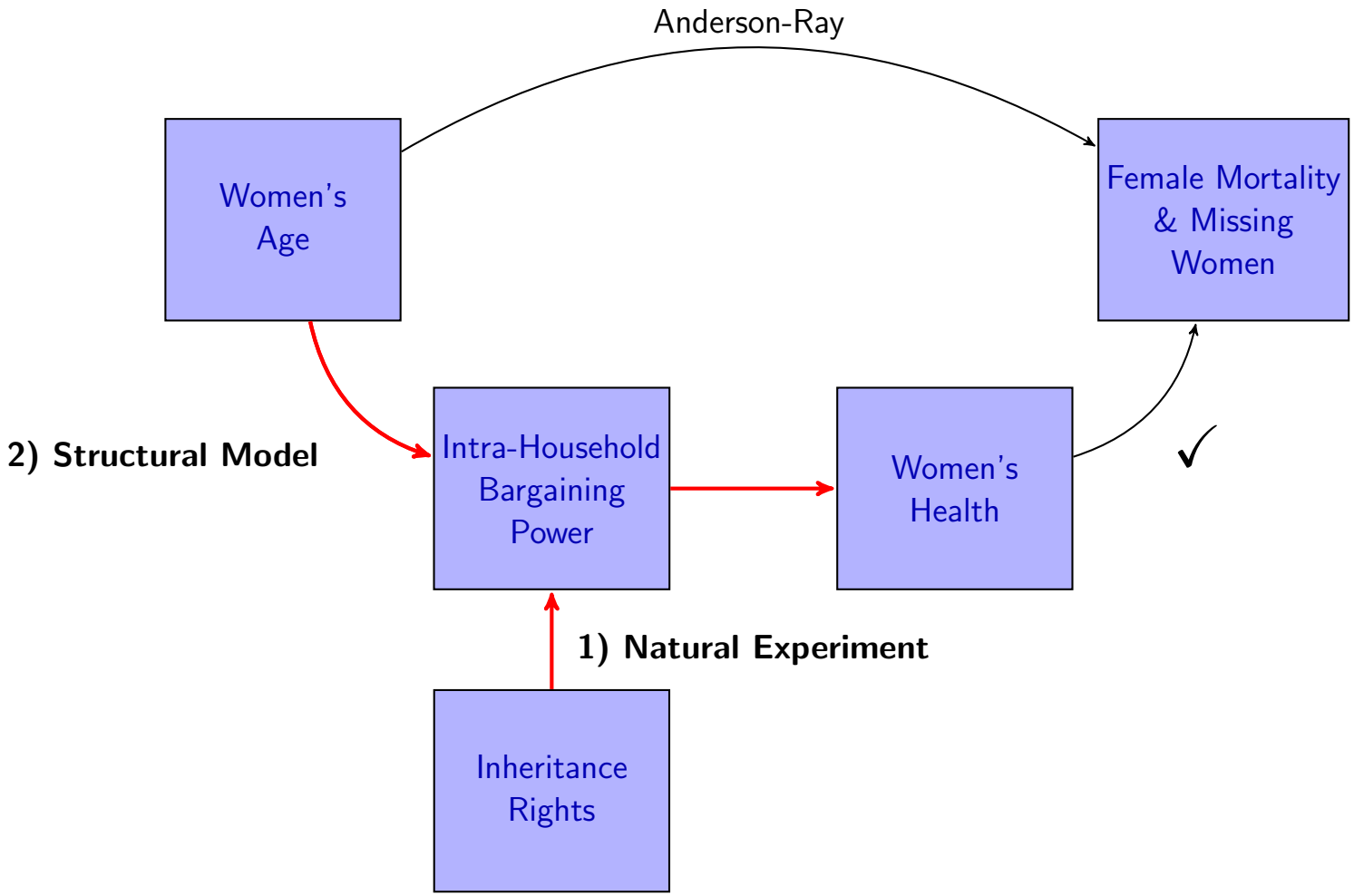

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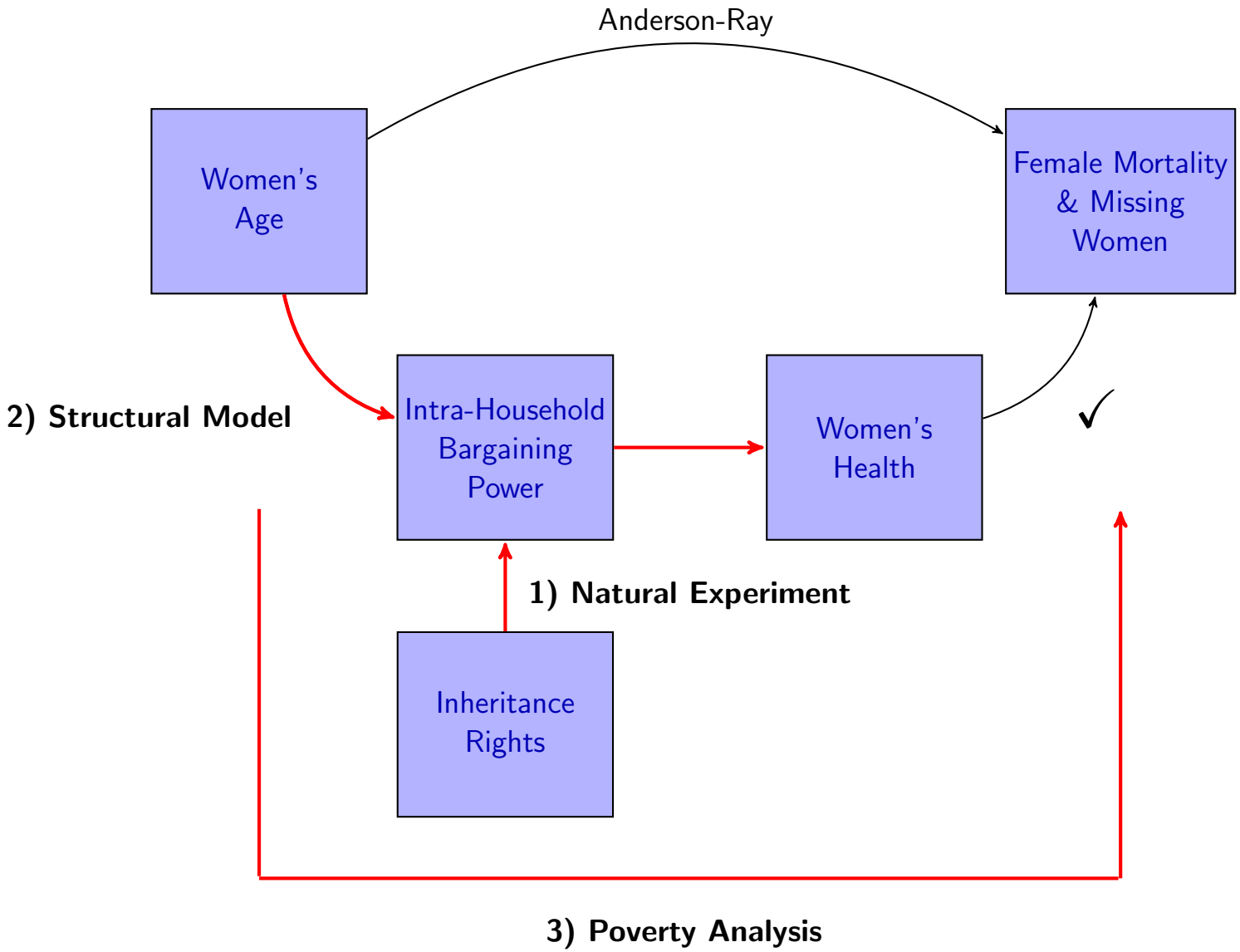

Preview of Results

- Women's bargaining power within the family positively affects their health (*natural experiment)*
- Women's bargaining power and access to household resources drop at older ages (*structural model)*

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- Poverty rates are higher among older women (*poverty analysis*)
  - The age profile of excess female mortality exactly matches the age profile of female poverty relative to males'
- Intra-household gender inequality explains up to 89% of missing women at post-reproductive ages (*counterfactual analysis*)

Related Literature

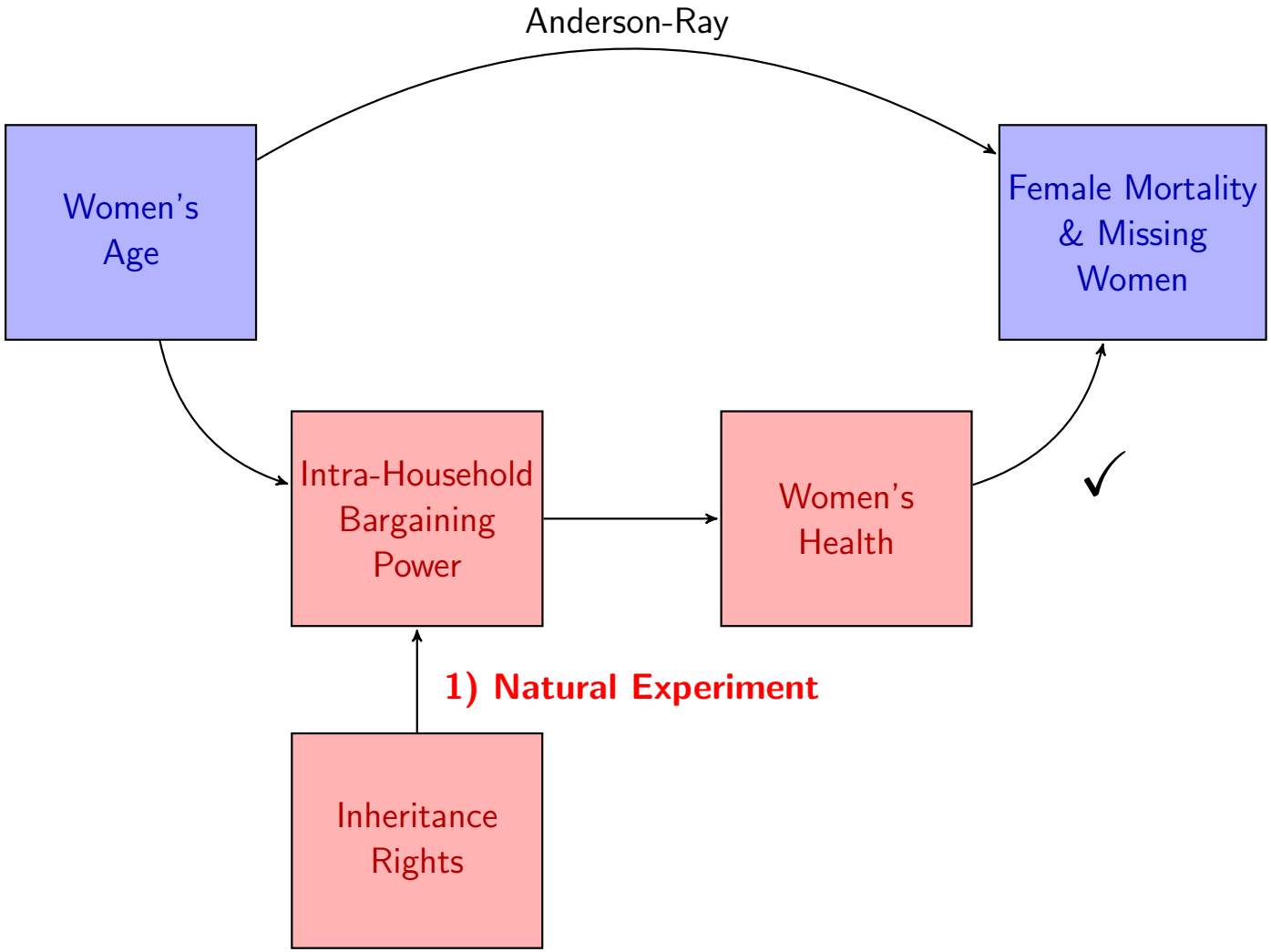
1. Age distribution of missing women
   (e.g., Anderson-Ray, 2010, 2012, 2015; Milazzo, 2014)
   Much wider literature on missing women: son preference, sex-selective abortion (Sen, 1990, 1992; DasGupta, 2005; Jha et al., 2006; Bhalotra et al., 2010, 2015)

