Spousal Control and Intra-Household Decision Making: An Experimental Study in the Philippines[*]

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October 1, 2004

Abstract

The majority of savings decisions are observed at the household level but economic theories of savings and consumption are predominantly designed with the individual in mind. I present a model where the context in which spouses make their decisions significantly affects savings outcomes in the household, and test the predictions of this model using an experiment with married couples in the Philippines. Because couples are randomly assigned to different treatment conditions within my experiment, I can plausibly take preferences as fixed and observe the changes in behavior caused by the context of decision making. I find that the conditions under which spouses make decisions about saving and spending significantly affect household outcomes. Specifically, I find that the same proportions of men and women save in a condition where information is kept private, but men save significantly less when they are in the presence of their wives without the ability to communicate. The proportion of men who choose to save increases in the condition where they are able to communicate with their wives, and again approaches those of women. This study is the first to bring spouses into the lab together to study intra-household financial decision-making.

JEL Codes: D190, J120, 0150, C900, C790

Keywords: Intra-Household, Bargaining, Experiments, Economic Development

1 Introduction

A large and growing literature in economics provides evidence from several countries that income in the hands of women is more likely to be used for investments in education, children's nutrition, and housing than income in the hands of men (Thomas (1990, 1994), Haddad and Hoddinott (1994), Khandker (1998), Duflo(2003)). Microfinance institutions report much higher rates of repayment by women(Armendariz de Aghion and Morduch (2003))[1] and women are more likely to use savings commitment products (Ashraf et al. (2003, 2004)). Growing development programs focus entirely on giving income to women. Indeed, the World Bank in a recent report[2] encouraged such programs, arguing that women are good investments. What accounts for such apparently pronounced differences between women and men? While they may a result of gender differences in intrinsic preferences and/or outside opportunities, as they are often described, it is also possible that the very nature of household decision making and bargaining could lead to such outcomes.

This paper is an attempt to gain a more detailed understanding of household decision making, through a new experimental approach. It provides evidence that the different contexts in which households make decisions, even when holding preferences fixed, can lead to significantly different outcomes. Whether strategic interaction is possible, what form that strategic interaction takes, and how private information informs such interaction, can make a significant difference in the household outcome.

These results confirm that current models of household decision making are incomplete. Our current economic theories of consumption and savings decisions are predominantly designed with the individual in mind, but the majority of such decisions are observed at the household level. Non-unitary models of household decision making, motivated by empirical evidence that individual

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[1] Khandker et al., (1995) find that, in 1991, 15.3 % of male borrowers at the Grameen Bank in Bangladesh were missed payments before the final due date versus 1.4% of female. Also in Bangladesh, Mahabub Hossain (1988) found that 81% of women had no repayment problems versus 74% of men. In Malawi, David Hulme (1991) found that 92% of women made on-time repayments versus 83 % for men. In Malaysia, D. Gibbons and S. Kasim (1991) report at 95% for women versus 72% for men.

[2] *EngenderingDevelopment*, 2001

endowments matter in the household, see outcomes as a result of a bargaining process (Manser and Brown(1980), McElroy and Horney (1981)) or of repeated interactions that lead to efficient outcomes (Browning and Chiappori (1998)). Cooperative bargaining models (Lundberg and Pollack(1992)) recognize the role played by threat points and individual endowments in the bargaining process but, critically, assume that players are able to make binding commitments, have full information, and are able to communicate. All these models either assume or predict that outcomes will be Pareto optimal. Evidence against Pareto optimality in household outcomes (Udry (1996)) and complete information within the household (Goldstein and Udry (1999), Boozer and Goldstein (2003)) suggest that more realistic assumptions are needed.[3]

There is little empirical work on the general topic of spousal decision-making, even in the growing literature on intra-household bargaining, often because it is hard to elicit honest responses from both spouses to survey questions about what truly happens in the household. Furthermore, ordinarily we can not observe the context in which household decisions are made, much less vary such contexts exogenously to be able to understand their causal influence.

I address this gap through a controlled experimental design with a sample of married couples in the Philippines on which I have large household baseline data. This study is the first to bring spouses into the lab together to study intra-household financial decision-making. I randomly assigned subjects and their spouses to one of three different treatment conditions under which they have to make decisions about spending or saving an endowment they are given, equivalent to a day's wage. I exogenously vary the degree of spousal influence and interaction on a subject's decisions. In the first condition, ("Negotiation"), subjects and their spouses communicate before making their decisions and their decisions are immediately observable to each other–providing a context where much of the assumptions of cooperative and collective household models are met. In the second condition ("Non-Private"), subjects and their spouses enter the room together and make simultaneous decisions, but cannot communicate or see the decisions the other is making until

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[3] As Bardan and Udry argue, "If the efficient household model cannot adequately account for the intra-household allocation of resources, it appears that it will be necessary to move towards more detailed, culturally and institutionally informed noncooperative models of the interaction between household members" (Development Microeconomics, Oxford, 1999, p18). Noncooperative models focus on self-enforcing equilibria and allow for a full range of strategic interactions and incomplete contracting, without assuming an efficient outcome.

the end of the experiment (at which point, they are not allowed to change their answers). Thus, information is revealed perfectly and completely but decisions are taken simultaneously and without recourse to communication or ability to make Coasian-type side payments, as in a noncooperative game. In the final, third, condition ("Private") subjects are separated from their spouses from the onset of the experiment and do not know what their spouse is doing, nor does their spouse have any opportunity to learn about the decisions the other made. Thus, as much information as possible is kept intentionally private from the other spouse.

I find that the conditions under which spouses make decisions about saving and spending, holding preferences constant, significantly affect household outcomes. Specifically, I find that the same proportions of men and women save in the Private condition, but a significantly lower proportion of men decide to save in the Non-Private condition. The proportion of men who choose to save increases in the Negotiation condition, and again approaches those of women. These results are not easily explained using existing models of household bargaining. I suggest two alternative, competing models that are consistent with these results which future experiments could tell apart.

The remainder of the paper is organized as follows. Section 2 sets up the theoretical framework for the paper and the experiments. Section 3 describes the experimental design and outcomes. Section 4 summarizes the main experimental results, and Section 5 describes two competing models that illustrate the mechanisms through which private information could affect household decision making. Section 6 describes additional data gathered in the experiment, supplemental survey, and household survey. Section 7 concludes.

2   Theoretical Framework

I start with the simplest possible set-up for utility functions, and show how outcomes can differ significantly depending on the bargaining process and conditions under which household decisions are made. In this section, I show that allowing communication and ability to make transfers, as in a collective or cooperative condition, will lead to greater provision of the public good and less private consumption than in a simultaneous move (noncooperative) game. I then discuss, but not

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model until later in the paper, the impact of allowing for private information on the provision of the public good.

Husband and wife have utility over their own present consumption, X_i, and a household public good, q, which can be provided separately or jointly, but which benefits the entire household. Individual utilities are interdependent in this setup, but only through utility from the public good, and not through direct altruism for the other's consumption.

The household public good can be a service, such as childcare, as in Lundberg and Pollak (1994) or a durable good, obtained through savings, as in Anderson and Baland (2000). Previous literature has assumed that men have a lesser preference for this household good, either through assuming that women care more about children or that women have a higher preference for saving and durable goods, due to their longer life expectancy. We will not necessarily make this assumption, but we will allow it. We take the husband's utility as: $U^M(x_m, q)$ and the wife's utility as: $U^W(x_w, q)$.

In order to solve the household utility maximization problem, we have to make some assumptions about the conditions under which the household makes their decision. The most common household models assume that members have complete information about each other, communicate with each other about the decision, and are able to form binding contracts. Collective decision making models (Chiappori, (1988, 1992)) make very minimal assumptions about the bargaining process but only assume that the intra-household allocation is Pareto-efficient. The household's problem is therefore to maximize:

$$U^{HH} = \lambda_M U^M(x_m, q) + \lambda_W U^W(x_w, q)$$

where λ_i are the Pareto or bargaining weights assigned to each individual.

Cooperative, or axiomatic, bargaining models impose more structure on the bargaining process and employ a Nash bargaining solution, which does not necessarily assume Pareto-efficiency but is characterized by it (Nash, 1950). Nash bargaining is characterized by the maximization of a "social welfare function" that depends on individual threat points, which are payoff received by each if agreement is not reached. The household problem, which is to maximize the product of the

gains to cooperation, is given by:

$$\max N = (U^M(x_m, q) - T^M)(U^W(x_w, q) - T^W)$$

The threat point is usually thought to be the individual's utility in case of divorce (Manser and Brown, 1980; McElroy and Horney,1981). The higher one's utility at the threat point, the higher one's utility in the Nash bargaining solution. In the separate spheres bargaining model of Lundberg & Pollak (1993), the threat point is internal to the marriage, not external as in divorce-threat bargaining models. The alternative to agreement is an inefficient noncooperative equilibrium within marriage. This can be the only equilibrium if transactions costs within the marriage are high.

In the models above, the efficient amount of the household good, q, will be provided because even if individuals have differing relative utilities over their own consumption versus the household good, they can be compensated through the bargaining process which maximizes overall welfare.

However, in a noncooperative setting - for example, when transaction costs to communication and contract making and enforcement are high - husband and wife simultaneously choose amounts x_i and q^i to maximize their own utility functions, subject to $q = q^h + \bar{q}^w$ and their own income constraint. Lundberg & Pollak (1993) show that this can lead to a lower provision of the public good. A simple example illustrates this point:

2.1 Setup

The are two players $i = \{M, W\}$ with Stone-Geary utility functions as follows:

$$U_i = \alpha_i \log(x_i) + (1 - \alpha_i) \log(q) \tag{1}$$

where x_i is the quantity of private consumption and $q \equiv q_m + q_w$ is the quantity in which a household public good is provided. Each player receives income, I_m and I_w respectively. The weight $(1 - \alpha_i)$ can represent player i's relative preference for the public good, versus his or her

personal consumption[4]. We will consider two different settings: (i) Non-Cooperative, and (ii) Cooperative, compare the outcomes, and then discuss what might happen in a setting where we allow for private information.

2.2 Non-Cooperative

In this setting the income of both players is common knowledge. Each player solves the following problem:

$$\max_{x_i} \left\{ \alpha_i \log(x_i) + (1 - \alpha_i) \log(q) \right\}$$

$$s.t. \ x_i + q_i = I_i \tag{2}$$

The first-order conditions are:

$$\frac{\alpha_m}{x_m} = \frac{1 - \alpha_m}{I_m + I_w - x_w - x_m}$$
$$\frac{\alpha_w}{x_w} = \frac{1 - \alpha_w}{I_m + I_w - x_w - x_m}$$

Solving simultaneously yields:

$$x_w^{*NC} = \frac{\alpha_w(\alpha_m - 1)(I_m + I_w)}{\alpha_m \alpha_w - 1} \tag{3}$$
$$x_m^{*NC} = \frac{\alpha_m(\alpha_w - 1)(I_m + I_w)}{\alpha_m \alpha_w - 1} \tag{4}$$

Thus the amount of private consumption is increasing in both players' incomes, increasing in the weight accorded to one's own private consumption, and decreasing in the weight which the other player places on their private consumption.

