

Banerjee, Debosree; Klasen, Stephan

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Intrahousehold allocations by mothers to children: The role of observability

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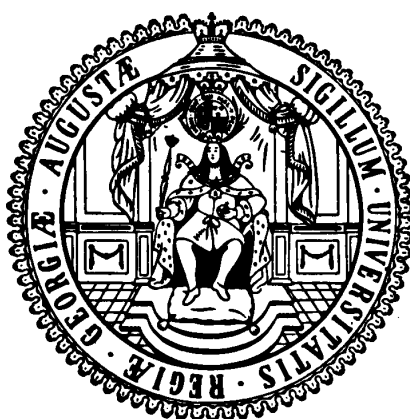
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Debosree Banerjee and Stephan Klasen

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Platz der Göttinger Sieben 5 · 37073 Goettingen · Germany
Phone: +49-(0)551-3921660 · Fax: +49-(0)551-3914059

Email: crc-peg@uni-goettingen.de Web: <http://www.uni-goettingen.de/crc-peg>

Intrahousehold allocations by mothers to children: The role of observability

Debosree Banerjee, Stephan Klasen¹

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Abstract

In this article we analyse the impact of spousal preference expectations on mothers' willingness to invest in children's food/nutrition and health/medical expenses. We use a survey conducted in Karnataka, South India, where women with children were asked to state their investment preference in child food and health corresponding to three endowment levels. Alongside, we also attempted to derive their expectations about spousal relative investment choices. We find that if mothers are able to elicit expectations about spousal preference, their own preferences remain unaffected, whereas, if expectation elicitation is impossible, female investments in children reduce significantly. We argue that in the absence of information sharing, uncertainty is created which decreases cooperation by mothers by reducing their willingness to invest in children, especially in girls and increasing their precautionary savings. These results remain consistent across the all endowments. Our study is particularly of relevance for policies that aim to alleviate poverty and improve child human capital accumulation with cash transfer policies. It also suggests that in a noncooperative set up, where household members do not share their financial information, resources tend to be under-allocated in household public goods such as children.

Keywords: Incomplete information, Uncertainty, Noncooperation, Intrahousehold allocation

JEL codes: D13, D81, D82, J12

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1. Introduction

Economic studies on household decision-making have increasingly moved from the unitary model (Becker, 1991) to collective models of decision-making which allow individuals to have divergent preferences and increase their own utility by bargaining over household resource allocations. Depending on their relative bargaining strength household decisions are made, and household demand could be seen as a weighted average of individual demand functions, weights capturing their relative bargaining strength. In such set-up, if all preferences are observed and decisions are implemented according to what has been decided by the household members jointly, we have cooperative bargaining models. Among the earliest examples of the collective models are Chiappori (1988, 1992), Manser and Brown (1980), McElroy and Horney (1981). However, if individual preferences are not completely observed, unobservability creates uncertainty in implementing decisions and resource allocation might not be Pareto optimal. Therefore, it is useful to investigate the role of unobservability and thus uncertainty on household decision-making. We examine such an information problem that induces uncertainty and inefficiency in resources allocation in household public goods² such as children.

Let us consider a household with husband, wife and children. If one of the spouses, say wife, does not have complete information or is uncertain about her spouse's investment preferences in household public goods, it is possible to have a situation in which she reduces her own investments in the same. This typically relates to the non-cooperative bargaining models where uncertainty about partner's investment choices reduces cooperation among spouses. This goes against economic theories supporting mothers having higher welfare motives for children (Quisumbing and Maluccio, 2003; Rubalcava et al., 2009; Schady and Rosero, 2008 and Thomas, 1990). Since in developing countries, women play a major role as primary caregivers of children, it is reasonable to assume that empowering women would generate better welfare outcomes for children. For example, in the intrahousehold context, if women exercise higher marital power they tend to spend more on children (Ross et al., 2015; Fafchamps et al., 2009; Lundberg, Pollak and Wales, 1997; Haddad and Hoddinott, 1994). These findings are purely driven by gender differences in preferences. We, on the other hand, argue that in a non-cooperative set up if preferences are not known, the choice of reducing child investment by women could be a strategic decision to pull higher investment from her partner and free ride on it. Since both husband and wife derive higher utility from improved child outcomes, a decrease in investment by one might increase in investments by the other³. Such incentives will either be absent or less if preferences are known and income contributions by spouses are determined jointly by the household through binding contracts⁴. In that case, as preferences are known and contracts are binding, individual actions will not affect each other. Observability serves as the mechanism to maintain the marital contracts.

² Household public goods can be thought of as those goods that benefit the entire household irrespective of who provides them, for instance investment in children's human capital, such as education and health, provides welfare to both spouses even if it is the mother that makes sure her child gets the proper nutrition.

³ Sometimes cultural norms dictates household expenditure pattern such that men takes over the financial responsibilities while women play the role of caregivers.

⁴ Since, families engage in long term repeated interactions; eventually they realize that the gains from cooperation are higher than the gains from noncooperation (Browning et al., 2008). However, opportunities for such cooperation diminish if spouses do not share their financial information. Absence of information sharing itself is an indication of noncooperation among spouses leading to inefficient resource allocation within household.

The hypothesis we test in our study is whether ignorance of spousal investment preferences in children reduces the mothers' willingness to invest in the same. Our study is built on the theories of noncooperative bargaining models (Ulph 1988; Kanbur 1991; Carter and Katz 1997; Lundberg and Pollak, 1993). In noncooperative models, individuals do not enter in to binding and enforceable contracts, instead they handle their resources separately, and none has access to the pool resources. Spouses decide independently about the share of income contributions and maximize his/her own welfare, given the behaviour of his/her spouse. Therefore, an individual's actions are conditional on the actions of others indicating not all equilibriums in noncooperative models are Pareto optimal. In the noncooperative equilibrium, an individual might choose to stay in a marriage as there might be emotional and social costs attached to divorce, but they do not coordinate their actions or pool their resources (Warr, 1983 and Bergstrom, Blume and Varian, 1986). Therefore, in the presence of incomplete information on spousal investment choices, free riding incentives might increase, leading to under investments in household public goods. Empirical studies on household bargaining have found evidence of such non-cooperative behaviour and inefficient allocation of resources within the household, implying that household public goods are being underprovided (Udry, 1996). Chen, 2006 in his study finds that noncooperation occurs due to asymmetric information in migrant households. Ashraf (2009) finds that in the Philippines in the absence of detection, husbands increase their private consumption and decrease monetary transfers to their wives. Castilla and Walker, 2013, in a Ghanaian context, argued that if spouses choose to exploit their information advantages by concealing resources from each other, the result is a noncooperative equilibrium and a Pareto suboptimal allocation of resources. However, evidence on the role of unobservability among couples in household resource allocations is rare.

We focus on two categories of human capital, namely food/nutrition and health/medical expenses. Our conjecture is that in a noncooperative structure, unobservability reduces the willingness to investments by mothers. Instead, it increases their precautionary savings motives to cope with the uncertainties of spousal noncooperation. We mainly focus on the investment behaviour of the mothers as women in the household are often responsible for managing the children. Our results confirm our hypothesis and show that when mothers are unaware of spousal investment preferences they are significantly less willing to invest in children's food and health compared to those who are able to elicit expectations about spousal investment preferences. We also find evidence of higher saving motives⁵ among mothers who are ignorant about spousal investment choices in children.

Understanding the role of ignorance and uncertainty in family decision making has relevant policy implications for government using cash transfers as instruments to alleviate poverty or improve child human capital accumulation. In the presence of information problems there might be a tendency among individuals to allocate those resources away from the desired categories failing to achieve the policy goals. Household members might increase their private consumption diverting the resource away from the household public goods such as, children, health, and education and so on.

The following sections are organized as follows. Section2 discusses the data and the study design; Section3 discusses the descriptive statistics; section 4 presents the estimation strategy; section5 interprets the estimation results and finally, section6 concludes the study.

⁵ Our survey does include further information on purpose of saving.