2. Plight of elderly and older women in South Asia
   (e.g., *Widows*: Chen-Drèze, 1995; Drèze-Srinivasan, 1997. *Poverty among the elderly*: Deaton-Paxton, 1995; Pal-Palacios, 2006)

3. Inheritance rights and women's outcomes
   (e.g., Roy, 2008, 2013; Deininger-Goyal-Nagarajan, 2013; Heath-Tan, 2014; Rosenblum, 2015; La Ferrara-Milazzo, 2014; Harari, 2014)

4. Collective household models and bargaining power
   (e.g., Chiappori 1988, 1992; Lewbel-Pendakur, 2008; Browning-Chiappori-Lewbel, 2013; Dunbar-Lewbel-Pendakur, 2013)

Natural Experiment



Hindu Succession Act and Amendments

- **Law changes:** State-level reforms equalizing inheritance rights between genders
  - Hindu Succession Act (1956)
  - Amendments (Kerala in 1976, Andhra Pradesh in 1986, Tamil Nadu in 1989, Maharashtra and Karnataka in 1994; India in 2005)
  - Hindu, Buddhist, Jain and Sikh women who married after the reforms

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  - Hindu, Buddhist, Jain and Sikh women who married after the reforms
- $\uparrow$ women's bargaining power

Bargaining Power and Health

- Data: 2005-2006 National Family Health Survey
  - Married women 15-49

- Empirical specification:

$$y_{irsc} = \beta * Treat_{irsc} + X'_{irsc}\gamma + \alpha_r + \alpha_c + \alpha_s + \alpha_{rs} + \alpha_{rc} + \alpha_{sc} + \epsilon_{irsc}$$

  - y_{irsc}: Woman i's health outcome (r: religion; c: cohort; s: state)
    - Body Mass Index
    - Pr(Underweight)
    - Pr(Anaemia)
  - $Treat_{irsc} =$ (Hindu,Buddhist,Jain,Sikh) $*$ (Unmarried at time of reform)
  - X_{irsc}: Individual and household controls
  - α: Fixed effects

More Bargaining Power, Better Health

	Body Mass Index		Pr(Anaemia)		
	BMI	Pr($BMI \leq 18.5$)	Severe	Moderate	Mild
	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS
HSAA Exposed	0.205***	-0.0446***	-0.0123***	-0.0304***	-0.0316***
	(0.0776)	(0.0102)	(0.00316)	(0.00897)	(0.0110)
N	81,534	81,534	77,777	77,777	77,777
Mean Dependent Variable	21.42	0.2648	0.0154	0.1559	0.5298

Note: *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. NFHS-3 data. Married women of age 15 to 49 included in the sample. Robust standard errors in parentheses. Standard errors clustered at the primary sampling unit (village) level (3,753). Sampling weights applied.

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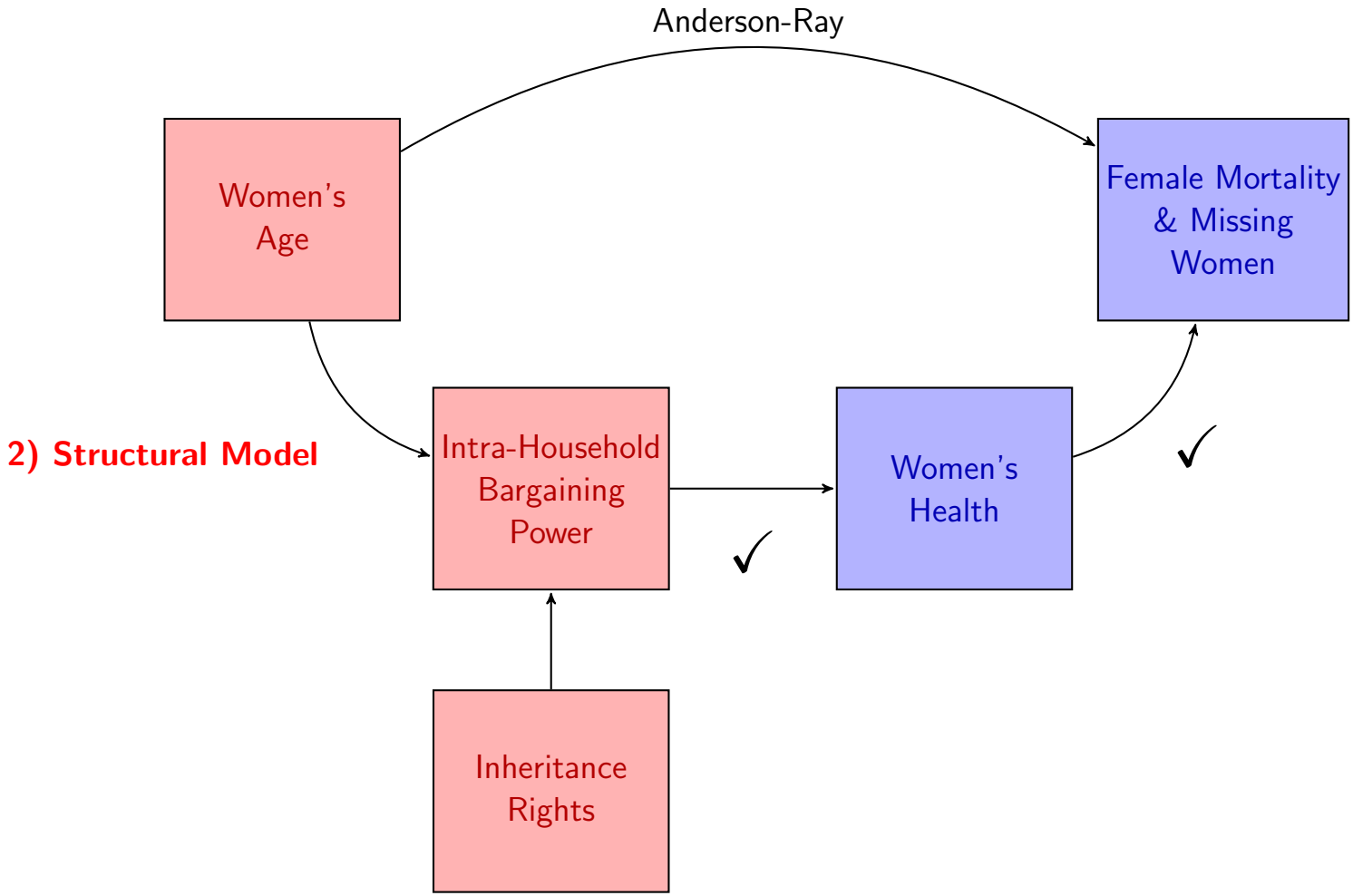
- Validity of empirical strategy ✓
- Robustness checks ✓

Structural Model



Collective Households

- Chiappori (1988, 1992)
- Separate utility functions over goods for each household member
- Pareto efficient outcomes (bargaining process unspecified)
- Goods can be shared (economies of scale in consumption)
- Caring preferences
- Children as separate agents

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- 3 types of individuals within each household ($j = f, m, c$): women, men, and children
- $J = F, M, C$: Total number of household members of type j

Household Program: Details

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Household Program: Details

- Nuclear and extended households, with and without children under 15
  - Nuclear households: 35% of the sample
  - No children under 15: 1/3 households

Resource Shares (Λ_j)

- Λ_j: **Fraction of household expenditure consumed by individuals of type j, $j = m, f, c$**

- y: Total household expenditure
- y_j: Household expenditure consumed by individuals of type j

- $\Lambda_f = y_f/y$: Women's resource shares
- $\Lambda_m = y_m/y$: Men's resource shares
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Resource Shares (Λ_f, Λ_m, Λ_c)

Measure of bargaining power and access to household resources but

- **not observable**
- **not identified**, without additional assumptions

Identification

- Identification of resource shares using **Engel curves of private assignable goods: Clothing** (Dunbar-Lewbel-Pendakur, 2013)
  - Engel curve: Relationship between a budget share and total expenditure, holding prices constant
  - Assignable clothing: Clothing items that are consumed **exclusively** by women, men or children

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- Assumptions (all testable, with additional data):
  1. Observability of one private assignable good (clothing)
  2. Restrictions on individual preferences (similar-tastes for clothing)
  3. Restrictions on how resource shares vary with expenditure

Details

Identification

- Engel curves for women's, men's and children's clothing (g_j):

$$W_f = g_f(\Lambda_f y, \Lambda_f)$$
$$W_m = g_m(\Lambda_m y, \Lambda_m)$$
$$W_c = g_c(\Lambda_c y, \Lambda_c)$$

  - W_j: Budget share spent on type j's clothing
  - y: Total household expenditure
  - Λ_j: Type j's resource share
  - $\Lambda_f + \Lambda_m + \Lambda_c = 1$
  - Important: $W_j \neq \Lambda_j$ Budget Shares W_j vs. Resource Shares Λ_j

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- Estimate g_j (with variation in y and W_j across households) Linear Case: Details
- Given y, W_j, and g_j^{-1}, back out Λ_j

Identification

- **Strengths**:
  - Exact identification of parameters of interest
    - **Resource shares (bargaining power)**
    - **Preference parameters on assignable clothing**
  - Mild data requirement
  - No price variation needed
- **Limitation**:
  - Not estimating the full model

Data

- NSS Consumer Expenditure Survey (68th round, 2011-2012)
- Detailed consumer expenditure and **assignable clothing items**
  - Women: Saree, shawls, chaddar, kurta-pajamas suits for females
  - Men: Dhoti, lungi, kurta-pajamas suits for males, salwar
  - Children: School uniforms, infant clothing
- Household characteristics: Composition (number of women, men, children, fraction of female children, presence of widow, daughter in law, unmarried daughter above 15), religion, caste, region, rural areas, land ownership, presence of salary earner, age of household members
- Women's eligibility to Hindu Succession Act amendments
- No data on health status/outcome
- $\approx 87,000$ households

Descriptive Statistics - Full Sample | Descriptive Statistics - Two Samples

System of Engel Curves

$$W_j = \overbrace{\alpha_j \Lambda_j + \beta \Lambda_j \ln\left(\frac{\Lambda_j}{J}\right)}^{\text{Intercept}} + \underbrace{\beta \Lambda_j}_{\text{Slope}} \ln y + \epsilon_j$$

- Linear in $\ln y$ Details
- Engel curves of assignable clothing for adults and children ($j = f, m, c$)
- $\beta = \beta_j$: Similar-tastes assumption
  - W_j: Budget share on assignable clothing
  - α_j, β: Preference parameters
  - Λ_j: Resource share
  - y: Total household expenditure
  - J: Number of individuals of type j
- W_j, y, J are **observable**
- Heterogeneity: α_j, β, Λ_j allowed to **vary linearly** with household characteristics

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1. Estimate the system for households **with** and **without** children (Non-Linear SUR)

Details

2. For each household, predict
   - Resource shares: $\hat{\Lambda}_f$, $\hat{\Lambda}_m$, $\hat{\Lambda}_c$
   - Preference parameters: $\hat{\alpha}_f$, $\hat{\alpha}_m$, $\hat{\alpha}_c$, $\hat{\beta}$

Estimation Results

- Women get less than men (64-85% of men's resources)
- Determinants of women's resource shares
  - **Women's age** $-$, especially in hhs without children
  - **Hindu Succession Act amendments** $+$
  - Household composition (number of women $+$, number of men $-$, **fraction of female children** $+$, **widow** $-$)
  - Socio-economic characteristics (salary earner $-$, high caste $-$, female and male education $+$)
  - Location (rural areas $-$, North $-$, North-East $+$)

Results Table

Predicted Resource Shares - Descriptive Statistics

Bargaining Power and Age

- **How does women's bargaining power vary with age?**
- Cross-sectional variation to trace out the **age profile of women's bargaining power**
- *Caveat: Cannot disentangle age from cohort*

