Does Marriage Work as a Savings Commitment Device? : Experimental Evidence from Vietnam *

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Abstract

Marriage is a traditional institution. We investigate if marriage works as a saving commitment device to alleviate individual present bias problems. We conducted a time discounting experiment with married couples in Vietnam, and examined how time preference parameters affect intrahousehold financial management. Though we find that joint decision with their spouses makes people more patient than individual decision, present-biased individuals turn over less earnings to and receive more from their spouses irrespective of their joint decision time preferences. Present-biased individuals also more likely keep cash within households compared with time-consistent individuals. We do find that couples who are joint decision time consistent allocate less allowance for present-biased spouses, but they conceal money to compensate it. We conclude that marriage not only fails in functioning as a savings commitment device, but also exacerbate the individual present bias problem. External savings commitment devices such as ROSCAs will play an important role to protect household budget from present-biased spouses.

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1 Introduction

Empirical evidence suggests people do not save as much as they think they should (Angeletos et al., 2001; Laibson et al., 1998). A number of studies have identified self-control problems as a major reasons for under-saving (Choi et al., 2003; Madrian and Shea, 2001; Thaler and Benartzi, 2004). People find it difficult to save if they do not have access to savings commitment devices such as retirement savings plan (Thaler and Benartzi, 2004; Madrian and Shea, 2001).[1] People who are present-biased place a particularly high value on immediate consumption. These individuals often spend their earnings immediately, and do not save much for the future.[2] Even though there is a strong demand for savings commitment devices in developing countries,[3] people in these countries have limited access to formal financial institutions. This makes it extremely difficult for them to save or resist the temptation of immediate consumption.

Sometimes people use their friends as a commitment device, by asking friends to punish them if they eat fatty foods when they are dieting, or if they do not exercise against their original plans. But if people use their as a commitment device, then they may also be able to use their spouses as a commitment device. Spouses will have better monitoring technology, and may have a good incentive to control the partners' self control problem because they share the budget. Households have been the primary units of consumption and saving decisions in many cultures, and this traditional institution may have developed commitment functions to deal with the intrinsic present bias problem. In this paper, we focus on the financial management in the household. In many cultures, the household incomes are pooled and one spouse is mainly in charge of daily consumption decision. Present-biased individual may be willing to entrust the consumption and savings decision to the non present-biased spouse to avoid the self control problem.[4] While most studies on the intrahousehold resource allocation focus on the conflicts between spouses (Udry,

[1] Bryan et al. (2010) review theoretical models and empirical evidence of commitment devices.

[2] Meier and Sprenger (2010) show present-biased individuals tend to over spend in the United States.

[3] Ashraf et al. (2006) conducted a field experiment with a bank in the Philippines and observed a high take-up of the commitment saving account among present-biased individuals. Dupas and Robinson (2010) offered an interest-free bank account with an withdrawal penalty and found the account had positive impacts on productive investment. Gugerty (2007) and Anderson and Baland (2002) provide evidences that ROSCAs, rotating savings and credit associations, are regarded as savings commitment devices by participants.

[4] The mere observation that patient and less present-biased household members make consumption and saving decisions does not necessarily imply that marriage functions as a savings *commitment device*. If the consumption of the present-biased spouse is restricted against their will, it cannot be called a "commitment device" (Bryan et al., 2010). Though potentially important, we do not argue this possibility hereafter because our empirical results, on the contrary, show that present-biased household members tend to control the budget as we show later.

1996; Anderson and Baland, 2002; Ashraf, 2009), few studies have investigated whether marriage alleviates the present bias problem.

This paper attempts to examine whether present-biased individuals use their spouses as a savings commitment device by using experimental and survey data we collected in Vietnam. Our experimental results suggest individuals are less likely to be present-biased when they make decisions jointly with their spouses than when they make decisions individually. This implies joint decision making within marriage could counteract the present bias. The analysis of survey data, however, shows that present-biased individuals turn over smaller percentages of their earnings to their spouses, withholding larger amounts of income for themselves. Unsophisticated present-biased individuals more likely to keep cash within households. Furthermore, present-biased individuals receive more earnings from their spouses, and these results hold irrespective of whether their joint decision is present-biased or not. Hence marriage not only fails in functioning as a saving commitment device but also provides more resources for present-biased individuals to consume, exacerbating the problem. We also find that although the couples whose joint decision is not present-biased do tend to allocate smaller amount of allowance to present-biased individuals, these individuals conceal money to counteract it. Our study indicates the importance of savings commitment institutions outside of households such as ROSCAs and savings accounts, and appropriate policy interventions to alleviate self-control problems. To our knowledge, this is the first research showing that household exacerbates the individual present bias problem.

The closest study to ours is Schaner (2012), who conducts a field experiment in Kenya and finds that couples who are poorly matched on discount factors tend to use costly individual savings accounts. Our study is complement to Schaner's study in the sense that we explore the possibility of marriage, instead of outside formal institution, functioning as a commitment device, and show how present bias affects the intrahousehold resource allocation. Though we do not provide opportunities for opening savings accounts, we find that wives whose husbands are present-biased are more likely to participate in ROSCAs.[5] This finding is consistent with Anderson and Baland (2002) who provide evidences that wives use ROSCAs to protect money from their husbands in Kenya. Our study demonstrates that those wives who use ROSCAs to protect money are the wives who have present-biased husbands. Our results that marriage exacerbate the present bias problem may partly

[5]Also note that Schaner (2012) uses the exponential discounting model while we introduce quasi-hyperbolic discounting. Many experimental and field data show that discount rates tend to decline over time (Ainslie, 1992; Benzion et al., 1989; Loewenstein and Prelec, 1992; Thaler, 1981) and people are often present-biased(Angeletos et al., 2001; Laibson, 1997; Laibson et al., 1998).

explain why married women more likely join ROSCAs (Anderson and Baland, 2002)

Another closely related study is Ashraf (2009). She conducts an experiment with couples in the Philippines and shows that individuals whose spouses control household savings, regardless of wives or husbands, are more likely to hide money if their decisions are not observable to their spouses. Her finding indicates that an additional income would have a different impact on household economy depending on the observability of the income and the allocation of control over household budgets. Our study complements her's by showing how time preferences, more specially present bias, affects the allocation of financial control. We find that the allocation of financial control is not designed to alleviate the self-control problem.

The next section presents a model of consumption and saving decisions of present-biased spouses which describes the idea of marriage as a savings commitment device and provides the condition of marriage as a savings commitment device. Given that our empirical results contradicting with this story, we extend the model to make it consistent with our results. Since we extend our model after observing the results, we do not intend to test this theory. However, it helps us infer the cause of the failure of marriage in functioning as a commitment device, and also help us interpret the empirical results. Section 3 describes our experimental and survey design, followed by experimental and empirical results in Section 4. Section 5 concludes.

2 A Model

2.1 Outline of New Model

In period 1, player i solve the following problem:

$$\max_{c_{1i},x_i^i,x_j^i} \quad u(c_1, x_i, x_j) + \beta^i \delta^i u(c_2) \tag{1}$$

$$\text{s.t.} \quad c_1 = c_{1i} + c_{1j} \tag{2}$$

$$x_i = x_i^i + x_i^j \tag{3}$$

$$x_j = x_j^i + x_j^j \tag{4}$$

$$c_2 = c_{2i} + c_{2j} \tag{5}$$

$$c_{1i} + x_i^i + x_j^i + c_{2i} = \alpha_i y_i + (1 - \alpha_j) y_j \tag{6}$$

By solving this, the decision rule can be obtained as functions of the partner's consumption and the resources he/she can uses, $\alpha_i y_i + (1 - \alpha_j) y_j$. In the Nash equilibrium,

Given these decision rule, player j determines the ratio of income transfer, α_i.

2.2 Marriage as a Savings Commitment Device

Consider a saving decision of married partners, player i and player j. For simplicity, we assume the consumption is common across two players.[6] There are three periods, $t = 0, 1, 2$. Period 0 is a commitment period. In period 0, the player who receives income decides whether to keep the income and make the decision on the common consumption levels in periods 1 and 2 by himself/herself, or to turn over the income to his/her spouse and let the spouse decide the common consumption levels in periods 1 and 2. Because their time preferences may be different, there is a potential conflict within a couple on how to allocate the household budgets intertemporelly. Suppose a player is present-biased but his/her spouse is not, then he/she may be willing to let his/her spouse make consumption decisions to mitigate the self-control problem. When present-biased player i turns over his income to player j and let spouse j make the consumption decisions in period 0, we say player i uses player j as *a savings commitment device*.

Denote consumption levels in periods 1 and 2 by $c_1 \geq 0$ and $c_2 \geq 0$ such that $c_1 + c_2 = 1$. We assume the instantaneous utility function $u(c_t)$ is twice differentiable, strictly increasing, strictly concave and $\lim_{c_t \to 0} u'(c_t) = +\infty$. To represent the present bias problem, we use quasi-hyperbolic discounting model(Phelps and Pollak, 1968; Laibson, 1997). We further assume players are sophisticated, that is, they are fully aware of their self-control problems.[7] We focus on pure strategy equilibria and derive the subgame-perfect Nash equilibrium.

Let $\beta^k \in (0, 1]$ be the degree of present bias of player $k \in \{i, j\}$ and $\delta^k \in (0, 1)$ be the time discount factor of player k. Then, player k's lifetime utility evaluated at $t = 0$ is

$$u(c_1) + \delta^k u(c_2).$$

In period 1, however, player k's decisions are affected by the present bias. Thus he/she evaluates his/her utility as

$$u(c_1) + \beta^k \delta^k u(c_2).$$

If player k makes a consumption plan alone in period 1, he/she will choose a consumption level of period 1, c_1^{k*}, such that

$$u'(c_1^{k*}) - \beta^k \delta^k u'(1 - c_1^{k*}) = 0.$$

[6] Jackson and Yariv (2011) also suppose common consumption across individuals and analyze collective decision problems.

[7] O'Donoghue and Rabin (1999, 2001) extend the quasi-hyperbolic discounting model by introducing partially naive agents.

It is straightforward that c_1^{k*} is decreasing in β^k and δ^k. Moreover, $c_1^{i*} > c_1^{j*}$ if and only if $\beta^i\delta^i < \beta^j\delta^j$. The more impatient player k is (lower β^k and δ^k), the more money he/she will allocate to the consumption in period 1.

If player k could commit to his/her consumption plan in period 0, they would choose a consumption levels $\bar{c}_1^k$ such that

$$u'(\bar{c}_1^k) - \delta^k u'(1 - \bar{c}_1^k) = 0.$$

Notice $\bar{c}_1^k \leq c_1^{k*}$, and an strict inequality holds if $\beta^k < 1$. If the players correctly expect their future self-control problems, they may be better off if they turn over their income and ask their spouses to make the consumption and savings decisions in period 0. We say individuals use their spouses as a savings commitment device when they make such a decision.

