

UNEQUAL PARTNERS:

THE DETERMINANTS AND CONSEQUENCES OF INTRA-HOUSEHOLD INEQUALITY IN SOUTH AFRICA

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Inequality – measurement, trends, impacts and policies

Motivation

- In inequality measurement and policymaking the focus is almost exclusively on the inter- rather than the intra-household dimension.
- Some estimates suggest that this causes underestimation of consumption inequality by as much as 50% (Lise and Seitz, 2011)
- Understanding household decision making can help design policies to better target most vulnerable members of households.
- Can also help us gain insights into decisions affected by household considerations, such as labour supply, human capital investment, fertility, etc.

Research questions

1. Is unitary model of household decision making valid for South African households?
2. Is collective model valid?
3. If so, can the effect of bargaining power be seen in expenditure on consumption items?
4. Which factors affect bargaining power of household members and can gender preferences for goods be observed?

Outline

- The Theoretical Model
- Econometric Model
- Data
- Results

Theoretical background

- Consider two-adult household consisting of wife (member F) and husband (member M).
- Household member g consumes vector of private consumption goods \mathbf{q}^g and two members jointly consume public goods \mathbf{Q} .
- Each have their own preferences denoted by the vector \mathbf{a}
- Individual utility of member g : $u^g(\mathbf{q}^F, \mathbf{q}^M, \mathbf{Q}, \mathbf{a})$.
- Consumption constrained by household budget:

$$\mathbf{p}'(\mathbf{q}^F + \mathbf{q}^M + \mathbf{Q}) = x$$

Theoretical model

- The Household utility function can be expressed as the weighted average of members' utilities:

$$U(u^F, u^M, \theta) = \theta(x, \mathbf{a}, \mathbf{z})u^F + (1 - \theta(x, \mathbf{a}, \mathbf{z}))u^M$$

- Pareto weight θ represents decision power or utility weight of member F .
- Pareto weight potentially determined by vector of distribution factors, \mathbf{z} : variables that affect relative bargaining power of household members without directly affecting either preferences or budget constraint (e.g. wife's share of income).
- Where we assume separability between private and public goods along with the usual technical assumptions on individual utility functions, this formulation allows us to write the private good demands for a utility maximising household as:

$$\mathbf{q}^* = \xi(x, \mathbf{a}, \mathbf{z}) = \Xi(x, \mathbf{a}, \theta(x, \mathbf{a}, \mathbf{z}))$$

Unitary model

- Unitary model assumes household behaves as if individual preferences can be aggregated into stable household preference relation.
- Very convenient model for economic analysis, but also implies strong and testable restrictions on household behaviour:
- After controlling for total household income, household demands should be unaffected by individual incomes, or any other factor that does not directly affect preferences. This is also known as the income pooling hypothesis and has been overwhelmingly rejected in empirical studies.

$$\frac{\partial \xi_i(x, \mathbf{a}, \mathbf{z})}{\partial z_k} = 0 \quad \forall i, k$$

Collective model

- The Collective model assumes that individual members have their own preferences and that the outcome of household decisions are Pareto efficient.
- This means bargaining power of individual members can affect household consumption outcomes, but only through one-dimensional effect on decision weights: $\mathbf{q}^*(x, \mathbf{a}, \theta(x, \mathbf{a}, \mathbf{z}))$
- Imposes important constraint that can be used to test collective model: any combination of values of \mathbf{z} that yields same value of θ must also produce same consumption outcomes.
- This provides cross-equation restrictions (*proportionality condition*) that can be used to test model.

$$\frac{\partial q_i / \partial z_k}{\partial q_i / \partial z_1} = \frac{\partial q_j / \partial z_k}{\partial q_j / \partial z_1} = \frac{\partial \theta / \partial z_k}{\partial \theta / \partial z_1} \equiv \kappa_k \quad \forall i, k$$

Collective model

- Households behave as if making decisions according to two-stage process:
 - first (sharing) stage determines how total private expenditure is allocated to each member based on relative bargaining power
 - In second (consumption) stage each member allocates share of total expenditure to consumption items according to own preferences.