Bargaining Power and Age

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- **Resource share ratio** $(\hat{\Lambda}_f/\hat{\Lambda}_m)$: Measure of women's bargaining power relative to men's
  - $= 1 \rightarrow$ No gender asymmetry in intra-household allocation
  - $\neq 1 \rightarrow$ Gender asymmetry in intra-household allocation

Women's Bargaining Power Decreases With Age

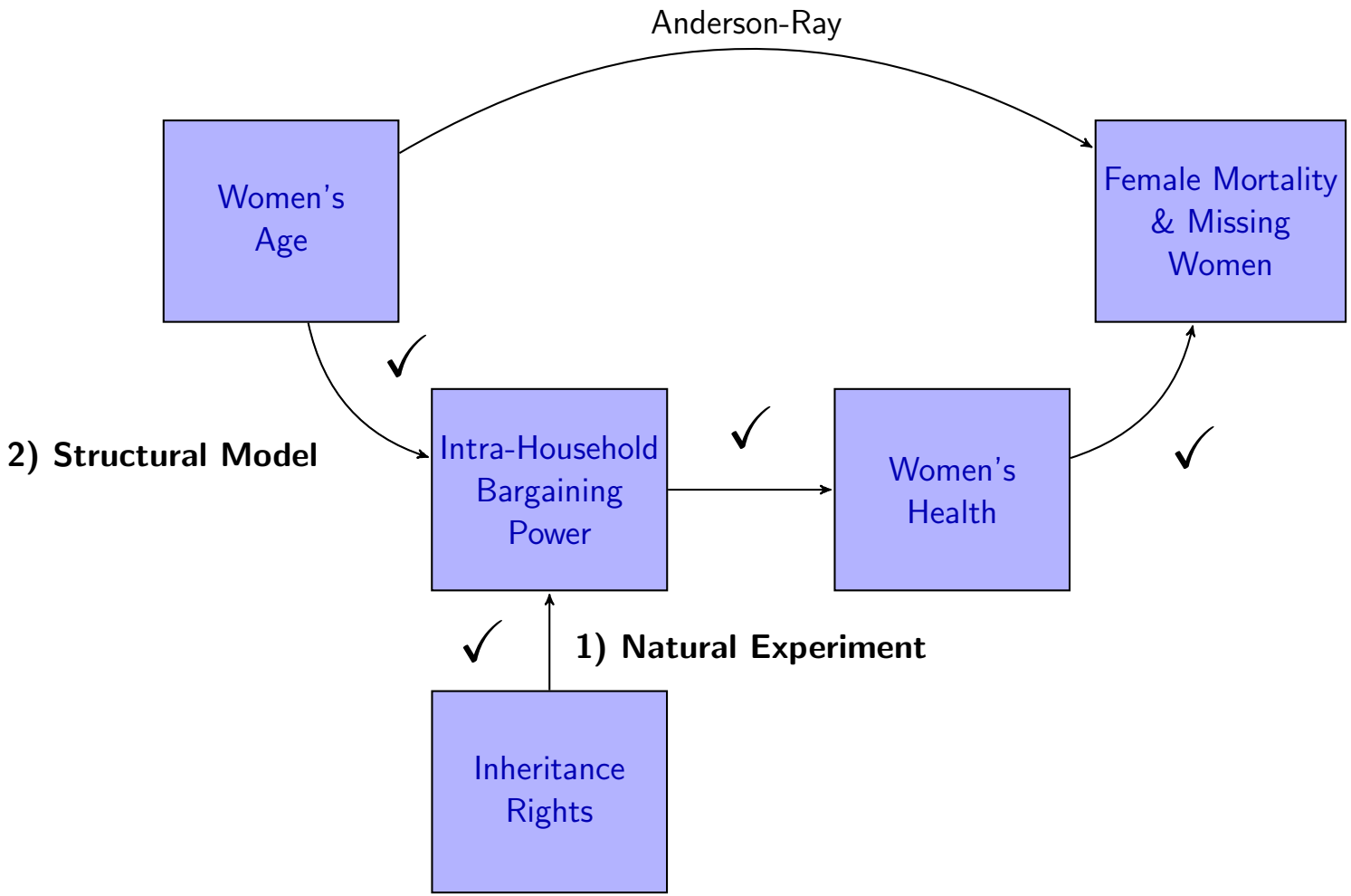
- Average ratio $\hat{\Lambda}_f/\hat{\Lambda}_m$, among households with women of age equal to $15, ..., 79$

Resource Share Ratio ($\hat{\Lambda}_f/\hat{\Lambda}_m$) and Women's Age

(The model does not impose restrictions on the shape of this relation)

Women's Resource Shares and Age | Women's Resource Shares and Age: Nuclear Hhs | Women's Resource Shares and Age: Reference Hhs | Women's and Men's Resource Shares and Age

Summary So Far



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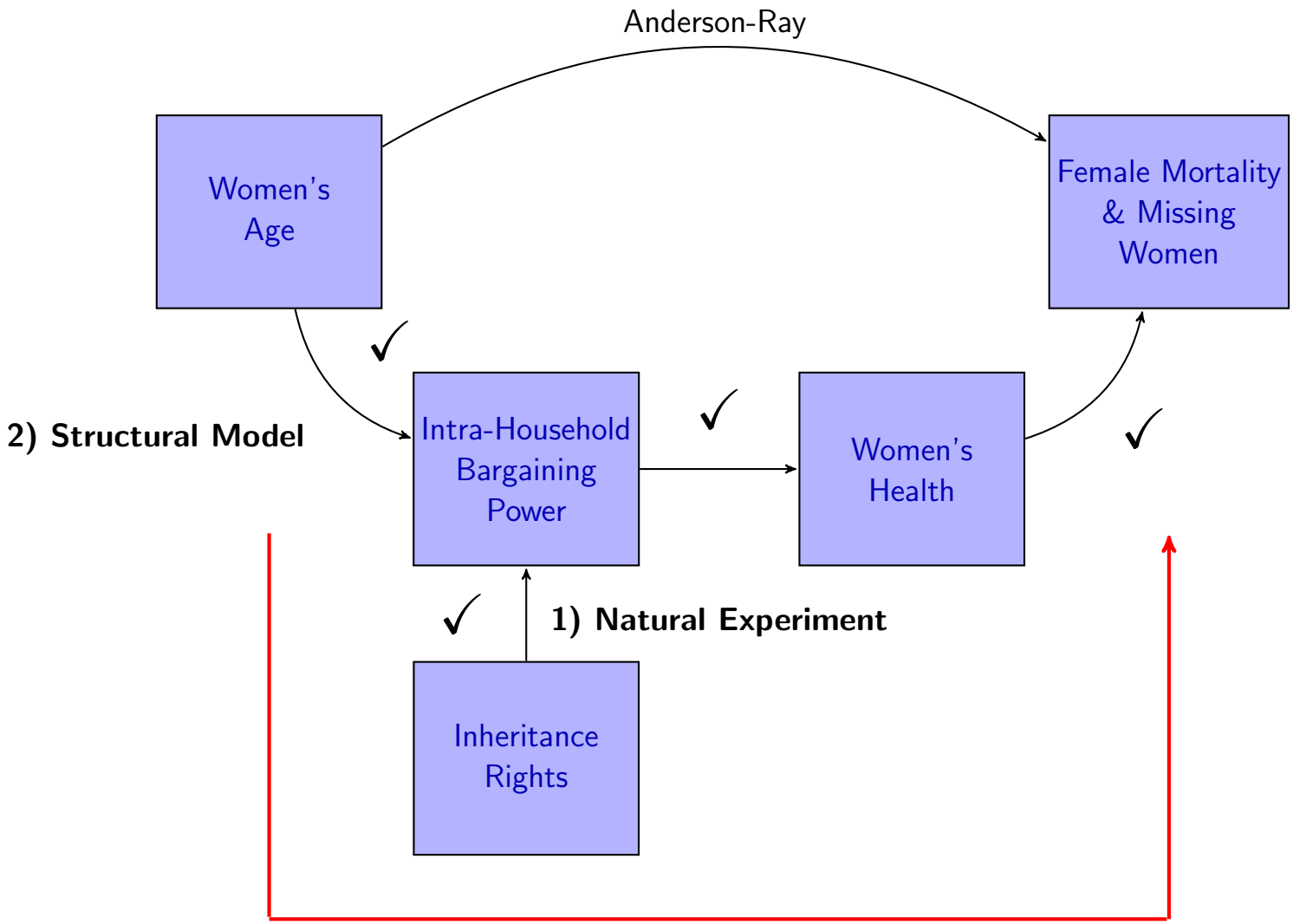
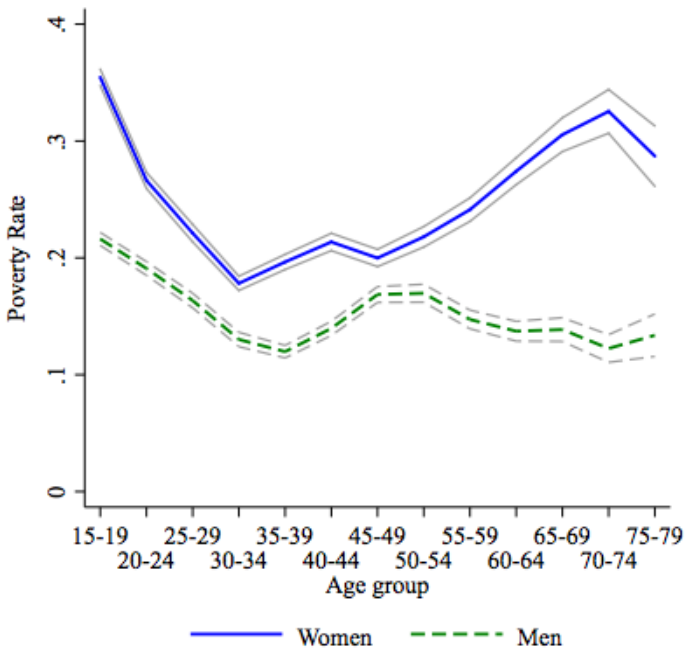


Poverty Analysis

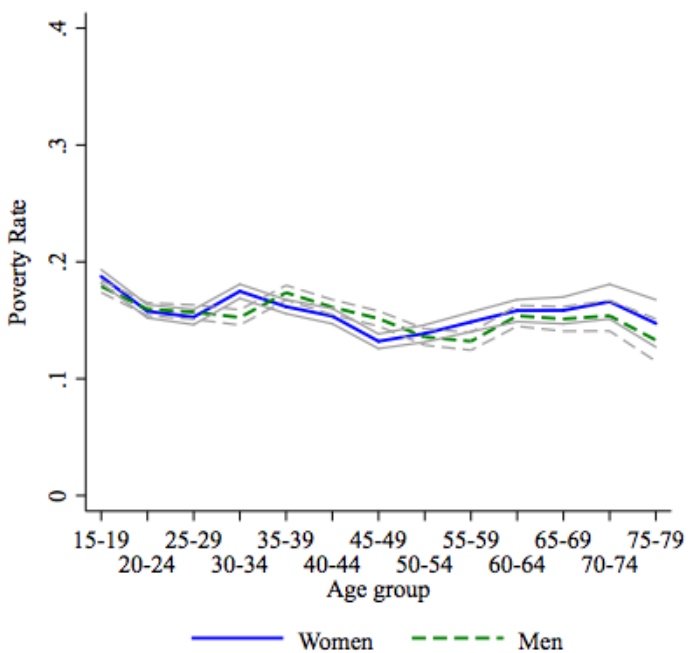
- Poverty rates that take into account *unequal sharing* of household resources
- Gender and gender-age specific poverty rates
- Different from standard poverty measures that assume *equal sharing*

Poverty By Gender and Age

- Poverty rates by gender and age group (5-year, 15-19 to 75-79)
- World Bank extreme poverty line (1.90$/day)



Unequal Sharing
(Model Predictions)