2. Data and Study design

Data

To test the hypotheses, we use data from a household survey conducted in 2016 in two districts of Karnataka, Bangalore Urban and Bangalore rural. The survey is a multipurpose survey and has two parts. One is a household level survey containing information on household demography, occupation, asset holding, land holding, access to credit, shock experience, crop production-marketing patterns and so on. The other part is essentially a women questionnaire having two parts again (implemented as one questionnaire). For the first part we interviewed the woman in the households who could provide information on household food and non-food consumptions along with food security related questions. In the second part of the same questionnaire, we attempted to interview at least one and at most three women from each household to collect detailed information on the female autonomy related issues such as labour force participation by women, domestic violence, and decision making experience in the household and so on. Not always, we could achieve our target of interviewing three women, but attempted to interview those who were available during the time of the interview upon their consent. Interviewees were all selected randomly. Sometimes the household survey was conducted first, and sometimes the female questionnaire was implemented first. Our choice of which part to implement first depended on the availability of the suitable respondents and therefore the order was kept random. We have a total 1,465 women from 1230 households.

Study design

In the women questionnaire, in the household decision-making section, we included a few questions for the female respondents (who have children) to understand their willingness to invest in children corresponding to three hypothetical endowment levels Rs 10000, Rs. 5000 and Rs.3000 (around US\$45). We also elicited expectations about their spousal investment choices corresponding to the same endowments. For each endowment there are three questions on the willingness to invest, expectations about spousal investment and saving intentions of others. First, for the willingness to invest question, respondents were asked to choose an investment for their children's in two categories food/nutrition and health/medical expenses. The order in which the questions were asked for the three endowments, were kept random, i.e. we controlled for the order effects in endowments. Furthermore, to check for the gender difference in the willingness to invest by mothers the questions were asked separately for girls and boys. Thus, respondents having a girls only provided information for girls and vice versa. Those having both girls and boys made their choices for both. Therefore, at most a respondent made 12 choices for three endowments, two categories and two genders. Second, for the expectation questions, we additionally asked that given the same endowment if they expect their husband to invest the same, more, less amount or if they are unaware of the preferences. Again, for the three hypothetical endowments, two categories and for girls and boys separately, we have at most 12 expectations formed by the respondents. These expectation questions were asked to elicit the information sharing patterns by the male counterparts in the family. Third, to understand the precautionary saving motive of the mothers, corresponding to all three endowments respondents were asked that given the same endowment and allocation choices how much they would like to keep as savings. Figure1 below briefly describes the structure of the willingness questions.

The objective of posing these questions is to understand the impact of known and unknown preferences on female investment choices in children. Elicitation of expectation itself might be an indication of the

presence of information sharing among spouses and thus the existence of cooperation⁶ in the household. Unobservability, on the other hand, would indicate noncooperation and uncertainty. Similarly, if spousal income contribution is not known to the mothers, spouses might not pool their income and we might expect them to reduce investment.

Figure1: Structure of the willingness questions⁷

	Food/nutrition				Health/health				Savings
Income	Girls	Expectation	Boys	Expectation	Girls	Expectation	Boys	Expectation	
Rs. 10000									
Rs. 5000									
Rs. 3000									

Note: Expectation (same, more, less, unaware) corresponds to the expected investment by husband for the corresponding endowment level. Order of the endowments was kept random during the survey; the same questions were asked for Rs. 10000, Rs.5000 and Rs. 3000.

3. Descriptive Statistics

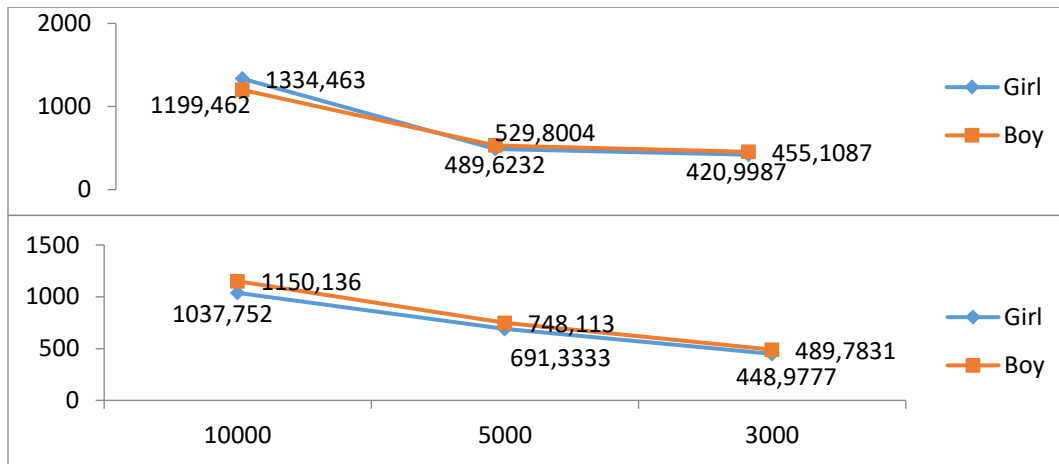
Figure2 shows the average willingness to invest by mothers. The upper panel corresponds to food and nutritional investment. It shows that at lower endowment levels, investments in boys are higher than that in girls. At highest endowment, investments in girls appear to be higher. At each income level, gender differences in investments are statistically significant (all at less than 1%). However, at lower levels of income, the gender differences in investment are much lower in absolute terms. As endowment increases from Rs.3000 to Rs. 5000 and then to Rs.10000 the gender gap increases further. In relative terms these are approximately 10% lower for the disadvantaged sex in all three income levels. Therefore, we find that a higher endowment level promotes rising absolute gender discrimination in willingness to invest.

Looking at health and medical spending related investments in the lower panel we find that at Rs 3000 and Rs 5000 average investments in boys are higher than investment in girls however when income level reaches Rs. 10000 gender gap reverses with girls receiving higher investment. Again these differences are all statistically significant (all at less than 1%).

⁶ We argue that even if women expect a lower (higher) income contribution by their partners that might be a result of household reaching such consensus in a cooperative manner.

⁷The precise questions are described in the appendix (TableA0)

Figure2: Mean willingness to invest by mothers in food and health



Note: the top panel refers to investments in food and nutrition, the bottom panel health and medical care.

In our study, we attempted to elicit expected investments by husbands to understand how women perceive their husbands' investment choices relative to hers. Given the same endowments, at each level, we asked if she expects her husband to invest same, more, less amount than herself or she does not have any clear expectation. If expectations do not have any impact on her investment choices, then there should not exist any significant difference in willingness to invest by these four expectation categories. Figure 3 presents the mean willingness to invest in food/nutrition by mothers by the expectation categories. The top three bar charts correspond to the willingness to invest in girls by the three hypothetical endowment levels and the bottom three bar charts relate to the same for boys. We find that investment is lowest when respondent are unaware of spousal preference. In other words, this figure indicates that ignorance creates incentives to reduce investments

Figure 3: Willingness to Invest in food by expectation categories

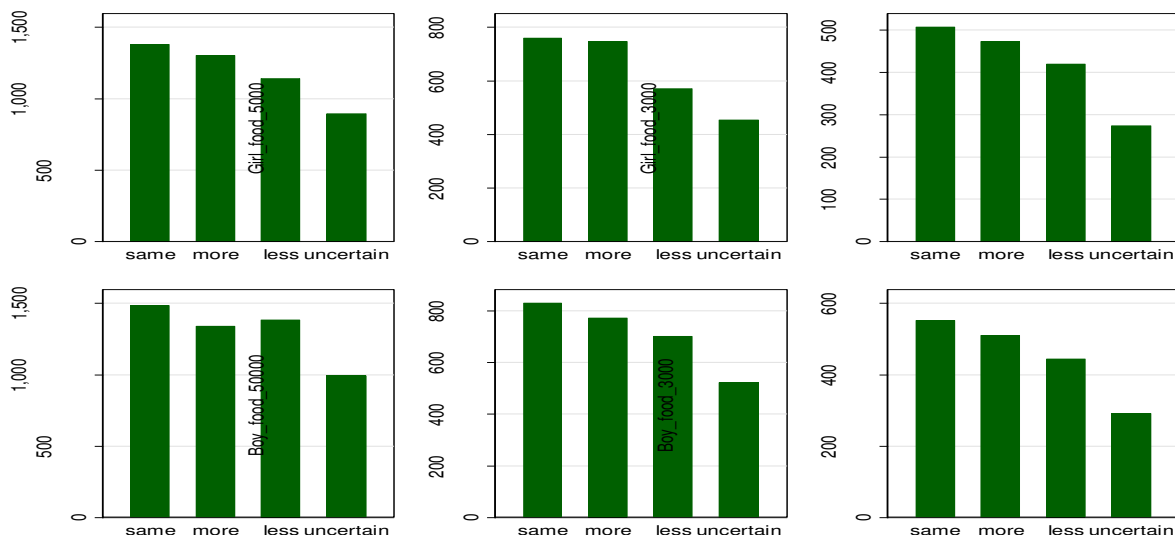


Figure 4 shows mean willingness to invest by expectation categories in health. We observe a similar pattern as observed in figure 3, except for girls. We find that unobservability of husbands' preferred investments increases mothers' willingness to invest in health corresponding to endowments 5000 and Rs. 3000. However, for boys still unknown preference correlates negatively with mothers' willingness to invest irrespective of the endowment levels.