$$\frac{\partial q_i}{\partial z_k} = \left(\frac{\partial q_i^F}{\partial \theta} - \frac{\partial q_i^M}{\partial \theta} \right) \frac{\partial \theta}{\partial z_k}$$

- Effect of distribution factor z_k on demand for good i depends on two magnitudes:
 - effect of z_k on female share of expenditure: $\frac{\partial \theta}{\partial z_k}$ (which is commodity invariant). This is the effect of distribution factors on the Pareto weight.
 - difference in wife's and husband's expenditure share elasticity of commodity i : $\frac{\partial q_i^F}{\partial \theta} - \frac{\partial q_i^M}{\partial \theta}$ (which is distribution factor invariant). This is the effect of a change in the Pareto weight on expenditure.

Collective model

- First empirical studies used relative incomes as distribution factor, but concerns that this may be correlated to unobserved preference factors.
- Age or education differences of spouses similarly problematic.
- More recent studies tend to use distribution factors that:
 - affect opportunities of wife outside marriage (e.g. local gender share, time/geographical variation in divorce or alimony laws)
 - reflect differences in family background of spouses (household income difference, whether husband's mother worked, maternal education)
- Wide empirical support for the collective model, France (Bourguignon *et al*, 1993), Canada (Browning & Chiappori, 1998), India (Fuwa *et al*, 2006) and Mexico (Bobonis, 2009) for example.
- Two studies have attempted to estimate relative gender preference for different commodities: wives have stronger relative preference for clothing, personal services and recreation, whereas husbands care more about food, alcohol and tobacco and transportation. (Browning and Bonke, 2009; Browning *et al*, 2013)

Econometric model

- Demand for good i modelled with specification that nests both unitary and collective models:

$$q_i = \alpha\pi_i + \gamma_{1i}x + \gamma_{2i}x^2 + \psi_{1i}z_1 + \psi_{2i}z_2 + \chi_{1i}z_1^2 + \chi_{2i}z_2^2 + \xi_{1i}z_1x + \xi_{2i}z_2x + \varphi_{12i}z_1z_2 + u_i \quad (1)$$

- We use Stata's seemingly unrelated regression (NLSUR) estimator to estimate model parameters.
- Preference factors include controls for children, ownership of home or car, location of household, race of household head, age, education level, employment status and hours worked of each adult household members.
- Distribution factors in preferred specification: local gender share and husband's maternal education share.

- Local gender share = $\frac{\text{Unmarried Men in District Council}}{\text{Unmarried Women in District Council}}$

- Husband's Maternal Education Share = $\frac{\text{Mother's Years of Education Completed}_M}{\sum_{g=F,M} \text{Mother's Years of Education Completed}_g}$

- Unitary model requires that household demand be unaffected by distribution factors: $\psi_{ki} = \chi_{ki} = \xi_{ki} = \varphi_{kli} = 0 \quad \forall i, k, l$

Econometric model

- Collective model requires that *either* (2) or (3) must be nested in (1)

$$q_i = \alpha \pi_i + \gamma_{1i}x + \gamma_{2i}x^2 + \lambda_i(\psi_1z_1 + \psi_2z_2 + \chi_1z_1^2 + \chi_2z_2^2 + \xi_1z_1x + \xi_2z_2x + \varphi_{12}z_1z_2) + u_i \quad (2)$$

$$q_i = \alpha \pi_i + \gamma_{1i}x + \gamma_{2i}x^2 + \lambda_i(z_1 + \psi_2z_2) + v_i(z_1 + \psi_2z_2)^2 + \omega_ix(z_1 + \psi_2z_2) + u_i \quad (3)$$

- Testing collective model requires re-estimating restricted version of SUR model and using **Likelihood-Ratio test**.
- If (2) is valid, it is convenient to interpret the results in terms of sharing rule and individual demands:

$$\frac{\partial q_i}{\partial z_k} = \left(\frac{\partial q_i^A}{\partial \theta} - \frac{\partial q_i^B}{\partial \theta} \right) \frac{\partial \theta}{\partial z_k} = \lambda_i(\psi_k + 2\chi_k z_k + \xi_k x + \varphi_{kl} z_l)$$

- Since λ_i is distribution factor invariant, must be equal to $\left(\frac{\partial q_i^A}{\partial \theta} - \frac{\partial q_i^B}{\partial \theta} \right)$.
- Effect of distribution factors on sharing rule is $\frac{\partial \theta}{\partial z_k} = \psi_k + 2\chi_k z_k + \xi_k x + \varphi_{kl} z_l$.