Equal Sharing

3.10$/day Poverty Line | Nuclear Hhs Only

Relative Poverty

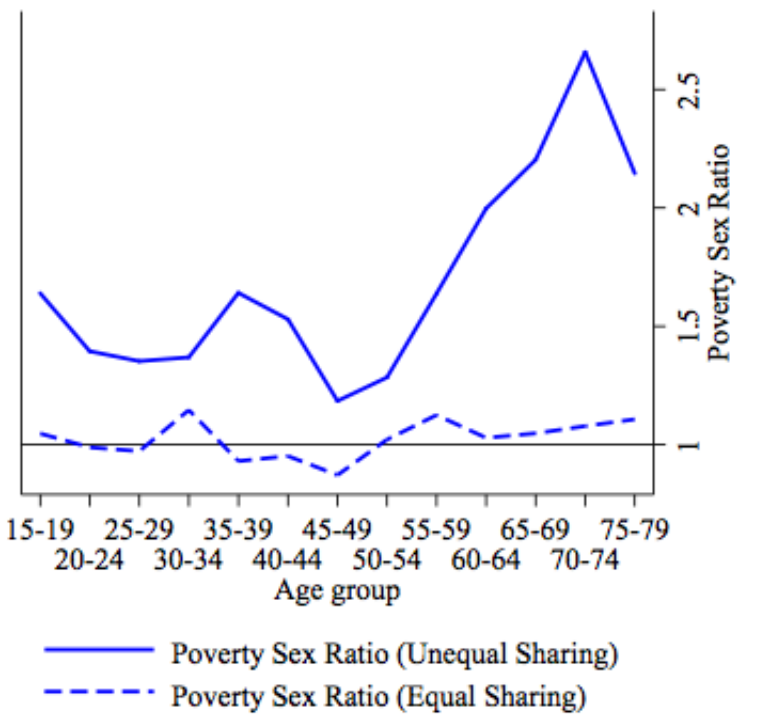
- **Poverty Sex Ratio**: Measure of female poverty relative to that of males

$$\text{Poverty Sex Ratio} = \frac{\text{Female Poverty Rate}}{\text{Male Poverty Rate}}$$

  - $= 1 \rightarrow$ No gender asymmetry in poverty
  - $\neq 1 \rightarrow$ Gender asymmetry in poverty
  - $> 1 \rightarrow$ *Excess female poverty*

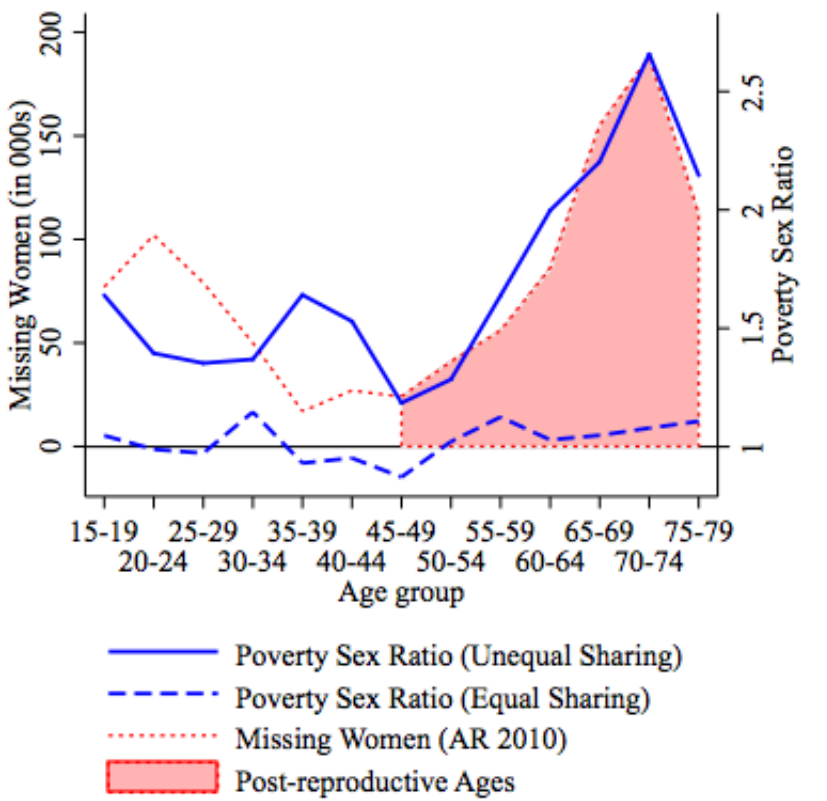
Relative Poverty, Missing Women and Age

- Poverty Sex Ratio by age group (5-year, 15-19 to 75-79)



Relative Poverty, Missing Women and Age

- Poverty Sex Ratio by age group (5-year, 15-19 to 75-79)
- Missing women by age group (Anderson-Ray, 2010)



The age distribution of excess female poverty matches almost perfectly that of excess female mortality

Counterfactual Analysis

1. Equal sharing of household resources
2. Equal inheritance rights for all women

Excess Female Poverty and Mortality

1. Equal sharing of household resources:	
Female poverty	$\downarrow 34\%$
Male poverty	$\approx$ (but 3.10\$/day $\uparrow$)
Excess female poverty (45-79)	$\downarrow 94\%$
Excess female mortality (45-79)	$\downarrow 85\%$
No excess female poverty (Poverty Sex Ratio = 1):	
Excess female mortality (45-79)	$\downarrow 89\%$
2. Equal inheritance rights for all women:	
Female poverty	$\downarrow 9\%$
Male poverty	$\approx$ (3.10\$/day $\uparrow$)
Excess female poverty (45-79)	$\downarrow 27\%$
Excess female mortality (45-79)	$\downarrow 24\%$

Concluding Remarks

- Mechanism to explain missing women at post-reproductive ages in India: intra-household bargaining power and resource allocation
  1. Women's bargaining power positively affects their health
  2. Women's bargaining position deteriorates at post-reproductive ages
  3. Poverty rates are higher among women than men, especially at older ages

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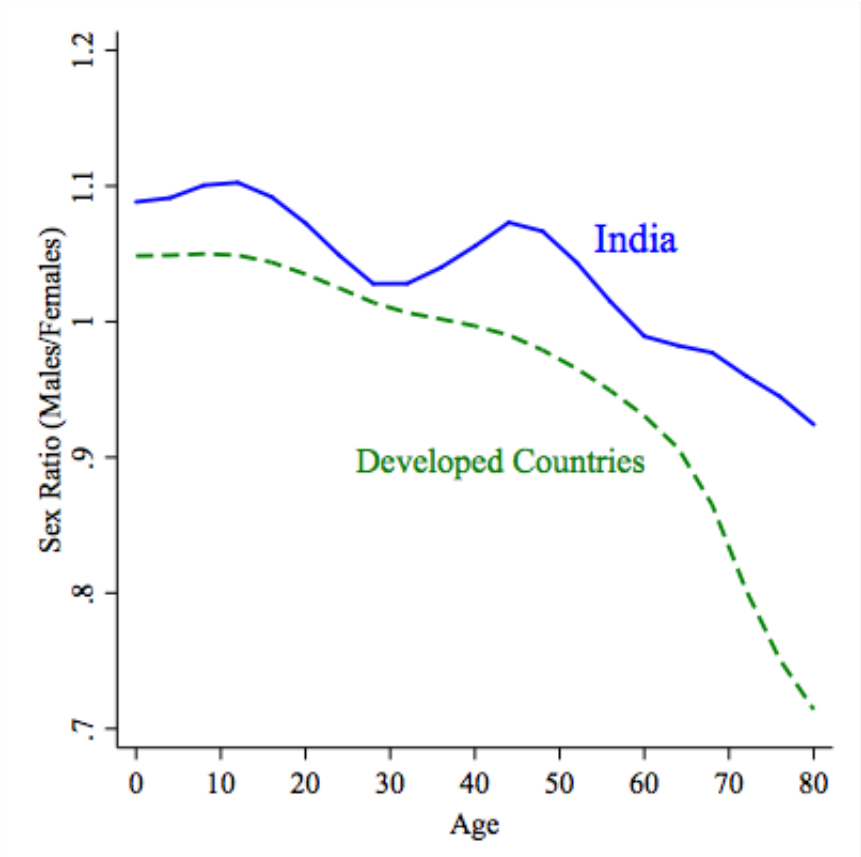
  1. Women's bargaining power positively affects their health
  2. Women's bargaining position deteriorates at post-reproductive ages
  3. Poverty rates are higher among women than men, especially at older ages
- Policy implications:
  - Need to focus on gender asymmetries among the elderly
  - Poverty measures should account for intra-household allocation
  - Policies aimed at promoting equality within households can have a large impact on female health, poverty and mortality

Future Work

Thank you!

Missing Women in India

- Sex ratio (males/females) by age



Source: United Nations Statistics Division and Census of India (2010-2011).
Developed countries: Canada, Germany, Italy, Japan, Portugal, Spain, US.

Sex-ratio By Age: Not A Cohort Effect

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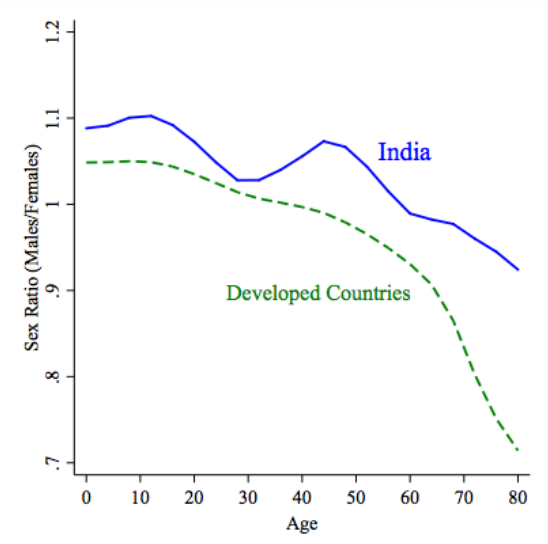
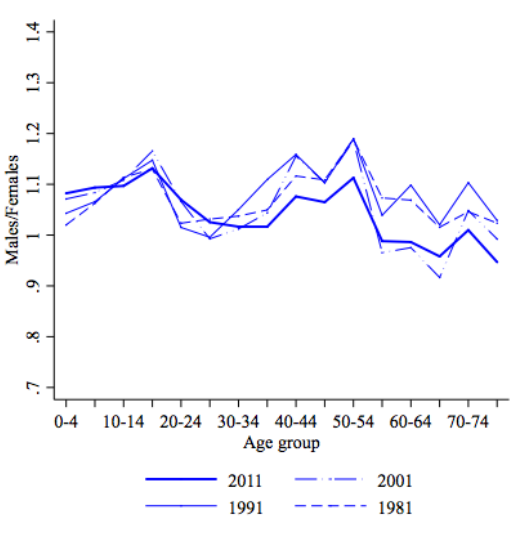
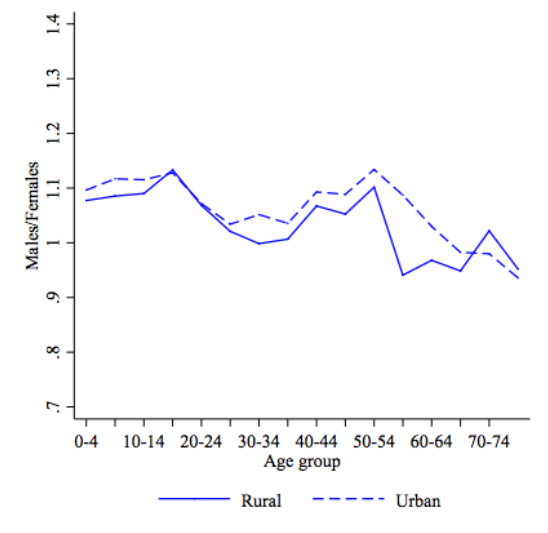
Sex Ratio and Age