Now consider the decision making at $t = 0$ in which player i receives income. Because we assume sophisticated individuals, player i correctly expects in period 0 that if he keeps his earnings, he will choose the consumption level c_1^{i*} instead of $\bar{c}_1^i$. His expected utility on this consumption plan at the time of period 0 is $u(c_1^{i*}) + \delta^i u(1 - c_1^{i*})$. On the other hand, if player i turns over his earnings to player j in period 0, then player j will choose the consumption level c_1^{j*}, and i's expected utility in period 0 is $u(c_1^{j*}) + \delta^i u(1 - c_1^{j*})$. Thus, player i chooses to turn over his earnings to player j in period 0 if the following inequality holds:

$$u(c_1^{j*}) + \delta^i u(1 - c_1^{j*}) > u(c_1^{i*}) + \delta^i u(1 - c_1^{i*}). \tag{7}$$

Because $c_1^{i*} \leq c_1^{j*}$ if and only if $\beta^i\delta^i \geq \beta^j\delta^j$, player i does not turn over their earnings to player j if $\beta^i\delta^i \geq \beta^j\delta^j$. Suppose $\beta^i\delta^i < \beta^j\delta^j$, i.e., player i is less patient than player j in period 1. In this case, player i may have an incentive to use his spouse as a savings commitment device. However, player i will not use his spouse as a commitment devise, if she is much more patient than player i would want her to be, that is, her consumption decision for period 1, c_1^{j*}, is much smaller than his choice of consumption at period 0, $\bar{c}_1^i$. Let $\beta_0^i(\beta^j, \delta^i, \delta^j)$ be the cut-off value of condition (7) for given β^j, δ^i and δ^j, i.e., $u(c_1^{j*}) + \delta^i u(1 - c_1^{j*}) = u(c_1^{i*}) + \delta^i u(1 - c_1^{i*})$ and $\beta^i = \beta_0^i(\beta^j, \delta^i, \delta^j)$.[8] When $\beta^i\delta^i < \beta^j\delta^j$, inequality (7) holds if and only if $\beta^i < \beta_0^i(\beta^j, \delta^i, \delta^j)$.

First, consider the case of $\beta^i\delta^i < \beta^j\delta^j \leq \delta^i$. This leads to $c_1^{i*} > c_1^{j*} \geq \bar{c}_1^i$ and hence the inequality (7) is satisfied. In this case, $\beta_0^i(\beta^j, \delta^i, \delta^j) > 1$. As $|c_1^{i*} - c_1^{j*}|$ increases, or $|\beta^i\delta^i - \beta^j\delta^j|$ increases, the incentive to turn over the earnings will be higher. Second, consider the case of $\beta^i\delta^i < \delta^i < \beta^j\delta^j$. Then we will have $c_1^{i*} > \bar{c}_1^i > c_1^{j*}$ and hence player i chooses to turn over his earnings to player j

[8] Note that c_1^{k*} depends on β^k and δ^k.

if and only if $\beta^i < \beta_0^i(\beta^j, \delta^i, \delta^j)$. Given c_1^{i*}, the incentive to turn over the earnings will be higher as $|\bar{c}_1^i - c_1^{j*}|$ increases, or $|\delta^i - \beta^j\delta^j|$ decreases, though c_1^{i*} itself is affected by δ^i. By the implicit function theorem and substituting the first order condition, we obtain

$$\frac{\partial\beta_0^i(\beta^j, \delta^i, \delta^j)}{\partial\beta^j} = \frac{(\beta^j\delta^j - \delta^i)u'(c_2^{j*}) \cdot \frac{\partial c_1^{j*}}{\partial\beta^j}}{\{u'(c_1^{i*}) - \delta^i u'(c_2^{j*})\} \cdot \frac{\partial c_1^{i*}}{\partial\beta^i}} < 0,$$

and

$$\frac{\partial\beta_0^i(\beta^j, \delta^i, \delta^j)}{\partial\delta^j} = \frac{(\beta^j\delta^j - \delta^i)u'(c_2^{j*}) \cdot \frac{\partial c_1^{j*}}{\partial\delta^j}}{\{u'(c_1^{i*}) - \delta^i u'(c_2^{j*})\} \cdot \frac{\partial c_1^{i*}}{\partial\beta^i}} < 0.$$

The comparative statics of δ^i on $\beta_0^i(\beta^j, \delta^i, \delta^j)$ is ambiguous.

The following claim summarizes the results.

Claim 1 (Marriage as a Savings Commitment Device.) *Player i turns over the earnings to player j if and only if $\beta^i < \min\{\beta^j\delta^j/\delta^i, \beta_0^i(\beta^j, \delta^i, \delta^j)\}$. If $\beta^j\delta^j \leq \delta^i$, player i is more likely to turn over the earnings to player j and less likely to be in charge of consumption decisions as $|\beta^i\delta^i - \beta^j\delta^j|$ increases. If $\beta^j\delta^j > \delta^i$, player i is more likely to turn over the earnings to player j and less likely to be in charge of consumption decisions as $|\delta^i - \beta^j\delta^j|$ decreases.*

Claim 1 says individuals are better off if they turn over their income to their spouses and ask their spouses to make consumption and savings decisions under the following two circumstances. In the first circumstances, their spouses will decide to consume less in period 1 and save more in period 2 than if the individuals make the decision by themselves. In addition, the spouses' decision on consumption in period 1 will be less than what the individuals would allocate if they are not affected by the present bias problem. In this case, the bigger the time discounting differences are between the couples, the better off the individuals will be if they ask their spouses to make consumption-savings decisions. Under the second circumstances, their spouses will decide to consume less in period 1 and save more for period 2 than if they make the decision by themselves, just like the first case. However, their spouses will decide to consume too little in period 1 compared with the ideal consumption level the individuals will choose if they do not suffer from the self-control problem. In this case, the individuals should prefer to ask their spouses to make consumption-savings decisions the smaller the gap between their ideal consumption and the level of consumption their spouses make.

3 Survey and Experimental Design

3.1 Selection of Research Site

We conducted a survey with economic experiments in one urban commune (called Commune A below) in Can Tho City, Vietnam, in May and June 2010. The commune was previously selected for Vietnam Household Living Standard Survey (VHLSS) 2002, a national representative survey conducted in 2002. VHLSS 2002 shows that the main job categories in Commune A were trade, transportation and services, and that Commune A is relatively wealthy in the region and is densely populated. The mean income is higher than the regional average.

3.2 Selection of Subjects and Experimental Procedure

We chose the parents of first and second graders living in Commune A as our subjects because we expect most of their parents to be economically active. There are 6 communities in Commune A; Area 1 through Area 6 . We asked the head of each Area to contact the parents of first graders and invite both spouses to the survey. There are 205 first graders living in the Commune. We excluded 45 parents who were divorced or separated from the subject pool. Another 45 parents did not want to participate in the study. So we conducted the survey with remaining 115 parents, which results in the participation rate among the parents of first graders being 72 percent. After we finished the survey with the parents of first graders in 6 Areas, we started to recruit parents of second graders in Areas 1, 2 and 3 until we were able to collect data from 150 couples (300 parents). Dropping the first 16 couples for which slightly different experimental design was applied, we report the results of 134 couples.[9]

As soon as a couple arrived at the commune office, we conducted a household survey with both spouses together and asked for demographic information of household members, income, properties, and financial management within the household. After the household survey, we conducted the experiment separately for a husband and a wife. We prepared a private room for each husband on the second floor and a private room for each wife on the first floor in the commune office building. After the experiment, we conducted an additional survey with individual subjects (without their spouses) and asked questions such as the ratios of their earnings turned over to other household members, the value of properties inherited from their parents, and ROSCAs participation, and tested each subject's financial literacy.

[9]The analytical results including all 150 couples are similar and available upon request.

Table 1 is the summary statistics of our experimental subjects. On average, our subjects were 37.5 years old and have received 8 years of education. The average monthly salary for husbands and wives are 2.5 million dong (US$120.85) and 1.4 million dong (US$67.68), respectively, and the difference between them is statistically significant at 1% level. Wives tend to be in charge of household budgets. Husbands entrust 71.9 percent of their income to their wives, and wives entrust 13 percent of their income to their husbands. 32.3 percent of husbands are responsible for keeping cash within the households, while that number of wives is 86.6 percent. Husbands and wives receive 648.1 thousand dong and 406.8 thousand dong of monthly allowances, respectively.[10]

3.3 Games

The experiment included ten games. One out of ten games was selected for payment at the end of the experiment. Subjects draw a dice with ten numbers to determine which game is used for payment. They received experimental payment for the selected game in addition to 100,000 dong (US$4.83) of a show-up fee, which is equivalent to 4% and 7% of monthly income for husbands and wives, respectively.

Game 1 is a risk game proposed by Binswanger (1981). Subjects were asked to choose one risky option out of six options available to them. Game 2 is a time discounting experiment under which subjects choose to receive either 100,000 dong today (Option X) or a larger amount of money in three days (Option Y) for each of ten questions. The amount of delayed payments vary from 100,000 dong to 145,000 dong. We used a notebook that shows two options (Options X and Y) on each page [11]. Similarly, Game 3 consists of ten questions under which subjects choose either 100,000 dong in three weeks (Option X) or a larger amount of money in three weeks and three days (Option Y). The experimental design of Game 2 and 3 are identical except for the number of days to wait. Similar to Casari (2009), subjects in our experiment were given the opportunity to change their decisions three weeks after the experiment.[12]

[10] As for occupation, 43 and 31 out of 134 male subjects work for private enterprises and other households (including casual work), respectively. 29 of them are self-employed. Regarding female subjects, 34 of them work for other households (including casual work) and 24 of them are not currently working. 23 of them are self-employed. This pattern is consistent with that of VHLSS 2002.

[11] We started to use the notebooks from the second day of the experiment. Therefore, we exclude the data from 16 subjects on the first day of the experiment in our analysis.

[12] Chabris et al. (2008) summarizes potential confounds in measuring time preferences using labaratory experiments such as unreliability of future rewards and transaction costs for receiving future rewards. To minimize the former, we entrust the chief of the commune office with the envelopes including the experimenta reward for the subjects who chose the later reward and that game was chosen for the payout game, though it will raise a concern on the latter.

If the delayed payment was selected for payments (Option Y in Game 2 or both Options in Game 3), subjects received only the show-up fee of 100,000 dong on the day of the experiment. We asked the commune officer who lives at the commune office to keep the delayed payments for these subjects. We put the money in an envelope, wrote down the subject name, and the date the subject should pick it up and sealed it in front of the subject. We prepared a special folder for the commune officer to keep these envelopes. We checked the folder every time we visited the commune office to make sure that experimental payments were securely kept and no envelope were missing from the folder. Commune A is a small commune in the middle of Can Tho City. Subjects usually live within five-minutes form the commune office by motorbike or bicycle. We confirmed all subjects came to the office to pick up delayed payments. We don't think that foot costs affected subjects' decision in the time discounting experiments.

Games 4 to 6 are similar to Games 1 to 3, except that if these games are selected for experimental payments, either the subject's decision or their spouse's decision is randomly selected for the payment. Games 7 to 9 are similar to Games 1 to 3 except that subjects and their spouses are allowed to talk with each other over the experimenter's phone to make joint decisions. If Games 7 to 9 are selected for experimental payment, the joint decisions made by the couple are used for individual subject's payment. In this paper we do not use the risk experiment and Games 4 to 6, and focus on the results of the time discounting experiment (Games 2, 3, 8, and 9).[13]

Another game we use in this paper is Game 0 where subjects were asked in advance if they wanted their spouses to know they had received 300,000 dong as experimental payment if Game 0 was selected for payment. If they answered "Yes," they were then asked if they wanted their spouses to keep 300,000 dong and save the money for them. If Game 0 is selected for payment, subjects received 300,000 dong (US$14.50) in addition to the show-up fee. Subjects could know their spouse's decision only when (i) Game 0 was selected as the payout game for their spouses, whose probability is 1/10, and (ii) the spouses chose to have them know they had received 300,000 dong. If they chose not to have their spouses know, the spouses would not be able to distinguish whether they did not choose to have the spouses know it, or Game 0 was not selected as the payout game. So we assume that subjects made their decision free from the influence of their spouses.