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[4]It could equivalently represent the responsibility that player has for providing the public good in the household. If one player is primarily responsible for providing the public good, which the other player contributes to but is not primarily responsible for (cf "Separate Spheres Bargaining"), this would show up as a greater weight put on the public good by the first player.

2.3 Cooperative

In this setting the players Nash bargain over the amount that each will contribute to the public good, with the equilibrium values of the non-cooperative game being their threat points. Let the generalized Nash weights be ϕ for player M and $1 - \phi$ for player W. Begin by noting that the first-best levels of x_m and x_w, obtained through maximizing the social welfare function, the sum of the two individual utilities, are:

$$x_m^{FB} = \frac{\alpha_m(I_m + I_w)}{2}$$
$$x_w^{FB} = \frac{\alpha_w(I_m + I_w)}{2}$$

The Coase Theorem implies that these are the equilibrium actions which are chosen and that the equilibrium utilities of the players are:

$$U_m^C = U_m^{NC} + \phi(U_m^C + U_w^C - U_m^{NC} - U_w^{NC})$$
$$U_m^C = U_w^{NC} + (1 - \phi)(U_m^C + U_w^C - U_m^{NC} - U_w^{NC})$$

ie. their threat point (the Non-Cooperative outcome) plus their bargaining power times the gains from trade.

2.4 Comparison of Cooperative and NonCooperative Outcomes

Even when $\alpha_w = \alpha_m$, i.e. husbands and wives have the same preference weightings over the household good versus their own private consumption, there will be greater personal consumption in the Noncooperative case than in the Cooperative:

$$x_m^{NC} = \frac{\alpha_m(\alpha_w - 1)(I_m + I_w)}{\alpha_m \alpha_w - 1} > x_m^C = \frac{\alpha_m(I_m + I_w)}{2} \tag{5}$$

When $\alpha_w < \alpha_m$ or $\alpha_w > \alpha_m$, there will still be less overall provision of the public good in the Noncooperative condition, but the distribution will be such that whoever has the higher weight on the public good will have less personal consumption.

2.5   Private Information

Existing noncooperative, cooperative and collective decision making models all assume complete information between spouses. Although in many cases this might be a reasonable assumption, there is growing evidence that there is often not complete information between spouses (see Boozer and Goldstein,2003, for eg) . There are many situations in which one can imagine that information about income, as well as consumption and savings decisions, wouldn't be completely observable or fully verifiable, and in fact spouses would have an incentive to hide information from each other about savings and consumption behaviors. There is surprisingly little attention given to this possibility in any household decision making models. In subsequent sections in this paper, I formally model the effects of differerences in information, in one case referring to the observability of decision outcomes and in another to the responsibility an individual has for the outcome the spouse observes. For the purposes of the framework, however, and in order to introduce the experimental conditions, we will think simply of relaxing the assumption of complete information. A first order effect of relaxing this assumption might be to make it harder for the spouse to punish "bad" behavior, because it is either unobservable or they can't fully hold their spouse responsible for any outcome they do see. If we think, for example, that wives have the ability to punish their husbands for spending their income gambling or at the bar instead of saving it or using it for their children, and husbands put lower weight on the household good, we might expect that if men were given the opportunity to make consumption decisions without their wives knowing they would be less inclined to choose the household good than even in the noncooperative case.

The above discussion illustrates the simple point that under assumptions of full communication and ability to make transfers where spouses are maximizing their utility jointly(a cooperative model), we would expect to see a greater provision of the household good and less personal consumption than if communication and transfers were not possible and spouses were maximizing their own utility as a best response to their spouse (a noncooperative model), which would provide still less personal consumption than a model in which information was held privately between spouses (a noncooperative model with private information), if spouses had different preferences. Thus we

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would expect to see the following ranking for the spouse who has less preference for the household good than their spouse does:

$$X_i^{\text{Private}} > X_i^{Noncooperative} > X_i^{Cooperative}$$

It's important to remember, however, that privacy of information could have many different effects: the one described above is only one of them. These are discussed fully in Section 5.

The following section describes how I designed experimental conditions to represent the three different household decision making models described above. I then describe the experimental outcomes that were measured. In this paper, I take savings to be the household good. One can think of the outcome of savings, such as a durable good, as a household good. Savings itself, through making decisions about budgeting and management of bank accounts, is not generally thought of within Economics as a service provided by one or both members of the household. However, there is a large sociology literature which shows that spouses tend to specialize in providing the financial management for the household. In many countries, this service is most often provided by the woman[5]. We thus think of "financial services" as a service provided for the household, similar to child care and food production.

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[5]Studies of family financial management describe a common pattern around the world, particularly among lower income households and in developing countries, of wive's roles as financial managers. Pahl(1983) found wife controlled management systems in 70% of British low income families, but in higher income families, 75% had husband-controlled management systems. In 70.5% of Imdonesian couples, the wife decided all money matters (Hanna Papanek & Laurel Schwede (1988)). In supplementary surveys of my subjects in the Philippines, I find that 80% of households have the wife hold the income and do the budgeting in the family; in 49% of households the wife also make the major decisions about saving or spending money. This is not necessarily a source of power in the household: budgeting and deciding about saving can be an onerous task when money is short.

3 Experimental Design

3.1 Experimental Conditions

Subjects were invited to the "laboratory"[6] and, upon arriving with their spouse, were randomly assigned to one of three conditions under which they made decisions about saving or spending an endowment they were given. In the first condition, which provided as much of the cooperative assumptions as possible to apply in a laboratory, subjects and their spouses are in the same room and talk through each decision before making it. Subjects sit with their spouse and are explicitly instructed to tell each other what they would like to do for each decision, discuss what would be best to do, and then to make their final (individual) decisions[7]. This condition, referred to henceforth as "Negotiation", provides a cooperative setting, with full information, communication and opportunities for transfers. It essentially imposes equal transaction costs across all couples (since all couples need to communicate and discuss their choices), and thus allows for an efficient outcome by the Coase Theorem. In the second condition, referred to as NonPrivate or Public, subjects and their spouses are placed in the same room, although each subject sits at a different table. Spouses are not allowed to talk during the process. At the end of the decision making process, subjects meet with their spouse, show each other all the decisions they made, and discuss. They are not allowed to change any decision at this point. When the couple returns together to compare responses, local researchers fill a supplement detailing each subject's decision and their response to their spouse's decision, as well as any discussion or conflict between the spouses that ensued. This condition provides a setting for noncooperative decision making, with observable

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[6]The experiments were run on the third floor of Green Bank, in a semi-urban town in Mindanao, Philippines. Usually either the subject, their spouse, or both were clients of Green Bank. Recruiters went door-to-door and invited subjects to a study. The sample was drawn from a larger sample which had been involved in a randomized field experiment (Ashraf et al, 2004).

[7]A detailed supplement for each couple is coded by local researchers for each decision, encompassing: the initial position of each spouse, arguments used for persuasion by each side (if initial positions were different), who appeared to dominate the negotiation process, the ultimate decision taken by each spouse, and whether the final outcome appeared to be more a result of convergence of preferences through dialogue or domination of one spouse's preferences (or a mutual agreement to disagree, if final individual decisions remained different). Although some of these variables are necessarily subjective, the local researchers who were able to tell rather quickly in most cases under what category the negotiation process falls, and who appears to dominate. Analysis on these measures shows that who dominates the majority of decisions in the negotiation is significantly correlated with which spouse has more years of education.

outcomes and choices–and hence opportunities for punishment, if needed- but no opportunity for communication or transactions.

In the third condition, we allow for some information about outcomes and choices to remain private. In this, the Privacy condition, subjects were separated from their spouses upon arrival and told that the women were to be in one room and the men in a different room. Once the subjects were settled into their respective rooms, they were registered and told about how much money they were getting and which decisions they were going to be asked to make. Subjects are explicity told that their choices will be kept private at the beginning of the experiment. Outcomes and choices were obscured, and subjects were provided "plausible deniability" in the following way: In all experimental conditions, there were eight decisions in all, the details of which will be discussed further in the following section. Using the strategy method, subjects were asked to fill in their responses for all eight decisions and told that a nine-sided die would be rolled and they would either receive one of their choices or, if the die came upon 9, they would receive what was called "luck of the draw", which was like a wild card and could be anything. This was common across all three experimental conditions: subjects had a 1/9 probability of getting an outcome in which any decision they made was irrelevant: they received. However, this feature interacted differently with the Privacy condition: unless spouses saw each other's entire range of choices (as they did in the other two conditions), the "luck of the draw" feature in the Privacy condition made it difficult to infer from any outcome one observed whether they were due to the spouse's personal choice or from "luck of the draw" . This provided some degree of plausible deniability to the subject that, even if the spouse were able to observe the outcome, the subject couldn't be held fully responsible for it. Furthermore, even outcomes were not as observable in the Privacy condition. Contrary to the other conditions, subjects were given their outcomes separate from their spouse. [Very little communication was observed between spouses when they returned together after going through the experiment in the Privacy condition]. Of course, spouses could try to get the information out of each other when they went home, but the important point here is that outcomes were not fully verifiable and perfectly observable the way they were in the other two conditions. Thus, information between spouses was made incomplete both about outcomes and about responsibility

for those outcomes.

Figure 1 provides a schematic diagram of the experimental design.

3.2   Experimental Outcomes

Subjects earned the equivalent of a day's wage (200 pesos=$4) which they received at the end of the experiment, and another 200 pesos in 3 months' time, given to them in the form of a post-dated check from the bank. During the experiment, subjects are asked to make several decisions in advance about what they would like to do with both their earnings today and their earnings in 3 months' time. One of these decisions is randomly chosen to be implemented at the end of the experiment[8] using Becker-Degroot-Marshak (BDM) strategy method[9] . Subjects also receive a show up fee, which is used in an additional experimental outcome, diagrammed in 1 as "Answer 20 Pesos Question". [10].

Subjects make a number of decisions about whether they prefer their earnings in cash today or as a certificate for direct deposit into a savings account or as a gift certificate for private and household goods[11], as shows in the diagram below. Subjects were asked to value the gift certificates against

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[8]There are 8 decisions in all. In all conditions subjects had a 1/9 probability of getting an outcome in which any decision they made was irrelevant: they received what was called "luck of the draw". This was done so that it was very difficult to know from the outcome someone received what their decisions had been, unless one saw all the decisions—thus allowing "plausible deniability" to the subjects in the privacy condition.

[9]BDM has been widely used in experiments as a way of eliciting true valuation: the subject states a maximum buying price or minimum selling price, but the actual buying or selling price is determined by a random device. In the decisions used in this experiment, subjects were simply given 4 or 5 ranges —thus their precise valuation of the gift certificate over cash now cannot be known, but a relatively narrow range in which their valuation occurs can be determined.