Data

- Wave1 of the National Income Dynamic Study (NIDS) 2008
- Restrict sample to households that consisted of **two adult** household members that reside in the household, are of **different genders**, are either **married or cohabitating partners**, where both members are between **25 and 65** and household **head is male**.
- We include households with **up to three children**, where the child's parents must be the two adult household members.
- Short time-period for income and expenditure (30 days) reduces problem of recall bias, but also increases proportion of zero expenditure values.
- Partly addressed by choice of seven broadly defined expenditure categories: communication, clothing, entertainment, food, medical expenditure, personal care and tobacco and alcohol.
- **Local gender share** is calculated using data from 2001 **census**.

Data

		Sample average	Standard deviation	Minimum	Maximum
Expenditure Items (dependent variables)	Clothing	4.31	2.08	0	8.61
	Medical	3.20	3.55	0	9.26
	Entertainment	2.24	2.68	0	7.31
	Food	6.90	0.95	3.95	8.82
	Communication	4.04	2.53	0	8.88
	Personal care	3.22	2.37	0	6.91
	Alcohol and tobacco	2.40	2.62	0	7.82
Preference factors					
Income	Log household income	8.57	1.34	5.06	11.50
Children	Any children	0.64	0.48	0	1
	More than two children	0.36	0.48	0	1
	Number of children	1.18	1.21	0	3
Assets	Home ownership	0.64	0.48	0	1
	Car ownership	0.47	0.50	0	1
Area	Rural	0.26	0.44	0	1
Race	Coloured	0.12	0.33	0	1
	Indian	0.03	0.17	0	1
	White	0.30	0.46	0	1
Female Controls	Age (female)	37.14	9.53	25	65
	Education (female)	10.04	4.02	0	24
	Hours worked (female)	15.17	23.12	0	180
	Employed (female)	0.39	0.49	0	1
Male Controls	Age (male)	41.44	9.36	26	65
	Education (male)	10.00	4.83	0	24
	Hours worked (male)	33.54	27.09	0	200
	Employed (male)	0.77	0.42	0	1
Distribution factors					
Distribution factors	Husband's maternal education share	0.47	0.23	0	1
	Local gender share	0.46	0.04	0.36	0.56

Unrestricted Model - Results

- Preference factors
 - **Children** are correlated with **higher food and clothing** expenditure, **lower entertainment** expenditure.
 - Residing in a **rural** area is associated with **lower clothing and personal care** expenditure.
 - **Asset ownership** is associated with **increased** expenditure on **entertainment, communication, medical and personal care**.
 - Households with a **better educated household head** tend to spend **more** on **medical expenses, entertainment** (which includes books) and **communication**
- Income
 - Clothing, Food, Communication are necessity commodities
 - Entertainment and Medical Care are luxury goods
 - Personal care is in between necessity and luxury
 - Alcohol and tobacco unclear
- Distribution factors
 - Local Sex-ratio along its quadratic term and interaction with total income is jointly significant
 - Maternal Education share its quadratic term and interaction with total income is jointly significant
 - All distribution factors are jointly significant
 - **Unitary Model is rejected.**