In order to prevent order effects, subjects with even ID household numbers played game 0 at the beginning of the experiment (before playing Games 1-9) and subjects with odd ID household numbers played game 0 at the end of the experiment (after playing Games 1-9). The experimental instruction for these games is provided in the Appendix.

[13]When we include the elicited risk parameters in the following regressions, they never become significant.

4 Results

4.1 Summary of Experimental Results

We elicit the time preference between today and three days later in Game 2 . The distribution of the choice is summarized in the upper panel of Appendix Figure 1. The numbers in the horizontal axis indicate the point Y at which the subject switched their choice from option X to option Y.[14] "Never shift" in the rightmost indicates that these subjects always chose to receive 100,000 dong today and didn't switch at all. Game 3 is used to elicit the time preference between receiving 100,000 dong in three weeks and receiving Y in three weeks plus three days. If subjects are time consistent, the choices should be the same in Game 2 and Game 3. However, Wilcoxon signed-rank test rejects this null hypothesis with the p-value less than 0.0001. Appendix Figure 1 indicates that the number of never shifters are smaller in Game 3 than in Game 2, and that more subjects switched to Option Y at relatively smaller values of Y. We define those whose switching points are smaller in Game 3 than in Game 2 as present-biased. It should be noted that 37 percent of the subjects always chose option X and never switched to Option Y both in Game 2 and Game 3. This is partly due to our experimental design in which the variation of range of the Option Y is quite small (100,000 dong to 145,000 dong).[15] In the main analysis, we treat these subjects as non-present-biased individuals, and perform the robustness checks by excluding these never-shifters.

The summary statistics on the elicited time preference parameters are shown in Table 1. 34 percent of the husbands and 40 percent of the wives are present-biased. This difference is not statistically significant ($p = 0.2659$).[16] The cross tabulation of the present bias indicator is shown in the upper panel of Table 2. While 38.8 percent of the couples are both non-present-biased and 12.7 percent are both present-biased, nearly half of the couples consist of a pair of present-biased and non-present-biased individuals. The discount factors elicited from Game 3 are larger for wives than for husbands (0.935 for husbands and 0.943 for wives), but the difference is marginally insignificant ($p = 0.1372$).

[14] A few subjects chose to receive 100,000 dong in three days rather than to receive 100,000 dong today, which is dipicted by the leftmost bin.

[15] We would have observed more subjects switch to option Y if we introduced larger value of Y.

[16] In this paper, we mainly focus on the binomial indicator for present bias. We also calculated the present bias parameter, β, but the elicited value is relatively high compared to other studies (Brown et al., 2009). This might be due to the short range of Y. The minimum value of β possible in our experimental design is 0.69 when the subject switched to Option Y at the first question in Game 3 but always chooses option X in Game 2. In addition, one grid deviation in the choice causes the change in β by 0.025-0.048. The upper panel of Appendix Figure 2 show the distribution of the elicited β.

Our model implies that, if marriage can function as a savings commitment device (when the cost of accessing the spouse's budget, z, is large), individual i will turn over the earnings to his/her spouse j when $\beta^i\delta^i < \beta^j\delta^j \leq \delta^i$, or when $\beta^i\delta^i < \delta^i < \beta^j\delta^j$ and $\beta^i < \beta_0^i(\beta^j, \delta^i, \delta^j)\}$. In the former case, the incentives to turn over the income would be larger as $|\beta^i\delta^i - \beta^j\delta^j|$ increases. On the other hand, if z is low, turning over the income more likely happens as $|\beta^i\delta^i - \beta^j\delta^j|$ increases, because the large difference will give a strong incentive for the impatient spouses to access their partners' budget. The lower panel of Appendix Figure depicts the distribution of $\beta^i\delta^i - \beta^j\delta^j$ for the husbands.[17] 34.3 percent of the couples have the same $\beta\delta$, 33.6 percent of the husbands have lower $\beta\delta$ than their wives, and 32.1 percent of the husbands have higher $\beta\delta$. The data shows those who satisfy $\beta\delta < \beta^s\delta^s < \delta$, the first condition of Claim 1 consists 11.6 percent of the all subjects.

Using the results from Games 8 and 9, we measure the joint decision present bias and joint decision discount factor. The fraction of the couples whose joint decision is present-biased is 23.1 percent, which is quite smaller than in the case of individual decision making (36.9 percent). The lower panel of Table 2 shows that, when neither of the couple is individually present-biased, most of them remain non-present-biased in their joint decision. When only one of the couple is present-biased, more than 70 percent of them (35.1/48.5) do not exhibit present bias any more in their joint decision. Even when both of the couples are present-biased, around 41 percent of them (5.2/12.7) are not present-biased in the joint decision making. These result is consistent with Shapiro (2010) who argues that people with other regarding preferences will not exhibit present bias for other's utility and shows using his experimental data in India that group decision making mitigates the present-bias problem.[18] This result implies joint decision-making within marriage could potentially alleviate individual time-inconsistency.

4.2 Intrahousehold Income Transfer

Now we investigate whether individuals utilize their spouses as a savings commitment device by analyzing how the time preference parameters affect the actual intrahousehold decision making.

First, we look at the share of earnings turned over to the spouse. This variable is calculated as the amount of the earnings turned over to his/her spouses divided by the sum amount of the earnings kept for him/herself and turned over to his/her spouse. We exclude the amount of the earnings turned over to other persons such as their parents because it would not be related to the

[17] The distribution for the wives is obtained by reversing this figure.

[18] Jackson and Yariv (2011) model the joint decision making of two self-interested individuals and show that the joint decision would balance the difference in individual temporal motives.

time inconsistency problems of the couples. Note that not all subjects have earnings to turn over (for example, housewives). This reduces our sample size to 127 for husbands and 110 for wives (out of 134 each).

Appendix Figure 3 shows the histogram of the share of the earnings turned over to their spouses. While over a half of the husbands entrust more than 80% of their earnings to their wives, around eighty percent of wives keep all of their own earnings. The figure also shows the proportion of the individuals who keep all of their earnings is larger in the present-biased samples. To control the effects of other variables, we proceed regression analyses.

The share ranges from 0 to 1, and substantial proportions of the observations have the values of 0 or 1, as described in Appendix Figure 3. Hence we use the following two-limit Tobit model:

$$\begin{aligned} y_i^* &= w_i\theta + x_i\gamma + u_i \qquad u_i|w_i, x_i \sim N(0,\sigma^2) \\ y_i &= \begin{cases} 0 & \text{if } y_i^* \leq 0 \\ y_i^* & \text{if } 0 < y_i^* < 1 \\ 1 & \text{if } y_i^* \geq 1 \end{cases} \end{aligned}$$

where y_i is the share of the earnings of individual i turned over to his/her spouse, y_i^* is the latent variable, w_i are a set of time preference variables, and x_i are a set of other observable controls which would affect the intrahousehold decision making (gender; the differences in age, education, earnings, own assets, own inherited assets, arithmetic score, and financial literacy score; years of marriage aiming at capturing the trust between the spouses). The parameter of interest is θ. For brevity, we do not report the estimates of γ excluding gender, which are in most cases not significant. Standard errors are clustered at the couple level in order to take into account the intra-couple correlations.

The estimation results are presented in Table 3. For readability, we relabel own time preference parameters as β and δ, and those of the spouse as β^s and δ^s. Our model implies that, if marriage can be used as a savings commitment device, an individual will turn over the earnings to his/her spouse (a) when $\beta\delta < \beta^s\delta^s \leq \delta$, or (b) when $\beta\delta < \delta < \beta^s\delta^s$ and $\beta < \beta_0^i(\beta^s, \delta, \delta^s)$. In case (a), the incentives to turn over the income would be larger as $|\beta\delta - \beta^s\delta^s|$ increases. On the other hand, in case (b), the individual may not turn over the earnings if $|\delta - \beta^s\delta^s|$ is very large because the large difference implies that the spouse's consumption plan is too patient for him/her. To capture these effects, we use two interaction terms in Column (1): $1[\beta\delta < \beta^s\delta^s \leq \delta] \times |\beta\delta - \beta^s\delta^s|$ and $1[\beta\delta < \delta < \beta^s\delta^s] \times |\delta - \beta^s\delta^s|$, where $1[\cdot]$ is the indicator function.[19] The coefficient of the first

[19] As Claim 1 states, in this case the individual will turn over the earnings if $\beta < \beta_0^i(\beta^s, \delta, \delta^s)$. $\beta_0^i(\beta^s, \delta, \delta^s)$ will be smaller if $\beta^s\delta^s - \delta$ is large. Because we can not obtain the closed form of $\beta_0(\beta^s, \delta, \delta^s)$ without specifying the utility function and levels of the earnings, we instead use $|\delta - \beta^s\delta^s|$ to capture the disincentive for turning over the income.

interaction term is not statistically different from zero, and the point estimate is negative. So we can not find any evidence supporting that marriage functions as a saving commitment device in case (a). On the other hand, the coefficient of the second interaction term is negative and significant. This may suggest the possibility of marriage as a commitment device, but it is also possible that this captures the negative effect of $|\beta\delta - \beta^s\delta^s|$ when $\beta\delta < \beta^s\delta^s$ in the model of the failure in commitment: when individuals are too impatient relative to their spouses, they expect that they would break the commitment and thus would not turn over the earnings at the first place. Further, we only have 7 observations satisfying $\beta\delta < \delta < \beta^s\delta^s$, which we rely on estimating the coefficient on $1[\beta\delta < \delta < \beta^s\delta^s] \times |\delta - \beta^s\delta^s|$. Hence we do not stress the significance of this coefficient. As expected from Figure 3, wives entrust smaller ratios of their earnings to their husbands.

Our threshold conditions, however, are the results of the simplification of the model. When we allow for other factors such as the difference in utility function and private consumption, these conditions become more complicated. So instead of solely using the conditions derived from our model, we also use several specifications which directly include the time preference parameters.

In Column (2), we include indicator variables for own present bias, `present bias (PB)`, and for spouse' present bias, `spouse PB (sp PB)`, and the own and spouse's discount factors separately. If marriage functions as a commitment device, then present-biased individuals turn over the earnings to their spouses when the spouses are patient. However the estimated result is contrary. Present-biased individuals turn over a smaller share of the earnings. Further, individuals turn over more earnings when their spouses are present-biased and δ^s is small. These imply that present-biased individuals tend to hold more household resources. Marriage not only fails in functioning as a commitment device, but also exacerbates the self-control problem by giving additional resources for present-biased individuals to consume.

We have seen that joint decision-making within marriage could potentially alleviate individual time-inconsistency as shown in Games 8 and 9. However, this debiasing effect of the joint decision making does not seem to alleviate the intrahousehold financial management. Adding an indicator variable for being individually present-biased but jointly not present-biased, `PB but joint NPB` little changes the results (Column (3)), only making the coefficient of the own present bias indicator insignificant, probably due to the collinearity between `present bias (PB)` and `PB but joint NPB`. The coefficient of `PB but joint NPB` itself is insignificant and close to zero.