Figure 4: Willingness to Invest in health by expectation categories

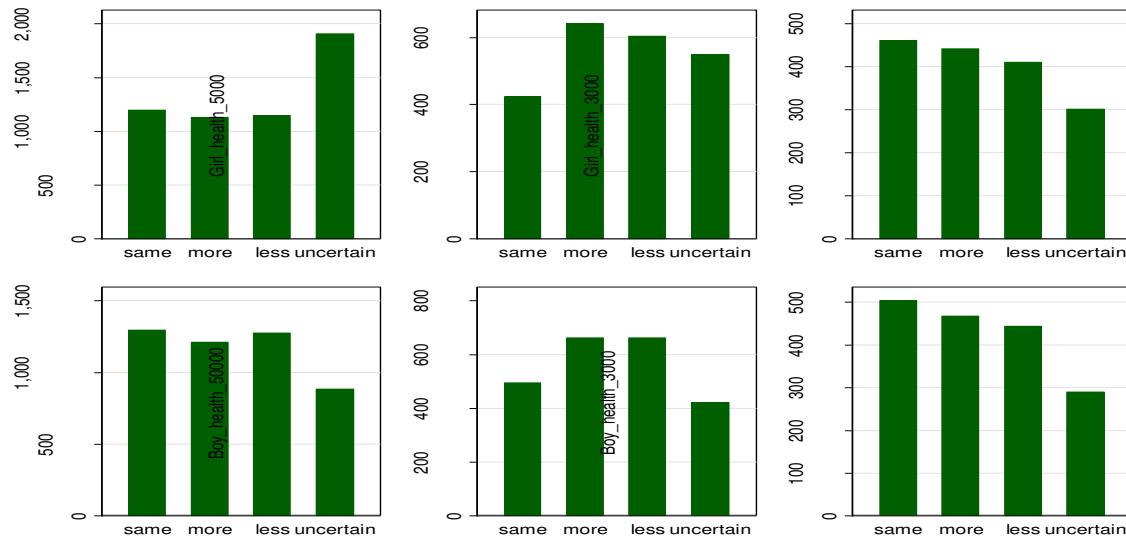


Table1 further shows if unobservability is higher for girls. We find that proportion of women uncertain about husbands invest preference is significantly higher in the case of girls than boys, (except in health for Rs. 10000, but this difference is insignificant). This could have implications for the gender difference in mothers' willingness to invest. Since we find that uncertain mothers are less willing to invest, higher mean uncertainty about husbands' investment preferences in girls could further aggravate the gender gap that we found in figure2.

Table 1: Proportion or ignorant mothers by endowment and child gender

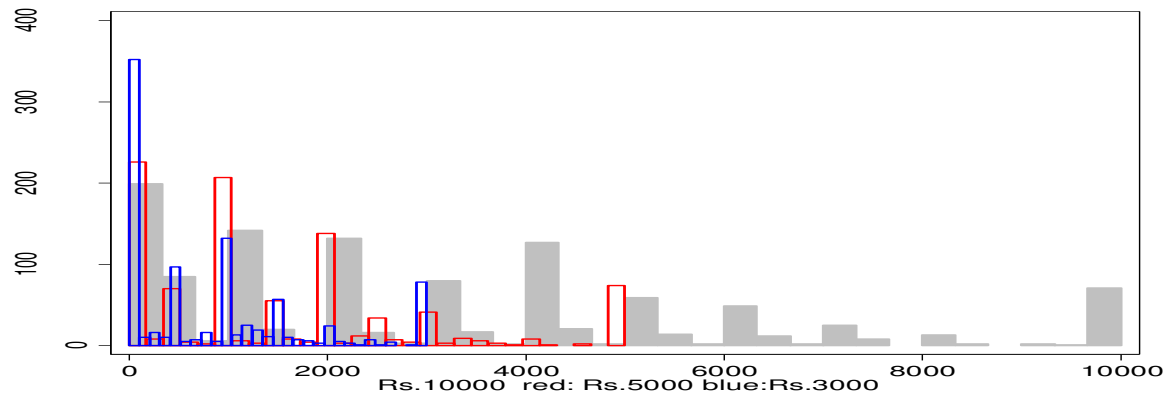
		Rs. 10000	Rs.50000	Rs.3000
Food	Girl	14.04	13.96	14.17
	Boy	13.2	12.48	12.89
Health	Girl	19.26	10.43	13.59
	Boy	20.02	9.91	12.88

Note: Gender differences in ignorance of husbands' preferred invest choices are significant (less than 1%), except in health for Rs 10000

We also attempted to investigate the saving motives of the mothers. Given the endowments the respondents were asked to make a choice between saving and investing an amount in children. The histograms in figure5 present the frequency density of the savings behavior of all mothers. The blue bars correspond to the endowment level Rs.3000, red bars to the Rs. 5000 and gray bars to Rs. 10000. We

find that frequency of mothers choosing to invest the entire endowment in children and save nothing decreases with the endowment levels indicating higher endowment increases savings motivations among women.

Figure 5: Histogram of savings by the endowment levels



Note: Corresponding to endowment Rs. 1000, Rs. 5000 and Rs. 3000, we find the proportion of mothers are willing to invest the full endowment amount in child health and food are 15.92%, 23.64% and 37.62 % showing that as endowment increases willingness to invest in children decreases.

In figure6, dividing the sample by mothers who are always uncertain about spousal investment choices in food and health categories and those who could elicit an expectation, we find that the former tends to save more than the latter at each endowment level. These differences are all significant at less than 1%, indicating that unobservability thus uncertainty reduces the willingness to invest in children and increases willingness to save. Increase in willingness to save might be precautionary measure taken up by mothers to cope with marital uncertainties arising due to unobservability.

Figure6: Mean of willingness to save by endowment amount

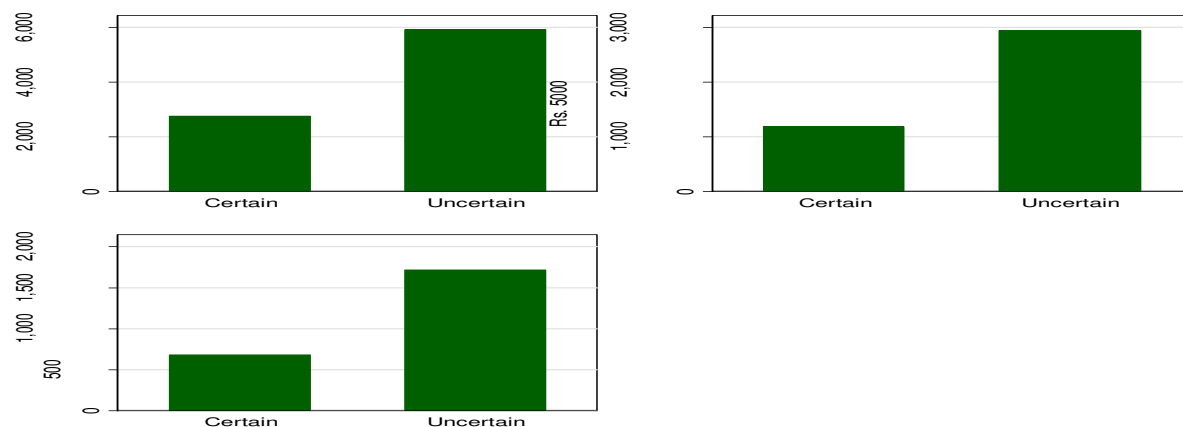


Table 2 descriptively shows the exogenous characteristics of the mothers in our study. The first column reports the mean exogenous characteristics for all women. In the last two columns we further divided the sample into two groups. The uncertain category describes those for whom investment expectations could never be derived for any of the categories and for none of the gender of the children. In other

words, these are the mothers who remained uncertain about spousal investment choices irrespective of the endowment amount. We categorized them as the uncertain. Accordingly, we create a dummy variable, uncertain which takes the value 1 if a woman is uncertain about spousal investment preferences at all endowment levels for food and health and zero otherwise. Our data show that there are no significant differences between uncertain and certain mothers, except for: if the husband is a migrant, number of living children and years of marriage (all significant at the less than 1 percent level). 25% of the uncertain mothers have migrant husbands while only 4% of the certain mothers' husbands have migrated. This is in line with Chen, 2006 finding that discusses how migration creates an information asymmetry and noncooperation in households in China. We also find that certain mothers are married for 27 years and uncertain mothers are married for 21 years. Desired number of girls and boys in all family is around 1, and most of the households belong to the middle wealth quintile. Average marital age of mothers is around 17 and first child bearing age is 18.

