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Decisions: An Experimental Approach**

Anandi Mani
University of Warwick

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Mine, Yours or Ours? The Efficiency of Household Investment Decisions: An Experimental Approach¹

Anandi Mani²

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²University of Warwick; email: a.mani@warwick.ac.uk

Abstract

We conduct an experiment to measure the relative importance of key factors that influence the efficiency of household investment decisions. We find that, both for men and women, their spouse's access to information does not affect efficiency. However, they are willing to sacrifice much efficiency for greater personal control over household income. Intriguingly, even when spouses' control over household income is exogenously assigned, inefficiency persists: As a wife's assigned share increases, husbands undercut their own income to reduce hers. This self-destructive and spiteful behavior is best explained by non-economic factors such as identity, seldom emphasized in mainstream household economic models.

KEYWORDS: INTRA-HOUSEHOLD, FAMILY, EFFICIENCY, BARGAINING, FIELD EXPERIMENT, IDENTITY

JEL CLASSIFICATION: D1,Z1

1 Introduction

The family is the basic building block in the edifice of institutions that govern social and economic interactions. How the family allocate resources across its members has important implications – both for individual outcomes such as health, education and occupation choice as well as for public policy on issues such as property rights and income transfers. Despite this, some of the most basic questions about the family remains unresolved: Is decision making within the family efficient? Are family members, with repeated interaction over a long run, able to eliminate the frictions that typically arise in contracting? Does their access to better information about each other help this process? Such questions remain unresolved at least partly because the inner workings of the family are not typically observed. In this paper, we therefore try to open up the black box of household decision-making, observing decisions in real time. Our experimental approach allows us to quantify the relative importance of the key economic mechanisms that influence household (in)efficiency. Our findings show that there is more to household efficiency than the factors emphasized in standard economic models of the household. In particular, they suggest a role for non-economic factors that have received little attention in this literature.

Theoretical models of the household differ in their assumptions about what households maximize: a common set of preferences (the unitary approach) or a weighted sum of individual preferences (the collective approach). This difference notwithstanding, most models either imply or assume efficiency in its decision-making process.¹ No doubt, there are some good theoretical arguments for why efficiency could be the natural presumption in household decision making, even without invoking altruism among family members: Family members have repeated and long term interactions with each other in a stable environment, which could make for much lower transac-

¹The unitary approach, pioneered by Samuelson(1956) and Becker(1974), starts with the premise that all members maximize the same set of preferences. This implies efficiency – either by assumption or through the inducement provided by an altruistic household head. The collective household approach, of which there are a few strands, assumes maximization of a weighted sum of individual family members' preferences, as a function of their bargaining power. Here, the cooperative bargaining framework introduced by McElroy and Horney(1981) and Manser and Browning(1980) assume efficiency, as does the more generalized framework adopted by Chiappori and others(1988, 1992).

tions costs. (Becker (1981)). They also have good information about each others' preferences and choices. Nevertheless, as the work by Lundberg and Pollak(1994) points out, repeated games can have several possible equilibria – and there is no reason that the one that emerges must always be pareto efficient. Also, when family members current decisions affect their future bargaining power in the household and they cannot make binding commitments, their decisions could be 'rationally' inefficient in the short term.(Lundberg-Pollak(2003), Basu(2006) and (Ligon(2004)). A third, non-economic factor that has been cited as important for efficiency is the role of identity considerations(Akerlof-Kranton(2000)). This work illustrates how gender identity features strongly in the efficiency of household decisions ranging from occupation choice, to the relative earnings of spouses or the division of chores between them.

Empirical tests of alternative household models have conclusively rejected the unitary approach: family members do not share a common set of preferences which they maximize. However, once we allow for different preferences, the question of whether bargaining among family members yields efficient outcomes remains stubbornly unresolved. There is considerable micro-level evidence in favor of efficiency² – but ample evidence to the contrary too.³ All in all, it seems reasonable to conclude that the jury is still out on the issue of intra-household efficiency! One simple reason why results may differ widely across settings is that household decision-making is sensitive to several context-specific parameters, many of which are hard to glean ex-post, even from the best survey data.⁴ In the present paper, we hence take an experimental approach, based

²For instance, Chiappori and Browning(1994) derive testable implications of assuming efficiency in the allocation of household's consumption resources on its demand patterns. Testing these implications with Canadian household data, they are unable to rule out efficiency; Thomas and Chen(1995) arrive at a similar conclusion for households in a different setting, Taiwan – as does Bobonis(2009), using data from the Oportunidades program in Mexico that relies on random assignment.

³Suggestive evidence against efficiency includes Duflo-Udry(2004)'s work on intra-household insurance against weather shocks and Fafchamps and Quisumbing(1998) work on the allocation of household chores in Pakistan. The most persuasive evidence of inefficiency has come from Udry(1996)'s seminal work on household production decisions in Burkina Faso; Here too, recent work by Akresh(2005) suggests that production decisions in all other areas of Burkina Faso drought conditions induce greater household efficiency.

⁴Bertrand-Mullainthan(2001) discuss various sources of bias in survey responses. Among these, the fact that respondents may not want to look bad in front of the interviewer may be particularly relevant for sensitive household

on real-time observation of decisions of individual spouses from three hundred households in rural South India. Unlike with survey data, our experiment design allows us to quantify the efficiency impact of the key factors emphasized in the household economics literature; further, it allows us to identify the impact of hitherto understudied non-economic factors.

We focus on two factors emphasized in the household economics literature: the *control over household income* that individual members have (or seek) and the *information* available to them about each other's options and actions. Control over income could become important for bargaining power when members' preferences differ and they are unable to make binding commitments on how they will spend family income. We study the role of this factor using a (within-subject) design where participants are required to allocate money across two investment options. Investors face a tradeoff between generating larger household income and greater personal control over that income. Further, we consider a variant of these treatments where spouses' income shares are fixed exogenously. Unlike with the earlier treatments, a person cannot increase the size of household income (s)he controls here by investing inefficiently – so the rational response is to invest efficiently. We use this treatment to test whether non-economic considerations have any effect on household efficiency. Finally, to study the effects of access to information, we assign participants randomly to one of three (across-subject) treatments. These varied the information provided to their spouses about their investment options, decisions and earnings.⁵

Our results show that control over household income matters a lot to both spouses: lower control reduces their investment efficiency considerably. Across all treatments, the efficient investment choice for the household was for its members to always invest the seed money in the high return option alone. In fact, underinvestment in this option ranged from 1.5% under high investor control over income to as much as 35% under low control. While women did invest somewhat more efficiently than men in all decisions, they were equally, if not more sensitive to variations in the degree of control over family income.

issues.

⁵We note the reason for our focus on investment, rather than consumption efficiency: With consumption decisions, participants can make compensatory adjustments outside the experiment. In contrast, our investment decisions were simply a one-time opportunity to earn additional income for their household.

Most intriguingly, we find evidence of inefficient investment even when it does not enlarge the family income under a member's control: With exogenously fixed income shares, men in our sample invested less efficiently when their wife's assigned was larger. In other words, they were willing to undercut their own income to make sure their wife earned less! It is hard to make the case that a rather modest, one-time income advantage for the wife would affect the her husband's future bargaining power in the household, as proposed by the limited commitment models cited earlier. It is equally hard to reconcile such self-destructive and spiteful behavior with the standard preferences depicted in household models.

However, work in social psychology does offer some other experimental evidence of spiteful behavior⁶, as does some recent work in economics.⁷ What is striking about our evidence is that it documents spite in a context where it would least be expected, the household. One plausible explanation for such self-destructive and spiteful behavior is Akerlof-Kranton(2000)'s concept of *identity*-based preferences. In their language, a husband whose wife earns a larger share of household income than him loses utility because it violates a gender-based 'behavioral prescription' that a man should earn more than his wife. There is clear support for this explanation in our data. There is also some evidence that higher caste husbands are more likely to undercut their own income here than those from scheduled-castes and tribes. This is consistent with anthropological evidence on lesser gender disparity among lower castes in India. The importance of identity in household decision-making has been widely discussed in the feminist economics literature.⁸ Our experimental findings suggest that it merits greater attention in mainstream economic models of the household as well.

This is especially so, given its noticeable impact on investment efficiency of both spouses: We find that men who are spiteful enough to undercut their own income are willing to sacrifice more family income for control, in all decisions. Furthermore, a wife with a spiteful husband

⁶See work by Van Lange(1999) and Lange et al(1997) on this.

⁷In experiments conducted in Uttar Pradesh in North India, Fehr-Hoff-Kshetramade(2008) found that higher caste participants were strikingly less capable of coordinating on welfare-improving equilibria. In dictator games, they were more likely to take actions that reduced others' payoffs if behind, or take other spiteful actions.