[10]All subjects are offered a show-up fee of 40 pesos when they arrive with their spouse: the 40 pesos consisted of two 20 pesos bills. The serial numbers of these 20 pesos bills were taken down by the experimenter; at the end of the experiments, subjects are told that if they bring back one of the 20 pesos bills they received when they have to come back for their "sign in" in 2 weeks, we would double it for them. Only one of the 20 pesos was considered for this "double your money" challenge, in order to allow subjects who were highly liquidity constrained and needed one of the 20 pesos for their fare to and from the experimental site to take part. Subjects are then asked whether they would like to hold on to the bill, or if they would like their spouse to hold onto it for them. Subjects who returned the 20 pesos bill were asked who held onto the money . 252 subjects out of 292 returned their 20 pesos bill to double it. 33% of men asked for their wife to hold onto their money, whereas only 8% of women asked their husbands to hold onto their money.

[11]These included a department store gift certificate, food/groceries, direct deposit into one's own savings account, and direct deposit into a savings account in the name of one's child. In this paper, I focus on those outcomes which are related to saving, and refer to these additional only when they are compared with saving. The full roster of experimental outcomes is in the Appendix.
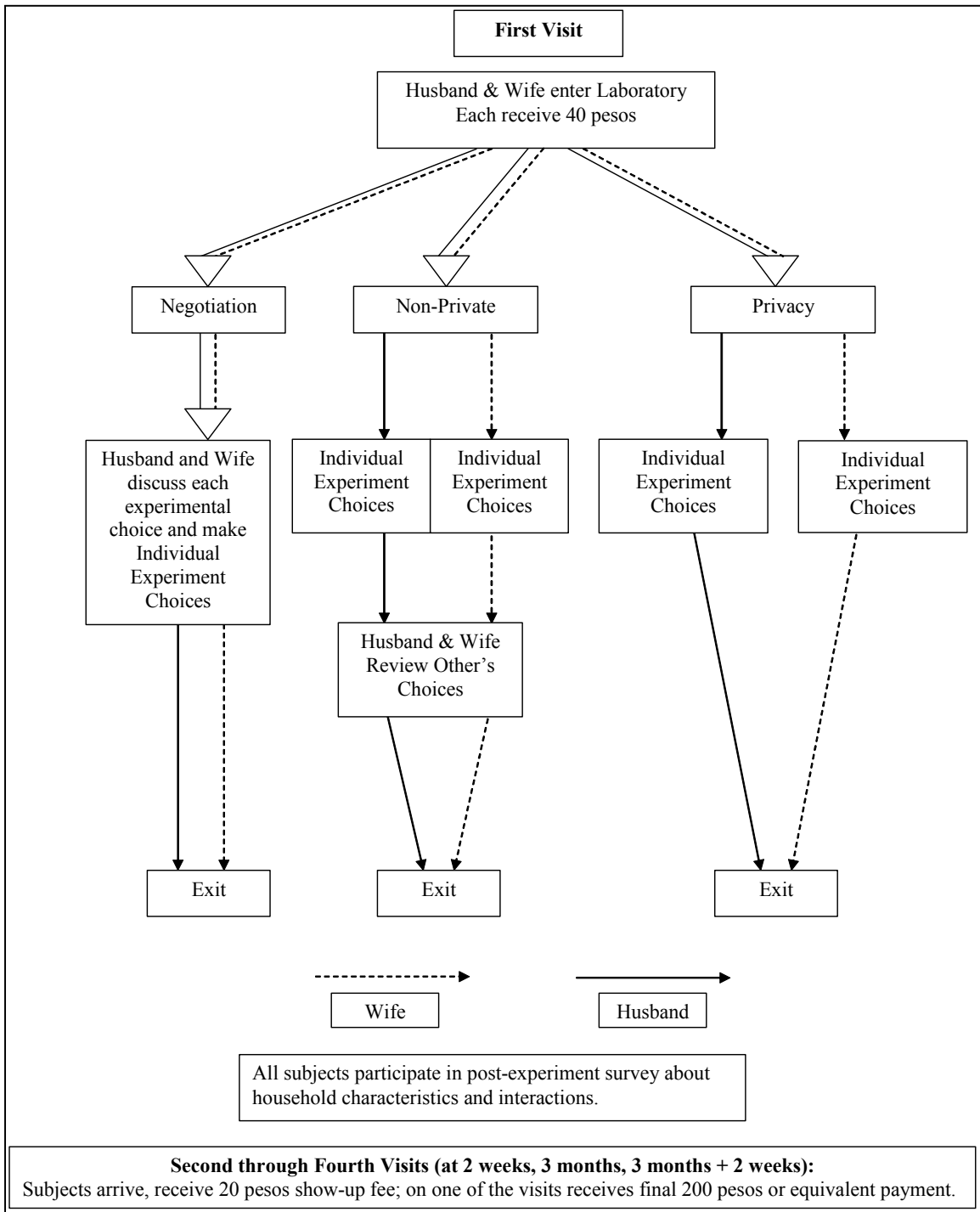
First Visit

Husband & Wife enter Laboratory
Each receive 40 pesos

Negotiation

Non-Private

Privacy

Husband and Wife discuss each experimental choice and make Individual Experiment Choices

Individual Experiment Choices

Individual Experiment Choices

Individual Experiment Choices

Individual Experiment Choices

Husband & Wife Review Other's Choices

Exit

Exit

Exit

- - - → Wife

——→ Husband

All subjects participate in post-experiment survey about household characteristics and interactions.

Second through Fourth Visits (at 2 weeks, 3 months, 3 months + 2 weeks):
Subjects arrive, receive 20 pesos show-up fee; on one of the visits receives final 200 pesos or equivalent payment.

Figure 1: Diagram of Experiment Design

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200 pesos cash. Subjects were then asked to value same priced certificates among the different goods. For example, subjects decided about getting a 200 pesos gift certificate for a "special good for self"[12] or getting 200 pesos directly deposited into a savings account. Subjects also decided about a 200 pesos gift certificate for food, reedeemable at whatever grocery store they choose, or getting 200 pesos directly deposited into a savings account. The final outcome, below, was essentially an eliciation of time preferences, in both short (now versus 2 weeks) and longer term (3 months vs 3 months+2 weeks) horizons[13]

For all savings deposit outcomes, subjects could choose to deposit it into their own account, their spouse's account or, if they didn't have an account, into a new account in their name. Subjects were also asked, in one of the decisions they made, to decide for their spouse what the spouse should do with the cash they receive today[14].

4   Results

Figure 4 describes the main results of the experiment for savings outcomes, by the three treatment conditions and for men and women separately, using Fisher's exact p-values. The first outcome

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[12] This gift certificate is only redeemable in the women's department, if and only if the bearer is a woman, and in the men's department, if and only if the bearer is a man. After several trials using different "private goods", this was what appeared to appeal to the broadest variety of both men and women as special, indulgent goods for themselves.

[13] Measuring time preference can be tricky; previous experiments on time preference have suffered from several confounding factors inhibiting clean interpretation of the results (see Frederick, Loewenstein, and O'Donoghue (2001) for a comprehensive review). Although it is impossible to address all of these factors, I am able to improve on previous time preference experiments in several significant ways. One major confounding factor is that subjects may choose the immediate reward because they don't trust that they would actually receive the later rewards. Because the experiments take place with bank clients and in conjunction with their bank, I am able to credibly offer larger sums of money in the future through post-dated bank checks signed by the bank manager. The experiments took place in a conference room at bank headquarters, with bank staff available to assure clients of their backing of future payments. Differential transactions costs may also be a reason to choose immediate rewards; I address this both by providing payments, through post dated checks, for each week and by requiring all subjects to come back 3 more times to the bank to "sign in" and receive 20 pesos (more than twice their fare to the bank) when they return: once in 2 weeks' time, once in 3 month's time, and once in 3 months + 2 week's time. Almost 90% of all subjects returned for these sign-in's and received their additional 20 pesos each time.

[14] Subjects were asked, through a series of discrete choices, for what amount of money should the spouse be willing to wait for two weeks, rather than getting the 200 pesos cash today. Subjects were told that if this decision was the one chosen, these choices would actually be implemented for their spouse. This decision, therefore, elicits a combination of the subject's desire for and their expectations of their spouse's behavior.
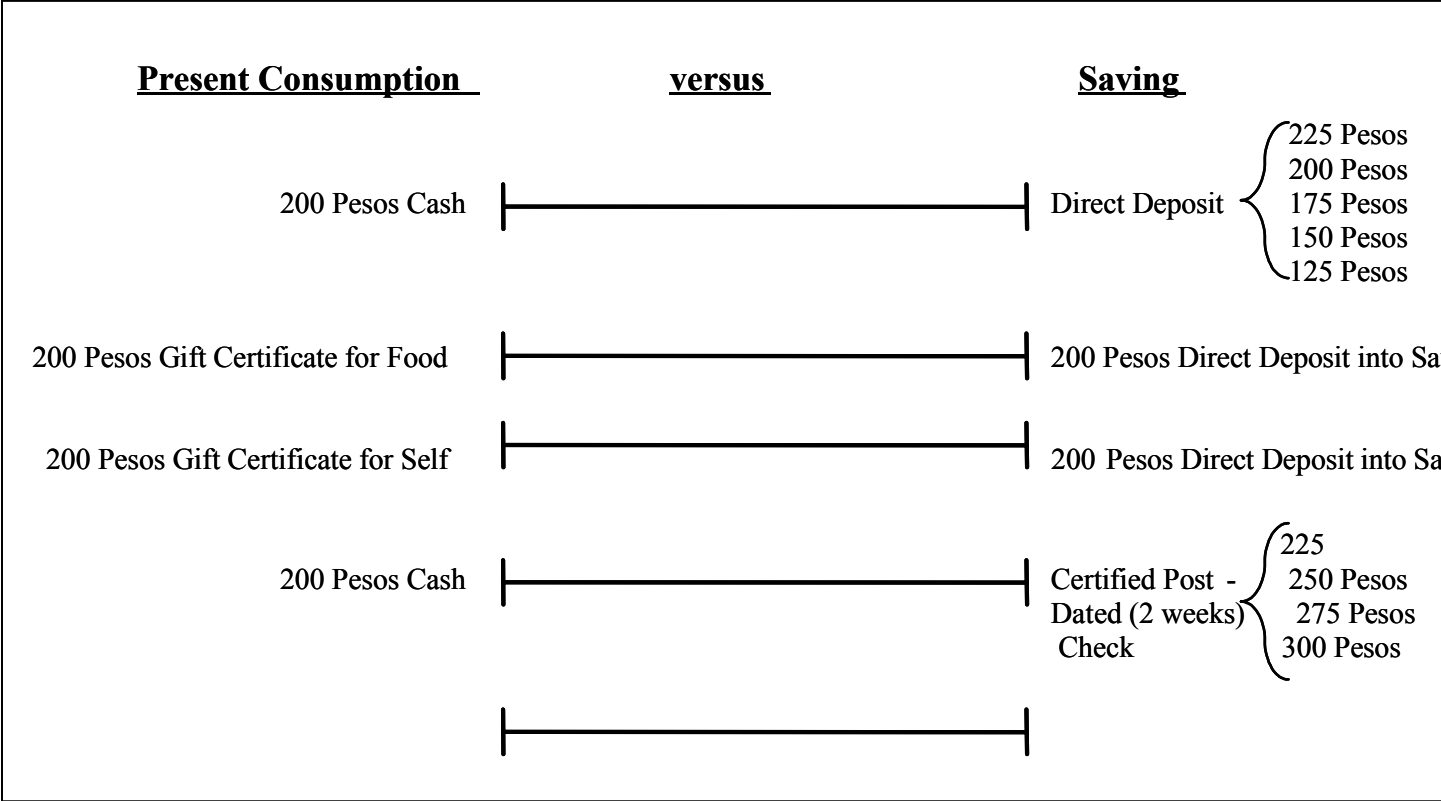
Present Consumption **versus** **Saving**

