

# Efficiency in intra-household allocation in Ethiopia: An experimental study

RES-167-25-0251 - The intra-household allocation of resources: cross-cultural tests, methodological innovations and policy implications.

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Seminario CEDE, Universidad de Los Andes, Bogota 2010

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**UKaid**  
from the Department for  
International Development

# Part of a bigger project – Research questions

- RES-167-25-0251 - The intra-household allocation of resources: cross-cultural tests, methodological innovations and policy implications.
  
- Economic theory testing and extensions
  - Testing some economic theories of the household
  - Providing data for new theories
  
- Example: Unitary
  - Households act as if it has a single set of preferences
  - Source of income does not matter for choices
  - Efficiency

## Part of a wider project

- 10 sites in Uganda (1), India (3+1), Nigeria (2+polygamy) and Ethiopia (3)
- Participants do a follow-up socio-economic survey at a later date
- 50 (approx) couples in each location are selected for subsequent in-depth interviews.



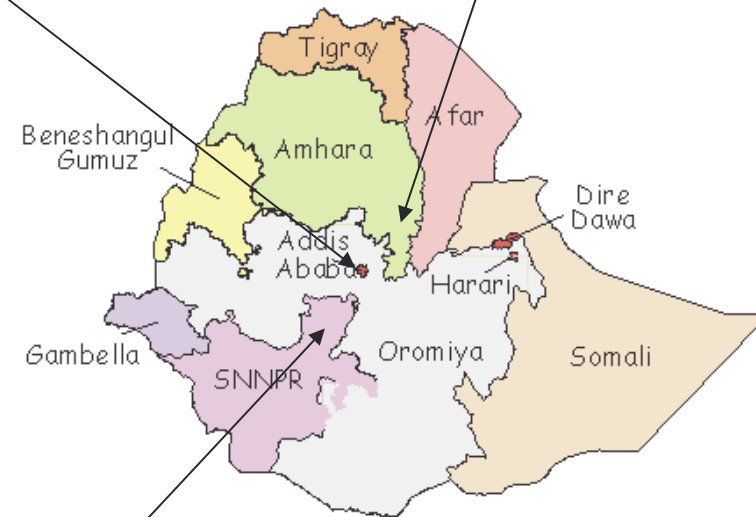
Nigeria

Uganda

Ethiopia

# Ethiopia Experiment

- 3 sites:
  - 1 in the North (Amhara)
  - 1 in the South (Hadiya)
  - 1 in Addis Ababa
- 1200 married couples
  - 400 couples in each location
- All the couples take part in an experiment



# The locations

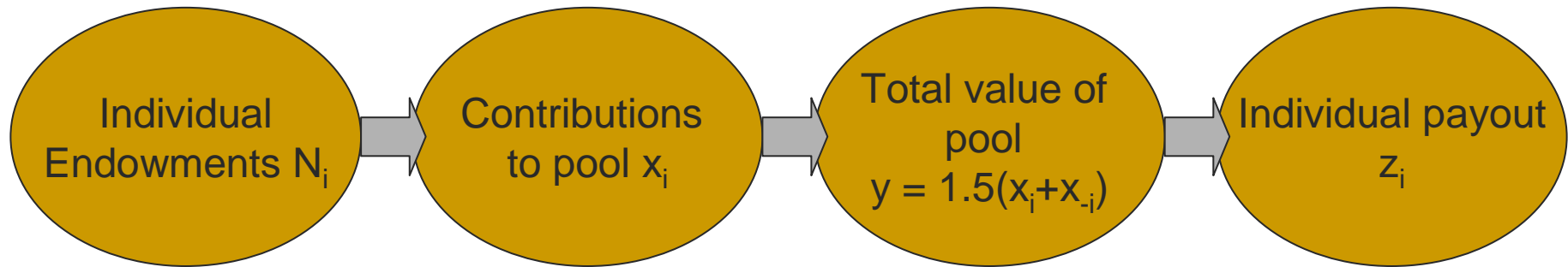
- The North:
  - Population: mainly Amhara ethnic group (second largest ethnic group)
  - Farming: traditional ox-plough culture and production of cereals/annuals
  - Implications: farming system characterised by centralised control of agricultural decisions in the hands of the male household head
  