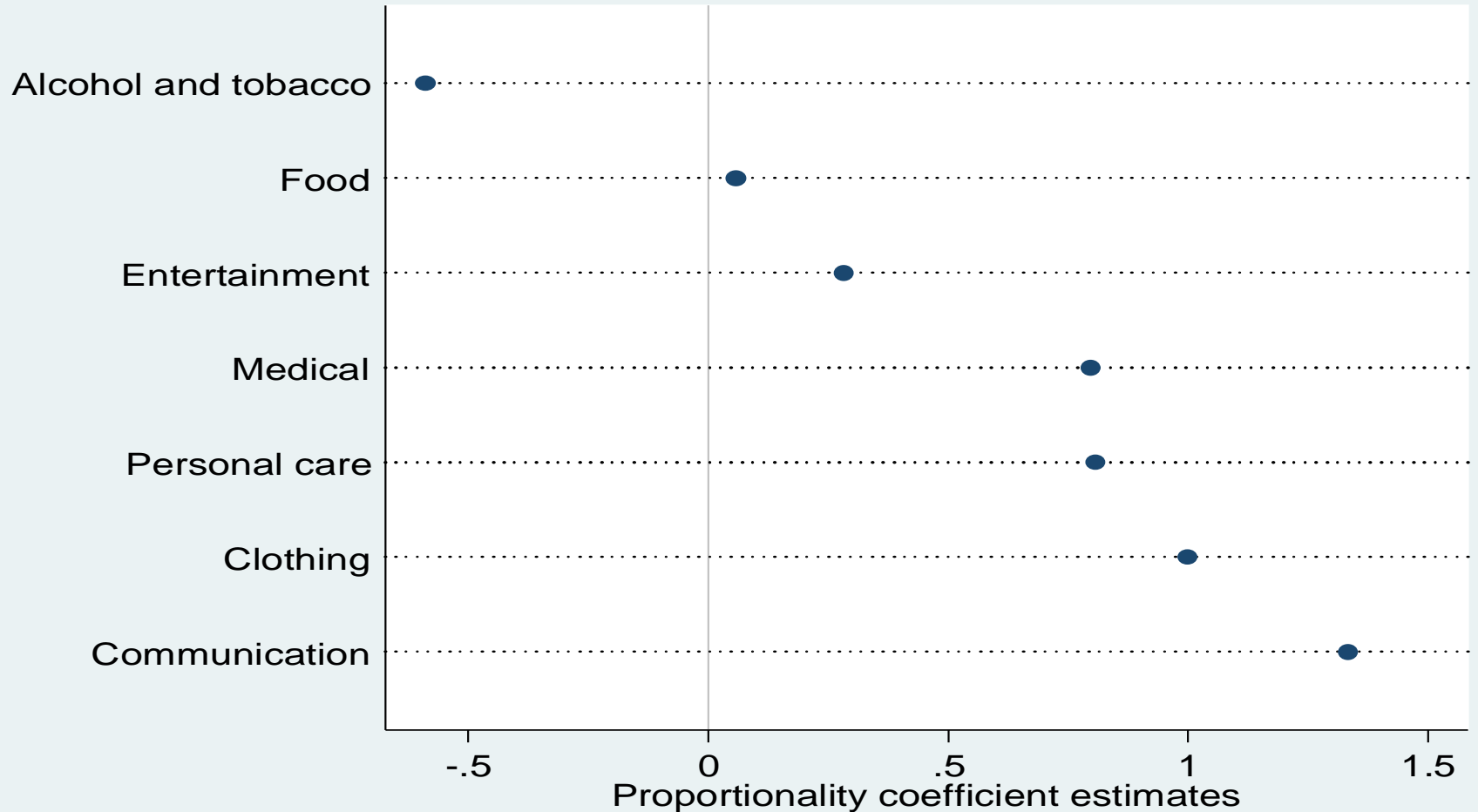
Restricted Model (2) Distribution Factor Estimates