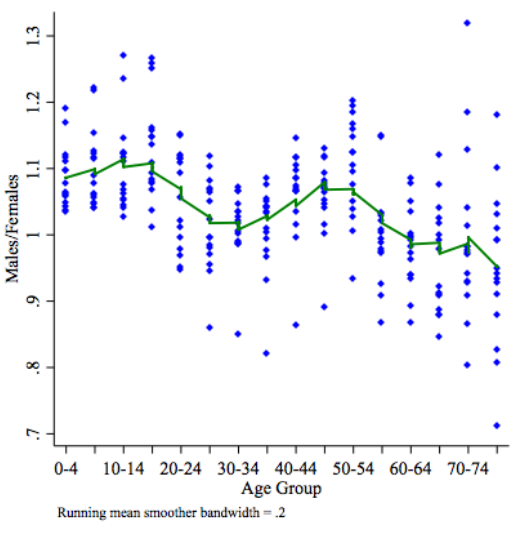
(A) Sex Ratio By Age Group



(B) Cohort Comparison



(C) Urban vs. Rural



(D) Distribution Across States

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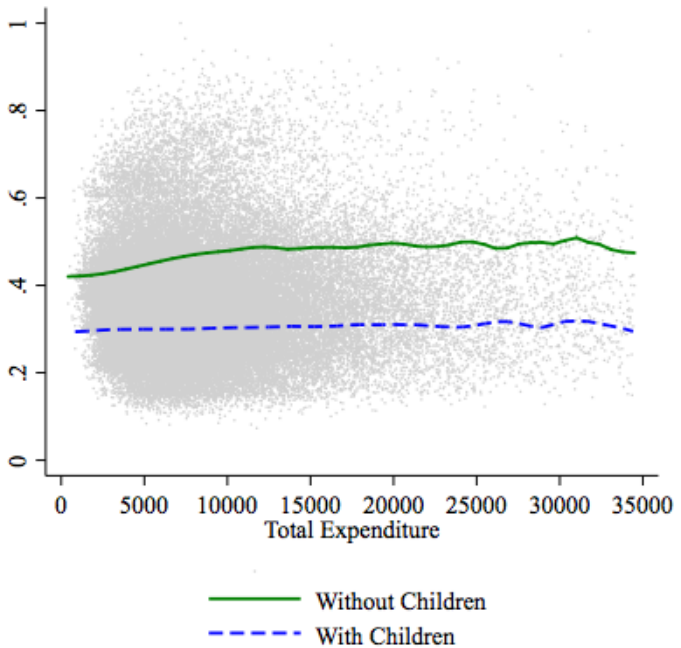
Assumptions

- *Similar tastes*: Pendakur, 1999; Blundell-Chen-Kristensen, 2007
- *y-independence*: Menon-Pendakur-Perali, 2012; Cherchye-De Rock-Vermeulen, 2012
- Can depend on stuff that is correlated with expenditure (e.g. wealth)
- Predicted women's resource shares and total expenditure



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Descriptive Statistics: NSS Full Sample

	Obs.	Mean	Median	St. Dev.
Total Expenditure	87,373	8,108.98	6,775.00	5,042.64
Expenditure On Non-Durable Goods	87,373	7,694.28	6,538.33	4,579.95
Expenditure On Durable Goods	87,373	414.70	106.85	1,156.44
Food Budget Share	87,373	39.24	39.26	9.62
Female Assignable Clothing Budget Share	87,373	1.37	1.17	1.16
Male Assignable Clothing Budget Share	87,373	1.68	1.41	1.42
Children Assignable Clothing Budget Share	87,373	0.51	0.00	0.76
No. Adult Females	87,373	1.68	1.00	0.85
No. Adult Males	87,373	1.76	1.00	0.92
Fraction of Female Children	57,158	0.45	0.50	0.39
Number of Children Under 5	87,373	1.32	1.00	1.26
$\mathbb{I}$(Daughter in Law)	87,373	0.20	0.00	0.40
$\mathbb{I}$(Unmarried Daughter Above 15)	87,373	0.23	0.00	0.42
$\mathbb{I}$(Widow)	87,373	0.15	0.00	0.35
Avg. Age Men 15 to 79	87,089	37.77	36.00	10.52
Avg. Age Women 15 to 79	87,263	36.96	35.00	10.15
Avg. Age Gap 15 to 79 (Men - Women)	87,005	0.88	3.00	11.15
Avg. Age Children 0 to 14	57,158	7.57	8.00	3.97
$\mathbb{I}$(HSAA Eligible)	74,127	0.12	0.00	0.33
$\mathbb{I}$(Hindu, Buddhist, Sikh, Jain)	87,373	0.79	1.00	0.41
$\mathbb{I}$(Sch. Caste, Sch. Tribe or Other Backward Classes)	87,373	0.69	1.00	0.46
$\mathbb{I}$(Salary Earner)	87,373	0.30	0.00	0.46
$\mathbb{I}$(Land Ownership)	87,373	0.89	1.00	0.31
$\mathbb{I}$(Female Higher Education)	87,373	0.12	0.00	0.32
$\mathbb{I}$(Male Higher Education)	87,373	0.19	0.00	0.39
$\mathbb{I}$(Rural)	87,373	0.61	1.00	0.49
$\mathbb{I}$(North)	87,373	0.31	0.00	0.46
$\mathbb{I}$(East)	87,373	0.20	0.00	0.40
$\mathbb{I}$(North-East)	87,373	0.14	0.00	0.35
$\mathbb{I}$(South)	87,373	0.22	0.00	0.41
$\mathbb{I}$(West)	87,373	0.12	0.00	0.33

Back

Descriptive Statistics: NSS Two Samples

	Households Without Children < 15				Households With Children < 15			
	Obs.	Mean	Median	St. Dev.	Obs.	Mean	Median	St. Dev.
Total Expenditure	57,158	8,226.58	6,908.00	4,911.55	30,215	7,886.53	6,481.00	5,274.64
Expenditure On Non-Durable Goods	57,158	7,849.90	6,695.14	4,492.67	30,215	7,399.88	6,206.62	4,726.76
Expenditure On Durable Goods	57,158	376.67	106.85	1,022.50	30,215	486.65	107.26	1,371.71
Food	57,158	40.46	40.41	9.42	30,215	36.95	37.06	9.58
Female Assignable Clothing	57,158	1.31	1.13	1.09	30,215	1.49	1.25	1.29
Male Assignable Clothing	57,158	1.62	1.36	1.38	30,215	1.78	1.51	1.48
Children Assignable Clothing	57,158	0.69	0.51	0.81	-	-	-	-
No. Adult Females	57,158	1.69	1.00	0.86	30,215	1.67	1.00	0.83
No. Adult Males	57,158	1.67	1.00	0.90	30,215	1.91	2.00	0.93
Fraction of Female Children	57,158	0.45	0.50	0.39	-	-	-	-
Number of Children Under 5	57,158	2.01	2.00	1.01	-	-	-	-
$\mathbb{I}$(Daughter in Law)	57,158	0.24	0.00	0.43	30,215	0.11	0.00	0.32
$\mathbb{I}$(Unmarried Daughter Above 15)	57,158	0.17	0.00	0.38	30,215	0.33	0.00	0.47
$\mathbb{I}$(Widow)	57,158	0.14	0.00	0.35	30,215	0.16	0.00	0.37
Avg. Age Men 15 to 79	57,109	36.94	36.00	8.76	29,980	39.37	36.00	13.10
Avg. Age Women 15 to 79	57,137	34.84	34.00	8.20	30,126	40.98	40.00	12.09
Avg. Age Gap 15 to 79 (Men - Women)	57,090	2.10	3.00	9.93	29,915	-1.44	1.50	12.86
Avg. Age Children 0 to 14	57,158	7.57	8.00	3.97	-	-	-	-
$\mathbb{I}$(HSAA Eligible)	47,330	0.15	0.00	0.35	26,797	0.08	0.00	0.28
$\mathbb{I}$(Hindu, Buddhist, Sikh, Jain)	57,158	0.77	1.00	0.42	30,215	0.83	1.00	0.38
$\mathbb{I}$(Sch. Caste, Sch. Tribe or Other Backward Classes)	57,158	0.71	1.00	0.45	30,215	0.65	1.00	0.48
$\mathbb{I}$(Salary Earner)	57,158	0.29	0.00	0.46	30,215	0.32	0.00	0.47
$\mathbb{I}$(Land Ownership)	57,158	0.89	1.00	0.31	30,215	0.90	1.00	0.30
$\mathbb{I}$(Female Higher Education)	57,158	0.10	0.00	0.30	30,215	0.14	0.00	0.35
$\mathbb{I}$(Male Higher Education)	57,158	0.17	0.00	0.37	30,215	0.24	0.00	0.43
$\mathbb{I}$(Rural)	57,158	0.63	1.00	0.48	30,215	0.57	1.00	0.50
$\mathbb{I}$(North)	57,158	0.33	0.00	0.47	30,215	0.28	0.00	0.45
$\mathbb{I}$(East)	57,158	0.21	0.00	0.41	30,215	0.19	0.00	0.39
$\mathbb{I}$(North-East)	57,158	0.16	0.00	0.36	30,215	0.12	0.00	0.33
$\mathbb{I}$(South)	57,158	0.19	0.00	0.39	30,215	0.27	0.00	0.45
$\mathbb{I}$(West)	57,158	0.12	0.00	0.32	30,215	0.13	0.00	0.34

Back

Back

	All Households Sample	With Children < 15 Only	Without Children < 15 Only
No. Adult Women	0.0396***	0.0319***	0.0552***
	(0.00406)	(0.00473)	(0.00908)
No. Adult Men	-0.0283***	-0.0217***	-0.0267***
	(0.00315)	(0.00364)	(0.00660)
No. Children	0.00553**	0.00592**	-
	(0.00219)	(0.00246)	-
Fraction of Female Children	0.0205***	0.0108*	-
	(0.00563)	(0.00554)	-
$\mathbb{I}$(Daughter in Law)	0.0139**	0.00727	0.0126
	(0.00658)	(0.00714)	(0.0179)
$\mathbb{I}$(Unmarried Daughter above 15)	0.00403	0.00717	-0.00253
	(0.00715)	(0.00803)	(0.0169)
$\mathbb{I}$(Widow)	-0.0136*	-0.0316***	-0.0168
	(0.00814)	(0.00972)	(0.0174)
$\mathbb{I}$(HSAA Eligible)	0.0117***	0.0124**	0.0218**
	(0.00402)	(0.00507)	(0.00932)
$\mathbb{I}$(Hindu, Buddhist, Sikh, Jain)	-0.0362***	-0.00978	-0.0167
	(0.00960)	(0.00808)	(0.0150)
$\mathbb{I}$(SC, ST, Other Backward Caste)	0.0567***	0.0613***	0.0555***
	(0.00802)	(0.00873)	(0.0123)
$\mathbb{I}$(Salary Earner)	-0.0283***	-0.0225***	-0.0126
	(0.00479)	(0.00502)	(0.00995)
$\mathbb{I}$(Land Ownership)	0.00764	0.00432	-0.0155
	(0.00899)	(0.00912)	(0.0180)
$\mathbb{I}$(Female Higher Education)	0.0302***	0.0277***	0.0368**
	(0.00732)	(0.00867)	(0.0159)
$\mathbb{I}$(Male Higher Education)	0.0303***	0.0387***	0.0813***
	(0.00562)	(0.00673)	(0.0126)
$\mathbb{I}$(Rural)	-0.0353***	-0.0300***	-0.0402***
	(0.00667)	(0.00707)	(0.0116)
Avg. Age Diff. (Men 15 to 79 - Women 15 to 79)	0.00202	-0.115**	0.0514
	(0.0404)	(0.0485)	(0.0805)
Avg. Age Women 15 to 79	-0.572	-0.208	-1.632
	(0.597)	(0.801)	(1.144)
(Avg. Age Diff. (Men 15 to 79 - Women 15 to 79))^2	-0.199*	0.129	-0.504***
	(0.112)	(0.139)	(0.188)
(Avg. Age Women 15 to 79)^2	0.959	0.374	2.912
	(1.437)	(2.027)	(2.658)
(Avg. Age Diff. (Men 15 to 79 - Women 15 to 79))^3	0.0456	0.478	-0.705
	(0.514)	(0.741)	(0.762)
(Avg. Age Women 15 to 79)^3	-0.354	-0.262	-1.623
	(1.110)	(1.666)	(1.970)
Avg. Age Children 0 to 14	-0.0710	-0.0151	-
	(0.0488)	(0.0681)	-
$\mathbb{I}$(North)	-0.0785***	-0.0984***	-0.0652***
	(0.0150)	(0.0168)	(0.0232)
$\mathbb{I}$(East)	-0.0141	-0.0171	-0.0234
	(0.0164)	(0.0180)	(0.0254)
$\mathbb{I}$(North-East)	0.0512**	0.0374	0.168***
	(0.0229)	(0.0241)	(0.0284)
$\mathbb{I}$(South)	-0.00814	-0.0254	-0.0537**
	(0.0163)	(0.0181)	(0.0235)
Constant	0.438***	0.298***	0.715***
	(0.0835)	(0.105)	(0.161)
N	73,759	47,262	26,497

$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. NSS data. Robust standard errors in parentheses. Standard errors clustered at the first sampling unit level. West India is the excluded region.