- The South:
  - Population: minority ethnic group
  - Farming : mostly dependent on hoe culture and on perennial crops
  - Implications: females have stronger involvement in the management of the staple crop in the southern site
  
- Addis Ababa:
  - Biggest city, ethnically diverse
  - Different urban activities
  - Implications: more modern and 'western', apparently increased female autonomy

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- **The experiment**

# The baseline game

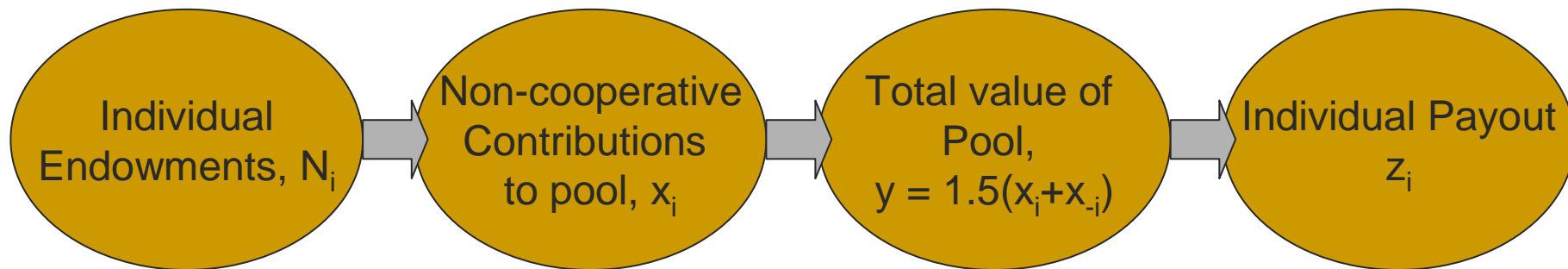


# Examples

- Baseline game
  - Each person receives 40 Birr (but neither knows what the other receives), about 2 days wage agricultural worker
  - Each decides separately how much to contribute to pool ( $x_m$ ,  $x_f$ )
  - Pool multiplied by 1.5 ( $y = 1.5(x_m + x_f)$ )
  - Pool split 50:50 ( $z_m$  and  $z_f$ )
  - Total monetary payoffs:
    - Husband:  $(40 - x_m) + 0.75(x_m + x_f) = 40 - 0.25x_m + 0.75x_f$
    - Wife:  $(40 - x_f) + 0.75(x_m + x_f) = 40 - 0.25x_f + 0.75x_m$



# The variants



22 variants in total (10 per location)

1. Make all endowments public knowledge
2. Make individuals work for their endowments
3. Assign all of the pool to one person
4. Assign control of the allocation to one person
5. Assign endowment to one person
6. Have one person control the investment decision and one person control the allocation (i.e. a trust game)
7. Have one person control both the investment and the allocation decision (i.e. a dictator game)

# Examples

- Trust game
  - Wife receives 40 Birr, (private information)
  - She decides how much to contribute to pool ( $x_f$ )
  - Pool multiplied by 1.5 ( $y=1.5(x_f)$ )
  - Husband then allocates pool ( $z_m$  and  $z_f$ )
  - Total monetary payoffs are then:
    - Husband: ( $z_m$ )
    - Wife:  $(40-x_f)+1.5(x_f)- z_m$

# The production games

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- In production games, subjects are taught how to assemble match boxes
- For every 2 boxes, they receive a greater endowment up to 8 boxes.
- In some variants these endowments are allocated by one partner or the other
- We also vary the relative price for production
- In some variants the partners then play an investment game.