	Clothing	Medical	Entertain ment	Food	Communi- cation	Personal care	Alcohol and tobacco
Log income	0.776*** (0.158)	1.166*** (0.247)	1.033*** (0.180)	0.352*** (0.0626)	1.077*** (0.150)	0.434** (0.204)	0.0898 (0.248)
Log income^2	-0.0518 (0.0616)	0.101 (0.0657)	0.163*** (0.0567)	-0.0154 (0.0198)	-0.0209 (0.0533)	0.0637 (0.0682)	0.147 (0.0898)
Commodity-specific factor	1 .	0.798* (0.452)	0.284 (0.258)	0.0581 (0.0808)	1.335*** (0.368)	0.807*** (0.298)	-0.591 (0.374)
Husband's maternal education share	-1.506*** (0.382)						
Husband's m. education share^2	-0.703 (0.601)						
Husband's m. education share*Log income	-0.0144 (0.224)						
Local sex ratio	0.926 (0.674)						
Local sex ratio^2	-1.050 (2.670)						
Local sex ratio*Log income	-1.218** (0.558)						
Husband's m. education share*Local sex ratio	-3.237* (1.730)						
Observations	344	344	344	344	344	344	344
R-squared	0.514	0.629	0.6001	0.7081	0.6078	0.4888	0.3218
Joint significance of distribution factors:							
	Husband's maternal education share			Local sex ratio		Both factors	
LR test statistic	16.83			8.14		19.46	
p-value	0.001			0.043		0.007	
Test of Proportionality Condition							
LR test statistic	35.32						
p-value	0.5009						