Table 2: Exogenous characteristics of the mothers

	All	Uncertain	Certain
Mother working	0.34	0.32	0.35
migrant husband	0.29	0.25	0.04***
Mothers' age at marriage	17.78	17.90	17.53
Mothers' age at first birth	18.99	18.72	19.48
No. living children	2.21	2.57	3.07***
Years of marriage	16.25	21.52	27.74***
Desired no. of girls	1.01	1.07	1.18
Desired no of boys	1.08	1.06	1.12
Spousal education gap(Yrs)	-0.35	-0.53	-1.12
No. of hh member	4.95	4.66	4.50
Wealth quintile	3.00	3.01	3.10

Note: *** indicates significant difference between certain and uncertain groups at <1% level

4. Estimation strategy

Our main objective is to analyse the impact of the expected relative investment preference of the husband on mothers' investment choices in child food/nutrition and health/medical expenses separately for girls and boys. We estimate models of the following type:

$$W_{ik} = \alpha_0 + \sum_{j=1}^3 \alpha_j E_{ijk} + \alpha_4 I_{ik} + \epsilon_{ik} \dots \dots (1)$$

$$G_i = \partial_0 + \partial_1 g_i + \partial_2 b_i + \partial_3 I_i + \mathfrak{z}_i \dots \dots (2)$$

Where, W is the willingness to invest by the i-th mother of the k-th child. j is the expectation dummies, i.e. if she expects her husband to invest more or lesser amount relative to what she is willing to invest or she is ignorant of it⁸. I_{ik} is the vector of individual and household level controls. ϵ_{ik} is a random error

⁸ The left out category is similar investment expectations from husband.

term. The second model estimates the impact of uncertainty on the gender difference in willingness to invest. Here we run our analysis with the mothers having both girls and boys. In Equation 2, G is the gender difference in willingness to invest in children by the i -th mother. We run ordinary least square estimation to estimate the impact of expectations on female willingness to invest in children. Presence of noncooperation is detected by the uncertainty dummy which takes 1 if mothers are ignorant of spousal relative investment preferences. It is possible that with the changing levels of endowment some mothers become uncertain about spousal preference at a higher amount of the endowment but not at a lower amount. Therefore, we estimate the same model for three endowment levels, Rs10000, Rs.5000 and Rs.3000, separately for girls and boys and for food and health categories.

Again, there are mothers who are uncertain about spousal choices irrespective of the level of endowment. This situation would reflect the complete absence of information sharing by the husband. It is useful to investigate how the complete absence of information sharing affects willingness to invest. In the third model we estimate the impact of uncertainty⁹ of these mothers on the willingness to invest for all three endowments.

$$W_{ik} = \beta_0 + \beta_1 U_{ik} + \beta_2 I_i + e_i \dots \dots (3)$$

Where, U is the uncertainty dummy capturing complete absence of information sharing. This estimation is run separately for food and health investments.

$$S_{ij} = \beta_0 + \beta_1 U_{ik} + \beta_2 I_i + e_i \dots \dots (4)$$

We repeat the same analysis in equation 3 in equation 4 as well to estimate the saving motives (S) of the mothers, i.e. if uncertainty increases selfishness, given a choice to invest in children or save.

5. Results

In this section we present our results. We estimate the willingness to invest by mothers described in equation1 separately for girls and boys. Table 3 presents the OLS estimates of willingness to invest in food /nutrition. Looking at the expectation dummies we find if mothers are uncertain about spousal investment choices they tend to reduce their investment. However, none of the other expectation dummies seem to exert any significant impact consistently on her willingness to invest, indicating preferences are predetermined and known and action by one agent does not impact action of the other. Interestingly, absolute magnitudes of the uncertainty dummy increases sharply at endowment level Rs.10000 compared to Rs. 5000 and Rs.3000, indicating at higher level of income uncertainty has an even higher detrimental effect in mothers' willingness to invest in food/nutrition. Looking at the mothers' characteristics we find that mothers' work force participation has significant positive impacts on their willingness to invest. As mothers' income earning opportunities increases her preference to invest in children also increases along with her bargaining power. Again, as the number of living children increases willingness to invest decreases which are possible as monetary requirements to invest in other categories such as education, health would increase. We further observe that if mothers desire for more girls that increase her willingness to invest in girl's food, and similar is also observed for desired

⁹ When we estimate impact of complete uncertainty on willingness to invest in food, we look at only those mothers who are uncertain of spousal preference only for food investments at all three endowment levels. These mothers might not be uncertain about health investments by husband. Same is for health uncertainty.

number of boys. Notably, at endowment level Rs. 5000 and Rs. 3000, if mothers desire for more girls, the willingness to allocate resources in boys decreases.

Table3: Willingness to invest in food

	(1)	(2)	(3)	(4)	(5)	(6)
Endowments(Rs)	10000	10000	5000	5000	3000	3000
VARIABLES	Girl food	Boy food	Girl food	Boy food	Girl food	Boy food
Expectations:						
More	35.04 (89.808)	-67.31 (74.286)	12.05 (50.821)	-17.05 (42.981)	-28.93 (22.828)	-18.02 (27.252)
Less	-72.85 (134.387)	30.89 (126.652)	-137.31** (68.394)	-102.95 (63.717)	-55.73 (45.985)	-89.23* (51.058)
Uncertain	-432.13** (188.805)	-447.84*** (154.137)	-275.67** (105.840)	-232.06** (89.833)	-233.91*** (56.746)	-244.12*** (59.686)
Mothers' characteristics:						
Mothers' work	275.08*** (88.408)	91.68 (86.225)	138.79*** (43.952)	91.21* (48.704)	82.54*** (26.161)	30.77 (22.788)
Migrant husband	49.42 (177.335)	155.71 (164.893)	41.36 (64.803)	11.81 (76.133)	73.93 (61.258)	22.12 (48.118)
Mothers' age at marriage	26.44* (14.506)	11.05 (14.006)	13.09 (8.590)	4.97 (7.268)	2.76 (4.780)	2.28 (4.743)
Mothers' age at first birth	-21.20** (8.148)	-17.64** (7.772)	-11.79** (4.795)	-6.70 (4.328)	-1.22 (2.640)	-1.25 (3.079)
No. living children	-130.59** (54.252)	-181.47*** (41.284)	-45.47* (25.468)	-91.43*** (26.115)	-42.33** (17.814)	-72.29*** (16.470)
Years of marriage	0.57 (4.287)	0.43 (4.081)	-2.94 (2.259)	-2.43 (2.127)	-2.16* (1.269)	-0.90 (1.340)
Desired no. of girls	249.36*** (81.430)	-86.99 (67.103)	115.86*** (37.409)	-53.99* (31.929)	116.69*** (27.970)	-56.50** (27.339)
Desired no. of boys	-23.85 (85.550)	253.35*** (70.716)	-30.99 (37.318)	119.00*** (29.212)	-29.64 (27.666)	89.20*** (29.755)
Spousal education gap(Yrs)	3.19 (8.607)	7.38 (8.958)	0.65 (4.190)	2.83 (4.543)	-0.34 (2.425)	3.45 (2.715)
No. of hh member	30.69 (24.166)	-9.67 (16.823)	2.82 (11.135)	-10.26 (7.681)	9.69 (7.998)	2.66 (6.811)
Wealth quintile	-17.06 (21.496)	-23.28 (26.570)	5.53 (12.899)	8.93 (14.912)	-5.98 (7.902)	-2.65 (9.265)
Constant	1,132.17*** (323.488)	1,875.32*** (378.467)	740.09*** (202.598)	1,024.42*** (166.306)	464.23*** (97.262)	650.72*** (110.798)
Observation	546	598	546	598	546	598
R-squared	0.112	0.119	0.108	0.116	0.169	0.179

Note: Robust standard errors are in parenthesis; *** p<0.01, ** p<0.05, * p<0.1; for the expectation dummies left out category is similar investment by the husband

Table4 repeats the analysis in Table3 for women's willingness to invest in health and medical expenses. Same as Table3 we find none of the expectation variables but uncertainty impacts female willingness to invest in health significantly. Uncertainty has a detrimental effect on investment choices. Labour force participation by mothers has a positive impact on willingness to invest in health only at the lower level of endowment. As the endowment amount increases the significance disappears. The number of living children negatively affects investment decisions, indicating as the number of children in household increases resource demand in other categories increases and then resources are thinly spread across in

health, food, education clothing etc. If mothers desire for more girls no changes occurs in her willingness to invest in girls and boys. However, if the desired number of boys increases, more resources are allocated by mothers in boys' health and existence of such son preference in mothers might reduce resource allocation in girls' health.