⁸See work by Agarwal(1994,1997) in the context of developing countries on this.

invests much less efficiently – by as much as twenty percent when she has low control over family income. Women’s behavior here is consistent with field evidence offered by de Mel, Mackenzie and Woodruff(2009) for why businesses owned by women earn lower returns. Overall, households where men’s behavior is adversely affected by identity concerns are more inefficient.⁹

In contrast to the importance of the two channels discussed above, we find that the information that spouses received ex-post did little to raise the efficiency of investor’s decisions. Given our earlier discussion on how information flows can affect household efficiency, we conclude that fear of retaliation or punishment by their partner does little to induce men – or women – to maximize household income. This is not so surprising, given our context, for two reasons. With respect to men’s behavior, our survey data indicate that financial budgeting is not predominantly the domain of the wife. Hence he does not feel more compelled to be efficient when she has access to more information. As for the women, nearly 90% of them earn independent income. Even though husbands are deemed to be heads of the household in this area(as per our survey data), women’s independent earning power could undermine this position, in practice.¹⁰

There is a small body of recent work in economics that shares our experimental approach to studying intra-household issues. Prominent among these is Ashraf(2009) which studies the effects of communication between spouses and observability of actions on savings and consumption outcomes. She finds significant positive effects of communication between spouses on savings for the family, rather than self – especially among spouses who have ceded financial management decisions to the other partner. Similar to our case, the mere observability of the decision (i.e. availability of information) to the other partner does not result in more family-oriented choices. On the specific issue of efficiency, related work has been done by Iversen et al(2007), who examine the effect of control over household income using dictator and trust games. Unlike in our case, their experimental design does not simultaneously focus on the impact of spouse’s access to information or other non-economic factors on efficiency. Bateman and Munro(2003) are also concerned with

⁹Rao(1998) provides related evidence of greater inefficiency in allocation of resources in households where men inflict domestic violence on their wives.

¹⁰Indeed, the insecurity reflected in men’s decision to undercut their own income is perfectly consistent with this scenario.

efficiency of household decisions, but do not focus on quantifying it. Other recent papers using an experimental approach to intra-household issues include Peters et al(2004) and Robinson(2006)) which study public good provision and insurance issues respectively.

Section 1 describes the setting where the experiment was conducted, as well as details of the experiment design. Section 2 describes the data and main findings on the impact of the various treatments. Section 3 examines various alternative explanations, including the role of identity-based preferences, for understanding men’s behavior in the fixed shares treatment and Section 4 concludes.

2 Experiment Details: Setting and Design

2.1 Setting

The experiment was conducted in the Anantpur district of Andhra Pradesh, India in October 2005. Being the second-most drought prone district in the country, it is among the poorest as well. The sample consisted of 300 households, recruited with the help of the Social Education and Development Society(SEDS), a non-governmental organization (NGO) that has operated in the area for twenty-five years. All the female participants recruited were members of self-help-groups (SHGs) started and promoted by SEDS¹¹. The set of 85 villages where SEDS operates were stratified by length of SHG membership of its women and groups were chosen for each treatment from all the strata so created.¹² All married members of 38 SHGs (and their spouses) from 32 of these villages were recruited for participation. Particular care was taken to select and schedule participating villages such that there was no contamination of the experiment through information

¹¹Self-help groups are a type of voluntary group savings and mutual support organization, promoted actively by the state government of Andhra Pradesh. Typically, SHGs have only women as members.

¹²Three strata were created, one each for membership durations of upto 3 years, 3-5 years and more than 5 years. Box et al(2005) highlight the benefits of stratification in increasing the possibility of detecting smaller treatment differences. See Bruhm & McKenzie(2008) for a broader discussion on the benefits of the use of stratification as a technique for randomized experiments.

leakage.

The recruitment process started with a brief initial pre-survey, where women were individually interviewed and invited to participate in the study, along with their spouses. Prospective participants were informed that they would each receive (i) a show-up fee of Rs.50 for participating in ‘a study on the understanding of financial matters’ in the area, and (ii) free transportation to and from the experiment site. Rs. 50 (roughly equivalent to \$1) is comparable to men’s daily wages and somewhat higher than women’s daily wages in the area. Consistent with such low wage rates and high poverty, Table 1 shows that both spouses work outside the home in close to 90% of the households in our sample. The level of education is also very low, for women and men. Interestingly, hardly any women in our sample report conflicts with their spouse over financial issues.

Insert Table 1 here: Participants’ Summary Statistics

At the time of recruitment, those who agreed to participate were informed of the fifteen day window in which the study was to be conducted. The specific dates and times of the experiment for different participant-groups were announced later, with at least a two-day advance notice. Members from each SHG were randomly assigned across the treatment groups, based on information gathered in the pre-survey. The experiments were conducted on the premises of the NGO over ten days in October 2005, with 3-4 village groups participating each day.¹³

2.2 Experiment Protocol and Tasks

Participants from each group were brought to the experiment location as per an announced schedule. Upon arrival, they were directed to separate waiting areas set up for men and women. At a time, three men and three women (couples) from these waiting areas were each directed to one of six separate rooms. Here, an experiment coordinator outlined the rules of the experiment and

¹³The no-show rate (among those who agreed to participate after the pre-survey) was around 10%, at least partly due to rainfall late in the planting season, after a four year drought.

the tasks involved. Participants were presented with four decisions, one at a time, in random order. Their decisions were recorded by two independent data entry staff (one each for the men and the women). In addition, male participants were administered a survey (very similar to the preliminary survey for women) once they had completed the experiment. Men and women who had completed the experiment were required to wait in separate designated areas, until they were individually called to receive their payment. When all members of the group had been paid, the entire group was transported back to their village.

Participants's tasks involved making investment decisions. They were given an initial sum of Rs.50(in the form of ten five rupee coins), to be allocated as they wished across two investment options, Red and Blue. Red yielded a return of 50%, so that each rupee invested in it yielded a gross return of Rs 1.50 and Blue yielded a 100% return (i.e. Rs. 2 for every rupee invested). There was no uncertainty in the returns, and all returns were determined and paid out at the end of the experiment itself. Given this linear return structure, it was pretty clear to all participants what they needed to do to maximize their household's income.

2.3 Experimental Treatments

In keeping with the economics literature on decision-making in non-unitary households, we aim to quantify the impact of two key factors on the efficiency of individual investment decisions: individual preferences for control over household income, and the role of information that household members have access to on each other's options and decisions. Accordingly, our design consists of two sets of treatments, implemented in conjunction with each other. The income-control treatments were implemented as within-subject treatments while the information treatments were implemented across subjects, as described below.

Insert Table 2 – Within Subject Treatments: Variations in Investor Control over Household
income

Income-Control Treatments: In a non-unitary household (i.e. when members' preferences differ), control over income would directly affect individual bargaining power, if members are

unable to make binding commitments on how to spend family income. Having more control over family income would simply allow them to assert their own preferences on how it is spent. To examine this issue, we presented each investor with four investment decisions. These varied his/her control over household income generated from these decision by varying both how it was to be distributed between the investor and his/her spouse, as well as the form of payment. (Refer to Table 2).

In the first ‘baseline’ decision, the investor and his spouse received exogenously fixed shares (s and $1-s$ respectively) of the household’s *total* income from his investment in both options Red and Blue. These earnings were paid into individual private accounts. The share s ranged between 0.3 and 0.7, with increments of 0.1. We note that these shares were varied on the first five days of the experiment only; on subsequent days, all spouses received an equal share $s=0.5$ of *total* household income from their decision. We therefore report all results pertaining to this decision not only for all participants, but also for this subset(see section 4 and the Appendix for details).Shares were varied so as to balance the fraction of participants receiving a particular share within each day and across information treatments as much as possible.¹⁴ Note that any amount a person invested in the low return (red) option would reduce total household income (from the maximum possible) – so he would then receive his fixed share s of a smaller pie. Thus, even if he cares only about income under his own control and not the family income, his rational response is to invest the entire seed money in the high return option. In other words, with fixed shares, there was no trade-off here between maximizing household income and investor’s control over it.

In the other three decisions however, there was such a tradeoff – because incomes from the two investment options were allocated differently. *All* returns from investment in the low return (red) option was paid to the investor in a private account, but all income from the high return (blue) option was paid to his spouse – either in a private account, in cash or in a joint account with the investor. It is easy to see how the form of payment would affect the investor’s control over his spouse’s income here: Income paid to the spouse in a private account would be hardest to

¹⁴ Table X in the appendix shows that the total number of participants receiving these different shares are roughly equal.

gain access to (‘low’ investor control), cash received by the spouse would be easier to appropriate (being physically available, unlike a private account – ‘medium’ investor control) while income in a joint account would be the most accessible (‘high’ investor control). Using these within-subject treatment variations allowed us to quantify how much members of a household valued individual control over family income – measured by the amount of family income they were willing to sacrifice for greater control over it.

Insert Table 3 – Across Subject Treatments: Variations in Spouse’s Information

Information Treatments: Individuals care about control over household income so that they can assert their preferences over how it is spent – but they may also care about how their family members perceive, and react to, their family-related decisions. What a person’s family members know about his options and actions could affect his investment choices: Any fear of retaliation from an irate spouse who find out that (s)he did not maximize family income should likely deter inefficiency. To focus on this retaliation channel, any information provided to participants’ spouses was given *after* (s)he had made all the investment decisions, and by the experimenter.¹⁵

We introduced three information treatments, ‘None’, ‘Full’ and ‘Partial’, with each spouse in a couple being assigned to the same treatment. (Refer to table 3). In the ‘None’ treatment, spouses receive no information about the options or actual investment choices made by their investing partners; under the ‘Full’ information treatment, the investment options, actual choices and incomes earned by investors were revealed to the spouse after the fact. In the ‘Partial’ information treatment, the spouse was only informed about what his partner earned for him, but not what her options were or what choices she made.