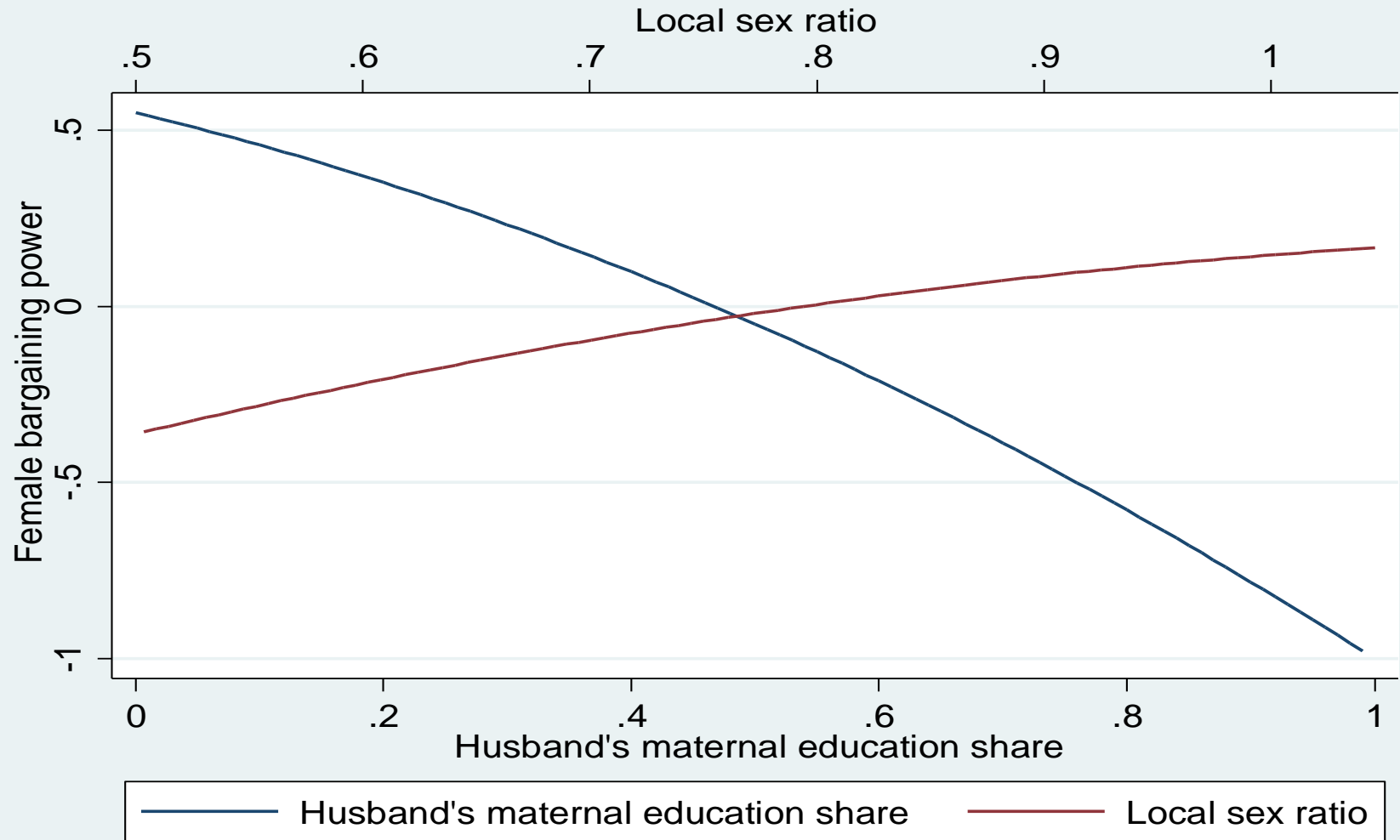
Restricted model estimates

- The Collective model of household behaviour is not rejected
 - Restricted versions of demand system estimated and proportionality conditions not rejected with p-values 0.5906 for (2) and 0.2370 for (3).
- We thus attempt to separately estimate the effect of the distribution factors on expenditure outcomes via the sharing rule.
- Local gender share (of unmarried men) shifts bargaining power in favour of the wife, whereas an increase in husband's maternal education share benefits husband.
- Quadratic effects not significant, but effect of local gender share stronger at lower income levels.
- Husbands estimated to have strongest relative preference for alcohol and tobacco, followed by food and entertainment.
- Wives have strongest preference for communication, followed by clothing, personal care and medical expenses.

Relative Impact of Sharing Rule on Consumption Item Expenditure



Bargaining Power and Distribution Factors



Refutability tests

- Causality can never be proven, but good theories provide many implications that we can test.
- Can check whether estimated female bargaining power corresponds to self-reported influence in expenditure decisions.
 - Predicted effect of distributional factors on sharing rule significantly increases probability that female will be reported as main decision-maker for day-to-day household expenditure
- According to collective model, distribution factors should affect consumption patterns of married couples but not singles.
 - Mother's education share is determined by scaling the variable to the unit interval.

Effects of distributional factors for couples and singles

	Couples	Single men	Single women
Husband's maternal education share			
Linear coefficient estimate (average partial effect)	-1.506	0.013	1.017
p-value	0.000	0.836	0.150
χ^2 test statistic for linear, quadratic and income interaction terms	16.830	0.680	2.870
p-value	0.001	0.878	0.413
Local sex ratio			
Linear coefficient estimate (average partial effect)	0.926	-0.116	-0.813
p-value	0.170	0.555	0.205
χ^2 test statistic for linear, quadratic and income interaction terms	8.140	0.600	2.210
p-value	0.043	0.897	0.531
All distribution factors			
χ^2 test statistic for all distribution factor terms	19.460	0.710	3.940
p-value	0.007	0.998	0.787

Other distribution factors

- Possible to add third distribution factor to model to gauge:
 - how female bargaining power is affected,
 - whether collective model is still valid
- Test effect of:
 - income difference of household during childhood,
 - whether husband's mother worked,
 - marital status,
 - living in rural area,
 - grant share,
 - hourly wage share,
 - number of pre-school children,
 - relative ages

Restricted demand system estimates

	Average Partial Effect		Total Effect		Proportionality Test
Distribution factor	Estimate	p-value	χ^2 test statistic	p-value	p-value
Age difference	0.016	0.160	3.88	0.275	0.126
Number of young children	0.336	0.059	7.48	0.058	0.061
Rural	-0.402	0.060	3.54	0.170	0.317
Log wage difference	0.066	0.021	15.11	0.002	0.177
Child support grant	-0.372	0.038	4.31	0.116	0.329
Household income step difference	0.231	0.001	11.09	0.011	0.020
Husband's mother worked	0.264	0.040	13.25	0.001	0.002
Married	-0.106	0.660	0.20	0.907	0.001
Education difference	-0.075	0.012	7.44	0.059	0.023
Hours worked difference	-0.005	0.040	9.25	0.026	0.033

Conclusions

- Unitary model is rejected for SA households.
- Evidence is in favour of the collective model.
- Household bargaining power determined by various factors, and important in that it affects consumption outcomes.
- Husbands estimated to have strongest relative preference for alcohol and tobacco, followed by food and entertainment; wives have strongest preference for communication, followed by clothing, personal care and medical care.