Table4: Willingness to invest in health

	(7)	(8)	(9)	(10)	(11)	(12)
Endowment(Rs.)	10000	10000	5000	5000	3000	3000
VARIABLES	Girl health	Boy health	Girl health	Boy health	Girl health	Boy health
Expectations						
More	12.26 (79.298)	-83.37 (89.292)	-36.36 (42.060)	-69.19* (39.401)	-27.48 (26.526)	-25.71 (25.071)
Less	-79.90 (100.613)	55.22 (146.924)	2.56 (59.271)	-43.17 (63.624)	-48.96 (37.976)	-46.38 (42.394)
Uncertain	-243.39 (168.034)	-261.11* (153.605)	-127.43 (99.447)	-263.28*** (71.816)	-154.06*** (54.190)	-176.10*** (57.464)
Mothers' Characteristics:						
Mothers' work	123.34 (101.901)	12.01 (72.141)	66.56 (53.538)	47.17 (47.716)	102.67*** (29.473)	51.64** (23.280)
Migrant husband	118.38 (172.773)	83.83 (118.150)	2.70 (92.221)	87.90 (91.275)	75.22 (77.058)	-1.53 (52.178)
Mothers' age at marriage	-27.59 (16.635)	-20.75 (13.389)	-6.18 (8.401)	-6.26 (7.562)	-7.58 (4.607)	-4.99 (5.047)
Mothers' age at first birth	11.80** (5.187)	9.82 (6.320)	4.20 (3.063)	-6.95 (5.738)	0.02 (2.254)	0.65 (2.825)
No. living children	-140.24* (83.884)	-217.25*** (38.838)	-67.38* (38.720)	-107.31*** (24.335)	-43.63* (24.134)	-102.05*** (15.296)
Years of marriage	-2.88 (5.470)	-2.41 (3.382)	-0.92 (2.777)	0.20 (2.029)	-3.09* (1.640)	-0.22 (1.434)
Desired no. of girls	110.65 (78.301)	14.93 (87.335)	69.47 (50.028)	-37.51 (45.762)	75.19** (28.815)	-31.10 (27.926)
Desired no. of boys	-74.05 (70.965)	158.89** (65.398)	-75.51* (40.842)	46.66 (37.771)	-58.97** (23.156)	46.32* (24.641)
Spousal education gap(Yrs)	-18.25 (13.137)	-5.43 (8.960)	-9.70 (6.586)	-0.21 (4.340)	-3.20 (4.331)	-3.01 (3.584)
No. of hh member	42.48 (37.071)	-20.44 (21.159)	28.55 (19.958)	-5.23 (11.043)	12.52 (11.806)	-1.91 (7.445)
Wealth quintile	-23.35 (22.303)	-21.58 (24.785)	-27.37** (12.222)	0.24 (14.281)	-14.67* (7.735)	5.37 (7.767)
Constant	1,631.62*** (367.360)	1,967.42*** (307.844)	801.04*** (148.896)	1,223.43*** (153.598)	685.39*** (88.390)	765.72*** (105.532)
Observation	546	598	546	598	546	598
R-squared	0.061	0.085	0.078	0.088	0.145	0.153

Note: Robust standard errors are in parenthesis; *** p<0.01, ** p<0.05, * p<0.1; for the expectation dummies left out category is similar investment by husband

Table3 and 4 confirms our hypothesis that as opposed to known preferences unknown preferences creates uncertainty. As a result, noncooperation among spouses increases, leading to inefficient resources allocations in children. Absence of information sharing, therefore, creates inefficiency in household resource allocation by creating uncertainty.

In Table5 we would now analyse equation 2 which investigates if uncertainty increases gender difference in willingness to allocate resources in food and health by mothers. We focus at the endowment level gender difference and uncertainties in resource allocations in boys' and girls' food and health. Since we are looking at gender difference in resource allocation we restrict our sample mothers having both girls and boys. The number of such mothers is 404. Our finding suggests that, by and large, uncertainty about resource allocations by fathers in girls' food/nutrition widens up the gender gap in willingness to invest in food and health by mothers. We also find a weak evidence of uncertainty about boys reducing the gender gap.

Table5: Impact of uncertainty on endowment level gender difference in willingness to invest by mothers

	(13)	(14)	(15)	(16)	(17)	(18)
Endowments(Rs.)	10000	5000	3000	10000	5000	3000
VARIABLES	(boy-girl)	(boy-girl)	(boy-girl)	(boy-girl)	(boy-girl)	(boy-girl)
	Food	Food	Food	Health	Health	Health
Uncertainty:						
Girls	3,897.74*** (55.654)	948.48 (623.973)	66.21* (37.700)	704.23* (354.845)	1,880.08*** (72.534)	423.24 (350.141)
Boys	-3,700.28*** (102.542)	-737.18 (605.853)	-0.17 (22.799)	-606.68 (373.169)	-1,900.87*** (147.693)	-419.70 (336.519)
Mothers' characteristics:						
Mothers' work	11.40 (38.474)	100.55** (43.464)	31.22* (17.220)	-124.72 (111.178)	-3.28 (70.220)	-21.40 (32.344)
Migrant husband	-71.49 (44.194)	-71.31 (49.768)	-28.62 (18.047)	-17.00 (144.247)	-35.00 (73.535)	-45.38 (52.398)
Mothers' age at marriage	-6.91* (4.117)	-6.04 (4.251)	-3.78** (1.691)	-4.80 (15.383)	-0.32 (8.923)	-1.48 (4.079)
Mothers' age at first birth	2.47 (1.505)	1.74 (1.797)	0.93 (0.644)	4.74 (3.507)	-6.93 (7.607)	2.03** (0.922)
No. living children	-26.01 (19.707)	-20.98 (18.923)	-15.35* (7.800)	-151.02* (84.437)	-35.94 (44.520)	-38.44 (27.512)
Years of marriage	0.26 (1.638)	2.03 (1.361)	0.54 (0.416)	3.35 (3.516)	1.41 (1.985)	1.17 (1.020)
Desired no. of girls	-1.76 (35.826)	6.23 (28.407)	-8.41 (14.577)	118.98** (58.572)	27.00 (33.464)	37.97 (24.639)
Desired no. of boys	21.81 (28.974)	40.98* (20.484)	16.10 (10.082)	73.48 (56.595)	-3.64 (29.753)	16.96 (17.664)
Spousal education gap(Yrs)	1.97 (5.140)	4.37 (5.394)	1.70 (1.448)	13.88 (14.724)	8.50 (7.714)	4.98 (4.288)
No. of hh member	-14.18* (7.670)	-12.10* (6.174)	-1.29 (2.542)	-69.26 (49.446)	-38.67 (25.178)	-22.52 (15.143)
Wealth quintile	14.40 (11.732)	15.59 (9.779)	9.10 (6.501)	45.21 (27.191)	25.96* (14.543)	16.32* (8.530)
Constant	167.18 (121.797)	34.01 (107.346)	49.42 (34.564)	383.23* (213.499)	310.82** (117.990)	82.93 (50.822)
Observation	404	404	404	404	404	404
R-squared	0.284	0.091	0.066	0.099	0.125	0.127

Note: Robust standard errors are in parenthesis; *** p<0.01, ** p<0.05, * p<0.1

Let us now identify uncertainty in a slightly different way. We again restrict our analysis to mothers having girls and boys both and we define a mother is uncertain when she is ignorant of spousal preference in willingness to invest in children irrespective of child gender and endowment amount. Thus a food uncertain mother refers to those who are always uncertain about spousal investment preference in food for all her children at all endowment level. Similar interpretation holds for health uncertain mothers.