225 Pesos
200 Pesos
200 Pesos Cash ├─────────────────────┤ Direct Deposit ⟨ 175 Pesos
150 Pesos
125 Pesos

200 Pesos Gift Certificate for Food ├─────────────────────┤ 200 Pesos Direct Deposit into Sa

200 Pesos Gift Certificate for Self ├─────────────────────┤ 200 Pesos Direct Deposit into Sa

225
200 Pesos Cash ├─────────────────────┤ Certified Post - ⟨ 250 Pesos
Dated (2 weeks) 275 Pesos
Check 300 Pesos

├─────────────────────┤

Figure 2:

refers to the choices faced between getting 200 pesos in cash immediately after the experiment, or direct depositing varying quantities into a savings account at the bank. Subjects chose whether they wanted the money deposited into their exisiting account, a new account opened in their name, their spouse's account or a joint account–an outcome interesting in itself, and analyzed in Table 5.2. Using the strategy method, subjects revealed the range in which they were indifferent between receiving cash or receiving a direct deposit into savings. Figure 3 shows the distribution of this outcome variable by treatment type.

Figure 3: Distribution of Choices for Cash or Saving
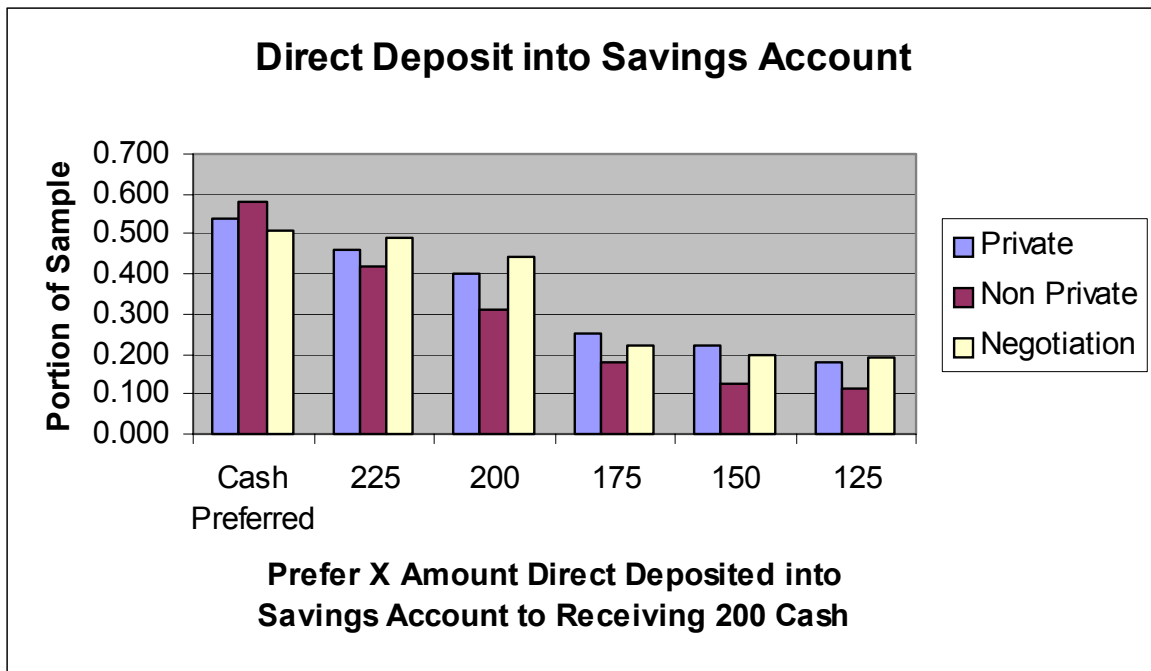
Subjects within each treatment condition tended to fall into three categories: those who always chose cash, to any amount offered for direct deposit into a savings account, those who choose direct deposit of 225 or 200 pesos above 200 cash, but choose 200 cash once the direct deposit amount went below 200 pesos, and those who were willing to choose a direct deposit of less than 200 pesos (

at 175, 150 and 125; as can be seen from the graph, the majority of subjects who were willing to go down to 175 pesos were willing to go all the way down to 125 pesos) rather than receive 200 pesos cash. These subjects were thus essentially sacrificing money in order to make sure it is deposited into the savings account[15].

Figure 4 describes these categories of the outcome variable, by treatment condition and by gender. The second outcome variable was a binary decision all subjects made between direct deposit into a savings account worth 200 pesos or a gift certificate for themselves worth 200 pesos. The third outcome variable was a binary decision between direct deposit into a savings account worth 200 pesos or a gift certificate for themselves worth 200 pesos. As Figure 4 reveals, men's decisions about savings- whether in exchange for cash, for a good for self, or for food- are strikingly sensitive to the condition under which they make the decision. For example, 75% of men in private choose to deposit 200 pesos in savings account rather than get a gift certificate for themselves, but only 41.7% of men choose to do so in the non-private condition –when their wives are in the room.

There are no significant differences between the men and women, in any of the three outcome measures, in Private or in Negotiation. In the NonPrivate condition, the differences between men and women on the outcome of savings over good for self is significant at 5% level and the difference on savings over food is significant at the 10% level. Couples tended to coordinate heavily on decisions in the negotiation condition. The correlation between husband's decisions and his wife's decisions is on average between 0.10 and 0.4 in the private and spousal presence conditions, and between 0.8-0.95 in the negotiation condition[16]. Table A.1 in Appendix A shows the differences between husband's and wive's decisions and how this difference is significantly exacerbated in the NonPrivate condition.

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[15]In debriefing surveys after the experiments, subjects who responded in this way explained that the direct deposit was "segurado" and used the popular Filippino expression "Inig ang kuarto"- the money is hot- to describe why they felt that they did not trust themselves to deposit the cash into the savings account on their own, despite being at the bank.

[16]When the outcome variables are aggregated at the household level and compared, household savings decreases significantly in the nonprivate condition- that is, wives cannot compensate fully for the decrease in the savings of their husbands.

	TREATMENT TYPE					
	Private		Non-Private		Negotiation	
	Males	Females	Males	Females	Males	Females
	N=48	N=48	N=48	N=48	N=50	N=50
Direct Deposit into Savings Account						
Prefer 200 Pesos Cash to Any Amount Direct Deposited into Savings Account	50.00%	56.30%	66.7%***	52.20%	54.00%	48.00%
Prefer Direct Deposit for 225 or 200 Pesos to 200 Pesos Cash	16.70%	25.00%	20.8%***	28.30%	26.00%	28.00%
Prefer Direct Deposit for 175, 150, or 125 Pesos to 200 Pesos Cash	33.30%	18.80%	12.5%***	19.60%	20.00%	24.00%
Prefer Direct Deposit over Self	75.00% 0	62.50%	41.70%***	60.40%	71.4%+++	70.00%
Prefer Direct Deposit over Food	60.40%	52.10%	21.70%***	41.70%	54.00%++-	56.00%

***Significant at 1%, when compared to privacy treatment

+++Significant at 1%, when compared to nonprivacy treatment

Prefer Direct Deposit over Self indicates individuals who preferred direct deposit into savings account over gift certificate for self.

Prefer Direct Deposit over Food indicates individuals who preferred direct deposit into savings over gift certificate for food.

Figure 4: Main Experimental Outcomes

4.1 Discussion

The most striking results from the main experimental outcomes are the degree and pattern of men's changing behavior. Men exhibit a sharp u-shaped pattern: a large proportion choose savings and few choose personal consumption (as defined either by cash, good for self, or food)[17] in Private, a much smaller proportion choose savings in Public and then a large proportion again choose savings in Negotiation. Recalling our predictions of the noncooperative and cooperative models on personal consumption of the spouse that has lower preference for the household good from Section 2, we can easily understand the strong increase in savings and decrease in personal consumption by men from the NonPrivate to the Negotiation condition that we see in 4. The results from the Private condition, however, suggest that private information may have been playing a different role from the one we had expected. Recall that we predicted that an individual with larger preference for personal consumption would be more likely to choose that in the Private condition. Instead we find that a large proportion of men chose savings over any form of consumption in the Private condition, but that this proportion decreased significantly once their choices were made public. This is not consistent with a model in which public information allows for ex-post punishment by the spouse, which would presumably cause individuals to make their choices closer to their spouses' when their choices would be public–or at least suggests that possible threats of ex-post punishment do not play a large role in men's decisions in this case.

The Privacy condition in the experiments created a situation in which spouses' choices and outcomes were not publicly revealed. The following section describes two alternative models for how private information could affect spouses' strategies. In both models, what is important is that spouses observe their spouse's outcomes in the Privacy condition with much more noise than in the Public condition, where they observed all the spouse's choices and his or her outcomes perfectly. In the Privacy condition, if subjects observed their spouse's outcome, they could not deduce with certainty whether their spouse had chosen that outcome or whether it had been "luck of the draw"

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[17]We refer to cash, gift certificate for self and food as "personal consumption" when obviously cash and food could be shared. To be sure, the u-shaped pattern is strongest and more pronounced for the tradeoff between the gift certificate for self–a purely selfish good- and savings. However, it also exists for the other consumption goods, suggesting that they are perhaps "imperfectly" selfish goods or goods which can still be enjoyed personally. Why savings is treated as a public/household good is revisited in the next section.