Further, investors in the partial information treatment were given the option to discuss all four investment decisions with their spouse, after they had made their initial allocation. They were allowed to change one/more of these after such discussion, if they wished to. The rationale for

¹⁵Information flows between family members could also influence efficiency by affecting how they communicate with and persuade each other over family decisions. Ashraf(2008) uses an experimental design with information flows between spouses *prior to* decision-making, which allows her to test for effects through both channels.

this ‘negotiation’ option was to ensure that any inefficiency observed in the data was not driven by spouses being unable to communicate and discuss the decisions with their partner. We note that while both spouses made investment decisions in the first two information treatments, only one spouse was asked to invest in the ‘partial’ information treatment.¹⁶

Insert Table 4: Means of Participant Characteristics across Information Treatments

Table 4 presents means for some key participant characteristics, across the three information treatments. Only two of these variables are significantly different across the three information treatments, husband’s age and wife’s age. We therefore control for these variables in the regressions that study the impact of the information treatments.

2.3.1 Experiment Instructions

Given the high rates of illiteracy in the population, all instructions and explanations during the experiment were provided orally by trained experiment coordinators.¹⁷ When a subject entered one of the experiment rooms, a coordinator explained to him that he was there to participate in a study on ‘understanding of financial matters’ among the area residents, and that he would be presented with four tasks as part of the study. He was also told that his payment (except for his participation fee of Rs.50) would be based on his decisions in *one* of these four tasks, to be chosen randomly with the roll of a die. It was also emphasized that each one of their decisions were equally likely to be chosen for payment, hence they should take them all seriously.¹⁸ Next, the participant was made aware of what information his spouse would be given at the end of the experiment (depending upon the information treatment they were assigned to). Then

¹⁶The rationale for having only one investing spouse here was to ensure that negotiation option did not create an opportunity for symmetric *quid-pro-quo* arrangements between investing spouses.

¹⁷Male coordinators were assigned to male participants, and female coordinators for female participants, on a one-on-one basis. Husbands and wives participated in the experiment at the same time, in separate rooms.

¹⁸In the interests of preserving confidentiality about the investor’s decisions, there was also a fifth payment option: If the roll of the die yielded a five, the experimenter chose the amount to be paid to both spouses. The presence of this option was clearly communicated to participants – but not the actual amount that would be paid (which was Rs.35 to each spouse in private accounts).

the coordinator explained the details of the investment options, ‘Red’ and ‘Blue’ and gave the participant Rs.50 (in the form of ten five rupee coins) for investment. The participant’s task was to allocate this amount across options red and blue as he desired. The four investment decisions were then presented, one decision at a time (in randomized order). At the end of each decision, a red box and a blue box in which the participant had ‘invested’ the money provided were taken to the data entry staff, who recorded these investments. When both spouses had completed their independent decisions, the earnings of each spouse was computed. Payments were made privately, on an individual basis. Accounts opened were in the form of post office savings accounts rather than bank accounts.¹⁹

It must be pointed out here that the set up and conduct of the experiment made it virtually impossible for spouses to know about each other’s tasks and options as part of the experiment, unless the experimenter chose to provide information at the end of the proceedings. Individual spouses were taken to separate rooms to make their decisions; the waiting areas were designated such that there was no scope for communication among the participants who were at different stages of the experiment. Payment was based either on one among the four decisions or the experimenter’s discretion, chosen randomly (through the roll of a die). The amounts that spouses actually received was a combination of their earnings from their own decisions and their spouse’s.

2.3.2 Design Issues with Artefactual Field Experiments CHANGE SUBSECTION TITLE

Using the classification of field experiments outlined in Harrison-List(2004), we would characterize our experiment as an ‘artefactual’ field experiment. A major concern with such experiments is that participants may find the decisions or the setting artificial because of which the results observed may not hold true in real life outcomes. Levitt-List(2007) discuss various ways in which this may bias the experimental results, as compared to natural field experiments. We address these concerns below, in the context of our experiment.

¹⁹The post office was chosen because all villages have access to a post office (but not banks), which would make operating the account equally easy for all participants.

The first is that lack of anonymity may bias lab participants' actions in the direction of choices that the experimental coordinators observing them would approve of. In our context, social norms are such that people would approve of a family with little domestic conflict.²⁰ If so, this should bias our participants to behave more efficiently and the outcomes we observe should be interpreted as a lower bound on the inefficiency that would actually exist within the household. The fact that we have chosen participants who are spouses in real-life to study intra-household decision-making helps us allay two other common concerns. Specifically, it is not a problem that our participants would regard the experimental game not as a one-shot game, but rather as a repeated one. Our underlying motivation for our experiments is to get a snapshot of actual decision-making in the family, which involves repeated interaction. By definition, our sample is very representative of the population we wish to study, so there is no bias arising from using student subjects as in standard lab experiments. It is true that participants in our study are most likely poorer than average (given their willingness to show up for the announced fee which was roughly equivalent to a day's wages). However, it is not obvious that poverty should induce greater inefficiency in household-related decisions. Another issue that Levitt & List(2007) raise is that choice sets in a laboratory setting may be artificially constrained, which may distort participants' decisions. In our context, the investment decisions presented allowed participants considerable flexibility to apportion their investment across the two options as they wished. We also allowed spouses to negotiate with each other in private in one of the experimental treatments. It also helped a lot that households could earn close to a week's wages, which was not an insubstantial amount of money. This made the decisions more real for them, even if they do not encounter such situations in their daily life.

Further, participants were familiar and comfortable with the location where the experiment was conducted, since they frequently visit the premises of the NGO that works closely with them. In keeping with the local area customs, experiment coordinators were matched with the sex of the participants, and their tasks were assigned to maximize participant privacy. All investment decisions were made with actual money, which made the decisions more real.

²⁰This is likely reflected in our survey data too, where less than 3% of the women in our sample report any conflict with their husbands over financial matters – which is not entirely consistent with their behavior in the experiment.

3 Empirical Findings

In table 5, we report the mean investment in the high return option by men and women (out of a maximum of Rs. 50) for each of the four decisions. Next, we estimate the impact of the control and information treatments using the following OLS specification:

$$y_i = \beta T_i + \gamma X_i + \alpha + \epsilon_i$$

where the outcome of interest y_i is the number of rupees invested in the high return (Blue) investment option by individual i , T is the treatment condition and X is a set of individual-specific controls.²¹ All regressions are run separately for men and women.

Insert Table 5(all investors) here

3.1 Impact of Investor Control: ‘Our’ income is good, but mine is better!

In table 5, the individual rows of column(1) shows men’s mean investment in the high return option for various ‘control over income’ treatments. In the Fixed Shares case, they invest Rs.42.2 in the high return option, on average. The next three rows in column (1) show how men invest for varying levels of control over income: With low control, they underinvest by as much as Rs.15, or thirty percent!(relative to the maximum of Rs.50) ; with high control, their investment in the high return option is almost at the same level as in the fixed shares case.

As for women (column (5)), they invest more efficiently in the fixed shares case, relative to men (row 1: Rs. 47.68 vs. Rs.42.20) – but their efficiency too decreases with weaker control over income. These patterns across varying levels of control remain true when the data is broken down by information treatments. (Columns(2)-(4) and (6)-(8)).

To verify that the mean investment values are not driven by a small fraction of households, Figure 1 reports the fraction of participants who maximized efficiency, for each of the four decisions. With lower control, fewer men and women are efficient, although this fraction is higher among women, across all treatments. An intriguing pattern that stands out here is that in the fixed

²¹Individual specific controls are included only in the regressions for the across-subject information treatments in Table 9 but not for the income control treatments, which are within-subject treatments.

shares case, even with no tradeoff between efficiency and control, a third of the men in the sample do not maximize efficiency. We return to this issue in greater detail in section 4.

Table 6 reports regression results on how variation in individual control over household income affects investment in the high return option. The omitted case is the fixed shares treatment; it involves no tradeoff between maximizing household income and investor’s control over it, so we use it as a benchmark against which we compare the other ‘control over income’ treatment outcomes. Both for men and women, the importance of control over income on investment efficiency is pretty systematic: both overall, and for most of the information treatments taken individually greater loss of control over the income generated, results in a larger magnitude of underinvestment.

Insert Table 6 here: Impact of ‘Control over Income’ on Investment Efficiency

If anything, women seem to care more about retaining control over the income than men.²² Unlike with men, their underinvestment is significant even with high control over income, where they are paid with their spouse in a joint account, suggesting that they are less confident of being able to successfully negotiate with their spouse even in this case.

3.1.1 Additional Concerns

Maximizing Household Income versus Maximizing Household Welfare

Our experiment design here is motivated by the literature on the efficiency of household production/income generation decisions and the treatments were designed to address this specific question. As a practical matter however, it could be argued that there could be reasons why underinvestment in the high return option may not necessarily be inefficient. For instance, the husband may have self-control problems, say with respect to spending on alcohol – which may end with domestic violence (which even he may regret after the fact). If so, household *welfare* would be maximized by the wife’s investing in the lower return option that she controls, rather than maximizing household income.