Predicted Resource Shares

	Reference Households		All Households				
	Estimate (1)	Sd. Error (2)	Mean (3)	Sd. Dev. (4)	Median (5)	Min. (6)	Max. (7)
Panel A: Without Children $<$ 15 Only							
Women's Resource Share $\hat{\Lambda}_f$	0.3710	0.0221	0.4593	0.1136	0.4388	0.1626	1.0000
Men's Resource Share $\hat{\Lambda}_m$	0.6290	0.0221	0.5407	0.1136	0.5612	0.0000	0.8374
Panel B: With Children $<$ 15 Only							
Women's Resource Share $\hat{\Lambda}_f$	0.2275	0.0160	0.3015	0.0726	0.3057	0.0732	0.5873
Men's Resource Share $\hat{\Lambda}_m$	0.3795	0.0339	0.4784	0.1604	0.5147	0.0000	0.7548
Children's Resource Share $\hat{\Lambda}_c$	0.3834	0.0333	0.2200	0.1129	0.1793	0.0100	0.5489

Note: Reference households are nuclear households for which all other covariates are equal to their median values.

Back

Household Program

- Household program:

$$\max_{x_f, x_m, x_c, h} \tilde{U}[U_f, U_m, U_c, p/y] = \sum_{j \in \{f,m,c\}} \mu_j(p/y)\tilde{U}_j$$

subject to

  - Budget constraint: $y = h'p$
  - Consumption technology function (goods can be shared):

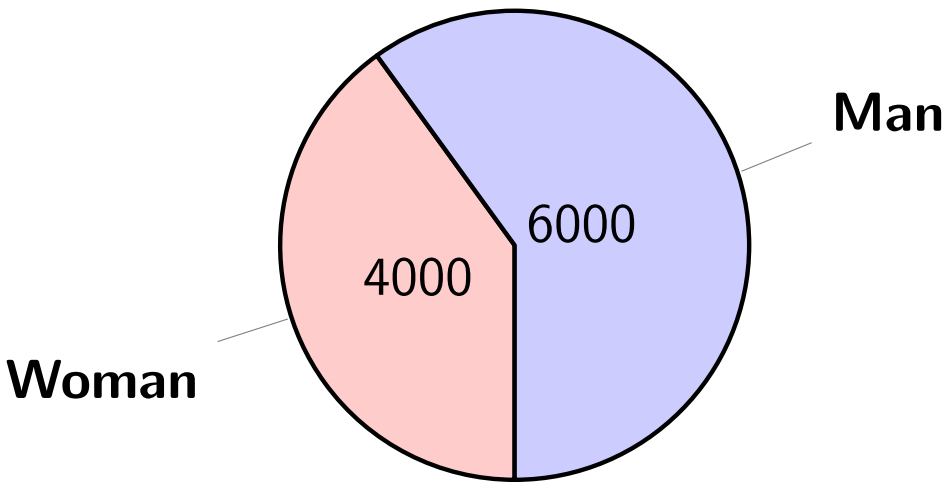
$$h = A(Fx_f + Mx_m + Cx_c)$$

- $\tilde{U}_j = \tilde{U}_j(U_j(x_j), U_{-j}(x_{-j}))$: Individual utility functions, $j = f, m, c$
- μ_j: Pareto weight
- p: Prices
- y: Total expenditure
- h: Quantities *purchased* by the household
- x_j: Quantities *consumed* by women, men and children

Back

Identification

- **Budget Shares W_j vs. Resource Shares Λ_j**
- Example: $M = F = 1$, $y = 10,000$ Rps.

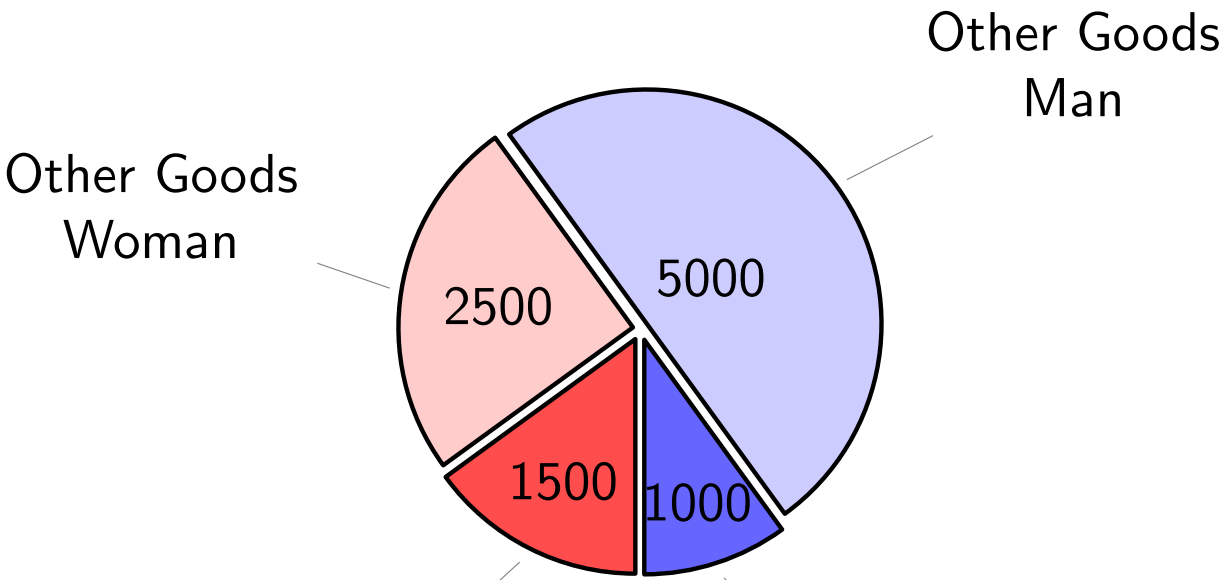


$\Lambda_f = 40\%$

$\Lambda_m = 60\%$

Identification

- **Budget Shares W_j vs. Resource Shares Λ_j**
- Example: $M = F = 1$, $C = 0$ $y = 10,000$ Rps.
  - $W_j \neq \Lambda_j$, $j = m, f$
  - $W_f > W_m \implies \Lambda_f > \Lambda_m$, and viceversa



Woman

$\Lambda_f = 40\%$

$W_f = 15\%$

Man

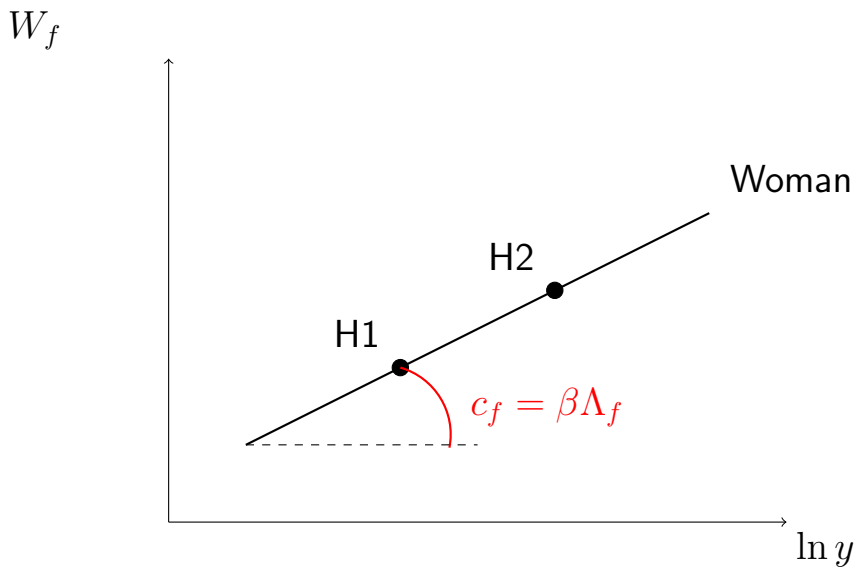
$\Lambda_m = 60\%$

$W_m = 10\%$

Back

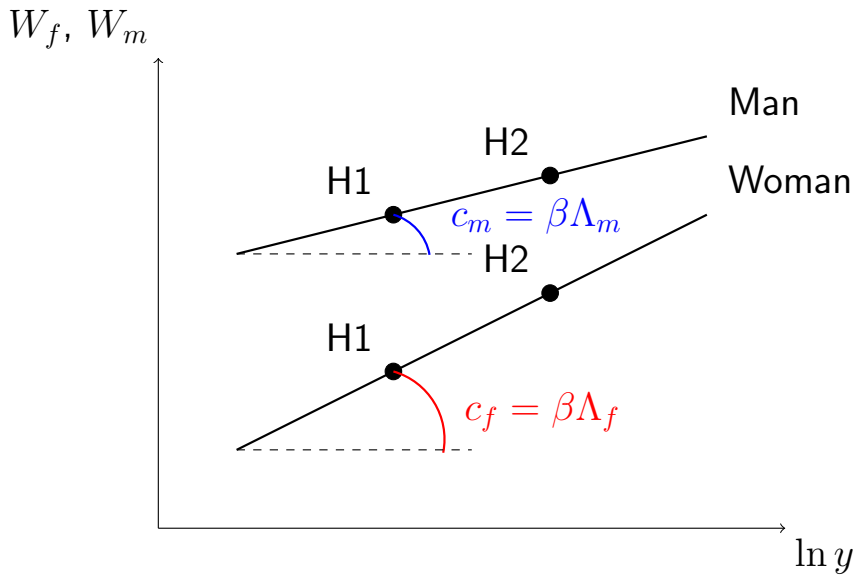
Identification: Linear Case

- Engel curves linear in $\ln y$
- Example: $F = M = 1$, $C = 0$
- Women's clothing: $W_f = a_f + c_f \ln y$



Identification: Linear Case

- Engel curves linear in $\ln y$
- Example: $F = M = 1$, $C = 0$
- Woman's clothing (W_f) and man's clothing (W_m)



- $k = \frac{c_f}{c_m} = \frac{\beta\Lambda_f}{\beta\Lambda_m} = \frac{\Lambda_f}{1-\Lambda_f} \quad \rightarrow \quad \Lambda_f = \frac{k}{1+k}$ Back