(as described in Section 3.1). Furthermore, they could not easily observe their spouse's outcome, the way they could in the Public condition, since spouses received their rewards in separate rooms, and there was uncertainty about whether the spouse had the same choices as them, whether they received the same amount of income, etc. We can assume that on average spouses had correct beliefs about what was happening to their partners, but there was intentionally more noise in the Privacy condition than in the Public condition. We now explore what effects this additional noise could have. The first model stresses that the noise is important because it made it more costly for one's spouse to investigate, placing the weight of importance on the observability of outcomes, and the second model stresses that the noise is important because it allows for noisy signaling of types, placing the weight of importance on the *responsibility* a subject has for the outcome he or she receives. These models describe two mechanisms through which changing information from Private to Public could affect savings in the pattern observed but both refer to changes created for the final bargaining situation; they therefore have similar implications for shifting from Public to Negotiation.

5 How does Private Information affect Savings Decisions?: Two Competing Models

5.1 Expropriation

In this model, private information is important to the extent to which it keeps outcomes less verifiable, contractible and therefore subject to household bargaining and expropriation. Imagine a husband coming home from work, where his income on average is common knowledge but each day's realization is his own private information, as is the case in informal sector occupations or businesses. He receives a positive shock to his income. He can either spend the additional money on the way home, and risk having his wife find out that he made extra money and spent it- in which case he would presumably face some punishment-, or he can turn it over to her and bargain over what is done with it. He will be less reluctant to turn over money when he has less control

over what is done with it, as can be the case when budgeting and saving is considered the wife's domain. An additional choice he has is to save the additional money in a place she doesn't know about; however, if she finds out about it, she can lay claim to it if she has more decision making power over savings. Thus, in households where wives are more responsible for savings, men might appear less willing to save- but only because their savings is essentially taxed.

Tables 5.2 and 5.2 show that, indeed, men with spouses who are more likely to make the savings decision - or even have more bargaining power in general - in the household exhibit a much sharper "u-shaped" effect from Private to NonPrivate than average. That is, the interaction of these household conditions with the treatment of making information public in the experiment causes men to save much less in the experiment. Furthermore, we can see from Table 5.2 that men are much more likely to put the money into their own accounts when they save in Private, as are women, in fact. In the Public condition, men switch to consuming and women switch to saving in a more public (spouse or joint) account. In the Negotiation condition, couples either consume jointly or save jointly, and coordinate on one person's account (usually the wife's) in which to deposit the money.

5.2 Why don't men "behave"? (in Public)

Men whose bargaining power is weak or whose wives make the decisions about savings would be much more likely to decrease their savings as outcomes appear observable. Indeed, it appears that this is exactly the case: men who report that their wives make the decisions in the household about whether to save or spend money are significantly less likely to choose savings in the nonprivate condition. The following table describes probit regressions for predicting the binary savings outcomes, using treatment conditions dummies and interactions with household structure. In households where wives make the decision about savings, the effect of the Nonprivate condition is even more significantly negative.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		MALE				**FEMALE**		
	Savings over Self	Savings over Food	Savings at 200+	Savings at less than 200	Savings over Self	Savings over Food	Savings at 200+	Savings at less than 200
Wife Decides Savings * Negotiation	0.050 (0.241)	-0.172 (0.228)	-0.147 (0.201)	-0.014 (0.181)	-0.023 (0.211)	-0.238 (0.191)	-0.362** (0.145)	-0.150 (0.108)
Wife Decides Savings * Non-Private	-0.455** (0.204)	-0.403*** (0.139)	-0.397*** (0.104)		0.321*** (0.088)	-0.024 (0.238)	-0.462*** (0.095)	-0.058 (0.175)
Wife Decides Savings	0.161 (0.158)	0.372** (0.157)	0.158 (0.162)	0.060 (0.137)	-0.228 (0.152)	0.018 (0.156)	0.043 (0.156)	-0.082 (0.116)
Non-Private	-0.241** (0.115)	-0.229** (0.112)	-0.062 (0.114)	-0.143* (0.081)	-0.130 (0.117)	-0.110 (0.119)	0.170 (0.118)	0.016 (0.096)
Negotiation	-0.051 (0.118)	-0.028 (0.117)	0.002 (0.116)	-0.115 (0.090)	0.083 (0.117)	0.115 (0.121)	0.205* (0.119)	0.091 (0.099)
Observations	145	146	146	136	145	145	145	143
Mean Dependent Variable	0.63	0.47	0.43	0.24	0.65	0.50	0.48	0.21

Notes:

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Wife decides savings: dummy if subject answered "Wife" to question: "Who decides whether money will be saved or spent on something?"

Non-private: dummy for random assignment to non-private treatment condition.

Negotiation: dummy for random assignment to negotiation treatment condition.

Excluded dummy is for random assignment to privacy treatment condition.

Wife Decides Savings*Nonprivate=1 in (4) predicts a zero outcome for "Savings at less than 200" perfectly and is therefore dropped in the probit regression.

Dependent variables:

Saving over self: dummy for choosing direct deposit into savings account of 200 pesos over gift certificate to self worth 200 pesos.

Savings over food: dummy for choosing direct deposit into savings account over gift certificate for food.

Savings at 200+: dummy for choosing direct deposit off 225 pesos and/or 200 pesos over receiving 200 pesos cash.

Savings at less than 200: dummy for choosing direct deposit of less than 200 pesos (175, 150, 125) over receiving 200 pesos cash.

Figure 5:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		MALE				**FEMALE**		
	Savings over Self	Savings over Food	Savings at 200+	Savings at less than 200	Savings over Self	Savings over Food	Savings at 200+	Savings at less than 200
Hpower * Negotiation	0.046 (0.089)	-0.002 (0.088)	0.156* (0.088)	-0.038 (0.068)	0.048 (0.080)	0.035 (0.084)	0.029 (0.083)	-0.051 (0.071)
Hpower * Non-Private	0.022 (0.095)	0.128 (0.101)	0.198** (0.098)	0.060 (0.078)	0.146 (0.091)	0.234** (0.102)	0.015 (0.095)	0.127 (0.085)
Hpower	-0.014 (0.072)	-0.056 (0.070)	-0.120* (0.073)	-0.037 (0.051)	-0.048 (0.061)	-0.081 (0.067)	-0.040 (0.066)	-0.009 (0.055)
Non-Private (0-1)	-0.339*** (0.101)	-0.341*** (0.094)	-0.182* (0.099)	-0.180*** (0.064)	-0.002 (0.099)	-0.120 (0.104)	0.038 (0.104)	-0.013 (0.086)
Negotiation (0-1)	-0.026 (0.107)	-0.091 (0.104)	-0.038 (0.102)	-0.115* (0.070)	0.076 (0.096)	0.036 (0.103)	0.068 (0.102)	0.030 (0.085)
Observations	142	143	143	143	144	144	144	142
Mean Dependent Variable	0.62	0.48	0.42	0.20	0.65	0.49	0.49	0.21

Notes:

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

dprobit estimation, calculated at the mean.

Hpower: Index of bargaining power of husband, based on difference in age, education, and income, calculated as a score through principal components analysis.

Figure 6:

	TREATMENT TYPE					
	Private		**Non-Private**		**Negotiation**	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Self vs Savings	**N=44**	**N=46**	**N=44**	**N=43**	**N=37**	**N=39**
Good For Self	27.27%	39.13%	63.64%	44.19%	37.84%	38.46%
Savings in Own Account	47.73%	52.17%	15.91%	27.91%	27.03%	43.59%
Savings in Spouse's/Joint Account	25.00%	8.70%	20.45%	27.91%	35.14%	17.95%
Cash vs Savings	**N=47**	**N=48**	**N=48**	**N=44**	**N=50**	**N=50**
Cash	51.06%	56.25%	66.67%	54.55%	54.00%	48.00%
Savings in Own Account	31.91%	39.58%	18.75%	22.73%	16.00%	40.00%
Savings in Spouse's/Joint Account	17.02%	4.17%	14.58%	22.73%	30.00%	12.00%
Food versus Savings	**N=46**	**N=46**	**N=44**	**N=45**	**N=39**	**N=39**
Food	41.3	50	79.55	62.22	58.97	56.41
Savings in Own Account	39.13	43.48	11.36	17.78	15.38	35.9
Savings in Spouse's/Joint Account	19.57	6.52	9.09	20	25.64	7.69

Figure 7:

The following presents a simple model of how we might observe such treatment effects from the Private to Public condition.

5.2.1 Expropriation Model Setup

Let us assume that the husband receives some income but its exact realization is not observed by his spouse, although its distribution is know. We create a discrete simple form:

$$I\epsilon\{I_1, I_2\}$$

(for simplicity, we assume the starkest distribution of I: $I_1 = 0; I_2 = 1$)

We set up a binary choice where he can choose to either save or not save the amount he receives:

$$S\epsilon\{0, I\}$$

If the money is saved, however, it must be distributed according to some sharing rule. The share of savings that goes to the spouse can be determined both by the extent to which the spouse is the one in the household that undertakes the "savings services" for the family, as well as the general bargaining power of the spouse. For now, we will assume an exogenous sharing rule, that she receives some share ϕS of whatever is saved. To simplify, we assume that this is a share of all observable savings done by the members of the household. By this sharing rule, she also has a right to a share of savings that is not perfectly observable, if she can find out about it and verify that it is there. In other words, if the savings are observable and verifiable, they become a household good. She has some cost of finding out whether her spouse has savings, if it is not initially perfectly observable, e. We can think of this as the cost of finding his passbook, going to the bank, or of pestering him until he tells her. The probability that she finds out about his private savings is: f(e), and the expected value of the savings is E(S).

She thus has to choose e such that:

$$\max \phi E(S) f(e) - e$$

Her First Order Condition is therefore:

$$\phi f^{'}(e^*) E(s) = 1$$

The husband, knowing that she will exert e* to find out whether he has savings, will save so long as his expected benefit from saving exceeds his cost,c:

$$b(1 - f(e^*)\phi) > c$$

5.2.2 Private vs Public: Observability of Savings

In the Privacy condition, she will have to pay some cost to finding out whether he saved or not because it was not immediately observable from the experiment. In the Public condition, the search costs become zero since all outcomes were immediately observable, and the probability that she will find out about his savings, f(e*), becomes 1. Once his savings are fully observable and verifiable, they are contractible- and therefore subject to the sharing rule discussed above. Thus, he will save in the Public condition if and only if: $b(1 - \phi) > c$.

Proposition 1 *The man will save in the Privacy condition but not in the Public condition so long as the ratio of his cost of savings to his benefit from savings falls in the following range:*

$$(1 - f(e^*)\phi) > \frac{c}{b} > 1 - \phi$$

5.3 Strategic Incompetence and Signaling

An alternative model of the importance of private information still relies on private information creating "gaming/strategizing" opportunities when members of a household have different prefer-

ences, but works through a different mechanism than keeping outcomes less observable. Instead, this model posits that when there is a household good to be provided, especially if it requires some sacrifice of personal consumption, there is an incentive to try to get the other person to provide it. One way to do this in an intimate, repeated interaction is to pretend to be incompetent at providing the good, thereby inducing the other person to either tolerate an incompetently provided good indefinitely or to provide it themselves in subsequent periods. In such a situation, individuals would embrace opportunities to signal that they are incompetent, even if in fact they are perfectly competent at providing the good, in order to create a reputation that the spouse would need to take into account when deciding whether she should contribute to providing the good.