²²Women’s mean investment level is higher than men’s in the omitted fixed shares treatment (Rs.47.64 vs. Rs. 42.20), which has an effect on the comparative size of the regression coefficients for women, relative to men.

In the present case, the observed investment patterns offer some suggestive evidence to rule out such a concern. Arguably, self-control problems of the kind described above are likely to be greater when the husband’s earnings are in cash than when they are in a private account. However, wives do not lower their investment in the high return option when the spouse is paid in cash.

Insert Table A1 here

Table A1 in the appendix compares the mean investment differences between the various income control treatments. From column(6), we see that when their husbands get paid in cash rather than in a private account (i.e. women have medium rather than low control), they invest a little *more* when he gets paid in cash for two of the three information treatments. The difference in the investment levels is not significant for any of the cases. This suggests that wives decisions to invest inefficiently are are not driven by such concerns about potential welfare-reducing negative effects of their husbands’ higher income.

Negotiation between Spouses

Another concern with the results discussed above could be that individuals’ behavior was driven by lack of an ability to communicate and discuss their decisions with their spouses. Investors may want to make side-deals with their spouses that would increase their incentive to invest efficiently. The negotiation option, provided to participants in the ‘partial information’ treatment was designed to address this specific issue. Investors could discuss all their initial decisions with their non-investing) spouse and revise them, if they so desired.

Insert Table A2 here: Negotiation with Spouses

This group consisted of 48 men and 50 women, and table 8 reports who exercised this option and how they invested. Among the 48 men, it turns out that not a single man chose to discuss his decisions with his spouse. However, 18 of these men invested the maximum amount of Rs.50 on their own initiative itself. 19 women chose *not* to discuss their decisions, although only 7 among them had underinvested in one or more of the four decisions originally. Only ten of the 31 women who chose to talk to their husbands had made any inefficient decision originally, and only one of them revised her decisions subsequently!

Overall, the fact that only a small fraction of participants exercised the option to negotiate and an even smaller fraction changed their decision after negotiation throws light on an important aspect of the household environment: participants' expectation of achieving binding commitments as an outcome of negotiation is limited. It appears safe to conclude that the inefficiency in spouses' choices were not driven by an inability to communicate with their partners.

Potential misunderstanding among some investors?

One concern arising from Figure 1 is with respect to the inefficient investment behavior of a third of the men in the sample, in the 'fixed shares' treatment. This is because they had effectively hurt their own private income, for no gain the share of household income under their control. This raises the doubt that these investors may not have understood the experiment instructions clearly, which may affect our results. We re-run our spousal income control regressions for the subsample of men and women who invested with full efficiency in the fixed shares treatment. Our results (reported in table A3 in the Appendix) are robust for this sub-sample as well. If anything, control over spousal income seems to matter even more for for this sub-sample of participants, when compared with the results reported for the full sample in table 6.

Insert Table A3 here

3.2 Impact of Information: I don't care what she(or even he) will know ex-post

Table 7 presents the results for the impact of information made available to spouses ex-post, on investment decisions (the omitted treatment is full information). As seen in column(1), neither of the other two information treatments has an impact on investment efficiency. Column (2) includes controls for husband's and wife's age, since these variables were not found to be comparable across information treatments. Regressions for the four decisions taken individually do not change this picture(columns(3)-(6)).²³ Women's investment efficiency declines more than men's, if their

²³These individual-specific controls are included since the F-statistics reported in table 4 indicate that the mean values for these variables were not identical across information treatments. The regression results are also robust to including dummies for the duration of SHG membership, which was used for stratification at the time of sample selection. (See Bruhn-McKenzie(2008) for a discussion on the rationale for this).

spouse receives no information(columns(7)-(12)) – but again, these effects are not statistically significant.

Insert Table 7 here: Impact of Information to Spouse on Investment Efficiency

There could be two reasons why information given to spouses ex-post had little impact on investor efficiency. One is that, irrespective of information treatment, investors expect that their spouses will be able to infer their actions from the outcomes. If so, investment behavior would not differ across information treatments. However, as described in detail in section 1.3.1, various aspects of the experiment protocol make such inference virtually impossible. The other, more plausible explanation in our context, is that investing spouses do not fear retaliation by their spouse for their lack of efficiency, when their investment decisions are a *fait accompli*. Both men and women work in nearly 90% of households in the sample, so they are used to having income that they have individual control over. Further, there is no clear norm of one person being in charge of the household financial planning and budgeting, male or female.²⁴ Hence, a vast majority of households in our area of study do not have a convention of either spouse handing over income to the other.²⁵

4 Why do husbands throw away own income?

One striking fact that emerges from table 7, column(6), is that a larger exogenously fixed income share under the wife’s control reduces her husband’s investment efficiency: a 10% increase in her share induces him to reduce his investment in the high-return option by Rs 2.6.²⁶ According to

²⁴For instance, on savings decisions and asset purchase/sale decisions, 57% and 64% of women respectively report that decisions on these matters are made jointly by both spouses. For decisions on food, health and education, the fraction of women reporting joint decision-making ranges from 57% to 61%.

²⁵2% of men and 24% of women report handing over their income entirely to their spouse.

²⁶As noted earlier in section 2, these shares were varied only for participants in the first five days of the experiment. All results reported in section 4 remain valid for this sub-sample of participants and are reported in the Appendix.

Figure 1, as high as 32% of husbands invest inefficiently in the fixed shares case.²⁷ Such behavior is intriguing: these men are willing to sacrifice income under their own control just so that their wife controls less! Before we label this behavior as self-destructive or irrational, we first consider some plausible rational reasons for it.

Misunderstood Investment Rules

Given the low literacy rates in our experiment setting, it is possible that the men did not understand the investment rules clearly. However, the rules of the investment game were explained orally by an experimental coordinator to game participants on a one-on-one basis, with follow-up questions to ensure that they had been understood clearly. The literacy patterns for our sample don't suggest misunderstanding either. The men who invest inefficiently do not have significantly fewer years of education than other men who maximize efficiency in this decision (3.08 years versus 3.22 years); their wives, with much less education (1.06 years), invested much more efficiently (Rs.46.6 vs. husbands' Rs. 25.6, on average). It is not as if women in our setting have greater exposure to financial decision-making (and hence greater proficiency) either: Our survey data on household decision-making in our sample show that financial decisions such as asset purchases are either made by husbands unilaterally (21%), or husbands and wives jointly (64%) – and only very rarely by women alone (4%).²⁸ Overall, misunderstanding among men about the rules of the investment game does not seem to explain why they undercut their own income.

Concern over effects on Future Bargaining Power

A second candidate explanation is one along the lines of Basu (2006) and other limited commitment models mentioned earlier. In his framework, a man will make decisions that do not maximize household returns in the short run, because allowing higher earnings for his wife today would undermine his future bargaining power in the household. If his current income level accords him the status of 'household head', he may rationally choose to undercut his wife's income

²⁷We note that, of the husbands who do invest efficiently, 81% have an assigned income share of fifty percent or higher in this treatment. If men's assigned share had been smaller, the fraction of inefficient male investors could have been higher. In this sense, the 32% fraction of households where inefficiency is observed is a lower bound.

²⁸In the remaining 11% of households, someone else in the joint family made asset purchase decisions.

to maintain this status.²⁹ The wife may choose to maximize her absolute earnings, even when her assigned share is small, simply because she has no such position to cede. Plausible as this may seem at first, the amounts involved in this decision are really too modest to cause fundamental shifts in intra-household bargaining power. So this explanation for the observed inefficiency seems inadequate as well.

Too small stakes

It may be argued that husbands are behaving inefficiently because the stakes are so small that they do not take the investment decision seriously. However, it is precisely the smallness of the stakes involved that make the men's behavior all the more intriguing. It is quite hard to explain why they would be willing to lose income to deny their wife such a modest, one-time monetary gain.

4.1 Identity and Spite

It is hard to reconcile such behavior that is at once self-destructive and spiteful with a standard preferences framework. Yet, there does exist some other experimental evidence of spite in preferences in the social psychology literature (Van Lange(1999) and Van Lange et al(1997)).³⁰ More recently, the behavior of of upper caste participants in Fehr-Hoff-Kshetramade(2008) towards lower caste ones reflects such spite as well.³¹ What is striking about our case however, is that it is the first documented instance of such behavior in a setting where it would be expected the least, the household.

A plausible explanation for such spiteful and self-destructive behavior may be based on participants' sense of *identity*. This concept that has received much attention in the feminist economics literature and has also been examined at length by Akerlof-Kranton(2000), but less so in main-

²⁹96% of women in our sample identify their husband as the household head.

³⁰For instance, the first paper finds that participants exhibit a preference for an allocation (480 for themselves, 0 for others) to (580 for themselves, 80 for others).