# Practical and ethical issues

- Literacy rate is low and variable therefore
  - Oral instructions to groups
  - One person at a time for execution
- Decisions are made separately
  - Partners sent to separate rooms
  - Handed envelope containing endowment & left alone to remove  $N_i - x_i$
  - 'Allocator' then receives pool for allocation
  - Common knowledge of pool
  - One couple at a time for payoffs



# Results

# Consistency checks

- Table 1: Consistency checks: tests for equality of contributions of husbands and wives in similar treatments

	t-test		Mann-Whitney test	
	t-stat	p-value	t-stat	p-value
Male contribution in treatments 2 & 7	1.2982	0.1961	1.292	0.1964
Female contribution in treatments 3 & 6	0.8788	0.3809	1.163	0.2447
Male contribution in treatments 2 & 11	1.0890	0.2795	0.866	0.3865
Female contribution in treatments 3 & 10	1.1135	0.2689	1.571	0.1161

Note: the t-tests are with the assumption of equal variances; but even with unequal variances the results hold.

- 2 all to male, 7 male control, 11 male dictator
- 3 all to female, 6 female control, 10 female dictator

## Consistency checks

- In all these treatments
  - Either the common pool is given to male or female
  - Or control is in the hands of the same male or female
  - Hence, for consistency, the contribution rates should be the same
  - Both parametric and non-parametric tests indicate that it is so

# Consistency checks

- Table 2: Percentage of correct responses for control questions to check understanding by husband and wives

	% with correct answers	
	Husbands	Wives
Control question 1	89.42	88.83
Control question 2	76.67	78.50
Control question 3	52.69	64.23
Control question 4	62.92	81.28

- Open ended questions
- First answer recorded
- Individual feedback



## Efficiency: is the total surplus maximized?

- Are contribution rates = 1?
- Table 3: Mean male and female contribution rates: overall and by region

	Male		Female	
	Mean	St. error	Mean	St. error
	<b>Overall</b>			
	0.578	0.009	0.531	0.009
	<b>By region</b>			
Amhara	0.535	0.016	0.449	0.018
Hadiya	0.599	0.016	0.531	0.016
Addis	0.600	0.016	0.586	0.014

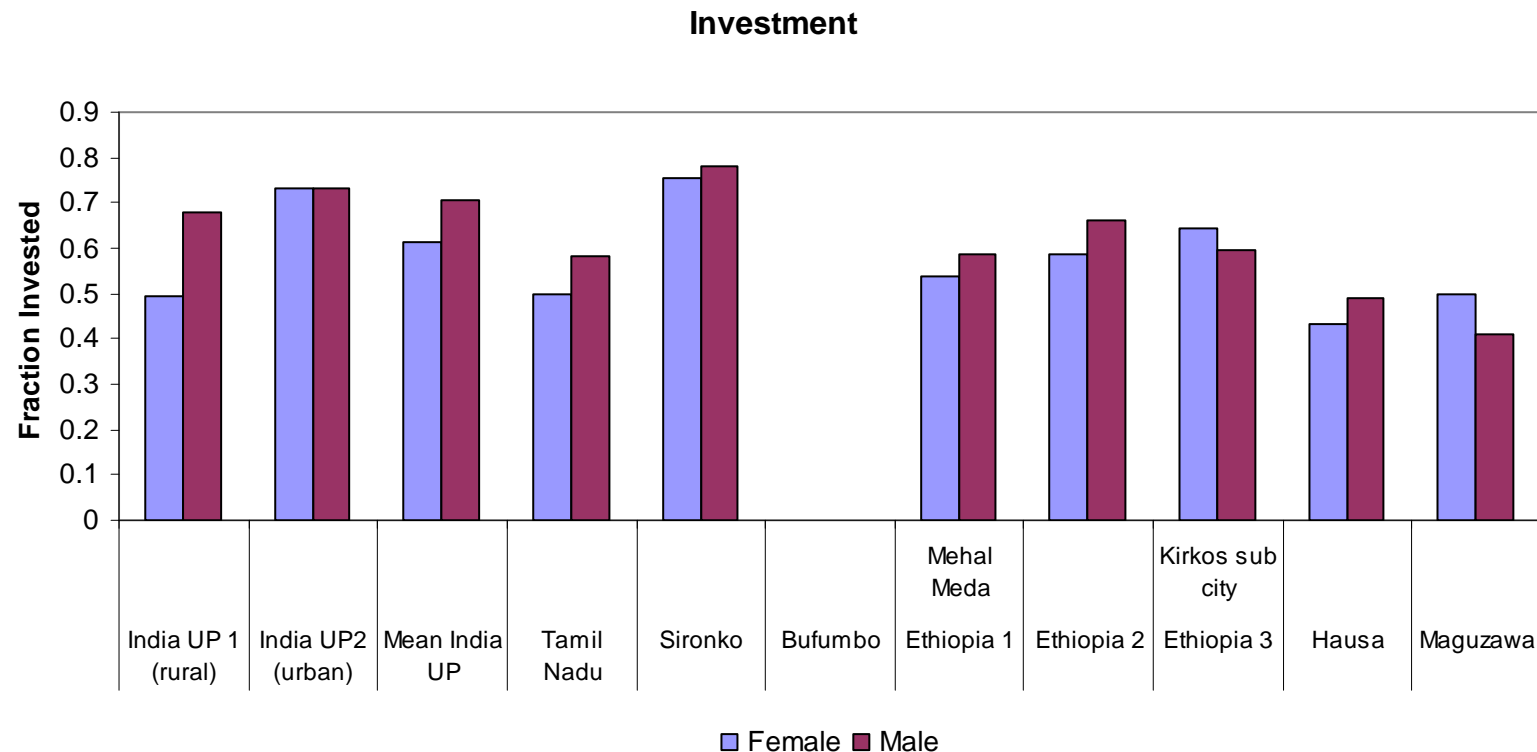
**Table 4. Efficiency tests: t-tests for household, male and female contribution rates being equal to 1**