Even though an individual is present-biased, he/she may have no incentive to turn over the earnings if his/her spouse is also present-biased. In Column (4), we instead use indicator variables for (i) a present-biased individual with a non-present-biased spouse, `PB w/ sp NPB`, (ii) a non-present-

biased individual with a present-biased spouse, `NPB w/ sp PB`, and (iii) a present-biased individual with a present-biased spouse, `PB w/ sp PB`. The reference category in the regression is thus the couples neither of whom is present-biased. The result turns out to be similar: present-biased individuals turns over less to their non-present-biased spouses, and non-present-biased individuals turns over more to their present-biased spouses. The couples both of whom are present-biased behave similarly with the couples neither of whom is present-biased. The coefficients of own and spouse's discount factors remain stable.

Through Columns (5) to (8), we split the sample into husbands and wives since the behavior could be different between husbands and wives reflecting intrahousehold bargaining power and social norms. While the coefficients of the indicators for own present bias and for a present-biased individual with a non-present-biased spouse become insignificant probably due to the smaller sample size, the coefficient of the indicators for spouse's present bias is still significant for both husbands and wives. What is striking is the large magnitude of the coefficients of the indicators for spouse's present bias and a non-present-biased individual with a present-biased spouse in the wives sample. Women seem suffer more from their spouse's time inconsistency problem.

Recall that the Tobit model relies heavily on the assumptions of normality and homoskedasticity. As a rough check of misspecification, Wooldridge (2010) suggests to run an alternative Probit estimation and to compare the results by dividing the estimated coefficients by the estimated standard errors in the Tobit model. As we are using the two-limit Tobit model, the counterpart is the ordered Probit model which uses as the dependent variable an ordered categorical variable which takes on 0 if $y = 0$, 1 if $y \in (0, 1)$, and 2 if $y = 1$. The results are reported in Appendix Table 1. The standard errors of the Tobit models of Columns (1) to (8) in Table 3 are 0.702, 0.682, 0.681, 0.679, 0.491, 1.454, 0.490, and 1.452, respectively. We find there are no significant change in signs nor in magnitudes, which lend support for the validity of our Tobit model estimation results.

One may also be concerned that the partner matching might be affected by the time preference. The upper panel of Table 2, however, does not show any matching patterns and Pearson's chi-squared test cannot reject the null hypothesis that the husband's present bias indicator and wife's are independent (p=0.50). It is still possible that couples with different time preferences are different from couples with the similar time preference in the way that they got married because they believed they could manage the present bias problem. If this is the case, we will more likely find couples using their spouses as a savings commitment device, which is opposite to our findings. So we are not worried about the possibility of endogenous matching deriving our results.[20]

[20]One may be also concerned that measurement of time preference will be affected by matching. For example, if a

One possible reason marriage does not function as a commitment device is that they are not aware of their time inconsistency problem and thus have no demand for commitment. To examine this possibility, we directly elicit a demand for commitment as in Casari (2009). After Game 3 in which the subjects make decisions between three weeks and three weeks plus three days, we offered them an option to change their decision in three weeks. If they are present-biased but sophisticated, then they know they will be subject to present bias when they change their decision and so they will reject this offer. But if they are not sophisticated, they might accept this offer for the sake of flexibility. We define those who exhibit present bias but reject this offer as sophisticated present-biased, expressed by an indicator variable `sophisticated PB`. Note that because naive individuals do not necessarily accept this option (for example, they may believe they would make the same choice in three weeks and feel cumbersome to make decision again so reject the offer), those who are defined as sophisticated present-biased might include some of naive individuals.[21] By including `sophisticated PB`, the coefficient of own present bias indicator now reflects the effect of the present bias without sophistication. As reported in Table 1, 31.3 percent of the subjects are sophisticated present-biased, which is quite a large number given the ratio of present-biased subjects being 36.9 percent. This is consistent with our assumption that present-biased individuals are sophisticated. However, it should be noted that the following analysis including the sophistication variables requires a caution in interpretation because the results associated with unsophistication depends on the relatively small number of observations who are unsophisticated present-biased, 15 subjects, or 5.6 percent of the total observation.[22]

The estimation results are reported in Table 4. We do not find any evidence supporting that sophisticated present-biased individuals utilize their spouses as a commitment device. Due to the collinearity between the present bias variables and the sophistication variables, the significance of the present bias goes away, but the linear combination of the present bias indicator and the sophistication variable is still negative through Columns (1) to (6). The coefficient of the indicator for a sophisticated present-biased individual with a non-present-biased spouse, `PB w/ sp NPB`×

patient wife knows that her husband is not patient, she may play more patiently than she would independently. Her husband will makes the same calculation to play more impatiently. This may explain why we find less present bias in joint decision making. But this measurement bias will not affect our main results because exaggerated variables will result in understating the coefficient parameters, or conservative estimates.

[21] Casari (2009) alleviates this problem by lowering the reward from the commitment option compared to the future choice option.

[22] Also note that we only have 7 observations who are unsophisticated present-biased with non-present-biased spouses.

`soph PB` becomes positive significant and large for the wives (Column (6)), but the large negative coefficient on `PB w/ sp NPB` makes the linear combination negative and insignificant. This implies that sophisticated present-biased wives do not turn over more to their non-present-biased husbands than wives free from present bias.[23] We find little changes in the coefficients of the indicators for spouse's present bias and a non-present-biased individual with a present-biased spouse. Individuals turn over more earnings if their spouses are present-biased.

Our model suggests that it depends on the cost of accessing spouse's budget, z, whether marriage functions as a commitment device. Unfortunately we do not have a direct measure of z. We have tried some available variables to proxy z. Since z may be correlated with the bargaining power, Appendix Table 2 reports regression results where we include the interaction terms of the present bias variables and some variables which may reflect the bargaining power such as the difference in the value of own asset (Columns (1) to (3)), education (Columns (4) to (6)), and age (Columns (7) to (9)). Contrary to our expectation, Columns (1) and (2) suggest that present-biased individuals with more asset (and thus supposedly stronger bargaining power and lower z) turn over a larger portion of their earnings to their spouses. This may be because the asset difference correlates with unobserved generosity. Using the difference in education levels and ages does not yield the expected results. Note that, however, our main results still holds throughout these specifications: present-biased individuals hold more household resources.

One may think that couples do not use their spouses as a commitment device just because of a lack of trust or difference in preference on the intratemporal consumption. But this cannot explain why they turn over more earnings when their spouses are present-biased. The observation that present-biased individuals hold more household resources would reflect that they have stronger in the intrahousehold resource allocation. Our model with low z formalizes this idea through the fact that more impatient players are more willing to pay z to access the spouse's budget. One can construct other models in the same spirit where time preference affects the bargaining on the current consumption level given the fixed bargaining power. We do not intend to exclude the alternative specifications. The point here is that marriage fails in functioning as a commitment device and rather exacerbating the present bias problem. We infer that this is due to relatively low cost of accessing spouse's budget, relative to external commitment devices.

[23] We also examined if sophisticated present-biased individuals whose joint decision with their spouses is not present-biased behave differently, only to find no significant differences.

4.3 Financial Manager

Next, we investigate the pattern of the intrahousehold financial management. We asked our subjects in the household survey who keep cash in their households with allowing multiple answers, and identify the individual who keeps cash as a financial manager. We use an indicator variable `keepcash` which equals 1 if the subject keeps cash within the household, and zero otherwise. The numbers in Table 1 suggest that wives are much more likely to be the financial manager, as often observed in other Asian countries.

The upper panel of Table 5 provides the estimation results of the Probit model, where we use the same covariates as in Table 3 and report the average marginal effects. Since the dependent variable is the indicator variables for keeping cash (not delegating the role of financial manager), we expect the signs of the coefficients to be opposite to those in Table 3, whose outcome variable was the share of the earnings turned over to the spouse.

Through Columns (1) to (4), none of the time preference variables appear significant. The coefficient of `sex` is always positive and significant. When we divide the sample into husbands and wives, however, we find that present-biased husbands (or present-biased husbands whose wives are not present-biased) are more likely to keep cash by 21 to 24 percent.

When we include the interaction term with the sophistication variable, the time preference variables become significant, as reported in the lower panel of Table 5. While naive present-biased individuals are more likely to keep cash than non-present-biased individuals, sophisticated present-biased individuals behave similarly to non-present-biased individuals as the linear combination of the interaction term and own present bias variable is close to zero and insignificant. These results suggest that couples with naive present-biased individuals suffer from the time-inconsistency problem by allowing present-biased individuals to keep cash. Even sophisticated individuals do not actively utilize marriage as a commitment device because they are not less likely to keep cash. Unlike the ratio of the earnings turned over, spouse's time preference does not have any significant effects. This would be because both spouses can keep cash, and whether or not keeping cash will not be affected by spouse's time preference. These patterns are observed both in male and female samples.[24]

[24]We also run the regression including the interaction term with bargaining power measures, but these do not appear significant. The results are available upon request.

4.4 Decision in Game 0

So far we have shown that marriage fails in working as a commitment device. Given relatively high β in our data, however, one may be concerned if our present bias variables really reflect the couple's time preferences. To confirm the validity of our present bias variables, we examine how our time preference variables affect the decision in Game 0.

In Game 0, subjects were asked if they wanted their spouses to receive 300,000 dong of the experiment's reward should Game 0 be selected as the payout game. Subjects would not know their spouses' choice unless the spouses chose to let them know. So the decision in this game would be free from intrahousehold bargaining. On the other hand, the decision would be subject to present bias because the payment was made on the same day. So if we find that present-biased individuals are less likely to choose their spouses to receive the payout, we will be more confident in our time preference variables.[25]

Table 1 shows in total, 51.5 percent of the subjects chose to have their spouses receive their experimental reward if Game 0 was chosen as the payout game. In line with the previous two outcome variables, husbands were more likely to choose this option compared with wives (75.4 percent vs. 27.6 percent).

The results of the probit model are presented in Table 6. As expected, presesnt-biased individuals are less likely to have their spouses receive the experimental reward. Given that the decision would be free from their spouse's influence, it is puzzling that the spouse's present bias shows significant influence in Column (1) and that the coefficients of `PB w/ sp NPB` and `PB w/ sp PB` are rather different. One possible explanation is that the actual intrahousehold decision forms a norm among the couples, which in turn affects the decision in Game 0. A framing effect may also work: those who usually turn over their earnings to their spouses would choose to ask their spouses to receive experimental payments in this particular game. The joint decision present bias does not affect the decision in Game 0 (not reported), which is consistent with the previous analysis and the setting of Game 0 which is free from intrahousehold decision making. The results are similar across male and female, also supporting that the decision is made individually and free from intrahousehold bargaining (Columns (4) to (7)). In all, these result confirm the validity of our time preference parameters.

[25] A better experimental design for testing marriage as a commitment device would be to make payment a few days later so that the decision in Game 0 is not subject to present bias. This design would allow us to directly test whether present-biased individuals are more likely to use their time-consistent spouses as a commitment device. We leave this for future research.

Game 0 and the percent of salary turned over to spouses.