³¹In dictator games, they were more likely to reduce others' payoffs when they themselves were behind, or take other spiteful actions. They were also significantly less likely to coordinate on welfare-improving equilibria in trust games. The authors attribute such behavior to 'spiteful' preferences of high-caste participants' with a concern for status superiority and aversion to disadvantageous inequality.

stream models of the household³². As these two authors note (p.717) "... identity can explain behavior that appears detrimental. People behave in ways that would be considered maladaptive or even self-destructive by those with other identities. The reason for this behavior may be to bolster a sense of self or to salve a diminished self-image." Their model amends standard preferences to add an identity-driven component: individuals lose utility when they take actions that go against behavioral prescriptions for their gender (or other social category that they identify with). What may such prescriptions consist of in the household context? The authors' offer some examples: for instance, that 'men should not do *women's work* in the home' or that 'men should earn more than their wives'. The latter prescription could be relevant for explaining men's behavior in our context.³³

Insert Table 8 here: Identity and Spite in Investment Behavior

Table 8 examines the validity of such an explanation. We label a spouse who invests the entire Rs.50 in the high return (blue) option in the fixed share treatment as 'rational' – and one who does not, as 'spiteful'. In the first four columns, the dependent variable is a dummy with a value 1 when the husband is 'rational' and zero when he is spiteful. To check whether men are spiteful only when their wife's earnings share is greater than his, we create two dummy variables based on her share. The first share dummy has a value of 1 if her share equals or exceeds his, and zero otherwise. The second dummy assumes a value of 1 only when her share exceeds his. Comparing the results in columns (1) and (2) of Table 8, it is clear that husbands behave spitefully only when their wife's share exceeds theirs – providing strong support for an identity based explanation as in Akerlof-Kranton(2000). These results are robust to using the amount invested by the husband in the high return option as the dependent variable.(columns(5) and (6)). Table 8A in the Appendix reports these results for participants from the first five days alone and finds them to be robust for this group as well.

³²In the feminist economics literature, see work by Agarwal(1994, 1997) on the inefficiencies and injustices arising from strongly gendered identities in developing countries.

³³Women could also suffer a loss of identity utility from violating this prescription – but a gain in monetary utility from efficient behavior could be offsetting this loss.

4.1.1 What makes some husbands more spiteful than others?

Of course, it is true that not all men care as much about their ‘masculine’ identity of being the prime earner. After all, several of them do invest efficiently even when their wife’s share is higher – which begs the question stated above. To address this issue, Columns(3) and (4) in Table 8 consider some economic and demographic variables that may be correlated with men’s spiteful behavior. It is clear that being more educated does not play much of a role. However, husbands who retain more control over asset decisions are more likely to be spiteful (column (3)). Another striking finding is that higher caste men in our sample (backward castes (BC) and other backward castes(OBC)) are more likely to be spiteful than those from the lower castes (Scheduled castes and Tribes-SCST) (column(4)).³⁴ This is consistent with other anthropological evidence from India which suggests that gender disparities and discrimination against women is worse within upper caste households.³⁵ Higher caste men invest around Rs.3.90 less in the high return option than SC-ST husbands. (Column(7)). While this gap is not statistically significant, it is notably the largest efficiency gap between these two caste groups, across all the four decisions.³⁶

4.1.2 ‘Masculine’ Identity and Overall Household Efficiency

If men undercut their income because of a perceived threat to their identity, this perception is likely to have spillover effects on their other investment decisions too. It may affect the behavior of their wives as well. Tables 9 examines the effect of being a ‘rational’ husband on investment efficiency.

Insert Table 9 here: Spite and Investment Efficiency

³⁴The picture does not change if caste is split up into the four categories above. Wives of higher caste men were not assigned higher shares than those from lower castes. (correlation between share and higher caste dummy = 0.03 (insignificant))

³⁵See for instance, Miller(1997) and other work cited therein.

³⁶Investment gaps for the other three decisions range across these two caste groups range between Rs 0.14 and Rs2.75 and are not significant.

It shows that ‘rational’ husbands are not significantly more efficient than ‘spiteful’ husbands when they have low control over their wife’s income (column 2). However, when they have medium or high control, they are more efficient (columns (3) and (4)). In other words, husbands who perceive an identity threat are more indiscriminately inefficient, irrespective of their degree of control over income. We also find that a woman with a husband who is spiteful invests less efficiently, though not in all decisions. This is despite the fact that spousal decisions during the experiment are not coordinated. Especially when her control over his income is low, she invests almost ten rupees less in the high return option (or 20% of initial investment funds) (column 6). To summarize, our findings show a very intriguing result: households where husbands’ actions suggest a perceived threat to their masculine identity are overall more inefficient, through the behavior of *both* spouses. (Table 9A in the Appendix reports these results to be largely robust for the initial five day-subsample of participants as well).

4.1.3 Discussion EDIT

Gender Differences in Returns to Capital: Our finding on the investment behavior of women with spiteful husbands is consistent with recent field experimental evidence on why returns to capital on female owned businesses are low in Sri Lanka (de Mel, McKenzie and Woodruff(2009)). According to this study, one reason for low returns is that women invest a smaller fraction of their experimental capital grant into their business, and generate lower profits when their husbands are not supportive of it. In our context, a man who is willing to undercut his own income to narrow the income gap with his (higher-earning) wife is definitely not a supportive husband! Our experimental design shows a simple way to concretely measure such lack of support between spouses.

Domestic Violence and Income Transfer Programs: There is by now a large body of evidence that documents the favorable impact of resource transfers targeted to women ³⁷. Unfortunately, there is also anecdotal evidence of adverse reactions to welfare initiatives that target women, some

³⁷For the impact on welfare outcomes in developing countries, see the meta-survey by Quisumbing-Maluccio(2000)

of it in the form of domestic violence.³⁸ Rao(1998) offers evidence that such domestic violence has adverse efficiency consequences, with respect to the nutritional allocation for children. While relative bargaining factors have a role to play in such adverse reactions, our findings suggest that promotion of these programs must be mindful of non-economic identity-based reasons as well.

Even in the United States, McMillan and Gartner (1999) find that a woman with an unemployed spouse faces a greater threat of domestic violence when she is herself *employed*, rather than unemployed. Such evidence runs counter to the predictions emerging out of a bargaining framework, but it is consistent with the identity-based preferences framework outlined above. It is also not clear that household inefficiencies related to gender identity are resolved fully with economic development.³⁹ Even in the year 2010, the recent U.S. recession, with seventy five percent of job losses having affected men, has triggered discussions in mainstream newspapers about the sustainability of marriages where women earn a greater part of the income.⁴⁰

5 Conclusion

This paper uses an experimental approach to measuring the relative importance of factors identified as key to the decision-making environment in the household economics literature: information flows and control over household income. Our results show that information flows within a family do not enhance efficiency through members' ability to punish each other for selfish behavior. However, there is clear evidence that family members are willing to sacrifice considerable efficiency for greater control over its income.

Strikingly, even when the share of household income controlled by both spouses is exogenously assigned, inefficiency persists in men's investment decisions. We find that men are willing to

³⁸For instance, Schuler et al(1997) report increased incidence of domestic violence against women benefited by micro-credit programs in Bangladesh, while Dey Abbas(1997) reports takeover of irrigation projects assigned to women in Gambia by men. Quisumbing and Maluccio(2000) also cite evidence on adverse reactions of men to transfers targeting women, from household level survey data in developing countries.

³⁹For instance, Hochschild(1990) book *The Second Shift* describes several case studies with respect to occupation choice and the allocation of household chores.

⁴⁰See 'Alpha Wives: The Trend and the Truth' – New York Times, 24th January 2010.

undercut their own income to reduce their wife's earnings, as her assigned share gets larger. Such spiteful and self-destructive behavior is inconsistent with standard household models. We find clear evidence in support of an alternative explanation based on *identity*-driven preferences, along the lines of (Akerlof-Kranton(2000)). We find that households where husbands's behavior reflects such identity concerns are less efficient overall, which offers insights on reasons for low returns to women-owned businesses. Overall, our experimental findings highlight the importance of accounting for identity considerations within the household, at various levels – not only in the the modelling of the household decision-making, but also in the design and promotion of programs designed to reduce gender disparity and poverty.

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| Table 1: Summary Statistics | | |
|---|-------------|------------------|
| Variable | Mean | Std. Dev. |
| | | |
| Family Characteristics | | |
| Years of Marriage | 21.31 | 10.76 |
| No. of children | 2.82 | 1.44 |
| Household Income (Rupees) | 15741.87 | 15184.87 |
| Women who report conflict with spouse over financial issues (0=no, 1=yes) | 0.0345 | 0.18 |
| Joint Family(% Households) | 25.33% | |
| Both spouses work(% Households) | 89% | |
| | | |
| Personal Characteristics | | |
| Wife's age | 36.10 | 9.80 |
| Husband's age | 43.20 | 10.99 |
| Wife's Education (years) | 1.36 | 2.77 |
| Husband's Education(years) | 3.12 | 4.12 |
| | | |
| Number of Participating Households | 300 | |
| | | |