Piglog Preferences

- Price-Independent Generalized Logarithmic preferences
- Muellbauer (1976)
- Piglog utility function (subutility of each individual of type j):

$$v_j = \ln(y/G_j(p))/F_j(p)$$

  where G and F are arbitrary (up to regularity) price functions
- The Piglog class of demand systems has the form

$$x_j(y,p) = b_j(p)y + d_j(p)y\ln(y)$$

  which gives Engel curves linear in the logarithm of y

Back

System of Engel Curves: Details

$$\begin{cases} W_f = \alpha_f \Lambda_f + \beta \Lambda_f \ln\left(\frac{\Lambda_f y}{F}\right) + \epsilon_f \\ W_m = \alpha_m \Lambda_m + \beta \Lambda_m \ln\left(\frac{\Lambda_m y}{M}\right) + \epsilon_m \\ W_c = \alpha_c \Lambda_c + \beta \Lambda_c \ln\left(\frac{\Lambda_c y}{C}\right) + \epsilon_c \end{cases}$$

where

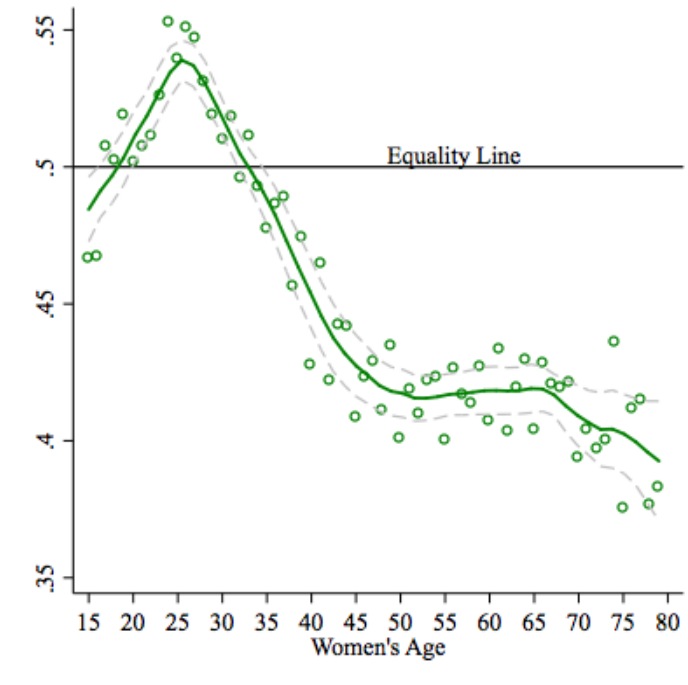
$$\alpha_f = \delta^0_{\alpha_f} + \delta^1_{\alpha_f} X_1 + ... + \delta^n_{\alpha_f} X_n$$
$$\alpha_m = \delta^0_{\alpha_m} + \delta^1_{\alpha_m} X_1 + ... + \delta^n_{\alpha_m} X_n$$
$$\alpha_c = \delta^0_{\alpha_c} + \delta^1_{\alpha_c} X_1 + ... + \delta^n_{\alpha_c} X_n$$
$$\beta = \delta^0_{\beta} + \delta^1_{\beta} X_1 + ... + \delta^n_{\beta} X_n$$
$$\Lambda_f = \delta^0_{\Lambda_f} + \delta^1_{\Lambda_f} X_1 + ... + \delta^n_{\Lambda_f} X_n + \delta^d_{\Lambda_f} HSAA$$
$$\Lambda_m = \delta^0_{\Lambda_m} + \delta^1_{\Lambda_m} X_1 + ... + \delta^n_{\Lambda_m} X_n + \delta^d_{\Lambda_m} HSAA$$
$$\Lambda_c = 1 - \Lambda_f - \Lambda_m$$

- Additional Engel curve for food to improve efficiency
- 318 parameters in hhs with children; 188 parameters in hhs without children

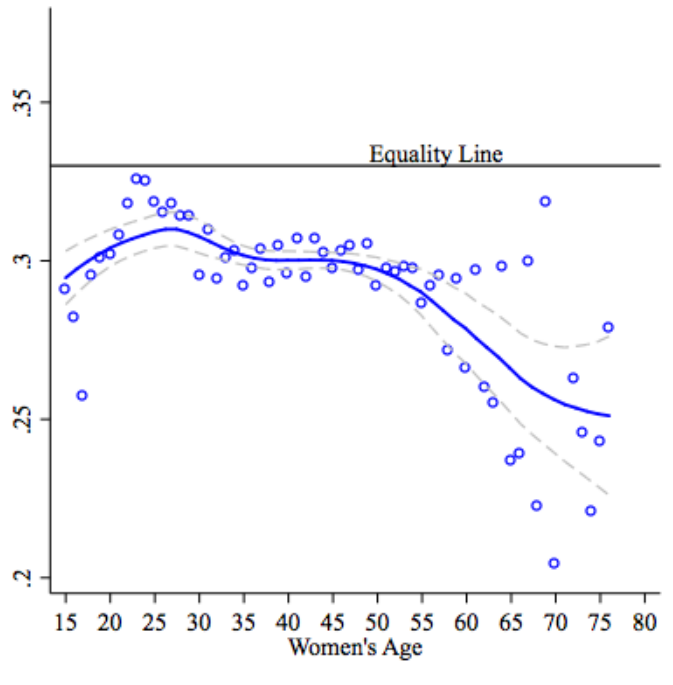
Back

Lower Women's Resource Shares at Older Ages

- Average $\hat{\Lambda}_f$, among hhs with women of age equal to $15, ..., 79$



(A) Hhs Without Children, $\hat{\Lambda}_f$



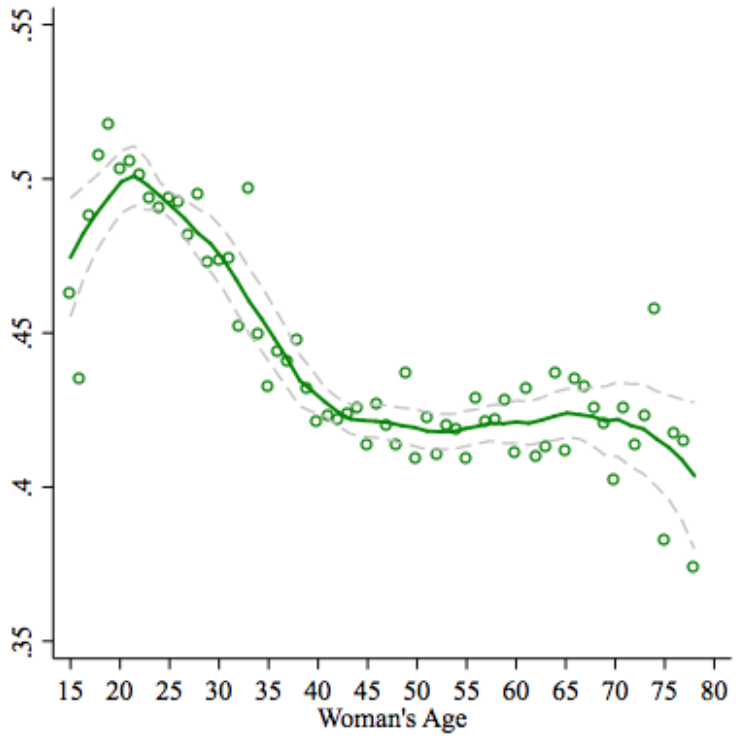
(B) Hhs With Children, $\hat{\Lambda}_f$

Women's Resource Shares and Age

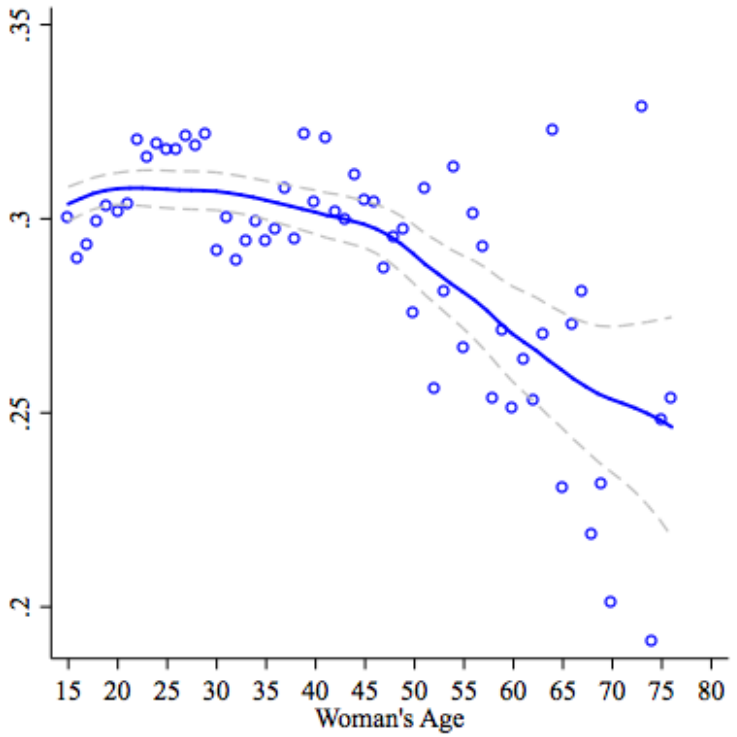
Back

Nuclear Households

- Average $\hat{\Lambda}_f$, among nuclear hhs with women of age equal to $15, ..., 79$



(A) Hhs Without Children, $\hat{\Lambda}_f$



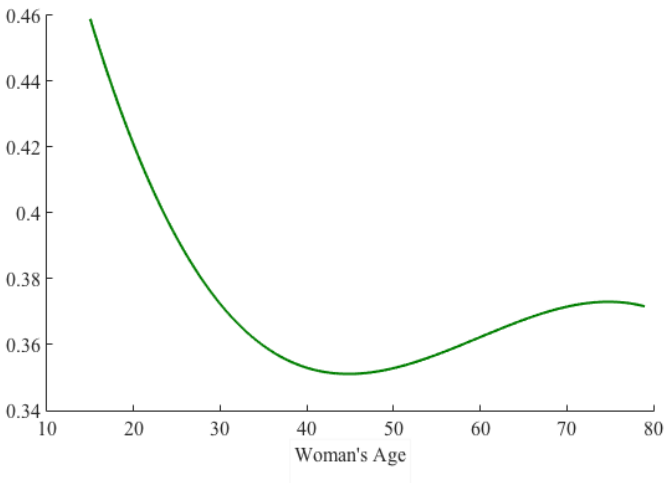
(B) Hhs With Children, $\hat{\Lambda}_f$

Women's Resource Shares in Nuclear Hhs

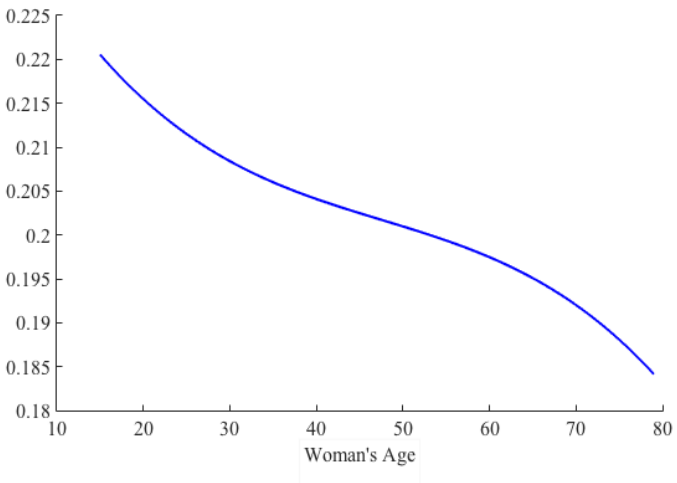
Back

Reference Households

- Third-order polynomials in women's age



(A) Hhs Without Children, $\hat{\Lambda}_f$



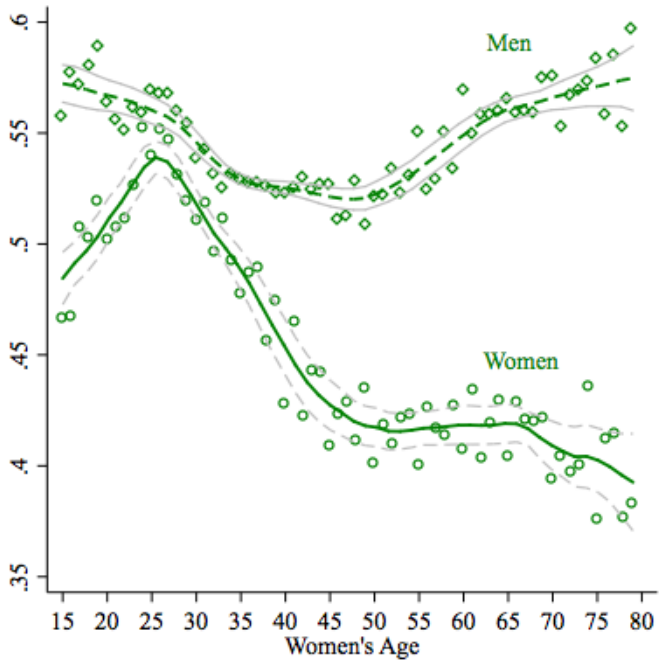
(B) Hhs With Children, $\hat{\Lambda}_f$