4.5 Pocket Money

Now we turn to the reallocation of the pooled resources. More specifically, we examine how much money couples allocate to each other as a monthly allowance. Although present-biased individuals turn over smaller portion of their earnings to their spouses, it's still possible for couples to manage the present bias problem by giving a smaller amount of allowance to present-biased individuals. Compared to the share of the income turned over to the spouses, the amount of allowance allocated to each spouse would be more likely under control of the financial manager or the couple's joint decision. This may enable joint-decision time-consistent couples to alleviate the time-inconsistency problems of the individually present-biased spouses by reducing the amounts of monthly allowances to them. To explore this possibility, we asked couples in the household survey how much money they each received as an allowance in the previous month. As reported in Table 1, the amount of allowance is larger for husbands than for wives and the difference is statistically significant.

The upper panel of Table 7 reports the regression results on monthly allowance where we use the indicator variables for the subject's present bias and for the spouse's present bias. We use the same covariate as before, and also control the size of the household income because the allowance amount will be affected by the income level. The result in Column (1) suggests a present-biased individual actually receives a smaller amount of allowance. In Column (2), we include the indicator variable for those who are individually present-biased but not jointly present-biased. The result suggests that the negative coefficient of the own present bias in Column (1) is driven by these individuals. Couples whose joint decision is not present-biased allocate less amount of allowance to present-biased individuals, while couples whose joint decisions are present-biased fail in reducing monthly allowances to present-biased individuals.

When we separate the sample into husbands and wives, we find more subtle results. The results in Columns (3) and (4) suggest when husbands are present-biased, *both* of husband's and wife's monthly allowances are reduced by more than 250,000 dong, which is more than fifty percent of the average amount of allowances for the wives. Whether wives are present-biased or not does not affect the amounts of allowances allocated to each. The results in Columns (5) and (6) suggest, while joint decision present bias does not affect the amount of allowance for present-biased husbands, it does affect for present-biased wives. Present-biased wives receive less allowance by 228,000 dong if joint decision is not present-biased. Present-biased husbands receive less allowance irrespective of

joint decision present bias. Having a present-biased husband reduces the allowance for his wife by 289,000 dong.

One may be concerned that the negative coefficients on present bias variables are caused by the fact that present-biased individuals turn over less to their spouses, or household budget. However, when we include the share of earnings turned over to spouses as regressors,[26] the magnitude of the coefficients on present bias variables slightly increases as reported in the upper panel of Appendix Table 3. Thus our finding that a present-biased individual receives a smaller allowance is not driven by the smaller earnings turned over.

Even though we have found some evidence that couples try to alleviate present bias problems by allocating smaller amount of money to present-biased individuals, it is still possible for these present-biased individuals to hide part of their income to maintain a desired level of discretionary income. To examine this possibility, we asked subjects individually (not in the presence of their spouses) the amount of money they could spend without their spouse's agreement. From this data we calculate the amount of hidden disposable money by taking the difference between the monthly allowance which is elicited from the household survey and the amount of money the subject could spend without their spouse's agreement. The lower panel of Table 7 reports the regression results. Column (1) shows that the coefficient of own present bias is significantly positive and its magnitude is comparable to that of Column (1) in the upper panel of Table 7. This suggests even though households allocate smaller amounts of allowances to present-biased individuals, they hide the same amount of money behind their spouses so that they have enough money to spend without their spouse's agreement. When we include the indicator variable for those who are individually present-biased but not jointly present-biased in Column (2), the coefficients of the own present bias and this indicator are positive with the magnitudes comparable to those of Column (2) in the upper panel. These results are confirmed by the regression results when we regress the amount of money the subject could spend without his/her spouse's agreement on the same set of the control variables, where the coefficients of own present bias indicator turn out to be insignificant. Although the households try to alleviate the present bias problem by allocating less money to present-biased individuals, these individuals undo this by hiding their income. When we split the sample into the husbands and wives, the significance goes away probably due to the smaller sample size, but the point estimates suggest the same story: present-biased individuals hide more money to counteract the reduction of allowance. It should be noted that when the reduction of the amount of allowance

[26] Clearly this variable is endogenous but it captures the omitted variables relating to the smaller household budget due to less pooled income.

is caused by the husband's present bias, then wives do not (or possibly cannot) increase the amount of hidden money. These results do not change if we control the share of earnings turned over to spouses as reported in the lower panel of Appendix Table 3.

Note that the amount of hidden disposable money is the difference between the amounts of money the subject could spend without his/her spouse's agreement and their monthly allowance. If the amount of money the subject could spend without their spouse's agreement is constant across individuals, then any variables positively correlating with the monthly allowance would correlate negatively with the amount of hidden disposable money by construction. Figure 4 indicates this might not be the case. The amount of money the subject could spend without their spouse's agreement distribute as sparsely as the monthly allowance. Further, the correlation coefficient of these two variables is a positive value of 0.52, which also supports the argument that the negative coefficients in the regression of the hidden disposal money do not just reflect the positive coefficients in the regression of the monthly allowance.

4.6 ROSCAs

Previous literature argues that ROSCAs function as a commitment mechanism to protect money from own present bias, spouse's pressure to use money, and neighbor's pressure to share income or lend money (Anderson and Baland, 2002). In this subsection, we examine whether the participation in ROSCAs is correlated with the own and spouse's present bias. Note that only 28 out of 268 subjects report participating in ROSCAs. In addition, twelve of these 28 subjects were in the same households. In these cases, it is not clear whether both husbands and wives have access to money in ROSCAs or only one of them join ROSCAs but both of them report they use ROSCAs. Hence we need a caution for interpreting the results.

Table 8 reports the average marginal effects of the probit models. We use the same covariates as in the last subsection. When we include the indicators for own present bias and spouse's present bias, we do not find any statistically significant results. Including the joint-decision time-preference do not change the results. Instead when we include the indicator for the present-biased subject with non-present-biased spouse, `PB w/ sp NPB`, the indicator for the non-present-biased subject with present-biased subject, `NPB w/ sp PB`, and the indicator for the couples both of whom are present-biased, `PB w/ sp PB`, then we find that couples with a present-biased spouse are more likely to use ROSCAs. Including the interaction terms with joint decision non-present bias only little changes of the coefficients and eliminates the significance due to the multicollinearity. Columns (5)

and (6) report the regression results splitting the sample into husbands and wives. For husbands, there are no observations whose value of PB w/ sp PB equals one and who joined ROSCAs, so these observations are dropped from the estimation leaving us 117 observations. The coefficients of PB w/ sp NPB and NPB w/ sp PB are positive for both husbands and wives, and statistically significant results are obtained only for the coefficient of NPB w/ sp PB for the wives. Notice that in the previous analyses, we found non-present-biased women who have present-biased husbands turn over substantially larger ratio of their earnings to their present-biased husbands, and receive less income from their husbands. Wives with present-biased husbands also receive less amount of allowance, and, though statisically insiginificant, less disposal money. The result in Column (6) in Table 8 shows it is exactly these wives who are more likely to utilize ROSCAs, probably in order to protect the income from the husbands' self-control problem.

4.7 Robustness

In the time discounting game, 37% of the subjects always choose to receive 100,000 dong sooner and never choose to receive a larger amount of money later. In the above analyses, we assumed these subjects are time-consistent. Table 4 report results when we drop these observations. Most of the estimated coefficients remain stable, though the estimates become less precise because of the smaller sample size. The first three columns in the upper panel of Appendix Table 4 report the estimation results of the percentage of earnings turned over to spouses, where Column (1) reports the estimation result using both the husband and wife samples, Column (2) the result using only the male observations, and Column (3) the result using only the female observations. Our main finding still holds: present-biased individuals turn over less to the non-present-biased spouses and non-present-biased individuals turn over more to the present-biased spouses. When we split the sample into husbands and wives, the significance goes away but the coefficients are still stable and the coefficients for wives are much higher than those for husbands as we found the analysis above.

Column (4) and (5) report the estimation results on the role of financial manager. Similar to the main analysis, we again find that estimated coefficients relating present bias are insignificant, but when we include the interaction term with the sophistication variable, both the interaction term and PB w/ sp NPB becomes significant: while unsophisticated present-biased individuals are more likely to keep cash than non-present-biased individuals, sophisticated present-biased individuals behave similarly to non-present-biased individuals. Couples with unsophisticated present-biased individuals seem to suffer from the present bias problem by allowing present-biased individuals

to keep cash, and even sophisticated individuals does not actively delegate the role of financial management to their non-present-biased spouses. Column (6) reports the estimation results on choices made in Game 0 and the results we obtained in the previous analysis still holds.

In the middle panel of Appendix Table 4, Columns (1) and (2) report the estimation results on monthly allowances and Columns (3) and (4) the hidden disposal money. The regression results are again similar to the main analyses. For the monthly allowance, the present-biased individuals receive smaller amount of allowances driven by those present-biased individuals whose joint decision with their spouses does not exhibit present bias. On the other hand, these individuals hide the corresponding amount of money so that they can have enough money to spend without their spouse's agreement. Although the households try to alleviate the present bias problems by allocating less money to present-biased individuals, these individuals undo this by hiding their income.

Columns (5) reports the estimation results on ROSCA participation using full sample, and Column (6) using only wife sample. The magnitudes of the coefficients are similar to Table 8, though the significance of `NPB w/ sp PB` for the wife sample goes away due to smaller sample size.

In the lower panel of Appendix Table 4, we drop drop observations who participate in ROSCAs. We have done this because individuals facing present bias problem may have already utilized an external commitment device such as ROSCAs before deciding whether to use their spouses as a commitment device, which would make the amount of the earnings turned over to the spouse smaller. The results are still similar to our main results, which confirms that marriage fails in functioning as a commitment device and rather provides additional resources for present-biased spouses to consume.

4.8 Impact on savings and asset accumulation

Finally, we investigate whether present bias affects the actual savings and asset accumulation of the couple. Columns (1) to (4) in Appendix Table 5 presents the regression results on the indicator for the household which have any savings, and Columns (5) to (8) report on the asset holdings. The results show the preference parameters of the husbands and wives do not predict these variables. Given the large standard deviation of the asset holdings, it will be difficult to detect any impact with a small sample size (134 for each of husbands and wives). From our data, we cannot find any evidence that present bias affects the actual household savings and the value of the household assets.

5 Explanatory Model

5.1 Failure in Commitment within Couples

The model above describes the situation where a present-biased player use his/her spouse as a savings commitment device. In this section we extend our model by allowing the possibility of breaking the commitment and accessing the spouse's budget. This extension generate results consistent with our empirical results: the share of the earnings turned over to the spouse is less among present-biased individuals and more among individuals having present-biased spouses. Suppose that at the beginning of period 1, a player can gain access to his/her spouse's budget by paying a cost $z > 0$, which also incurs a cost $z_S > 0$ on his/her spouse. The model above can be considered the case where z is sufficiently large and nobody will break the commitment. The costs z and z_S can be interpreted as a psychological or physical cost of conflict caused by the player trying to gain access to the spouse's budget. If that player gains access to the household budget and hence both players are in charge of consumption decision, the common consumption level in period 1 is determined by the sum of their demands. For the sake of simple exposition, in the analysis above we did not specify how the common consumption level is determined when both spouses are in charge of consumption decision, but the result does not change by explicitly consider this decision rule. [27] [28]

First consider the common consumption levels when both players are in charge of consumption decision. As assumed above, the equilibrium consumption level in period 1 is determined by the sum of the players' claims. If $c_1^{i*} = c_1^{j*}$, there is no conflict between husbands and wives on how to allocate the household budgets in period 1. Suppose $c_1^{i*} \neq c_1^{j*}$. By examining strategic interaction of the players, we obtain the following lemma:[29]

Lemma 1 *Suppose both players are in charge of consumption decision. Let $c_1^{k*} > c_1^{l*}$ where $k, l \in \{i, j\}$ and $k \neq l$. Then, player k claims c_1^{k*} and player l claims zero in equilibrium. The equilibrium consumption in period 1 is c_1^{k*}.*

[27] The assumption that the common consumption level in period 1 is determined by the sum of their demands is just for simplicity and other alternative assumptions will yield the similar results. One example is to assume that the common consumption level is determined by the average of their demands, instead of the sum.