	Overall			
Overall	Male		Female	
	t-stat	p-value	t-stat	p-value
	-45.211	0.0000	-51.371	0.0000
	By region			
Region	Male		Female	
	t-stat	p-value	t-stat	p-value
Amhara	-28.600	0.0000	-31.271	0.0000
Hadiya	-24.576	0.0000	-29.687	0.0000
Addis	-25.719	0.0000	-30.093	0.0000
	By treatment			
Treatment	Male		Female	
	t-stat	p-value	t-stat	p-value
1	-17.270	0.0000	-17.791	0.0000
2	-8.317	0.0000	-7.271	0.0000
3	-10.926	0.0000	-14.492	0.0000
4			-18.235	0.0000
5	-12.288	0.0000		
6	-21.326	0.0000	-24.309	0.0000
7	-15.874	0.0000	-17.208	0.0000
8			-14.705	0.0000
9	-11.603	0.0000		
10			-16.374	0.0000
11	-8.400	0.0000		
12	-7.457	0.0000	-7.313	0.0000
13			-12.972	0.0000
14	-8.959	0.0000		
21	-20.686	0.0000	-18.732	0.0000
22	-11.597	0.0000	-15.275	0.0000
23	-9.313	0.0000	-9.197	0.0000

- In all treatments there is no evidence of efficiency!

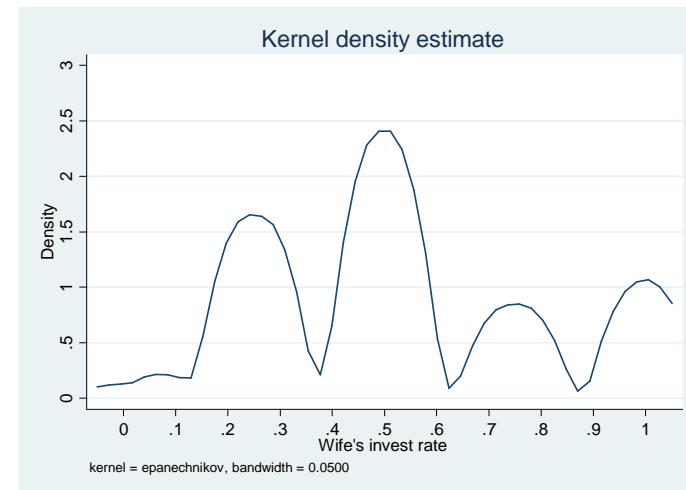
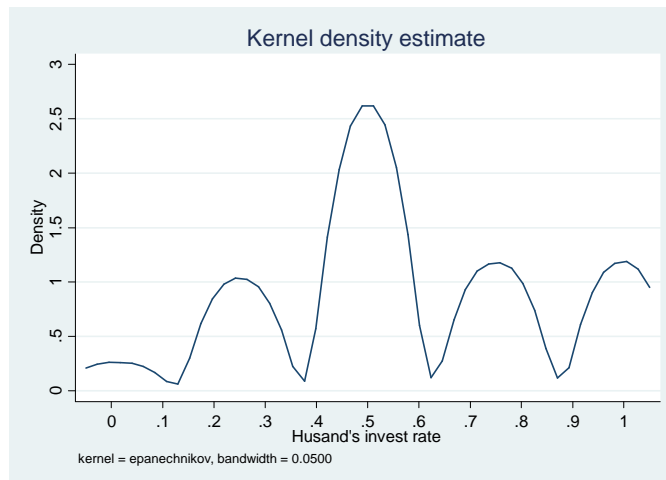
## Similar for other countries: Total surplus is not maximized