TABLE 2: 'CONTROL OVER HOUSEHOLD INCOME' TREATMENTS

Seed money for Investment (provided by experimenter) = Rs.50; Household chooses X and Y

| Household Income Allocation Treatments | Income from Blue Investment=X, Return=2X | | | Income from Red Investment=Y=(50-X), Return=1.5Y | | |
|---|---|-----------|---------|---|---------|-----------|
| | Recipient | Paid in | Amount | Recipient | Paid in | Amount |
| (1) Fixed Share=s, where (0.3 ≤ s ≤ 0.7) | Spouse | Pvt. a/c | s.2X | Spouse | Own a/c | s(1.5)Y |
| | Self | Own a/c | (1-s)2X | Self | Own a/c | (1-s)1.5Y |
| Investor Control over Spouse's income | | | | | | |
| (2) Low | Spouse | Pvt. a/c | 2X | Self | Own a/c | 1.5Y |
| (3) Medium | Spouse | Cash | 2X | Self | Own a/c | 1.5Y |
| (4) High | Both | Joint a/c | 2X | Self | Own a/c | 1.5Y |

Notes: The two investment options are 'Blue' and 'Red' -- the first with a 100% return, and the second with a 50% return. All treatments are within-subject treatments. In treatment (1) above, both spouses receive a fixed share of income from investments in both options. Hence, the investor does not increase his private income by investing in the lower return option Red. In treatments (2)-(4), the investor gains private income by investing in option Red, but in doing so (s)he lowers household income. There is no uncertainty in investment returns.

| TABLE 3: INFORMATION TREATMENTS | | | |
|--|---|--|--|
| | None | Full | Partial 'Plus' |
| Information given to spouse | No information about investor's (a) options (b) choices or (c) earnings | Full information about investor's (a) options (b) choices and (c) earnings | Information about investor's earnings for him/her only -- PLUS -- Investor Option to Negotiate (and Revise) own |
| No. of participants | 202 | 202 | 98 |
| Both spouses | Yes | Yes | No -- one spouse invests. |

Notes: Information treatments are across subjects

Table 4: Average Participants' Characteristics across Information Treatments

Information Treatment Groups

| Participant Characteristics | None N=101 | | Full N=101 | | Partial N=98 | | F-stat F-stat |
|-----------------------------------|---------------|----------|---------------|----------|-----------------|----------|------------------|
| | Mean | Std.Dev. | Mean | Std.Dev. | Mean | Std.Dev. | |
| Years of marriage | 21.66 | (10.9) | 19.76 | (10.66) | 22.52 | (10.66) | 1.72 |
| Number of Children | 2.71 | (1.38) | 2.86 | (1.55) | 2.898 | (1.38) | 0.46 |
| Family type: (3=nuclear, 1=joint) | 2.74 | (0.50) | 2.66 | (0.55) | 2.735 | (0.50) | 0.76 |
| Caste: | | | | | | | |
| Backward | 0.58 | (0.49) | 0.594 | (0.49) | 0.561 | (0.49) | 0.11 |
| Scheduled | 0.18 | (0.38) | 0.138 | (0.34) | 0.132 | (0.34) | 0.48 |
| Other backward | 0.17 | (0.37) | 0.188 | (0.39) | 0.214 | (0.41) | 0.34 |
| Scheduled tribe | 0.06 | (0.23) | 0.049 | (0.21) | 0.071 | (0.25) | 0.21 |
| Wife age | 36.66 | (9.88) | 34.36 | (9.87) | 37.285 | (9.47) | 2.49* |
| Husband age | 43.55 | (11.05) | 41.31 | (11.22) | 44.786 | (10.48) | 2.58* |
| Wife Education (years) | 1.29 | (2.83) | 1.53 | (2.88) | 1.265 | (2.58) | 0.28 |
| Husband Education (years) | 3.18 | (4.19) | 3.27 | (4.08) | 2.918 | (4.09) | 0.19 |
| Household income (Rs. 000s) | 15.52 | (9.84) | 16.68 | (20.74) | 15 | (12.69) | 0.32 |
| Household debt (Rs. 000s) | 30.43 | (24.65) | 28.049 | (33.78) | 30.18 | (26.48) | 0.18 |
| Domestic Conflict (0=no, 1=yes) | 0.04 | (0.19) | 0.021 | (0.14) | 0.041 | (0.19) | 0.4 |
| Both spouses work (0=no;1=yes) | 0.88 | (0.32) | 0.88 | (0.32) | 0.91 | (0.30) | 0.07 |

Notes: * Significant at the 10% level (critical value=2.32)

The only variables that differ significantly across treatment groups are wife's and husband's age.

Table 7 controls for these variables and finds little or no difference in the treatment outcomes

TABLE 5: Mean Investment in High return(Blue) Option-- Rupees (Min=Rs.0, Max.=Rs.50)
(ALL Investors)

| | INFORMATION (Treatments Across Participants) | | | | | | | |
|---|---|------------------|------------------|------------------|------------------|------------------|------------------|-----------------|
| | Husbands | | | | Wives | | | |
| | ALL | None | Full | Partial | ALL | None | Full | Partial |
| CONTROL OVER SPOUSAL INCOME | N=250 | N=101 | N=101 | N=48 | N=252 | N=101 | N=101 | N=50 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Fixed Share Treatment^a | 42.2 (13.24) | 42.48 (12.6) | 41.34 (14.78) | 43.44 (11.12) | 47.68 (8.44) | 48.27 (7.76) | 47.48 (7.83) | 46.9 (10.73) |
| Income Control Treatments: | | | | | | | | |
| Low Control^b | 34.94 (18.33) | 34.66 (18.19) | 35.45 (18.3) | 34.48 (19.06) | 38.32 (20.06) | 36.19 (21.23) | 38.47 (19.84) | 42.3 (17.65) |
| Medium Control^c | 35.62 (18.85) | 36 (18.01) | 36.59 (19.3) | 32.82 (19.76) | 40.98 (18.35) | 40 (19.14) | 42.13 (17.14) | 40.6 (19.32) |
| High Control^d | 41.36 (15.92) | 41.14 (15.83) | 41.99 (16.44) | 40.53 (15.24) | 45.36 (13.63) | 46.09 (12.61) | 44.11 (15.06) | 46.4 (12.58) |
| Overall Mean Investment - Rs.(4 decisions) | 38.53 (17.03) | 38.57 (16.59) | 38.84 (17.46) | 37.82 (17.09) | 43.09 (16.18) | 42.64 (16.74) | 43.05 (15.9) | 44.05 (15.6) |

Notes: ^a Spouse gets paid a fixed share s of returns from both investment options, $0.3 \leq s \leq 0.7$. ^b Spouse gets paid all returns from High return (blue) option in a private account, investor receives all returns from Low return (red) option in own account. ^c Spouse gets paid all returns from High return (blue) option in cash, investor receives all returns from Low return (red) option in own account. ^d Spouse gets paid all returns from High return (blue) option in a Joint account with investor, investor receives all returns from Low return (red) option in own account. Standard deviation reported in parantheses.

TABLE 6: IMPACT OF CONTROL ON INVESTMENT EFFICIENCY

| Independent Variables | Dependent Variable: Investment in High Return Option | | | | | | | |
|---|--|----------------------|----------------------|-----------------------|------------------------|-----------------------|----------------------|---------------------|
| | MEN | | | | WOMEN | | | |
| | Information Treatments | | | | Information Treatments | | | |
| | Combined | None | Full | Partial | Combined | None | Full | Partial |
| Investor CONTROL-- (Spouse paid in): | | | | | | | | |
| Low Control Treatment^b | -7.260*** [1.322] | -7.822*** [2.056] | -5.891*** [2.225] | -8.958*** [2.631] | -9.365*** [1.296] | -12.079*** [2.175] | -9.010*** [1.965] | -4.600* [2.721] |
| Medium Control Treatment^c | -6.580*** [1.302] | -6.485*** [2.097] | -4.752** [2.075] | -10.625*** [2.732] | -6.706*** [1.252] | -8.267*** [2.070] | -5.347*** [1.837] | -6.300** [2.930] |
| High Control Treatment^d | -0.84 [1.290] | -1.337 [2.126] | 0.644 [2.021] | -2.917 [2.688] | -2.321** [1.101] | -2.178 [1.770] | -3.366** [1.709] | -0.5 [2.458] |
| Mean Value of Dependent Variable | 42.2 [0.883] | 42.475 [1.395] | 41.337 [1.468] | 43.438 [1.723] | 47.679 [0.792] | 48.267 [1.395] | 47.475 [1.023] | 46.9 [1.928] |
| Number of Observations | 1000 | 404 | 404 | 192 | 1008 | 404 | 404 | 200 |
| | 250 | 101 | 101 | 48 | 252 | 101 | 101 | 50 |
| R² | 0.06 | 0.06 | 0.05 | 0.12 | 0.08 | 0.13 | 0.07 | 0.05 |

Footnotes: The omitted control treatment here is the Fixed Share case where each spouse gets paid a fixed share s of returns from both investment options. b Spouse gets paid all returns from High return (blue) option in a private account, investor receives all returns from Low return (red) option in own account. c Spouse gets paid all returns from High return (blue) option in cash, investor receives all returns from Low return (red) option in own account. d Spouse gets paid all returns from High return (blue) option in a Joint account with investor, investor receives all returns from Low return (red) option in own account. All regressions reported here include individual fixed effects. Robust Standard errors in brackets. * Significant at 10% level, ** Significant at 5% level, *** Significant at 1% level