[28] Unfortunately, in our data set we do not have the direct measure of z. Further, we extend our model after observing that our empirical results are not consistent with the model of marriage as a commitment device. Hence we do not attempt to test the model described here. We present our extended model here with the purpose of providing a framework which can help readers interpret the results.

[29] The proof is provided in Appendix.

Now consider the case of $\beta^i\delta^i > \beta^j\delta^j$. Then $c_1^{i*} < c_1^{j*}$ and hence when both players are in charge of consumption decision, the equilibrium consumption level in period 1 is c_1^{j*} by Lemma 1. Supose player i keep his earnings. Then player j will try to access player i's earnings by paying the cost z:

$$u(c_1^{j*}) + \beta^j\delta^j u(1 - c_1^{j*}) - z > u(c_1^{i*}) + \beta^j\delta^j u(1 - c_1^{i*}). \tag{8}$$

Notice that when player i's earnings are quite small relative to player j's, then j's income will be sufficient for her to achieve c_1^{j*}. Hereafter, we analyze the cases where the difference in earnings within a couple are not so large and hence players may be enticed to access his/her spouse's earnings. In the estimation, we always control the difference in the income levels within a couple.

Now let $\beta_{1j}^i(\beta^j, \delta^i, \delta^j, z)$ be the cut-off value of β^i in inequality (8) for given β^j, δ^i, δ^j, and z, i.e., $u(c_1^{j*}) + \beta^j\delta^j u(1 - c_1^{j*}) - z = u(c_1^{i*}) + \beta^j\delta^j u(1 - c_1^{i*})$ when $\beta^i = \beta_{1j}^i(\beta^j, \delta^i, \delta^j, z)$.[30] Given $\beta^i\delta^i > \beta^j\delta^j$, inequality (8) holds if and only if $\beta^i > \beta_{1j}^i(\beta^j, \delta^i, \delta^j, z)$. By the implicit function theorem and substituting the first order condition, we have

$$\frac{\partial\beta_{1j}^i(\beta^j, \delta^i, \delta^j, z)}{\partial\beta^j} = \frac{\delta^j\{(u(c_2^{i*}) - u(c_2^{j*})\}}{(\beta^i\delta^i - \beta^j\delta^j)u'(c_2^{j*}) \cdot (-\frac{\partial c_1^{i*}}{\partial\beta^i})} > 0,$$

and

$$\frac{\partial\beta_{1j}^i(\beta^j, \delta^i, \delta^j)}{\partial\delta^j} = \frac{\beta^j\{(u(c_2^{i*}) - u(c_2^{j*})\}}{(\beta^i\delta^i - \beta^j\delta^j)u'(c_2^{j*}) \cdot (-\frac{\partial c_1^{i*}}{\partial\beta^i})} > 0.$$

If $\beta^i > \beta_{1j}^i(\beta^j, \delta^i, \delta^j, z)$, then player j will try to gain access to her spouse's budget, which imposes a cost z_S on player i, and the consumption level will be determined by player j's preference. So there are no use for player i of keeping the earnings in period 0, and hence player i will choose to turn over his earnings to player j to avoid incurring cost z_S. It implies that an agent is more likely to turn over the earnings as the spouse is more present-biased or more impatient.

Next, consider the case of $\beta^i\delta^i < \beta^j\delta^j$. It leads to $\max\{c_1^{i*}, c_1^{j*}\} = c_1^{i*}$. Then, player i turns over his earnings and player j is in charge of household consumption decisions if both inequalities (7) and

$$u(c_1^{j*}) + \beta^i\delta^i u(1 - c_1^{j*}) > u(c_1^{i*}) + \beta^i\delta^i u(1 - c_1^{i*}) - z \tag{9}$$

hold. Let $\beta_{1i}^i(\beta^j, \delta^i, \delta^j, z)$ be the cut-off value of inequality (9) for given β^j, δ^i and δ^j, i.e., $u(c_1^{j*}) + \beta^i\delta^i u(1-c_1^{j*}) = u(c_1^{i*}) + \beta^i\delta^i u(1-c_1^{i*}) - z$ when $\beta^i = \beta_{1i}^i(\beta^j, \delta^i, \delta^j, z)$. Given $\beta^i\delta^i < \beta^j\delta^j$, inequality 9 holds if and only if $\beta^i > \beta_{1i}^i(\beta^j, \delta^i, \delta^j, z)$.

By combining them, we obtain the following results:

[30] Note that c_1^{k*} depends on β^k and δ^k.

Claim 2 *(i) Suppose $\beta^i\delta^i > \beta^j\delta^j$. Then, player i turns over the earnings to player j if and only if $\beta^i > \beta^i_{1j}(\beta^j, \delta^i, \delta^j, z)$, where $\beta^i_{1j}(\beta^j, \delta^i, \delta^j, z)$ is increasing in β^j and in δ^j. Otherwise player i becomes in charge of household consumption decisions. (ii) Suppose $\beta^i\delta^i < \beta^j\delta^j$. Then, player i turns over the earnings if and only if $\beta^i \in (\beta^i_{1i}(\beta^j, \delta^i, \delta^j, z), \min\{\beta^j\delta^j/\delta^i, \beta^i_0(\beta^j, \delta^i, \delta^j)\})$. Otherwise, player i keep the earnings and is in charge of household consumption decisions.*

It is ambiguous that how player i is likely to be in charge of consumption decisions as his/her present bias varies. When $\beta^i\delta^i > \beta^j\delta^j$, too high $\beta^i\delta^i$ will induce player j to gain access to player i's budget. In this case, having a more present-biased spouse will make a player more likely to turn over the earnings. A large difference in c_1^{i*} and c_1^{j*}, which reflects a large difference in $\beta^i\delta^i$ and $\beta^j\delta^j$, will give a less patient agent an incentive to try to access the household budget. On the other hand, when $\beta^i\delta^i < \beta^j\delta^j$, too present-biased players will not turn over the earnings because they expect that they will eventually gain access to their spouses' budgets. Also note that both $\beta^i_{1j}(\beta^j, \delta^i, \delta^j, z)$ and $\beta^i_{1i}(\beta^j, \delta^i, \delta^j, z)$ approach to $\beta^j\delta^j/\delta^i$ as z goes to zero. It implies that if the cost of conflict $z > 0$ is sufficiently small and if the distribution of β^i is not concentrated around $\beta^j\delta^j/\delta^i$, then player i is more likely to be in charge of consumption decisions as β^i decreases.

5.2 External Commitment Device

The above analysis shows that if z is small, marriage cannot work as a commitment device and a more impatient player becomes in charge of the household budget. In such a situation, a player who wants to protect the household budget from the impatient spouse would have an incentive to use external commitment devices such as ROSCAs. Suppose the cost of conflict z is very low, but in period 0 player i can also choose to put aside his/her earnings into an external commitment institution. If player i uses this external device, they have to pay a cost $r > 0$ and the consumption level is determined in period 0. The cost r can be interpreted as a participation cost or a transaction cost.

If player i uses an external commitment device, then player i chooses the consumption level $\bar{c}_1^i$. In this case, player i expected utility in period 0 is $u(\bar{c}_1^i) + \delta^i u(1 - \bar{c}_1^i) - r$. On the other hand, suppose player i does not use an external commitment device. By Claim 2, the consumption level is $\max\{c_1^{i*}, c_1^{j*}\} \equiv c_1^{max*}$, and the couples will not incur z or z_S because they will avoid incurring these costs by choosing whether to turn over their earnings. In this case, i's expected utility in period 0 is $u(c_1^{max*}) + \delta^i u(1 - c_1^{max*})$. Thus, player i takes up the external commitment device in

period 0 if and only if

$$u(\bar{c}_1^i) + \delta^i u(1 - \bar{c}_1^i) - r \geq u(c_1^{max*}) + \delta^i u(1 - c_1^{max*}).$$

Note that $c_1^{max*} = c_1^{i*}$ if and only if $\beta^i\delta^i \leq \beta^j\delta^j$. We have the following comparative statics results. In the case of $\beta^i\delta^i < \beta^j\delta^j$, player i is more likely to use the external commitment device as β^i decreases, player i's tendency to use it does not depend on β^j, δ^j, and comparative statics with respect to δ^i is ambiguous. In the case of $\beta^i\delta^i > \beta^j\delta^j$, player i is more likely to use the external commitment device as δ^i increases or β^j, δ^j decreases, and player i's tendency to use it does not depend on β^i. By summing up, we obtain the following claim:[31]

Claim 3 (External Commitment.) *Suppose z is small and an external commitment device is available. If $\beta^i\delta^i < \beta^j\delta^j$, player i is more likely to use the external commitment device as β^i decreases. If $\beta^i\delta^i > \beta^j\delta^j$, player i is more likely to use the external commitment device as δ^i increases or β^j, δ^j decreases.*

Claim 3 implies a player is more likely to use external commitment devices when (i) the player is more present-biased, (ii) the spouse is more present-biased and (iii) the spouse is more impatient. When the player is more present-biased, he/she has an incentive to use external commitment devices to alleviate own self-control problem as developed in Laibson (1997), Ambec and Treich (2007), and Basu (2011). When the spouse is more impatient, the player has an incentive to use external savings commitment devices to protect money from the spouse as described in Anderson and Baland (2002). Tanaka and Nguyen (2010) find a positive correlation between the participation rate of ROSCAs and the degree of present bias.

6 Conclusion

We examine whether marriage works as a savings commitment device. While our experimental results suggest the possibility of joint decision making alleviating the present bias problem, the actual household resource allocation exhibit opposite patterns. Present-bias individuals turn over less to their spouses and receive more from their spouses. Present-biased individuals are more likely to keep cash within households. These patterns hold irrespective of whether their joint decision is present-biased or not. Our results suggest that marriage not only fails in functioning as a saving commitment device but also exacerbates the present-biased problem by providing more resources

[31] The proof is provided in Appendix.

for present-biased individuals to consume. Households whose joint decision is not present-biased actually allocate less monthly allowance to present-biased spouses, but these individuals undone this by concealing money. We also found that wives are more affected by their husbands' present-biased, and these wives are more likely to use ROSCAs.

Given that household exacerbates the present bias problem, the role of commitment devices outside of households is quite important. This may explain why previous studies found that married women tend to use ROSCAs.

Our model indicates that it is the low cost of accessing the spouse's budget, z, which leads marriage to failure in functioning as a commitment device. However, we do not have direct measures of z and we also do not know what causes low z. The low z may arise from affection and acceptance which marriage is based on, which may result in Samaritarian's dilemma: individuals consume more because they know their spouse will help them if they are in need. We leave for further research what causes low z and what interventions can help households alleviate individual self control problems.