Table6 reports the estimation result for food investment choices. It shows that women who are always uncertain about husband's choice irrespective of child gender and endowment amount tend to invest significantly less. We further find that impact sizes of food uncertainty is higher for girls indicating uncertainty in investments in girls could be widening the gender gap in willingness to invest in food by mothers.

Table6: Impact of food uncertainty on willingness to invest in food

	(19)	(20)	(21)	(22)	(23)	(24)
Endowments(Rs)	10000	10000	5000	5000	3000	3000
VARIABLES	Girl food	Boy food	Girl food	Boy food	Girl food	Boy food
Food uncertainty	-667.66*** (119.852)	-483.56*** (120.387)	-340.82*** (70.454)	-174.99** (82.573)	-244.86*** (40.029)	-196.57*** (49.653)
Mothers' Characteristics:						
Mothers' work	99.99 (81.466)	169.34* (85.708)	113.79*** (40.119)	198.13*** (43.435)	45.74** (19.682)	72.52*** (19.151)
Migrant husband	111.58 (162.715)	39.63 (161.343)	71.34 (90.141)	5.73 (89.315)	28.19 (56.152)	2.86 (54.376)
Mothers' age at marriage	17.18 (12.478)	6.67 (10.933)	10.56 (7.024)	2.64 (6.860)	2.29 (2.701)	-1.03 (3.189)
Mothers' age at first birth	-22.01*** (7.658)	-20.05*** (7.253)	-10.01** (4.413)	-8.69** (4.211)	-2.81 (1.975)	-2.23 (1.930)
No. living children	-19.82 (49.098)	-34.86 (49.213)	-17.11 (23.163)	-25.32 (25.026)	-2.46 (14.890)	-12.24 (14.898)
Years of marriage	-1.03 (3.440)	-0.74 (3.177)	-3.55* (2.040)	-1.74 (1.684)	-1.59 (0.993)	-1.12 (1.045)
Desired no. of girls	104.45* (58.790)	92.20 (64.492)	51.56* (29.771)	56.00 (34.592)	47.20** (21.216)	37.81* (22.291)
Desired no. of boys	139.04* (69.906)	196.48** (74.544)	68.06** (32.689)	104.02*** (33.516)	48.82** (22.092)	62.53*** (21.859)
Spousal education gap(Yrs)	5.48 (8.626)	8.85 (8.427)	-4.54 (4.353)	0.98 (5.374)	0.33 (2.161)	2.21 (2.154)
No. of hh member	0.31 (14.533)	-12.65 (15.601)	-7.61 (7.845)	-17.96** (8.755)	3.08 (5.723)	2.09 (5.960)
Wealth quintile	-19.31 (21.639)	-1.62 (23.210)	6.19 (13.227)	16.28 (13.627)	-2.27 (7.130)	5.76 (8.043)
Constant	1,102.32*** (319.471)	1,258.34*** (302.314)	615.84*** (178.214)	685.61*** (170.532)	329.43*** (85.641)	371.90*** (90.469)
Observation	404	404	404	404	404	404
R-squared	0.164	0.128	0.129	0.126	0.199	0.163

Note: Robust standard errors are in parenthesis; *** p<0.01, ** p<0.05, * p<0.1

Similarly, in Table7 we find that that if uncertainty about health investment decisions of husbands reduces women willingness to invest in child health, however, impact sizes are less than that in Table6. Also the gender difference does not appear in health investment decisions by mothers as they did in food investments decisions by her.

Table7: Impact of health uncertainty on willingness to invest in health

	(25)	(26)	(27)	(28)	(29)	(30)
Endowment(Rs.)	10000	10000	5000	5000	3000	3000
VARIABLES	Girl health	Boy health	Girl health	Boy health	Girl health	Boy health
Health uncertainty	-258.77 (173.585)	-310.62** (132.831)	-174.18* (89.639)	-216.46** (82.172)	-112.80** (56.295)	-114.31** (56.422)
Mothers' Characteristics:						
Mothers' work	224.32* (114.077)	118.30 (77.446)	87.83 (54.443)	96.16 (59.727)	106.29*** (31.112)	83.24*** (23.372)
Migrant husband	108.39 (196.750)	84.60 (146.364)	64.37 (126.864)	20.12 (100.917)	-23.52 (62.514)	-67.50 (59.687)
Mothers' age at marriage	-21.67 (16.623)	-24.50** (9.338)	-6.66 (8.365)	-11.18 (7.415)	-5.93 (3.867)	-7.03** (3.246)
Mothers' age at first birth	4.96 (5.548)	8.88* (4.565)	-1.73 (2.596)	-8.84 (8.255)	-3.05 (2.153)	-1.04 (1.940)
No. living children	56.18 (93.533)	-102.83*** (27.104)	24.12 (46.664)	-16.43 (22.754)	2.79 (27.683)	-37.26*** (11.534)
Years of marriage	-3.28 (4.885)	0.79 (2.872)	-1.81 (2.604)	-0.04 (1.907)	-2.20 (1.622)	-0.83 (1.111)
Desired no. of girls	-23.64 (82.504)	101.29 (79.652)	32.57 (46.060)	54.89 (48.742)	28.88 (28.641)	68.10** (30.538)
Desired no. of boys	-14.52 (71.375)	72.76 (53.123)	-19.38 (34.329)	3.33 (33.596)	-14.98 (21.288)	9.29 (20.160)
Spousal education gap(Yrs)	-25.32* (15.065)	-11.97 (8.893)	-13.87* (7.097)	-3.51 (4.373)	-7.98* (4.652)	-2.23 (3.049)
No. of hh member	74.00 (49.483)	8.74 (20.005)	37.02 (24.510)	-7.06 (8.588)	22.94 (14.383)	-2.79 (5.460)
Wealth quintile	-40.43 (24.290)	22.00 (25.282)	-28.12** (12.534)	2.72 (13.279)	-13.59* (7.120)	4.04 (8.415)
Constant	919.24*** (261.546)	1,191.94*** (245.821)	508.59*** (141.285)	898.47*** (158.444)	439.03*** (67.491)	518.09*** (70.890)
Observation	404	404	404	404	404	404
R-squared	0.101	0.067	0.116	0.077	0.151	0.119

Note: Robust standard errors are in parenthesis; *** p<0.01, ** p<0.05, * p<0.1

Table8 below estimate the impact of uncertainty on the saving motives. Respondents were asked that given the endowment amount how they would prefer to allocate the endowment between children and savings. We find that women who are always uncertain about their spousal choices tend to save

significantly more than others. This result is robust in food and health uncertainties separately and jointly. Positive impact of uncertainty on personal savings indicates that when preferences are not transparent, women tend to noncooperate by increasing their precautionary savings motives. Among the other controls we find that exogenous bargaining variables such as, years of marriage, age at the first birth are positively affecting willingness to save. Clearly, as years of marriage increases women gain higher say in gender relations and control over her resources which further contributes to increasing their private consumptions. Similarly, young mothers tend to have lower bargaining power and as the age of first child bearing age increase female decision making power in control over resources, leading to higher investment in personal consumption and savings.