5.3.1 Strategic Incompetence Model Setup

1. There are 2 players, H (husband) and W (wife)

2. Wife's "saver" type is known. The husband's type is private information. There are two possible types, $\theta \epsilon \{S,C\}-$ that is, someone who likes savings and has low costs (S) or someone who dislikes savings and has high costs associated with savings[18] , (C).

3. The distribution of types is common knowledge. The probability ($\theta = S) = p$.

4. Type C has no discretion over strategies; he always chooses S_L: low savings effort

5. Type S can choose high savings S_H or low savings effort S_L

5.3.2 Timing

1. There are two games: the first is the experiment which provides a particularly salient opportunity (in the Public condition) for the husband to signal his type to the wife. After the experiment, there is a regular "savings game" in which the wife, based on her updated priors

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[18]In my surveys of the subjects individually, I asked who is the one in the household who takes the savings decisions and/or does the budgeting. For the men who answered that their wives make the savings decisions, I asked why they handed over their money to their wives to carry out this service. Their answers were, for eg, "doing the books gives me a headache", "I'll spend the money if I have it but she's very good at controlling the money", etc. When I asked their wives why their husbands don't do the savings and budgeting, they replied with the same answers, implying that both members of the couple believed that the husband had high costs/was incompetent at doing this work.

from the husband's signal, decides whether to save (or carry out the "savings services") for the family.

2. Experiment is played: husband signals type to wife.

3. Wife updates prior based on husband's signal

4. Savings "game" ensues: wife moves first, and can decide to put in high savings effort to provide the service (S_H) or low savings effort. If she knows that he is a high saver type, she can be sure that he will save even if she doesn't.

5. Game ends

6. Time ends

5.3.3 Game Structure under Public versus Private Experimental Conditions
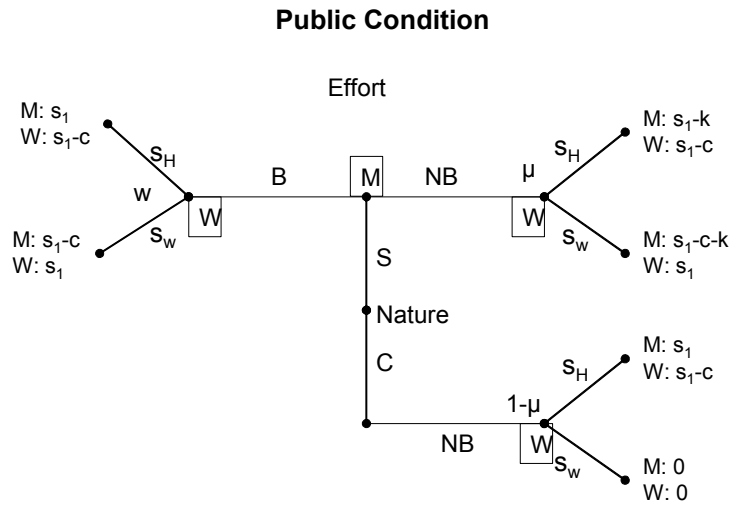
Public Condition

Figure 8:

In the Public Condition, all information about choices is publicly observable. Recall that in the Public condition, the spouse not only observes the outcome which is a result of the roll of the die, but also all the choices his or her spouse made. Thus "B" (=deposit money in the Bank) and "NB" (=Not Bank) represent actual choices taken by the spouse. "Luck of the draw" doesn't obscure how the outcome observed by the spouse is related to the choices of the individual, because the spouse can observe all the choices. If the wife sees the outcome B="Bank", she knows that he put high savings effort in and must be Type S, because only Type S has the option of choosing B. However, if she sees NB="Not Bank", she doesn't know if it's because he's Type S and just decided not to save (ie, put in low effort) or that he's Type C. S is the utility each member of the household gets from the savings service, c is the cost whoever does the saving has to pay, and k is the cost of a high saver type, S, having to pretend he's a low saving type, C. k is much smaller than c. The high saver types, therefore, have to make the tradeoff between losing out a bit now from not getting to save (=k), but sending out a signal that can confirm an incompetent reputation and thus save him the cost of having to be the one to carry out the savings in the future (=c).

If the wife sees B, she forms a posterior π equal to:

$$\pi = \Pr ob(\theta = S|B) = \frac{\Pr ob(B|\theta = S) * \Pr ob(\theta = S)}{\Pr ob(B|\theta = S) * \Pr ob(\theta = S) + \Pr ob(B|\theta = C) * \Pr ob(\theta = C)}$$

In the Public Condition, $\pi = 1$ since only Type S can take action B. This result does not hold necessarily hold in the Private condition, where, due to noise, there's a positive probability that action B is seen from both types.

Equivalently, if the wife sees NB, she forms a posterior μ equal to:

$$\mu = \Pr ob(\theta = S|NB) = \frac{\Pr ob(NB|\theta = S) * \Pr ob(\theta = S)}{\Pr ob(NB|\theta = S) * \Pr ob(\theta = S) + \Pr ob(NB|\theta = C) * \Pr ob(\theta = C)}$$

This posterior belief is endogenous to the equilibrium: in a separating equilibrium, it is 0, and in a pooling equilibrium it is equal to p.

Proposition 2 *In the Public Condition, the only equilibrium in pure strategies be a Pooling Equilibrium, in which both Types S & C choose to play NB, where both types decide not to save, so long as*

$$1 - \frac{c}{s} > p$$

Proof. *Assume there exists a Separating Equilibrium, where Type C chooses NB and Type S chooses B. The wife, upon seeing B, will choose S_L, because she has updated her belief that he is a high savings type and she can therefore put in low effort ($s>s-c$). However, this is not an equilibrium strategy for the husband, who would prefer to chooose NB in order to have the possibility that she will choose S_H. Hence, there is no pure strategy separating equilibrium. Under a pooling equilibrium, she will choose S_H upon seeing action NB so long as $s_1 - c > \mu s = 1 - \frac{c}{s} > p$.* ∎

In the Private condition, we add noise in that choices are no longer necessarily responsible for outcomes. There is thus some chance, say σ, that the spouse received "the luck of the draw" and that the signal was completely uninformative. This is the probability that one would observe B even if spouse chose NB, and vice versa.

Now if the wife sees B, she forms a posterior π equal to:

$$\pi = \Pr ob(\theta = S|B) = \frac{\Pr ob(B|\theta = S) * \Pr ob(\theta = S)}{\Pr ob(B|\theta = S) * \Pr ob(\theta = S) + \Pr ob(B|\theta = C) * \Pr ob(\theta = C)}$$

$$\pi = \Pr ob(\theta = S|B) = \frac{(1-\sigma)p}{(1-\sigma)p + \sigma(1-p)} = \frac{(1-\sigma)p}{p + \sigma - 2\sigma p}$$

and similarily she forms a posterior μ equal to:

$$\mu = \Pr ob(\theta = C|NB) = \frac{\sigma p}{1 + (p + \sigma - 2\sigma p)}$$
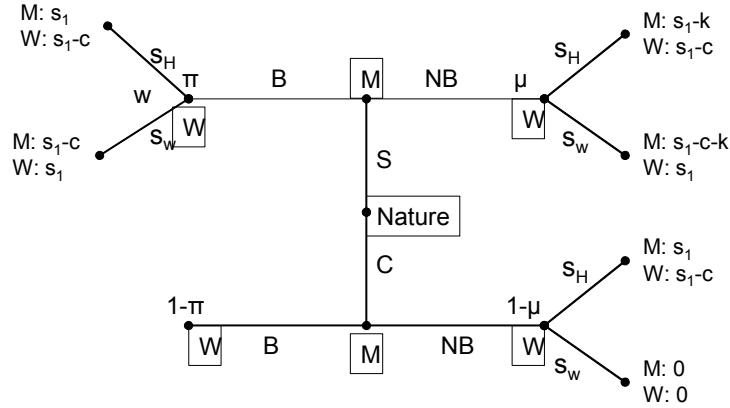
Private Condition

Figure 9:

Proposition 3 *In the Private Condition, the only equilibrium in pure strategies is a separating equilibrium, in which high saving men ($\theta = S$) save and low saving men ($\theta = S$) don't save, so long as:*

$$1 - \frac{c}{s} > \pi$$
$$1 - \frac{c}{s} > \mu$$

The intuition behind this is as follows: Increasing the noise creates a situation where the wife cannot infer from the signal B that her husband is a high-saving type, and thus she still has some likelihood of playing S_H in the subsequent savings game. This allows her husband to play B, if he's a high-saver type, as an equilibrium strategy, without worrying this will, in a sense, take a way his freedom to be a low-saver type and free ride on his wife's savings in future periods.

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5.3.4 Discussion

A model of strategic incompetence suggests that, in the absence of the ability to make Coasian transfers and binding contracts, couples could try to hide their underlying cost or preference for a household good in order to induce the other spouse to provide it. It suggests that men who appear like they don't like saving in the NonPrivate condition could actually be those same men who save in the Private Condition, when they won't held as responsible for their actions, and thus won't be sending out a clear signal that will affect their future reputation. This is consistent with the treatment interaction tables introduced in the previous section: men whose wives make the savings decisions are likely to be in households where this sort of game process has happened before, where they have a reputation for being relatively more incompetent at providing the savings, and thus see no reason to change that reputation–although it is likely that they enjoy savings more than they let on.

6   Supplemental Data

Future work will explore further treatment interactions. I have gathered substantial data on these households. Along with the experimental outcomes described in full in Appendix A.4, I gathered survey data from subjects in post-experiment interviews, conducted either in the "lab" after experiments or in the homes of the subjects, individually with each spouse. These surveys include measures of education, occupation, income variability, immediate money needs, how income is received and how much, if any, is given to spouse, and extensive questions on decision making and conflict in the household, including perceptions of patience, impulsiveness, and responsibility of one's spouse and problems with liquor and gambling. Appendix A.2 provides some summary statistics from this survey. For approximately 100 of my households, I have extensive data from a baseline survey regarding level of household income, individual income, household physical assets, including consumer durables, as well as enterprise assets for those who own a business and all savings, loans, and financial assets information, and many household decision making variables.

7 Conclusion

Because couples are randomly assigned to different treatment conditions within my experiment, I can plausibly take preferences as fixed and observe the changes in behavior caused by the context of decision making. I find substantial evidence for what appears to be strategic behavior when the spouse is in the room–but which has different outcomes depending on the form of strategic interaction that is available to the couple. This suggests that previous empirical work which observes household outcomes and changes in member's incomes to draw conclusions about underlying preferences should be interpreted with caution. Much more should be understood about the degree of information available within the household, the ways in which this information can affect strategies, and what types of strategic possibilities exist.