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Table 1: Summary statistics

	Male	Female	Total
Age	38.56	36.40	37.48
	(6.530)	(6.782)	(6.733)
Education	8.104	7.910	8.007
	(3.419)	(3.626)	(3.519)
Own monthly income: million VND	2.528	1.442	1.985
	(1.819)	(1.515)	(1.757)
Value of own asset: million VND	280.0	222.8	251.4
	(495.6)	(602.8)	(551.5)
Value of own inherited asset: million VND	128.5	97.48	113.0
	(380.6)	(245.5)	(320.0)
Number of correct answers in the arithmetic problems	4.888	4.657	4.772
	(2.524)	(2.567)	(2.543)
Number of correct answers in the financial literacy questions	1.821	1.455	1.638
	(1.032)	(0.993)	(1.028)
The percent of salary the subject gives to his/her spouse	0.719	0.130	0.446
	(0.318)	(0.297)	(0.426)
Keep cash in the household (yes=1, no=0)	0.321	0.866	0.593
	(0.469)	(0.342)	(0.492)
Prefer spouse receiving my reward in Game 0	0.754	0.276	0.515
	(0.432)	(0.449)	(0.501)
Amount of allowance per month: thousand VND	648.1	406.8	527.5
	(553.2)	(411.1)	(501.2)
Any savings (yes=1, no=0)	0.612	0.612	0.612
	(0.489)	(0.489)	(0.488)
β	0.965	0.940	0.953
	(0.160)	(0.119)	(0.141)
present bias (PB)	0.336	0.403	0.369
	(0.474)	(0.492)	(0.484)
δ	0.935	0.943	0.939
	(0.0478)	(0.0461)	(0.0470)
present bias (joint decision)			0.231
			(0.423)
δ (joint decision)			0.935
			(0.0474)
sophisticated PB	0.291	0.336	0.313
	(0.456)	(0.474)	(0.465)

Note: The mean values are reporpted with standard errors in the parenthesis. The differences between husband and wife in age, own monthly income, number of correct answers in the financial literacy questions, the percent of salary the subject gives to his/her spouse, whether to keep cash in the household, amount of monthly allowance are significant at 1% level. The differences in other variables are not statistically significant even at 10% level.

Table 2: Elicited preference parameters

	Wife		
Husband	non present-biased	present-biased	Total
non present-biased	38.8	27.6	66.4
present-biased	20.9	12.7	33.6
Total	59.7	40.3	100.0

	Joint decision		
Individual decision	non present-biased	present-biased	Total
neither are present-biased	36.6	2.2	38.8
One person is present-biased	35.1	13.4	48.5
Both are present-biased	5.2	7.5	12.7
Total	76.9	23.1	100.0
Observations	134		

Table 3: The percent of salary turned over to spouses: Tobit

	(1) All	(2) All	(3) All	(4) All	(5) Husband	(6) Wife	(7) Husband
PB×$(\beta\delta - \beta^s\delta^s)$	-0.003						
	(1.634)						
sp PB×$(\beta\delta - \beta^s\delta^s)$	-2.082						
	(2.105)						
present bias(PB)		-0.253*	-0.238		-0.170	-0.605	
		(0.142)	(0.165)		(0.125)	(0.490)	
spouse PB(sp PB)		0.438***	0.435***		0.286**	1.403***	
		(0.146)	(0.152)		(0.138)	(0.536)	
PB but joint NPB			-0.026				
			(0.181)				
PB & sp NPB				-0.333**			-0.236
				(0.165)			(0.162)
NPB & sp PB				0.368**			0.230
				(0.164)			(0.159)
PB & sp PB				0.229			0.151
				(0.188)			(0.175)
δ		3.399**	3.384**	3.468**	2.635*	8.558	2.719*
		(1.573)	(1.586)	(1.572)	(1.395)	(5.568)	(1.392)
δ^s		-3.733**	-3.726**	-3.675**	-3.448**	-7.562	-3.395**
		(1.573)	(1.575)	(1.575)	(1.453)	(5.370)	(1.445)
Female	-1.388***	-1.392***	-1.390***	-1.394***	0.000	0.000	0.000
	(0.166)	(0.163)	(0.162)	(0.163)	(.)	(.)	(.)
Difference in age from spouse	-0.066	-0.065	-0.064	-0.065	-0.058	-0.100	-0.059
	(0.066)	(0.067)	(0.067)	(0.066)	(0.058)	(0.265)	(0.058)
Difference in education from spouse	0.023	0.052	0.051	0.052	0.037	0.080	0.036
	(0.083)	(0.079)	(0.079)	(0.079)	(0.058)	(0.277)	(0.058)
Difference in income from spouse	0.063	0.064	0.065	0.062	0.012	0.459	0.010
	(0.054)	(0.055)	(0.055)	(0.055)	(0.049)	(0.299)	(0.050)
Difference in asset from spouse	0.041	0.049	0.050	0.048	0.122**	-0.443	0.122**
	(0.053)	(0.042)	(0.041)	(0.042)	(0.055)	(0.350)	(0.054)
Difference in inherited asset	-0.031	-0.041	-0.043	-0.043	-0.062	0.086	-0.063
	(0.067)	(0.056)	(0.057)	(0.056)	(0.056)	(0.249)	(0.057)
length_marriage	-0.008	-0.004	-0.004	-0.004	0.005	-0.065	0.004
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.052)	(0.010)
Observations	237	237	237	237	127	110	127

Standard errors in parentheses

Other control variables such as the differences in income, asset, age, education, arithmetic score, and financial literacy are not reported but always included.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Including sophistication variable

	(1) All	(2) All	(3) husband	(4) wife	(5) husband	(6) wife
present bias(PB)	-0.206		-0.100	-0.117		
	(0.273)		(0.227)	(0.975)		
spouse PB(sp PB)	0.438***		0.287**	1.377**		
	(0.146)		(0.137)	(0.540)		
sophisticated PB	-0.055		-0.078	-0.559		
	(0.255)		(0.229)	(1.024)		
PB & sp NPB		-0.387			-0.151	-7.924***
		(0.319)			(0.306)	(0.184)
NPB & sp PB		0.366**			0.232	1.344***
		(0.163)			(0.159)	(0.101)
PB & sp PB		0.228			0.154	0.836***
		(0.187)			(0.175)	(0.094)
PB & sp NPB× soph PB		0.059			-0.093	7.294***
		(0.311)			(0.304)	(0.184)
Observations	237	237	127	110	127	110

Standard errors in parentheses

Other control variables such as the differences in income, asset, age, education, arithmetic score, and financial literacy are not reported but always included.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Whether subjects keep cash in their households

	(1) All	(2) All	(3) All	(4) All	(5) Husband	(6) Wife	(7) Husband	(8 Wi
PB×$(\beta\delta - \beta^s\delta^s)$	0.545							
	(0.937)							
sp PB×$(\beta\delta - \beta^s\delta^s)$	0.086							
	(0.783)							
present bias(PB)		0.081	0.013		0.212**	-0.013		
		(0.056)	(0.069)		(0.107)	(0.061)		
spouse PB(sp PB)		-0.042	-0.029		-0.079	-0.014		
		(0.063)	(0.063)		(0.095)	(0.080)		
PB but joint NPB			0.109					
			(0.080)					
PB & sp NPB				0.070			0.236*	-0.0
				(0.065)			(0.128)	(0.0
NPB & sp PB				-0.053			-0.056	-0.0
				(0.065)			(0.110)	(0.0
PB & sp PB				0.047			0.119	-0.0
				(0.068)			(0.146)	(0.1
δ		-0.683	-0.639	-0.677	-1.455	-0.600	-1.474	-0.5
		(0.648)	(0.646)	(0.649)	(1.135)	(0.685)	(1.136)	(0.6
δ^s		0.352	0.376	0.360	0.585	0.218	0.562	0.2
		(0.762)	(0.753)	(0.759)	(1.052)	(0.843)	(1.050)	(0.8
Female	0.528***	0.530***	0.526***	0.530***	0.000	0.000	0.000	0.0
	(0.056)	(0.053)	(0.054)	(0.053)	(.)	(.)	(.)	(.
Difference in age from spouse	0.056*	0.055*	0.053*	0.055*	0.055	0.048	0.056	0.05
	(0.032)	(0.031)	(0.031)	(0.031)	(0.041)	(0.032)	(0.041)	(0.0
Difference in education from spouse	0.077**	0.071**	0.075**	0.071**	0.095**	0.064*	0.095**	0.06
	(0.033)	(0.033)	(0.033)	(0.033)	(0.043)	(0.034)	(0.043)	(0.0
Difference in income from spouse	0.006	0.008	0.007	0.008	-0.020	0.026	-0.020	0.0
	(0.042)	(0.042)	(0.042)	(0.042)	(0.051)	(0.039)	(0.051)	(0.0
Difference in asset from spouse	-0.023	-0.021	-0.027	-0.021	-0.070	0.065	-0.071	0.0
	(0.020)	(0.020)	(0.019)	(0.019)	(0.046)	(0.044)	(0.048)	(0.0
Difference in inherited asset	0.017	0.018	0.023	0.018	0.006	0.007	0.006	0.0
	(0.029)	(0.028)	(0.028)	(0.027)	(0.045)	(0.037)	(0.045)	(0.0
length_marriage	-0.004	-0.004	-0.004	-0.004	-0.014*	0.006	-0.014*	0.0
	(0.003)	(0.003)	(0.003)	(0.003)	(0.008)	(0.006)	(0.008)	(0.0
Observations	268	268	268	268	134	134	134	13

	(1) All	(2) All	(3) husband	(4) wife	(5) husband	(6) wife
present bias(PB)	0.302**		0.385*	0.856***		
	(0.125)		(0.199)	(0.194)		
spouse PB(sp PB)	-0.041		-0.075	-0.020		
	(0.061)		(0.095)	(0.077)		
sophisticated PB	-0.244*		-0.190	-0.884***		
	(0.126)		(0.192)	(0.195)		
PB & sp NPB		0.378**			0.482**	0.802***
		(0.174)			(0.240)	(0.149)
NPB & sp PB		-0.044			-0.044	-0.052
		(0.064)			(0.110)	(0.089)
PB & sp PB		0.058			0.131	0.001
		(0.067)			(0.146)	(0.103)
PB & sp NPB× soph PB		-0.332*			-0.270	-0.861***
		(0.178)			(0.234)	(0.158)
Observations	268	268	134	134	134	134

Standard errors in parentheses

Other control variables such as the differences in income, asset, age, education, arithmetic score, and financial literacy are not reported but always included.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Probit estimation: Whether subjects want to ask their spouses to keep the experimental rewards