Unrestricted model (1) : preference factors

	Clothing	Medical	Entertain- ment	Food	Communi- cation	Personal care	Alcohol and tobacco
Constant	4.770***	1.845	0.812	6.586***	4.450***	3.013**	1.229
Any children	0.198	-0.417	-0.0774	0.0506	-0.401	0.225	-0.707
More than two children	0.423	0.842	-0.773*	-0.0433	0.557	0.757*	-0.288
Number of children	-0.0655	-0.326	0.00869	0.0489	-0.270	-0.477***	0.139
Home ownership	0.252	0.566	0.544*	-0.0661	-0.0943	0.347	-0.487
Car ownership	0.236	1.807***	0.879**	0.327**	0.765**	1.029***	0.293
Rural	-0.499*	0.259	-0.343	0.0948	0.429	-0.590	-0.0988
Coloured	0.177	0.281	0.228	0.358**	0.368	1.065***	-0.602
Indian	1.213***	0.291	-1.960	0.627***	0.0502	0.484	3.314***
White	-0.513	0.672	-1.340**	0.180	0.242	0.239	2.037***
Age (male)	-0.0129	-0.0147	-0.00528	0.00109	0.00443	-0.0418*	0.0266
Education (male)	0.135***	0.0879*	0.121***	0.0349***	0.0151	0.0821**	0.0640
Hours worked (male)	0.00974*	0.0142*	0.00321	0.00599**	0.0175***	0.00783	0.000264
Employed (male)	-1.050**	-1.570**	-0.500	-0.472***	-1.132**	-0.331	1.114**
Age (female)	0.00509	0.0123	0.0151	-0.00421	-0.0220	0.0347	-0.0291
Education (female)	-0.103**	0.0392	-0.00109	0.00215	0.0440	-0.0932*	-0.0887
Hours worked (female)	-0.00182	-0.0145*	-0.00883	-0.00540	3.93e-05	0.00167	-0.000271
Employed (female)	-0.0952	0.378	0.412	0.143	-0.144	0.398	0.298

Unrestricted Model (1): Distribution Factors

	Clothing	Medical	Entertainment	Food	Communi- cation	Personal care	Alcohol and tobacco
Log income	0.781***	1.081***	1.075***	0.351***	1.080***	0.464**	0.0539
	(0.160)	(0.244)	(0.175)	(0.0619)	(0.150)	(0.200)	(0.255)
Log income^2	-0.0457	0.0960	0.153***	-0.0231	-0.0231	0.0496	0.169*
	(0.0611)	(0.0709)	(0.0560)	(0.0202)	(0.0548)	(0.0715)	(0.0924)
Husband's maternal education share	-1.516***	-1.072	-0.826	-0.0922	-2.072***	-1.288**	0.924
	(0.437)	(0.957)	(0.577)	(0.139)	(0.495)	(0.641)	(0.680)
Husband's m. educ. share^2	-0.129	-1.469	-1.278	-0.383	-0.698	-2.154	2.144
	(1.067)	(1.707)	(1.115)	(0.407)	(1.191)	(1.355)	(1.352)
Husband's m. educ. share*Log income	-0.0326	-0.222	-0.271	0.121	-0.0326	0.150	-0.346
	(0.405)	(0.669)	(0.455)	(0.142)	(0.393)	(0.476)	(0.559)
Local sex ratio	0.575	-1.003	-0.264	-0.0246	1.627	0.461	-1.610
	(0.992)	(2.137)	(1.437)	(0.410)	(1.209)	(1.360)	(1.686)
Local sex ratio^2	1.640	-9.415	-0.176	-1.779	-3.832	0.456	0.502
	(4.891)	(7.458)	(4.980)	(1.678)	(5.034)	(6.100)	(7.518)
Local sex ratio*Log income	-1.657*	-2.477	0.297	0.0547	-1.223	-0.690	-1.101
	(0.965)	(1.805)	(1.066)	(0.352)	(0.942)	(1.095)	(1.518)
Husband's m. educ. share*Local sex ratio	-0.857	0.0304	-0.293	0.881	-4.374	-0.412	10.57**
	(2.924)	(4.164)	(3.079)	(1.100)	(3.680)	(4.548)	(4.181)
Observations	344	344	344	344	344	344	344
R-squared	0.516	0.6399	0.604	0.713	0.6083	0.494	0.339
Joint significance of distribution factors:							
	Both factors		Husband's maternal education share			Local sex ratio	
χ^2 test statistic	133.07		59.36			35.37	
p-value	0.000		0.000			0.026	