TABLE 7: IMPACT OF INFORMATION ON INVESTMENT IN HIGH RETURN (BLUE) OPTION

| Information Treatments ^a | Dependent Variable: Investment in High Return (blue) Option | | | | | | | | | | | |
|---|---|------------------------|--------------------------|-----------------------------|---------------------------|---------------------|------------------------|--------------------------|--------------------------|-----------------------------|---------------------------|-------------------|
| | Control Treatments | | | | | | Control Treatments | | | | | |
| | MEN | | | | | | WOMEN | | | | | |
| | All decisions combined | All decisions combined | Low Control ^b | Medium Control ^c | High Control ^d | Fixed shares | All decisions combined | All decisions + controls | Low Control ^b | Medium Control ^c | High Control ^d | Fixed shares |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | |
| No Information | -0.272 [1.469] | 0.223 [1.436] | 0.187 [2.535] | -0.194 [2.654] | -0.38 [2.239] | 1.546 [1.883] | -0.408 [1.382] | -0.593 [1.385] | -2.578 [2.948] | -2.188 [2.603] | 2.101 [2.021] | 0.233 [1.025] |
| Partial Information | -1.024 [2.014] | -0.248 [2.027] | -0.369 [3.234] | -3.18 [3.505] | 0.052 [2.777] | 2.562 [2.166] | 1.005 [1.709] | 0.836 [1.747] | 3.611 [3.250] | -1.629 [3.293] | 2.458 [2.438] | -1.083 [1.655] |
| Wife's Share of Earnings (Fixed Shares Case) | | | | | | 0.260*** [0.092] | | | | | | 0.069 [0.061] |
| Other Controls: | | | | | | | | | | | | |
| Husband's age | NO | YES | YES | YES | YES | YES | NO | YES | YES | YES | YES | YES |
| Wife's age | NO | YES | YES | YES | YES | YES | NO | YES | YES | YES | YES | YES |
| Constant | 38.837 | 45.703 | 45.256 | 41.267 | 54.78 | 57.032 | 43.045 | 42.547 | 38.53 | 39.33 | 44.184 | 44.671 |
| No. of Obs. | | 996 | 249 | 249 | 249 | 249 | | 1004 | 251 | 251 | 251 | 251 |
| R-squared | | 0.01 | 0.04 | 0.01 | 0.05 | 0.05 | | 0 | 0.01 | 0 | 0.01 | 0.01 |

Notes: ^a The omitted information category is 'Full information' where the investor's spouse is informed about his/her investment options, actual choices and earnings. Under 'partial information' the spouse is only informed of what the investor earned for him/her -- but not about the investor's options or actual choices.

In the Fixed Share case treatment each spouse gets paid a fixed share s (between 30% and 70% of returns) from *both* investment options . ^b Spouse gets paid all returns from High return (blue) option in a private account, investor receives all returns from Low return (red) option in own account. ^c Spouse gets paid all returns from High return (blue) option in cash, investor receives all returns from Low return (red) option in own account. ^d Spouse gets paid all returns from High return (blue) option in a Joint account with investor, investor receives all returns from Low return (red) option in own account. Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 8: IDENTITY AND SPITE IN INVESTMENT BEHAVIOR

| Independent Variables: | Dependent Variables | | | | | | |
|---|--------------------------|----------------------|----------------------|----------------------|--|----------------------|-----------------------|
| | 'Rational' Husband Dummy | | | | Man's Investment in High Return option | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Wife's share equals or exceeds husband's (dummy variable) | 0.109 [0.108] | | | | 0.174 [2.273] | | |
| Wife's share exceeds husband's (dummy variable) | | -0.333*** [0.085] | -0.372*** [0.083] | -0.359*** [0.085] | | -9.710*** [2.979] | -10.528*** [3.082] |
| No Information ^b | 0.015 [0.058] | 0.021 [0.058] | -0.015 [0.059] | -0.026 [0.057] | 1.309 [1.576] | 1.301 [1.601] | 0.279 [1.723] |
| Partial Information ^c | 0.027 [0.078] | 0.038 [0.072] | 0.035 [0.077] | 0.031 [0.078] | 2.504 [2.104] | 2.66 [1.966] | 2.063 [2.089] |
| Husband's age | -0.004 [0.008] | -0.008 [0.007] | -0.007 [0.008] | -0.005 [0.008] | -0.146 [0.191] | -0.251 [0.173] | -0.208 [0.225] |
| Wife's age | 0 [0.009] | 0.004 [0.009] | 0.003 [0.009] | 0.002 [0.009] | 0.1 [0.247] | 0.202 [0.239] | 0.203 [0.303] |
| Husband's Education level | | | -0.004 [0.009] | -0.001 [0.009] | | | 0.118 [0.251] |
| Wife's education level | | | 0.015 [0.013] | 0.016 [0.013] | | | 0.366 [0.374] |
| Household Income | | | 0.001 [0.001] | 0.002 [0.001] | | | 0.043 [0.037] |
| Asset Decision(1=wife; 2 = joint; 3=husband) | | | -0.149** [0.064] | -0.164** [0.071] | | | -2.777* [1.452] |
| Savings Decision(1=wife; 2 = joint; 3=husband) | | | 0.067 [0.069] | 0.07 [0.073] | | | -0.089 [1.285] |
| High Caste Dummy(1=BC/OC; 0 = SC/ST) | | | | -0.209*** [0.072] | | | -3.877 [2.374] |
| Constant | 0.742*** [0.182] | 0.931*** [0.130] | 1.143*** [0.209] | 1.272*** [0.230] | 43.678*** [4.693] | 46.724*** [3.836] | 53.755*** [7.557] |
| Observations | 249 | 249 | 238 | 233 | 249 | 249 | 233 |
| R-squared | 0.02 | 0.09 | 0.13 | 0.16 | 0.01 | 0.1 | 0.14 |

a The "Rational" husband dummy = 1 when he invests the entire Rs.50 in the high return option in the fixed shares treatment and 0 when he does not. b The omitted information category here is 'Full Information' where spouses receive information about investor's options, actual choices and earnings. Under 'No information' they do not receive information about any of these and under 'Partial Information' they are told about the amount the investor earned for them, but not his/her investment options or actual choices. Robust standard errors in brackets, clustered at the self-help-group level. * significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 9: SPITE AND INVESTMENT EFFICIENCY

| Dependent Variable: Investment in High Return option (Rs.) (Min.=Rs.0; Max.=Rs.50) | | | | | | | | |
|--|---------------------|--------------------------|-----------------------------|---------------------------|--------------------|--------------------------|-----------------------------|---------------------------|
| Independent Variables: | MEN | | | | WOMEN | | | |
| | All Control | Low Control ^c | Medium Control ^c | High Control ^c | All Control | Low Control ^c | Medium Control ^c | High Control ^c |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| "Rational" Husband ^a | 5.057*** [1.582] | 3.03 [2.153] | 6.648*** [2.376] | 5.472** [2.130] | 6.946*** -2.054 | 9.906*** [3.171] | 4.515 [2.957] | 6.417** [2.519] |
| No Information ^b | -0.252 [1.662] | 0.121 [2.539] | -0.339 [2.627] | -0.533 [2.201] | -0.974 -1.751 | -2.802 [2.903] | -2.176 [2.609] | 2.055 [2.007] |
| Partial Information | -1.337 [2.289] | -0.47 [3.221] | -3.402 [3.437] | -0.138 [2.676] | 0 0 | 0 [0.000] | 0 [0.000] | 0 [0.000] |
| Husband's age | -0.139 [0.259] | 0.324 [0.351] | -0.079 [0.344] | -0.663** [0.325] | 0.145 -0.221 | 0.196 [0.323] | 0.108 [0.324] | 0.13 [0.230] |
| Wife's age | -0.055 [0.302] | -0.665 [0.407] | -0.014 [0.388] | 0.515 [0.371] | -0.144 -0.252 | -0.186 [0.376] | -0.076 [0.352] | -0.17 [0.248] |
| Constant | 42.125 | 42.736 | 35.739 | 48.231 | 35.96 | 30.502 | 37.174 | 40.205 |
| Observations | 747 | 249 | 249 | 249 | 603 | 201 | 201 | 201 |
| R-squared | 0.03 | 0.04 | 0.04 | 0.07 | 0.03 | 0.06 | 0.02 | 0.05 |

^a A "Rational" ("spiteful") husband is one who invests (does not invest) the entire Rs.50 in the high return option in the fixed shares treatment. ^b The omitted information category here is 'Full Information' where spouses receive information about investor's options, actual choices and earnings. Under 'No information' they do not receive information about any of these and under 'Partial Information' they are told about the amount the investor earned for them, but not his/her investment options or actual choices. ^cLow, Medium and High (investor) Control treatments had returns from the high return option paid to spouse in a private a/c, in cash and in a joint a/c with the investor respectively. Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

TABLE A1: MEAN INVESTMENT BY MEN AND WOMEN ACROSS DECISIONS/INFORMATION TREATMENTS

| | MEN | | | | WOMEN | | | |
|-------------------------|-----------------------------|---|----------------------|----------------------|-----------------------------|---|----------------------|----------------------|
| | Control Mean Inv.(Rs) | Mean Diff. Across Income Control Treatments | | | Control Mean Inv.(Rs) | Mean Diff. Across Income Control Treatments | | |
| | | Low vs. Med (Rs) | Low vs. High (Rs) | Med vs. High (Rs) | | Low vs. Med (Rs) | Low vs. High (Rs) | Med vs. High (Rs) |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | |
| Info Treatments: | | | | | | | | |
| None | 34.653 [1.809] | 1.337 [2.546] | 6.48*** [2.39] | 5.149** [2.385] | 36.188 [2.112] | 3.812 [2.843] | 9.901*** [2.456] | 6.089*** [2.279] |
| Full | 35.446 [1.820] | 1.139 [2.646] | 6.53 [2.44] | 5.396** [2.522] | 38.465 [1.974] | 3.663 [2.608] | 5.644** [2.478] | 1.98 [2.270] |
| Partial | 34.479 [2.750] | -1.667 [3.962] | 6.04 [3.52]* | 7.708** [3.601] | 42.3 [2.496] | -1.7 [3.700] | 4.1 [3.065] | 5.800* [3.260] |

Notes: a: Spouse gets paid all returns from High return (blue) option in a private account, investor receives all returns from Low return (red) option in own account. b: Spouse gets paid all returns from High return (blue) option in cash, investor receives all returns from Low return (red) option in own account. c: Spouse gets paid all returns from High return (blue) option in a Joint account with investor, investor receives all returns from Low return (red) option in own account. * significant at 10%; ** significant at 5%; *** significant at 1% (Robust standard errors in brackets).