A deeper and more nuanced understanding of such interactions is critical, particularly in light of the increasing number of development programs which focus exclusively on women. Gaining a better understanding of household decision-making is critical to ensuring that income generating policies become more sensitive to intra-household dynamics and that programs aimed at improving livelihood have a more sustainable and balanced impact.

A Appendix

A.1   Differences in Husband and Wife's Decisions

A.2   Summary Statisitics from Subject Survey

A.3   Savings Experimental Outcomes by Account Status

A.4   Full Experimental Outcomes

	TREATMENT TYPE		
	Private	Private	Negotiation
Wife's Choice - Husband's Choice	N=48	N=48	N=50
Prefer Direct Deposit into Savings Account for 225 or 200 Pesos to 200 Pesos Cash	**-0.063**	**0.1667***	**0.060**
Standard Deviation	-0.700	0.592	0.312
[min, max]	[-1,1]	[-1,1]	[-1,1]
Prefer Direct Deposit into Savings Accountfor 175, 150, or 125 Pesos to 200 Pesos Cash	**-0.137**	**0.0652***	**0.04****
Standard Deviation	0.612	0.530	0.281
[min, max]	[-1,1]	[-1,1]	[-1,1]
Prefer Direct Deposit over Gift Certificate for Self	**-0.126**	**0.1875****	**-0.020++**
Standard Deviation	0.606	0.604	0.142
[min, max]	[-1,1]	[-1,1]	[-1,0]
Prefer Direct Deposit over Gift Certificate for Food	**-0.084**	**0.1458****	**0.020**
Standard Deviation	0.613	0.542	0.245
[min, max]	[-1,1]	[-1,1]	[-1,1]
Prefer Gift certificate for Food over Gift Certificate for Self	**0.116**	**0.208**	**0.02+++**
Standard Deviation	0.481	0.501	0.141
[min, max]	[-1,1]	[-1,1]	[0,1]
Prefer 200 Pesos Now over 225+ Later	**0.000**	**0.178**	**0.104**
Standard Deviation	0.700	0.646	0.307
[min, max]	[-1,1]	[-1,1]	[0,1]

Notes:

Bold indicates mean of the variable.

***Significant at 1%, when compared to Privacy treatment

**Significant at 5%, when compared to Privacy treatment

+++Significant at 1%, when compared to Non-Private treatment

++Significant at 5%, when compared to Non-Private treatment

Each variable is constructed from two dummy variables of the experimental outcomes in Table 1: the husband's decision on the outcome variable subtracted from the wife's decision on the outcome variable. These couple-level variables can take on the discrete values of -1, 0 and 1; -1, for example, would denote that the husband chose in preference for the outcome, getting a 1, and the wife chose not, getting a zero.

Figure 10:

	Mean (St. Dev)	
	Males (N=146)	*Females (N=146)*
Financial Management		
Spouse Holds the Income in Household	0.836	0.048
	(0.372)	(0.215)
Give Spouse All the Income	0.582	0.000
	(0.495)	0.000
Give Spouse Some of Income	0.849	0.007
Wife Does Budgeting in Family	0.801	0.717
	(0.400)	(0.452)
Decision Making and Bargaining Power		
Wife Makes Savings Decisions in Household	0.493	0.545
	(0.500)	(0.499)
Wife Makes Decisions about Major Purchases (purchases of house, land, etc.)	0.390	0.460
	(0.490)	(0.500)
Couple has conflicts over money	0.356	0.393
	(0.481)	(0.490)
Wife Makes More Income than Husband	0.308	0.262
	(0.463)	(0.441)
Spousal Control Problems		
Problem Spouse [1]	0.164	0.276
	(0.372)	(0.448)
Problem Self [2]	0.253	0.262
	(0.436)	(0.441)
Spouse is Irresponsible	0.308	0.497
	(0.463)	(0.502)
Spouse is Impulsive	0.336	0.372
	(0.474)	(0.485)
Men are More Impulsive than Women	0.568	0.497
	(0.497)	(0.502)
Women are More Impulsive than Men	0.171	0.297
	(0.378)	(0.458)

[1] *Spouse with liquor, gambling, or extreme spending problems*
[2] *Self with liquor, gambling, or extreme spending problems*

Figure 11: Summary Statistics from Supplemental Survey

	TREATMENT					
	Private		**Non-Private**		**Negotiation**	
	Males	**Females**	**Males**	**Females**	**Males**	**Females**
	N=48	**N=48**	**N=48**	**N=48**	**N=50**	**N=50**
Gift Certificate for Self						
Gift Certificate Less Than 200 over 200 cash or GC of 200+	12.8%	13.0%	8.5%	4.2%	2.0%**	2.0%**
Gift Certificate for Food over Gift Certificate for Self	77.1%	89.6%	70.8%	91.7%	86%+	88%
Own Savings Account **Direct Deposit of Less than 200 pesos**	33.3%	18.8%	12.50%***	19.6%	20.0%	24.0%
for Green Bank Account Holders	27.8%	13.6%	11.7%	18.8%	10.0%	38%**
for NonAccount Holders	36.7%	24.0%	13.3%**	20.0%	26.7%	4.7%*
Direct Deposit into Own Savings Account over Gift Certificate for Self	75.0%	62.5%	41.70%***	60.4%	71.4%+++	70.0%
for Bank Account Holders	78.0%	73.0%	59.0%	71.0%	65.0%	76.0%
for NonAccount Holders	73.0%	56.0%	33%***	55.0%	76%+++	62.0%
Direct Deposit into Own Savings Account over Gift Certificate for Food	60.4%	52.1%	21.70%***	41.7%	54%+++	56%
for Bank Account Holders	67.0%	50.0%	47.0%	42.0%	45.0%	72%
for NonAccount Holders	57.0%	52.0%	17%***	42.0%	60%+++	33%
Deposit Into Spouse's Account	0.154	0.048	0.125	0.227	0.522++***	0.154

***Significant at 1%, when compared to privacy treatment

** Significant at 5%, when compared to privacy treatment

* Significant at 10%, when compared to privacy treatment

"+++ Significant at 1%, when compared to nonprivacy treatment

"++ Significant at 5%, when compared to nonprivacy

Bank Account holders in each condition:N=19-20

Non-Account holders in each condition:N=25-30

Figure 12:

	TREATMENT TYPE					
	Private		*Non-Private*		*Negotiation*	
	Males	**Females**	**Males**	**Females**	**Males**	**Females**
	N=48	**N=48**	**N=48**	**N=48**	**N=50**	**N=50**
Gift Certificate for Self Gift Certificate Less Than 200	12.77%	13.04%	8.51%	4.17%	2.00%**	2.04%**
Own Savings Account Gift Certificate Less Than 200	33.33%	18.75%	12.50%***	19.57%	20.00%	24.00%
Child's Savings Account Gift Certificate Less Than 200	25.53%	20.83%	18.75%	25.00%	18.00%	16.00%
Gift Certificate for Food Gift Certificate Less Than 200	12.50%	16.67%	14.58%	4.17%	4.00%	6.00%
Gift Certificate for Food over Gift Certificate for Self	77.10%	89.60%	70.80%	91.70%	86.00%	88.00%
Direct Deposit into Own Savings Account over Gift Certificate for Self	75.00%	62.50%	41.70%***	60.40%	71.40%+++	70.00%
Direct Deposit into Child's Savings Account over Gift Certificate for Self	53.20%	79.20%	54.20%	68.80%	60.00%	58.00%**
Direct Deposit into Own Savings Account over Gift Certificate for Food	60.40%	52.10%	21.70%***	41.70%	54.00%+++	56.00%
Direct Deposit into Child's Savings Account over Gift Certificate for Food	52.20%	66.00%	52.10%	56.30%	46.00%	50.00%*
Direct Deposit into Child's Savings Account over Direct Deposit into Own Savings Account	54.20%	72.90%	52.10%	59.60%	46.00%	48.00%+++
Patient	66.70%	64.60%	60.40%	79.20%*	64.00%	74.00%
Impatient	6.30%	8.30%	10.40%	4.20%	6.00%	6.00%
Impatient Now, Patient Later	37.50%	35.40%	37.50%	37.50%	40.00%	32.00%

***Significant at 1%, when compared to privacy treatment
** Significant at 5%, when compared to privacy treatment
* Significant at 10%, when compared to privacy treatment
"+++ Significant at 1%, when compared to nonprivacy treatment
"++ Significant at 5%, when compared to nonprivacy

Figure 13:

References

[1] Ainslie, George, Picoeconomics: The Strategic Interaction of Succesive Motivational States within the Person (New York: Cambridge University Press, 1992).

[2] Ashraf, Nava, Iris Bohnet and Nikita Piankov, "Is Trust a Bad Investment?", Kennedy School of Government Working Paper No. 03-047, November 2003.

[3] Ashraf, Nava, Nathalie Gons, Dean Karlan and Wesley Yin, "A Review of Commitment Savings Products in Developing Countries", Asian Development Bank Economics and Research Department Working Paper No. 45, July 2003.

[4] Ashraf, Nava, Dean Karlan, and Wesley Yin, "Getting Odysseus to Save: Evidence from a Field Experiment on Savings in the Philippines", mimeo, Jan, 2004.

[5] Anderson, C. Leigh, Maya Dietz, Andrew Gordon, and Marieka Klawitter, "Debt and Discount Rates in Vietnam," University of Washington, 2002.

[6] Anderson, Siwan, and Jean-Marie Baland, "The Economics of Roscas and Intra-Household Resource Allocation," Quarterly Journal of Economics, CXVII (2002), 963-995.

[7] Andreoni, James, and Lise Vesterlund, "Which Is the Fair Sex? Gender Differences in Altruism," Quarterly Journal of Economics, CXVI (2001), 293-312.

[8] Angeletos, D., D. Laibson, A. Repetto, J. Tobacman, and S. Weinberg, "The Hyperbolic Buffer Stock Model: Calibration Simulation, and Empirical Evaluation," J. of Economic Perspectives, XV (2001), 47-68.

[9] Barsky, Robert B., F. Thomas Juster, Miles S. Kimball, and Matthew D. Shapiro, "Preference Parameters and Behavioral Heterogenity: An Experimental Approach in the Health and Retirement Study," Quarterly Journal of Economics, CXII (1997), 537-579.

[10] Becker, Gary, "A Theory of Social Interactions", Journal of Political Economy, December, 1974, 82, 1063-94.

[11] Becker, G., A Treatise on the Family (Harvard University Press, Cambridge, Mass. , 1981).

[12] Becker, Gary S., and Casey B. Mulligan, "The Endogenous Determination of Time Preference," Quarterly Journal of Economics, CXII (1997), 729-758.

[13] Benzion, Uri, Amnon Rapoport, and Joseph Yagil, "Discount Rates Inferred from Decisions: An Experimental Study," Management Science, XXXV (1989), 270-284.

[14] Berman, Eli, and Zaur Rzakhanov, "Fertility, Migration and Altruism," National Bureau of Economic Research Working Paper No. w7545, 2000.