Women's Resource Shares in Reference Hhs

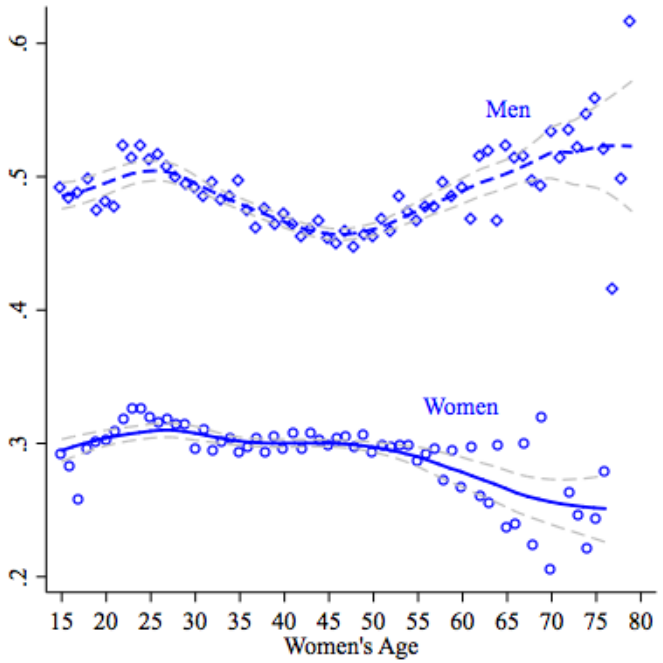
Back

Resource Shares and Age

- Average $\hat{\Lambda}_f$ ($\hat{\Lambda}_m$), among hhs with women (men) of age equal to $15, ..., 79$



(A) Hhs Without Children, $\hat{\Lambda}_f$ and $\hat{\Lambda}_m$

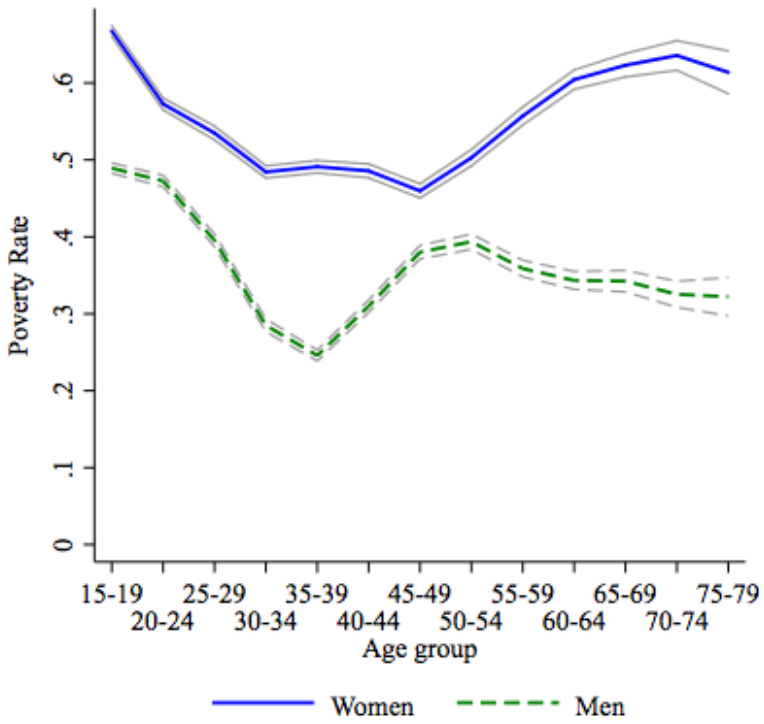


(B) Hhs With Children, $\hat{\Lambda}_f$ and $\hat{\Lambda}_m$

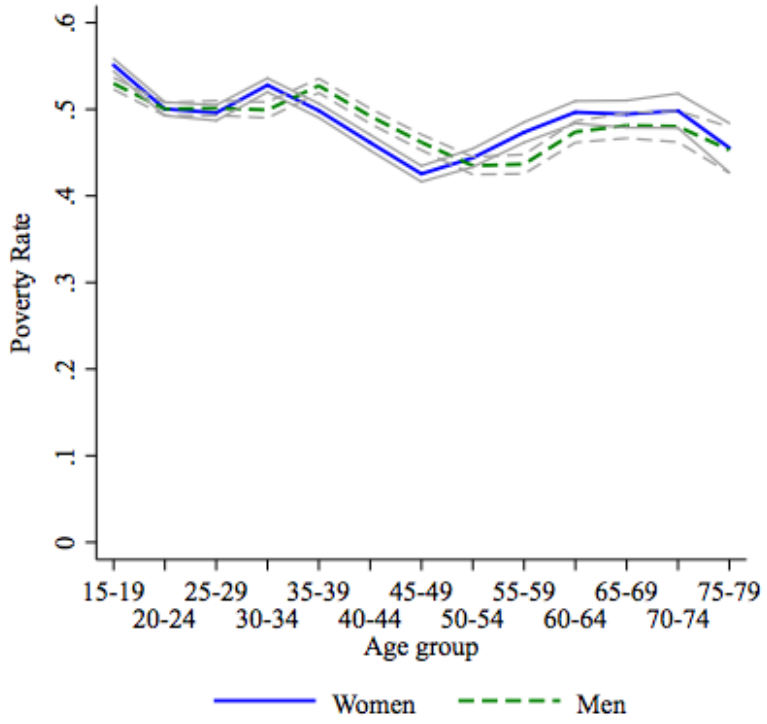
Average Predicted Resource Shares

Back

Poverty and Age



Unequal Sharing
(Model Predictions)

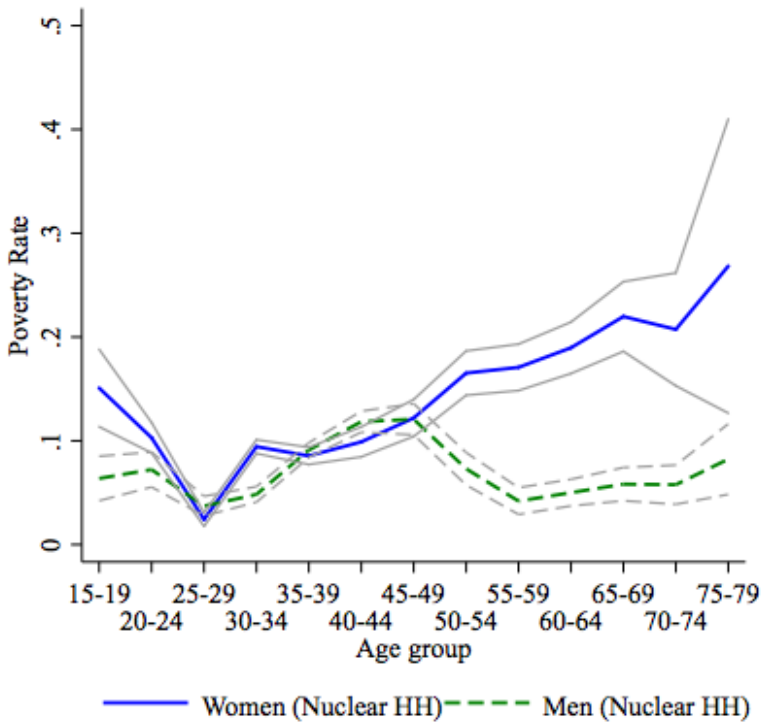


Equal Sharing

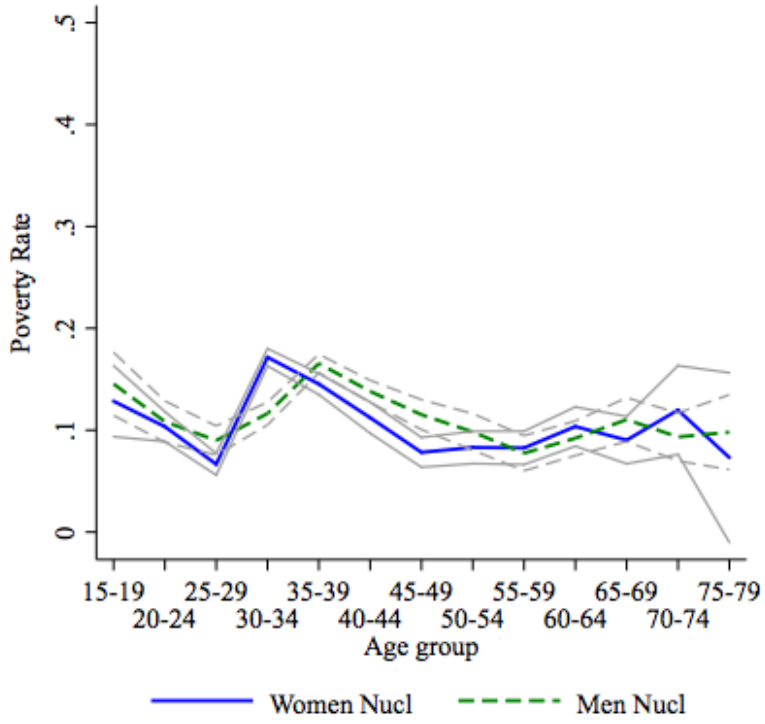
3.10US$/day Poverty Line

Back

Poverty and Age



Unequal Sharing
(Model Predictions)



Equal Sharing

1.90US$/day Poverty Line (Nuclear Hhs Only)

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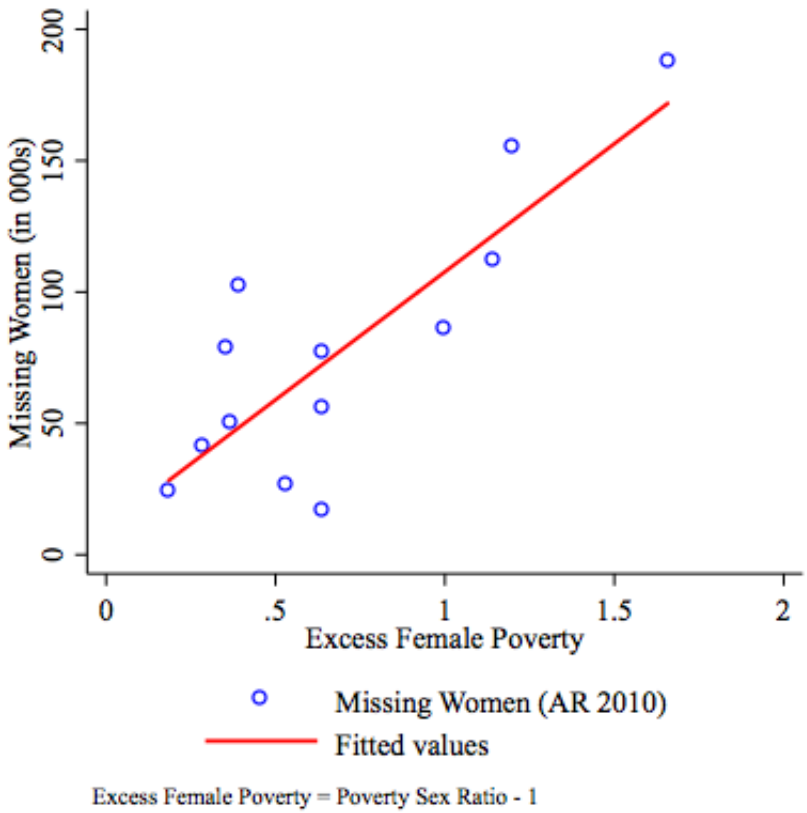
Excess Female Poverty and Mortality



$$EFM = 10,237 + 97,465 \times EFP$$

$$R^2 = 0.68$$

Back

Future Work

- Disentangle age from cohort effect
  - Additional survey waves
  - Intertemporal model of the household
- IV to account for measurement error in expenditure
- Effects of women's resource shares on health
- Identify alternative mechanisms generating excess female mortality at post-reproductive ages
- Applications to other developing countries

Back