TABLE A2: NEGOTIATION WITH SPOUSE

| | Men | | | | Women | | | |
|---|---------------------|-----------------|----------------|------|---------------------|-----------------|----------------|--|
| | Number of Investors | | | | Number of Investors | | | |
| | Total | Negotiation | | | Total | Negotiation | | |
| | No | Yes | | No | Yes | | | |
| | 48 | 48 | 0 | | 50 | 19 | 31 | |
| | | Before Neg'n | After Neg'n | | | Before Neg'n | After Neg'n | |
| Invt. in Option Blue | | | | | | | | |
| (a) =Rs.50 (all decisions) | 18 | n.a. | n.a. | 12 | 21 | 22 | | |
| (b) <Rs. 50 (in at least 1 decision) | 30 | n.a. | n.a. | 7 | 10 | 9 | | |
| Mean Invt. in Blue (Rs.): | | | | | | | | |
| -- Fixed Share Treatment | 39.5 | n.a. | n.a. | 42.9 | 39.5 | 39.5 | | |
| -- Low Control Treatment | 22.5 | n.a. | n.a. | 21.4 | 31.5 | 36.5 | | |
| -- Medium Control Treatment | 22.5 | n.a. | n.a. | 21.4 | 23 | 23 | | |
| -- High Control Treatment | 38.4 | n.a. | n.a. | 35.7 | 42 | 37 | | |
| Notes: | | | | | | | | |
| In Low, Medium and High Control treatments, spouses were paid in Private accounts, Cash and in a Joint account with the investing spouse respectively. The Negotiation option allowed the investing spouse in each household in the 'Partial Information' Treatment to discuss and his/her initial set of investment decisions and change them. | | | | | | | | |

TABLE A3: INVESTMENT BEHAVIOR OF "RATIONAL" INVESTORS

| | MEN | | | | WOMEN | | | |
|---|------------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|----------------------|----------------------|
| | Information Treatments | | | | Information Treatments | | | |
| | All | No Info | Full Info | Partial | All | No Info | Full Info | Partial |
| Investor CONTROL-- (Spouse paid in): | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Low Control Treatment^b | -13.912*** [1.543] | -14.348*** [2.380] | -13.603*** [2.507] | -13.636*** [3.509] | -11.070*** [1.301] | -14.468*** [2.138] | -9.722*** [2.069] | -6.667*** [2.531] |
| Medium Control Treatment^c | -12.176*** [1.540] | -12.681*** [2.486] | -10.588*** [2.338] | -14.394*** [3.626] | -8.646*** [1.252] | -10.426*** [2.031] | -6.667*** [1.930] | -8.889*** [2.764] |
| High Control Treatment^d | -6.706*** [1.467] | -8.913*** [2.460] | -4.779** [2.074] | -6.061* [3.556] | -3.974*** [1.074] | -4.043** [1.689] | -4.778*** [1.771] | -2.222 [2.173] |
| Constant | 50 [0.872] | 50 [1.316] | 50 [1.381] | 50 [2.149] | 50 [0.709] | 50 [1.231] | 50 [1.021] | 50 [1.462] |
| Number of Observations | 680 | 276 | 272 | 132 | 916 | 376 | 360 | 180 |
| R² | 0.15 | 0.14 | 0.15 | 0.17 | 0.11 | 0.17 | 0.08 | 0.09 |

The sample above consists of only men and women who invested with full efficiency in the Fixed Shares case.

The omitted control treatment here is the Fixed Share case where each spouse gets paid a fixed share s of returns from both investment options. b Spouse gets paid all returns from High return (blue) option in a private account, investor receives all returns from Low return (red) option in own account. c Spouse gets paid all returns from High return (blue) option in cash, investor receives all returns from Low return (red) option in own account. d Spouse gets paid all returns from High return (blue) option in a Joint account with investor, investor receives all returns from Low return (red) option in own

All regressions reported here include individual fixed effects. Robust Standard errors in brackets

* Significant at 10% level, ** Significant at 5% level, *** Significant at 1% level

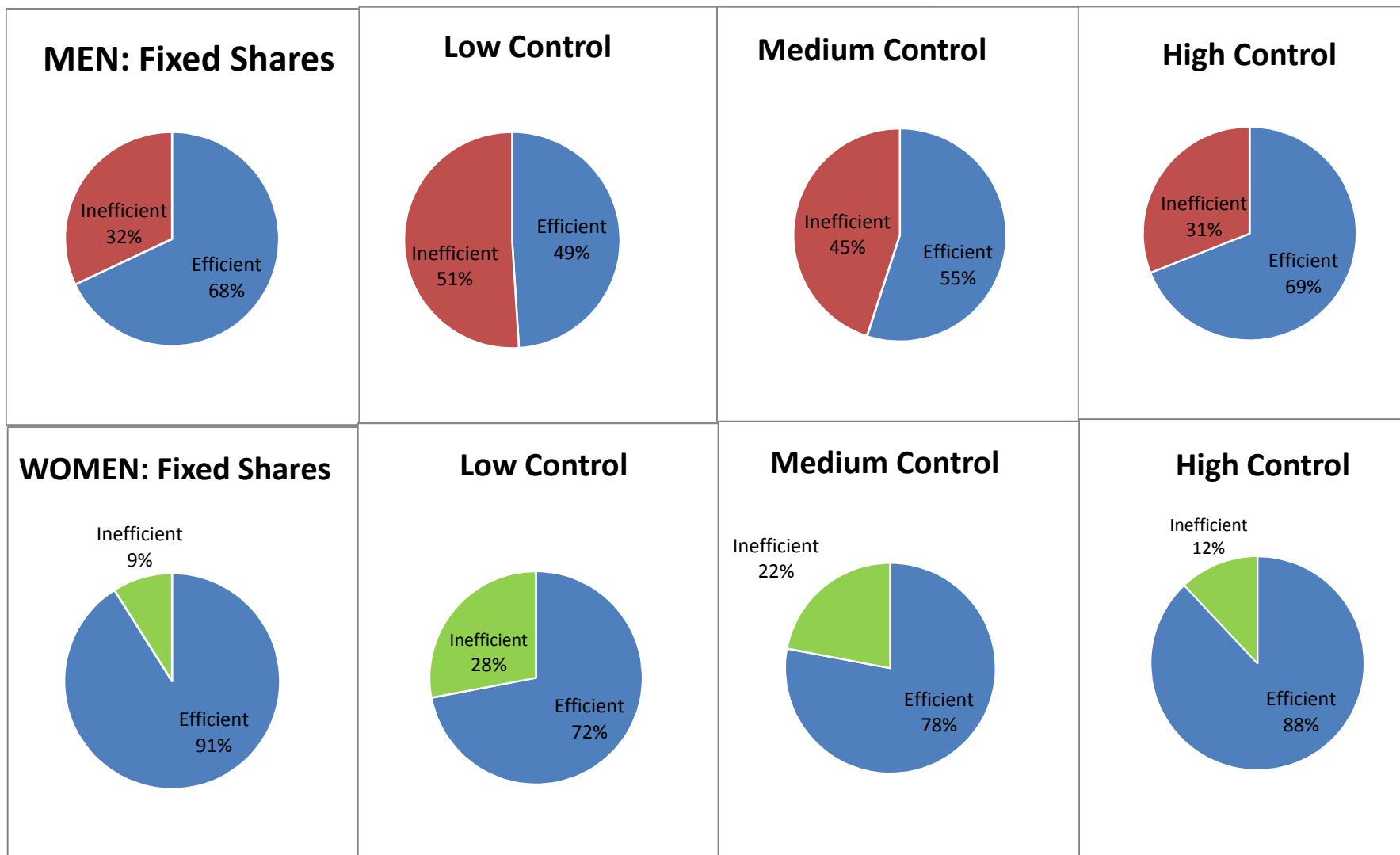


FIGURE 1: FRACTION OF HOUSEHOLDS WHERE SPOUSES INVEST EFFICIENTLY