[15] Besharov, Gregory, and Bentley Coffey, "Reconsidering the Experimental Evidence for Quasi-Hyperbolic Discounting," Working Paper, Duke University, 2003.

[16] Bourguignon, F., M. Browning, P-A Chiappori, and V. Lechene, "Intra-Household Allocation of Consumption: A Model and Some Evidence from French Data," Annales D'Economie et de Statisque, XXIX (1993), 137-156.

[17] Browning, Martin, Francois Bourguignon, Pierre-Andre Chiappori, and Valerie Lechene, "Income and Outcomes: A Structural Model of Intrahousehold Allocation," Journal of Political Economy, CII (1994), 1067-1096.

[18] Cebu Longitudinal Health and Nutrition Study Team. 1994-5. "Cebu Longitudinal Health and Nutrition Survey: Study Description."

[19] Chiappori, Pierre-Andre, "Collective Labor Supply and Welfare," Journal of Political Economy, C (1992), 437-467.

[20] Chiappori, Pierre-Andre, "Rational Household Labor Supply," Econometrica, LVI (1988), 63-90.

[21] Croson, Rachel, and Nancy Buchan, "Gender and Culture: International Experimental Evidence from Trust Games," American Economic Review, LXXXIX (1999), 386-391.

[22] Croson, Rachel, Melanie Marks, and Jessica Snyder, "Groups Work for Women: Gender and Group Identity in the Provision of Public Goods," 2003.

[23] DellaVigna, Stefano, and Ulrike Malmendier, "Contract Design and Self-Control: Theory and Evidence," Harvard University mimeo, 2003.

[24] Duflo, Esther, "Grandmothers and Granddaughters: Old Age Pension and Intra-Household Allocation in South Africa," World Bank Economic Review, XVII (2003), 1-25.

[25] Duflo, Esther, and Christopher Udry, "Intrahousehold Resource Allocation in Côte d'Ivoire: Social Norms, Separate Accounts and Consumption Choices," Bureau for Research in Economic Analysis of Development Working Paper No. 016, 2003.

[26] Echavez, C.R. 1996. Women and Factory Work: A Case in Cagayan de Oro City, Philippines. Unpublished Thesis. The Australian National University. Canberra, Australia.

[27] Feingold, Alan, "Gender Differences in Personality: A Meta-Analysis," Psychological Bulletin, CXVI (1994), 429-456.

[28] Frederick, Shane, George Loewenstein and Ted O'Donoghue, Journal of Economic Literature, 40, 351-401, (2002).

[29] Godoy, Ricardo, and William R. Leonard, Karishna Patel, Elizabeth Byron, Lilian Apaza, Eddy Pérez, Victoria Reyes-García, Vincent Vadez, and David Wilkie, "Socio-Economic Determinants of Patience: Evidence from a Foraging-Horticultural Society in the Bolivian Amazon," Brandeis University, 2003.

[30] Godoy, Ricardo, and William R. Leonard, Karishna Patel, Elizabeth Byron, Lilian Apaza, Eddy Pérez, Victoria Reyes-García, Vincent Vadez, and David Wilkie, "Why Do Parents Disagree When Investing in Daughters and Sons? Theory and Evidence from a Foraging-Horticultural Society in the Bolivian Amazon," Brandeis University, 2003.

[31] Goldstein, Markus, Alain de Janvry and Elizabeth Sadoulet, "Is a Friend in Need a Friend Indeed? Inclusion and Exclusion in Mutual Insurance Networks in Southern Ghana", Working Paper, Department of Agricultural Economics, University of California, Berkeley, 2001

[32] Goldstein, Markus, and Christopher Udry, "Gender and Land Resource Management in Southern Ghana," Working Paper, Yale University, 1999.

[33] Goldstein, Markus, and Christopher Udry, "Gender, Land Rights and Agriculture in Ghana," Working Paper, 2002.

[34] Gugerty, Mary Kay, "You Can't Save Alone: Testing Theories of Rotating Savings and Credit Associations in Kenya," Working Paper, University of Washington, 2003.

[35] Hindin, M.J., and L. Adair, "Who's at Risk? Factors Associated with Intimate Partner Violence in the Philippines," Social Science and Medicine, LV (2002), 1385-1399.

[36] Hoddinott, John, and Lawrence Haddad, "Does Female Income Share Influence Household Expenditures? Evidence from Côte d'Ivoire," Oxford Bulletin of Economics and Statistics, LVII (1995), 77-96.

[37] Hoff, Karla, and Priyanka Pandey, "Why Are Social Inequalities So Durable? An Experimental Test of the Effects of Indian Caste on Performance," World Bank mimeo, 2003.

[38] Horowitz, John K., "A Test of Intertemporal Consistency," Journal of Economic Behavior and Organization, XVII (1992), 171-182.

[39] Khandker, Shahidur R, Fighting Poverty with Microcredit Experience in Bangladesh (New York: Oxford University Press for the World Bank, 1998).

[40] Kirby, Kris N., Ricardo Godoy, Victoria Reyes-García, Elizabeth Byron, Lilian Apaza, William Leonard, Eddy Pérez, Vincent Vadez, David Wilkie, "Correlates of Delay-Discount Rates: Evidence from Tsimane' Amerindians of the Bolivian Rain Forest," Journal of Economic Psychology, XXIII (2002), 291-316.

[41] Laibson, David, "Golden Eggs and Hyperbolic Discounting," Quarterly Journal of Economics, LXII (1997), 443-477.

[42] Loewenstein, George, and Drazen Prelec, "Anomalies in Intertemporal Choice: Evidence and an Interpretation," Quarterly Journal of Economics, CVII (1992), 573-597.

[43] Loewenstein, George, and Drazen Prelec, "Negative Time Preference," American Economic Review, LXXXI (1991), 347-352.

[44] Lowenstein, George, and Richard H. Thaler, "Intertemporal Choice," Journal of Economic Perspectives, (1989), 181-193.

[45] Lundberg, Shelly, and Robert A. Pollack, "Bargaining and Distribution in Marriage," Journal of Economic Perspectives, X (1996), 139-158.

[46] Lundberg, Shelly, and Robert A. Pollack, "Noncooperative Bargaining Models of Marriage," American Economic Review, LXXXIV (1994), 132-137.

[47] Lundberg, Shelly and Jennifer Ward-Batts, "Saving for Retirement: Household Bargaining and Household Net Worth", January 2000, Mimeo

[48] Madden, Gregory J., Andrew M. Begotka, Bethany R. Raiff, and Lana L. Kastern, "Delay Discounting of Real and Hypothetical Rewards," Experimental and Clinical Psychopharmacology, XI (2003), 139-145.

[49] Manser, Marilyn and Murray Brown, "Marriage and Household Decision making: A Bargaining Analysis", International Economic Review, (1980)21:1 (February), 31-44

[50] McElroy, Marjorie B. and Mary Jean Horney, "Nash Bargained Household Decisions", International Economic Review, (1981)22:2 (June), 333-349

[51] Miller, David C., and James P. Byrnes, "The Role of Contextual and Personal Factors in Children's Risk Taking," Developmental Psychology, XXXIII (1997), 814-823.

[52] Nielsen, Uffe, "Poverty and Attitudes towards Time and Risk – Experimental Evidence from Madagascar," Royal Veterinary and Agricultural University, 2001.

[53] O'Donoghue, Ted, and Matthew Rabin, "Risky Behavior Among Youths: Some Issues from Behavioral Economics," Working Paper, University of California at Berkeley, 2000.

[54] Phipps, Shelley A., and Peter S. Burton, "Bargaining Models of Household Behavior: An Empirical Test Using the Luxembourg Income Study," Dalhousie University, 1993.

[55] Pitt, Mark M., Shahidur R. Khandker, and Jennifer Cartwright, "Does Micro-Credit Empower Women? Evidence from Bangladesh," World Bank Working Paper No. 2988, 2003.

[56] Schubert, Renate, Martin Brown, Matthias Gysler, and Hans Wolfgang Brachinger, "Financial Decision-Making: Are Women Really More Risk-Averse?" American Economic Review, LXXXIX (1999), 381-385.

[57] Shapiro, Jesse M., "Is There a Daily Discount Rate? Evidence from the Food Stamp Nutrition Cycle," mimeo, Harvard University, 2003.

[58] Strotz, R. H., "Myopia and Inconsistency in Dynamic Utility Maximization," Review of Economic Studies, XXIII, 165-180.

[59] Thaler, Richard H., "How to Get Real People to Save," in Personal Savings, Consumption, and Tax Policy, Marvin Kosters, ed. (Washington, D.C.: American Enterprise Institute, 1992).

[60] Thaler, Richard H., "Saving, Fungibility, and Mental Accounts," Journal of Economic Perspectives, (1990), 193-205.

[61] Thomas, Duncan, "Intra-household Resource Allocation: An Inferential Approach," Journal of Human Resources, XXV (1990), 635-664.

[62] Thomas, Duncan, "Like Father, Like Son or Like Mother, Like Daughter: Parental Education and Child Health," Journal of Human Resources, XXIX (1994), 950-989.

[63] Udry, Christopher, "Gender, Agricultural Production and the Theory of the Household," Journal of Political Economy, CIV (1996), 1010-1046.

[64] Van Praag, Bernard M.S., and Adam S. Booij, "Risk Aversion and the Subjective Time Discount Rate: A Joint Approach," Tinbergen Institute Discussion Paper No. 03-018/3, 2003.

[65] Villaverde, Jesús Fernández, and Arijit Mukherji, "Can We Really Observe Hyperbolic Discounting?" University of Pennsylvania, 2002.

[66] Waseem, Saba, "Policy Research Paper Number 23: Household Monies and Decision-Making," Australian Government, Departmentof Family and Community Services, 2004.

[67] Wegner DM, Erber R, Raymond P Review: Journal of Personality and Social Psychology, 1991 Dec;61(6):923-9.

[68] Winter, David G., "The Power Motive in Women—and Men," Journal of Personality and Social Psychology, LIV (1988), 510-519.

[69] Wright, Graham A.N., Deborah Kasente, Germina Ssemogerere, and Leonard Mutesasira, "Vulnerability, Risks, Assets and Empowerment—The Impact of Microfinance on Poverty Alleviation," Assessing the Impact of Microenterprise Services Paper, 1999.

[70] Vonderlack, Rebecca M., and Mark Schreiner, "Women, Microfinance, and Savings: Lessons and Proposals," Development in Practice, XII (2002), 602-612.

[71] Yunus, Muhammed, "Towards eliminating poverty from the World: Grameen Bank Experience", The Progress Project—the Imperative of Public Policy (Lanham, MD: Lexington Books, 2001)

[72] Yesuf, Mahmud, "Rates of Time Preference of Farm Households in Ethiopia: Does Consumption Seasonality Matter?" Gothenburg University, 2003.