Table 8: Impact of uncertainty on personal savings

	(31) 10000 Savings	(32) 5000 Savings	(33) 3000 Savings	(34) 10000 Savings	(35) 5000 Savings	(36) 3000 Savings	(37) 10000 Savings	(38) 5000 Savings	(39) 3000 Savings
VARIABLES									
Food uncertainty	3,105.70*** (549.657)	1,778.82*** (259.925)	1,068.24*** (167.226)						
Health uncertainty				3,134.15*** (520.044)	1,782.46*** (249.556)	1,082.35*** (162.098)			
Food&Health uncertainty							3,087.50*** (552.582)	1,754.79*** (269.273)	1,070.61*** (177.138)
Mothers' Characteristics:									
Mothers' work	-7.59 (268.414)	-205.92 (126.579)	-202.98** (85.539)	-145.74 (259.353)	-238.91* (130.011)	-208.59** (86.151)	-84.60 (275.685)	-257.37** (127.909)	-231.12** (87.966)
Migrant husband	-164.53 (451.650)	-162.32 (333.385)	-60.68 (262.525)	101.80 (584.637)	-18.60 (365.768)	41.90 (259.352)	102.26 (577.996)	-20.50 (367.161)	33.93 (262.275)
Mothers' age at marriage	3.34 (44.986)	25.11 (25.533)	19.06 (14.462)	-5.02 (44.905)	11.88 (25.759)	14.86 (14.656)	2.29 (46.026)	15.23 (26.857)	18.24 (15.250)
Mothers' age at first birth	50.41** (24.574)	31.14** (14.781)	17.19* (9.479)	53.83** (23.981)	34.85** (14.016)	18.66** (9.127)	52.91** (25.851)	35.17** (15.230)	17.38* (10.018)
No. living children	237.69 (188.248)	118.42 (86.998)	65.95 (56.478)	214.77 (188.620)	83.28 (93.111)	58.64 (58.871)	197.66 (195.424)	92.98 (92.697)	56.74 (59.366)
Years of marriage	47.26*** (15.126)	32.98*** (8.508)	18.66*** (5.263)	49.45*** (15.333)	34.79*** (9.028)	19.88*** (5.417)	51.66*** (15.111)	35.85*** (8.934)	20.43*** (5.480)
Desired no. of girls	-357.30 (304.156)	-159.78 (160.795)	-141.69 (114.248)	-324.50 (313.091)	-153.54 (168.358)	-138.57 (118.990)	-319.00 (318.388)	-155.18 (168.650)	-135.83 (119.606)
Desired no. of boys	-442.91 (289.529)	-168.07 (136.821)	-18.44 (81.711)	-323.81 (298.035)	-63.66 (142.107)	49.41 (83.168)	-316.27 (304.833)	-73.45 (146.075)	42.30 (84.759)
Spousal education gap(Yrs)	52.41 (35.711)	28.38* (15.770)	10.93 (10.542)	55.29 (35.618)	32.93** (15.247)	15.37 (10.340)	57.25 (36.503)	31.93* (16.177)	12.82 (11.308)
No. of hh member	22.75 (89.240)	-3.03 (38.458)	-39.16* (22.747)	37.62 (85.414)	13.52 (41.113)	-29.21 (23.424)	25.40 (92.908)	1.34 (39.121)	-36.15 (24.070)
Wealth quintile	140.03 (87.463)	68.65* (38.766)	36.88 (32.379)	119.66 (80.766)	68.36* (40.748)	40.03 (32.392)	128.30 (88.200)	71.17* (42.301)	38.33 (33.760)
Constant	538.65 (1,176.105)	-641.51 (668.120)	-231.00 (386.147)	509.96 (1,148.112)	-577.63 (665.339)	-315.22 (395.676)	385.00 (1,189.845)	-638.62 (696.520)	-312.91 (419.128)
Observations	404	404	404	404	404	404	404	404	404
R-squared	0.224	0.294	0.257	0.226	0.289	0.256	0.222	0.294	0.258

Note: Robust standard errors are in parenthesis; *** p<0.01, ** p<0.05, * p<0.1; food and health uncertainty captures those mothers who are uncertain about expected investments by husbands both in food and health categories at all endowment levels.

6. Conclusion

In this paper we used data from a field survey in South India, Karnataka to elicit the causal effects of expected spousal preference on intra-household allocation in children by mothers. The results indicate that women's willingness to invest in children depends not so much on spousal preference, but on the observability of spousal preference. Information sharing at the time of decision making serves as a technology to main cooperation among spouses. Unobservability of preferences, on the other hand, increases uncertainty and women behave according to a noncooperative marital allocation contract by reducing allocations in children. We furthermore observe that there exists a gender difference in the willingness to invest caused essentially by the unobservability of spousal investment preference in girls. These results remain consistent even when we vary the endowment amounts.

We also provide evidence of noncooperation and existence of precautionary savings motives among mothers due to unobservability of preferences which aggravates marital uncertainty. Our findings shows that when asked to allocate the endowment between children and private savings, women tends to save more when they are uncertain about spousal choices than when they are able to elicit expectations about the same.

The implication is if men do not share their investment preferences, inefficiencies are likely to arise due to free riding motives by women. With unobservability, uncertainty is created and the spouse with the information disadvantage tend to noncooperate by reducing investments, and thus household public goods, such as, children remain underprovided. In developing countries, where resources are limited, this can function as a vicious circle (unless spouses do not realize the gain from cooperation), where reduction in investments in children might cause harm to children's human capital development. On the other hand, information sharing, at the time decision making, could serve as a tool to enforce marital contracts and possibility of deviation becomes minimum.

From the policy perspective our study points to the fact that development agencies targeting child development and/or poverty alleviation should take into account such possibilities of noncooperation in intrahousehold resource allocation due to lack of information sharing. Therefore, before designing any cash transfer policies, policy makers may also wish to consider how the efficacy of targeted transfers could be improved by improving intra-gender communications and transparency.

From a research perspective, it is important to understand what causes this lack of information-sharing and associated uncertainty. Is it related to how marriages were formed (e.g. arranged or by free consent)? In what way does it depend on the characteristics of the spouses? And is it amenable to policy interventions?

Reference

- Ashraf, N. (2009). Spousal control and intra-household decision making: An experimental study in the Philippines. *American Economic Review*, 99(4), 1245-77.
- Becker, G. S. (1981). Altruism in the Family and Selfishness in the Market Place. *Economica*, 48(189), 1-15.
- Becker, G. S., & Becker, G. S. (2009). *A Treatise on the Family*. Harvard university press.
- Bergstrom, T., Blume, L., & Varian, H. (1986). On the private provision of public goods. *Journal of public economics*, 29(1), 25-49.
- Carter, M., and E. Katz. 1997. Separate spheres and the conjugal contract: Understanding the impact of gender-biased development. In *Intrahousehold resource allocation in developing countries: Methods, models, and policy*, ed. L. Haddad, J. Hoddinott, and H. Alderman. Baltimore, Md., U.S.A.: Johns Hopkins University Press for the International Food Policy Research Institute.
- Castilla, C., & Walker, T. (2013). Is ignorance bliss? The effect of asymmetric information between spouses on intra-household allocations. *American Economic Review*, 103(3), 263-68.
- Chen, J. J. (2006). Migration and imperfect monitoring: implications for intra-household allocation. *American Economic Review*, 96(2), 227-231.
- Chiappori, P. A. (1988). Rational household labor supply. *Econometrica: Journal of the Econometric Society*, 63-90.
- Chiappori, P. A. (1992). Collective labor supply and welfare. *Journal of political Economy*, 100(3), 437-467.
- Fafchamps, M., Kebede, B., & Quisumbing, A. R. (2009). Intrahousehold welfare in rural Ethiopia. *Oxford Bulletin of Economics and Statistics*, 71(4), 567-599.
- Haddad, L., and J. Hoddinott. 1994. Women's Income and boy-girl anthropometric status in the Côte d'Ivoire. *World Development* 22 (4): 543-553.
- Kanbur, R. 1991. Linear expenditure systems, children as public goods, and intrahousehold inequality. Development Economics Research Centre Discussion Paper. University of Warwick, Coventry, U.K.
- Lundberg, S., and R. Pollak. 1993. Separate spheres bargaining and the marriage market. *Journal of Political Economy* 101 (6): 988-1010
- Lundberg, Shelly J., Robert A. Pollak, and Terence J. Wales. 1997. Do husbands and wives pool their resources? Evidence from the United Kingdom Child Benefit. *Journal of Human Resources* 32 (3): 463-480.
- Manser, M., & Brown, M. (1980). Marriage and household decision-making: A bargaining analysis. *International economic review*, 31-44.