- This shows data from the baseline game
- The null hypothesis of surplus maximization is rejected
- In some locations less than 50% of endowments are invested
- Women invest less than men, usually



# If no efficiency, then what?

- Kernel densities of male and female contribution rates
- Most contributions in the middle (also by gender and by treatment)
- Husbands



# If no efficiency, then what?

- T-tests for contribution rates being equal to 0.5 or 0.6 - significant p-values – By region

By region		
Region	Male	Female
<b>60% rule</b>		
Significant		
Amhara		
Hadiya	✓✓	
Addis	✓✓	✓✓
<b>50% rule</b>		
Amhara		
Hadiya		✓
Addis		

✓✓ significant at 5%

✓ significant at 10%

## If no efficiency, then what?

- T-tests for contribution rates being equal to 0.5 or 0.6 - significant p-values – Number of treatments

Number of treatments	By treatment			
	Male		Female	
	10%	5%	10%	5%
60% rule	7	4	4	3
50% rule	6	4	9	7
Total treatments	13	13	13	13
Not explained by any of these rules	2	5	2	4
Explained by 'both' rules	2	0	2	1

# Female vs. male behaviour

Table : Efficiency tests: t-tests for household, male and female contribution rates being equal to 1 by treatment and region

	Amhara		Hadiya		Addis	
	Male	Female	Male	Female	Male	Female
1	-9.496	-11.398	-9.561	-8.708	-11.110	-11.000
2			-8.317	-7.271		
3			-10.926	-14.492		
4				-18.235		
5	-12.288					
6	-11.129	-17.432	-20.188	-13.153	-10.018	-15.244
7	-10.233	-13.869	-9.713	-9.199	-7.930	-8.062
8		-11.071				-9.802
9	-10.066					
10				-16.374		
11			-8.400			
12					-7.457	-7.319
13		-10.058				-8.563
14	-8.959					
21	-17.669	-16.620			-12.775	-11.117
22					-11.597	-15.275
23					-9.313	-9.197

Note: All p-values are 0.0000.

# Female vs. male behaviour

Table : T-tests for equality of male and female contributions

	t-stat	p-value	Which is higher if difference is significant?
Overall	-3.6029	0.0003	Male
Treatment 1	-0.8606	0.3912	
Treatment 2	0.4427	0.6604	
Treatment 3	0.0000	1.0000	
Treatment 6	-3.1411	0.0021	Male
Treatment 7	-2.8128	0.0057	Male
Treatment 12	-0.2552	0.7999	
Treatment 21	0.0375	0.9702	
Treatment 22	0.8046	0.4260	
Treatment 23	-1.6475	0.1077	



# The role of information

Mean male contribution in treatment 1 (investment baseline)	0.6146	
Mean male contribution in treatment 12 (public endowments)	0.7000	
T-test	t-stat	p-value
	-1.8944	0.0600
Mann-Whitney test	z-stats	p-value
	-1.745	0.0810
Mean female contribution in treatment 1 (investment baseline)	0.5896	
Mean female contribution in treatment 12 (public endowments)	0.6875	
T-test	t-stat	p-value
	-2.0861	0.0386
Mann-Whitney test	z-stats	p-value
	-2.021	0.0433
Mean male contribution in treatment 9 (male trust)	0.6563	
Mean male contribution in treatment 14 (public male)	0.4906	
T-test	t-stat	p-value
	2.8549	0.0051
Mann-Whitney test	z-stats	p-value
	2.548	0.0108
Mean female contribution in treatment 8 (female trust)	0.5531	
Mean female contribution in treatment 13 (public female)	0.5516	
T-test	t-stat	p-value
	0.0339	0.9730
Mann-Whitney test	z-stats	p-value
	0.230	0.8179

Note: The results of the t-tests hold even if unequal variances are assumed.