Restricted Model (2): preference factors

	Clothing	Medical	Entertain- ment	Food	Communi- cation	Personal care	Alcohol and tobacco
Constant	4.819***	1.807	0.745	6.546***	4.430***	2.914**	1.341
Any children	0.152	-0.404	-0.0486	0.0723	0.551	0.256	-0.822
More than two children	0.424	0.851	-0.794*	-0.0506	-0.274	0.735*	-0.289
Number of children	-0.0521	-0.356*	0.00321	0.0429	-0.274	-0.481***	0.160
Home ownership	0.255	0.492	0.562*	-0.0525	-0.101	0.421	-0.532
Car ownership	0.208	1.763***	0.961**	0.327**	0.761**	1.103***	0.196
Rural	-0.434	0.170	-0.232	0.0954	0.388	-0.496	-0.0692
Coloured	0.174	0.249	0.297	0.381**	0.378	1.141***	-0.635
Indian	1.276***	0.435	-1.816	0.595***	0.0483	0.435	3.604***
White	-0.512	0.503	-1.270**	0.209	0.238	0.382	1.913***
Age (male)	-0.0123	-0.0214	-0.00397	0.00108	0.00620	-0.0438*	0.0254
Education (male)	0.139***	0.0865*	0.121***	0.0343***	0.0163	0.0761*	0.0735
Hours worked (male)	0.0102**	0.0150*	0.00312	0.00582**	0.0179***	0.00658	0.00273
Employed (male)	-1.064**	-1.639**	-0.549	-0.476***	-1.135**	-0.316	1.061*
Age (female)	0.00393	0.0223	0.0109	-0.00460	-0.0234	0.0339	-0.0259
Education (female)	-0.103**	0.0303	0.00145	0.00155	0.0419	-0.0886*	-0.0984*
Hours worked (female)	-0.00289	-0.0156*	-0.00839	-0.00509	0.000813	0.00200	-0.00293
Employed (female)	-0.0586	0.434	0.415	0.148	-0.173	0.423	0.380

Unrestricted model estimates: distribution factors

- **Husband's maternal education share** has a large significant **negative** effect on **clothing, personal care and communication** expenditure.
- Positively correlated to alcohol and tobacco consumption, but effect is imprecisely estimated.
- Local gender share (of males) is associated with higher expenditure on clothing, communication and personal care and lower expenditure on alcohol and tobacco, and medical expenses, although all these effects are insignificant.
- Hypothesis test of joint significance of distribution factors easily rejects "income pooling" hypothesis implied by unitary model (p-value < 0.0001).
- **Unitary model is thus rejected**

Data Consists

- Entertainment
 - Reading materials, movies, music and Television
- Medical
 - Medical aid, medical supplies, medical professionals and life insurance
- Food
 - All food except alcohol
- Communication
 - Telephone and cell-phone expenditure
- Clothing
 - Clothing, fabric for clothing, payment on clothing accounts and washing and cleaning agents
- Alcohol and Tobacco
- Personal Care
 - “Cosmetics, soap, shampoo and haircuts” (NIDS, 2008)