- McElroy, M. B., & Horney, M. J. (1981). Nash-bargained household decisions: Toward a generalization of the theory of demand. *International economic review*, 333-349.
- Quisumbing, A. R., & Maluccio, J. A. (2003). Resources at marriage and intrahousehold allocation: Evidence from Bangladesh, Ethiopia, Indonesia, and South Africa. *Oxford Bulletin of Economics and Statistics*, 65(3), 283-327.
- Ross, K. L., Zereyesus, Y. A., Shanoyan, A., & Amanor-Boadu, V. (2015). The health effects of women empowerment: recent evidence from Northern Ghana. *International Food and Agribusiness Management Review*, 18(1), 127-143.
- Rubalcava, L., Teruel, G., & Thomas, D. (2009). Investments, time preferences, and public transfers paid to women. *Economic Development and cultural change*, 57(3), 507-538.
- Schady, N., & Rosero, J. (2008). Are cash transfers made to women spent like other sources of income?. *Economics Letters*, 101(3), 246-248.
- Thomas, D. (1990). Intra-household resource allocation: An inferential approach. *Journal of human resources*, 635-664.
- Udry, C. 1996. Gender, agricultural production and the theory of the household. *Journal of Political Economy* 104 (5): 1010-1046.
- Ulph, D. 1988. A general noncooperative Nash model of household consumption behavior. University of Bristol, Bristol, U.K. Unpublished.
- Warr, P. G. (1983). The private provision of a public good is independent of the distribution of income. *Economics letters*, 13(2-3), 207-211.

Appendix

Table A0: Please indicate your preferred amount of investments corresponding to each amount of hypothetical income earned (vary the order of the income level while asking the questions)

	If you suddenly earn	Rs.1000 0	Rs. 5000	Rs. 3000
	HHMID			
1	How much of it you would invest in your Girls health			
2	How much will your husband invest compared to yours (1=Same, 2=More, 3=Less, 4=Don't know)			
3	How much of it you would invest in your Boys health			
4	How much will your husband invest compared to yours (1=Same, 2=More, 3=Less, 4=Don't know)			
5	How much of it you would invest in your Girls' nutrition/food			
6	How much will your husband invest compared to yours (1=Same, 2=More, 3=Less, 4=Don't know)			
7	How much of it you would invest in your Boy's nutrition/food			
8	How much will your husband invest compared to yours (1=Same, 2=More, 3=Less, 4=Don't know)			
9	Given a choice will you keep some money for your-self as well ? (0=No, if yes write the amount)			

TableA1: Impact of spousal expectations about opposite sex child on food/nutrition investments

	(1')	(2')	(3')	(4')	(5')	(6')
Endowment(Rs.)	10000	10000	5000	5000	3000	3000
VARIABLES	Girl food	Boy food	Girl food	Boy food	Girl food	Boy food
Expectations about opposite sex child						
More	-19.20 (72.032)	-18.32 (83.399)	-18.26 (49.991)	17.00 (41.830)	-25.02 (19.630)	-23.50 (19.260)
Less	2.38 (122.526)	-96.01 (127.112)	-81.85 (67.297)	-63.50 (78.579)	-58.50 (37.068)	-71.45* (40.379)
Uncertain	-643.21*** (106.720)	-354.35*** (119.897)	-372.52*** (67.689)	-80.53 (92.105)	-249.04*** (36.655)	-189.98*** (48.543)
Mothers' Characteristics:						
Mothers' work	100.82 (80.803)	175.14** (83.748)	108.15** (40.643)	223.90*** (45.611)	37.31 (23.214)	69.44*** (21.481)
Migrant husband	104.38 (162.502)	17.20 (155.085)	75.57 (90.089)	-9.68 (83.361)	19.28 (53.854)	-5.53 (50.916)
Mothers' age at marriage	20.03 (12.740)	4.66 (11.488)	9.67 (7.474)	1.87 (7.706)	1.69 (3.027)	-1.56 (3.568)
Mothers' age at first birth	-25.21*** (7.128)	-21.25*** (6.951)	-9.45** (4.440)	-9.42** (4.269)	-2.76 (2.115)	-1.89 (2.159)
No. living children	-17.69 (43.265)	-52.47 (43.445)	-15.94 (22.007)	-43.67 (26.655)	-4.97 (13.071)	-18.38 (14.275)
Years of marriage	-0.27 (3.438)	0.31 (3.205)	-3.59* (1.983)	-1.27 (1.928)	-1.63 (1.092)	-1.09 (1.154)
Desired no. of girls	110.28* (59.119)	76.74 (64.996)	48.67* (28.853)	58.27* (32.996)	45.48** (20.402)	32.32 (21.609)
Desired no. of boys	121.98* (66.118)	202.04*** (72.366)	64.00** (30.945)	111.37*** (30.941)	43.03** (20.764)	60.39*** (20.288)
Spousal education gap(Yrs)	2.89 (8.899)	6.58 (8.197)	-3.93 (4.142)	-1.00 (5.354)	-1.17 (2.164)	0.90 (2.163)
No. of hh member	7.97 (13.709)	-7.79 (16.324)	-7.06 (7.332)	-18.63** (8.897)	2.70 (5.402)	2.66 (5.439)
Wealth quintile	-28.80 (19.820)	0.72 (22.400)	6.11 (12.677)	19.98 (13.754)	-6.43 (6.514)	2.13 (7.222)
Constant	1,091.83*** (310.457)	1,321.22*** (299.754)	639.47*** (201.412)	718.21*** (186.312)	385.37*** (91.585)	420.14*** (93.090)
Observation	546	598	546	598	546	598
R- squared	0.163	0.105	0.138	0.127	0.200	0.152

Note: Robust standard errors are in parenthesis; *** p<0.01, ** p<0.05, * p<0.1

TableA2: Impact of spousal expectations about opposite sex child on health/medical investments

	(7')	(8')	(9')	(10')	(11')	(12')
Endowment(Rs.)	10000	10000	5000	5000	3000	3000
VARIABLES	Girl health	Boy health	Girl health	Boy health	Girl health	Boy health
Expectations about opposite sex child						
More	-97.29 (68.101)	-65.23 (85.694)	-52.39* (30.594)	-78.44** (33.316)	-19.17 (21.363)	-1.97 (20.678)
Less	-40.32 (105.963)	30.86 (110.440)	38.21 (54.488)	9.70 (58.596)	1.52 (35.586)	-10.01 (40.367)
Uncertain	-219.52 (175.542)	-157.31 (166.480)	-197.85** (92.468)	-187.62*** (68.265)	-125.85** (53.567)	-113.58** (56.677)
Mothers' Characteristics:						
Mothers' work	200.10* (111.921)	95.39 (85.101)	65.02 (52.283)	76.09 (57.419)	99.80*** (29.514)	91.23*** (23.970)
Migrant husband	129.94 (185.851)	49.64 (143.042)	71.79 (126.914)	26.63 (97.598)	-16.07 (63.450)	-57.65 (59.666)
Mothers' age at marriage	-25.13 (16.497)	-30.66*** (10.177)	-11.59 (8.765)	-14.75** (7.076)	-6.11 (3.716)	-6.19* (3.286)
Mothers' age at first birth	6.47 (5.704)	11.39** (4.726)	-0.74 (2.607)	-7.06 (7.573)	-2.61 (2.129)	-0.83 (1.784)
No. living children	34.85 (89.797)	-113.09*** (32.543)	15.89 (45.689)	-24.16 (20.667)	1.39 (28.285)	-38.83*** (11.766)
Years of marriage	-3.21 (4.838)	0.63 (2.930)	-1.27 (2.425)	0.28 (1.794)	-1.60 (1.572)	-0.32 (1.072)
Desired no. of girls	-26.17 (78.985)	93.71 (77.768)	21.34 (43.801)	38.90 (46.803)	21.44 (27.490)	60.73** (29.652)
Desired no. of boys	7.35 (69.182)	127.73** (51.984)	5.48 (31.250)	23.15 (31.305)	-5.49 (19.996)	17.53 (18.507)
Spousal education gap(Yrs)	-22.47 (14.624)	-7.45 (9.372)	-11.88* (7.050)	-2.12 (4.144)	-7.42* (4.414)	-2.22 (3.012)
No. of hh member	65.16 (47.340)	-3.95 (23.122)	34.03 (24.056)	-5.19 (8.445)	22.58 (14.103)	0.38 (5.977)
Wealth quintile	-30.03 (24.469)	26.28 (26.094)	-23.76* (12.194)	4.10 (12.267)	-11.89* (6.680)	4.98 (7.995)
Constant	1,028.76*** (262.453)	1,313.22*** (286.432)	604.37*** (155.660)	954.01*** (157.223)	429.07*** (67.566)	471.38*** (71.005)
Observation	546	598	546	598	546	598
R-sq	0.085	0.052	0.106	0.077	0.146	0.119

Note: Robust standard errors are in parenthesis; *** p<0.01, ** p<0.05, * p<0.1