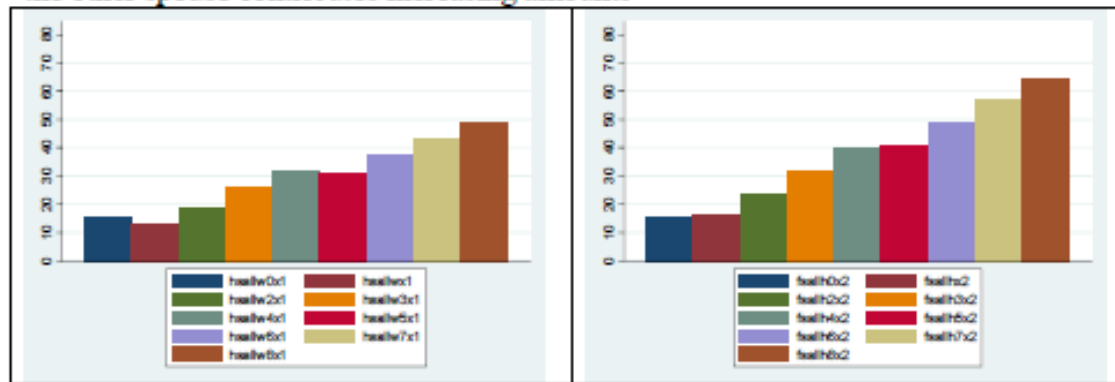
# The role of information

- Overall
  - Baseline: higher contribution with public information (both female and male)
  - Trust:
    - Male lower contribution with public information
    - No significant difference for female

# Reciprocity

- Strategy treatments:  
If your husband put Birr x into the envelope, so that there is Birr [y] in the common envelope, how do you want to split the money? How much for you [write down]; and how much for your husband [Write down & check sums]?

Figure: Expected reciprocity? Amount husbands and wives will keep for themselves if the other spouse contributes increasing amounts



- When the other contributes more I will take more. 'Negative' reciprocity?
- Women take more for themselves compared to men. T- and Mann Whitney tests confirm that.

# Actual and expected behaviour

- If your husband/wife had Birr 40 in his envelope, how much do you think he would take out?

Table : Actual and expected contribution behaviour

Actual amount kept by husband	19.387	
Expected amount by wife	21.687	
	t-stats	p-value
t-test	-3.6207	0.0003
	z-stats	p-value
Wilcoxon signed rank-test	-4.420	0.0000
Actual amount kept by wife	22.944	
Expected amount by husband	20.570	
	t-stats	p-value
t-test	3.4264	0.0006
	z-stats	p-value
Wilcoxon signed rank-test	3.117	0.0018

Note: Actual amount kept by spouse is the mean amount of initial endowment kept by the spouse. Expected amount by a spouse is the expectation about this amount from the other spouse.

- Wives overestimate (husbands more altruistic than expected by wives)
- Husbands underestimate (wives more selfish than expected by husbands)
- Assumption: my decision is made based on my expectations from others:
- Systematic error → failure of efficiency.
- Game theory: error eliminated in repeated game: these are married couples.

## Regression analysis: initial results

- Men contribute more even after controlling for other variables
- Hadiya and AA contributing more even after controlling for other variables
- Catholics contributing more (but doesn't seem to survive fixed effects probably because of small number of observations)
- Spouses who disagree with "A man should have final say in family matters" (strongly agree omitted) contribute more
- Father's activity seem to influence contribution rates rather than mother's

## [ Summing up ]

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- Key point is lack of surplus maximization
- Is there any other rule? 50% or 60%
- Systematic miscalculation of partner's behaviour
- Men contribute more than women