	(1) All	(2) All	(3) All	(4) Husband	(5) Wife	(6) Husband	(7) Wife
present bias(PB)	-0.202***	-0.218***		-0.240***	-0.202**		
	(0.068)	(0.082)		(0.093)	(0.093)		
spouse PB(sp PB)	0.119*	0.122*		0.097	0.167		
	(0.070)	(0.072)		(0.089)	(0.113)		
PB & sp NPB			-0.245***			-0.306***	-0.207*
			(0.084)			(0.110)	(0.111)
NPB & sp PB			0.076			0.036	0.162
			(0.083)			(0.103)	(0.131)
PB & sp PB			-0.055			-0.103	-0.030
			(0.084)			(0.138)	(0.150)
PB but joint NPB		0.024					
		(0.081)					
Female	-0.440***	-0.441***	-0.440***	0.000	0.000	0.000	0.000
	(0.064)	(0.064)	(0.063)	(.)	(.)	(.)	(.)
δ	1.416**	1.427**	1.442**	2.343**	0.839	2.390**	0.843
	(0.694)	(0.700)	(0.692)	(0.977)	(1.033)	(0.985)	(1.035)
δ^s	-1.143	-1.145	-1.100	-0.648	-1.813	-0.593	-1.805
	(0.700)	(0.702)	(0.695)	(0.978)	(1.157)	(0.968)	(1.162)
Difference in age from spouse	-0.010	-0.011	-0.011	0.019	-0.037	0.017	-0.037
	(0.029)	(0.029)	(0.029)	(0.037)	(0.045)	(0.037)	(0.045)
Difference in education from spouse	0.004	0.004	0.003	0.038	-0.024	0.041	-0.024
	(0.031)	(0.031)	(0.031)	(0.041)	(0.041)	(0.041)	(0.041)
Difference in income from spouse	-0.000	-0.000	-0.000	0.037	-0.034	0.036	-0.034
	(0.034)	(0.034)	(0.034)	(0.045)	(0.047)	(0.045)	(0.047)
Difference in asset from spouse	0.017	0.016	0.017	0.075*	-0.055	0.075*	-0.055
	(0.016)	(0.016)	(0.016)	(0.041)	(0.042)	(0.042)	(0.042)
Difference in inherited asset	-0.006	-0.005	-0.006	-0.064	0.070	-0.064*	0.070
	(0.024)	(0.024)	(0.024)	(0.039)	(0.048)	(0.038)	(0.048)
length_marriage	-0.007	-0.007	-0.008	-0.009	-0.004	-0.009	-0.004
	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
Observations	268	268	268	134	134	134	134

Table 7: Amount of monthly allowance and hidden disposal money

Monthly allowance:

	(1) All	(2) All	(3) husband	(4) wife	(5) husband	(6) wife
present bias(PB)	-164.236**	-44.814	-270.670**	-58.669	-254.637*	101.195
	(66.630)	(79.997)	(129.096)	(73.348)	(145.026)	(113.464)
spouse PB(sp PB)	-98.123	-120.972	13.559	-253.702**	10.719	-289.060**
	(72.192)	(73.993)	(81.081)	(123.778)	(84.631)	(125.332)
PB but joint NPB		-182.636**			-27.564	-228.393**
		(82.036)			(128.608)	(111.679)
Observations	268	268	134	134	134	134

Hidden disposal money:

	(1) All	(2) All	(3) husband	(4) wife	(5) husband	(6) wife
present bias(PB)	191.236*	71.099	112.260	220.809	77.432	34.273
	(100.071)	(103.398)	(104.048)	(149.317)	(138.328)	(158.423)
spouse PB(sp PB)	-100.448	-77.462	-15.509	-183.849	-9.339	-142.593
	(107.711)	(101.783)	(68.890)	(249.101)	(73.048)	(238.023)
PB but joint NPB		183.730			59.875	266.498
		(123.659)			(145.805)	(205.743)
Observations	268	268	134	134	134	134

Table 8: Participation in ROSCAs

	(1) All	(2) All	(3) All	(4) All	(5) husband	(6) wife
present bias(PB)	0.024	-0.021				
	(0.046)	(0.066)				
spouse PB(sp PB)	0.034	0.042				
	(0.053)	(0.053)				
PB but joint NPB		0.066				
		(0.065)				
PB & sp NPB			0.109*	0.123	0.111	0.104
			(0.058)	(0.078)	(0.086)	(0.077)
NPB & sp PB			0.120*	0.106	0.097	0.161*
			(0.067)	(0.088)	(0.083)	(0.095)
PB & sp PB			-0.025	-0.025	0.000	0.031
			(0.094)	(0.095)	(.)	(0.120)
PB & NPB sp*joint NPB				-0.016		
				(0.065)		
NPB & PB sp*joint NPB				0.016		
				(0.069)		
Observations	268	268	268	268	117	134

Standard errors in parentheses

Other control variables such as the differences in income, asset, age, education, arithmetic score, and financial literacy are not reported but always included.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: The percent of salary turned over to spouses: Tobit

	(1) All	(2) All	(3) All	(4) All	(5) All	(6) All	(7) All	(8) Husband	(9) Wife
$\beta\delta < \beta^s\delta^s \leq \delta$	0.055								
	(0.284)								
PB$\times(\beta\delta - \beta^s\delta^s)$		0.028							
		(2.430)							
sp PB$\times(\beta\delta - \beta^s\delta^s)$		-2.735							
		(2.471)							
$\beta - \beta^s\delta^s/\delta$			-0.289						
			(0.702)						
$1[\beta^s\delta^s < \beta\delta] * \lvert\beta\delta - \beta^s\delta^s\rvert *$ sp PB				-0.977				0.123	-1.210
				(2.984)				(1.604)	(7.981)
$1[\beta^s\delta^s > \beta\delta] * \lvert\beta\delta - \beta^s\delta^s\rvert *$ PB				-1.062				-1.663	-7.508
				(3.248)				(2.158)	(10.607)
$1[\beta\delta < \beta^s\delta^s \leq \delta]$					10.605	10.244			
$\times \lvert\beta\delta - \beta^s\delta^s\rvert$					(7.096)	(7.122)			
$1[\beta\delta < \delta < \beta^s\delta^s]$					-0.028*	-0.029*			
$\times \lvert\delta - \beta^s\delta^s\rvert$					(0.017)	(0.018)			
$1[\beta\delta < \beta^s\delta^s]$						12.065			
$\times \lvert\beta\delta - \beta^s\delta^s\rvert^2$						(37.039)			
$\beta\delta > \beta^s\delta^s$							-0.017		
							(0.150)		
$\beta\delta < \beta^s\delta^s$							0.010		
							(0.165)		
Observations	237	237	237	237	163	163	237	127	110

Standard errors in parentheses
Other control variables such as the differences in income, asset, age, education, arithmetic score, and financial literacy are not reported but always included.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

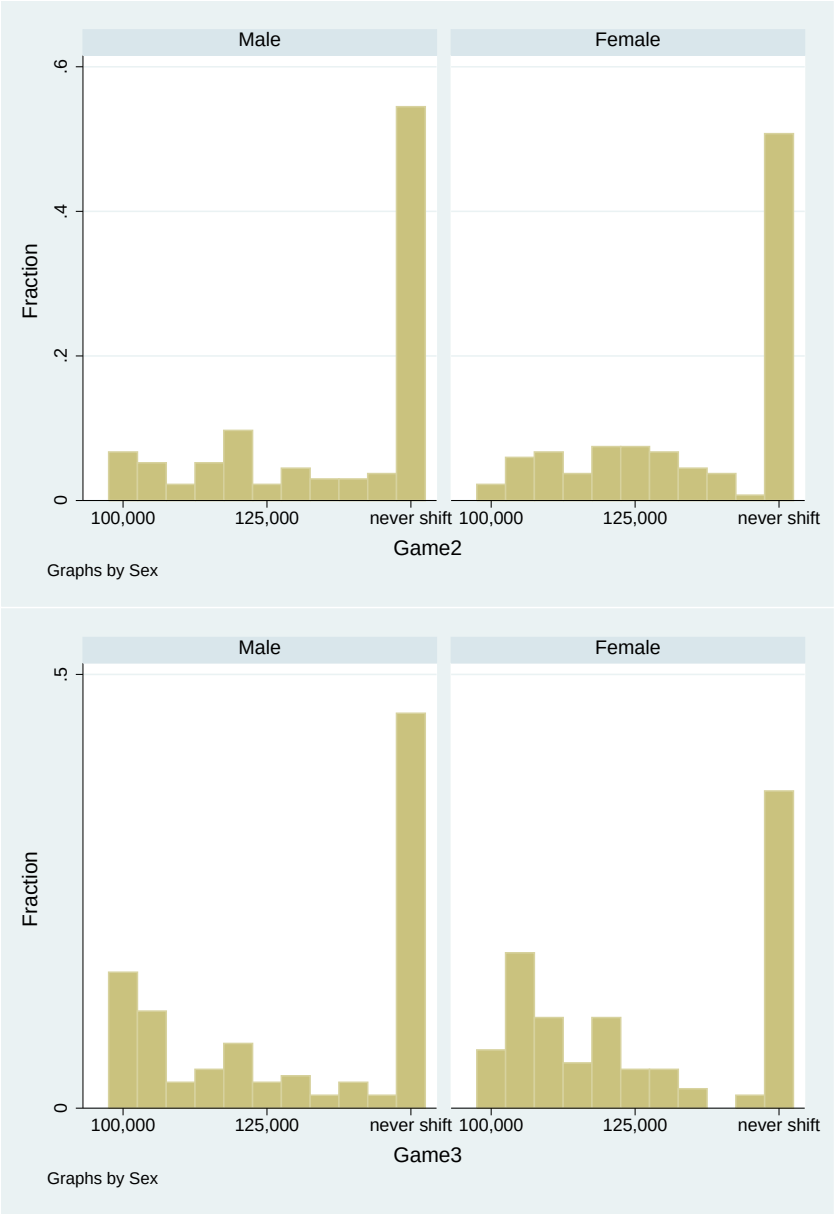
Table 10: Whether subjects keep cash in their households

	(1) All	(2) All	(3) All	(4) All	(5) All	(6) All	(7) All	(8) Husband	(9) Wife
$\beta\delta < \beta^s\delta^s \leq \delta$	0.137								
	(0.099)								
PB$\times(\beta\delta - \beta^s\delta^s)$		0.531							
		(0.966)							
sp PB$\times(\beta\delta - \beta^s\delta^s)$		-0.247							
		(0.978)							
$\beta - \beta^s\delta^s/\delta$			-0.268						
			(0.243)						
$1[\beta^s\delta^s < \beta\delta] * \lvert\beta\delta - \beta^s\delta^s\rvert *$ sp PB				-0.407				-3.943*	1.754
				(1.257)				(2.144)	(1.509)
$1[\beta^s\delta^s > \beta\delta] * \lvert\beta\delta - \beta^s\delta^s\rvert *$ PB				0.421				1.503	-0.709
				(1.289)				(1.528)	(1.249)
$1[\beta\delta < \beta^s\delta^s \leq \delta]$					0.269	-0.006			
$\times \lvert\beta\delta - \beta^s\delta^s\rvert$					(2.796)	(2.779)			
$1[\beta\delta < \delta < \beta^s\delta^s]$					0.001	0.000			
$\times \lvert\delta - \beta^s\delta^s\rvert$					(0.005)	(0.005)			
$1[\beta\delta < \beta^s\delta^s]$						10.750			
$\times \lvert\beta\delta - \beta^s\delta^s\rvert^2$						(13.015)			
$\beta\delta > \beta^s\delta^s$							-0.019		
							(0.061)		
$\beta\delta < \beta^s\delta^s$							0.038		
							(0.062)		
Observations	268	268	268	268	185	185	268	134	134

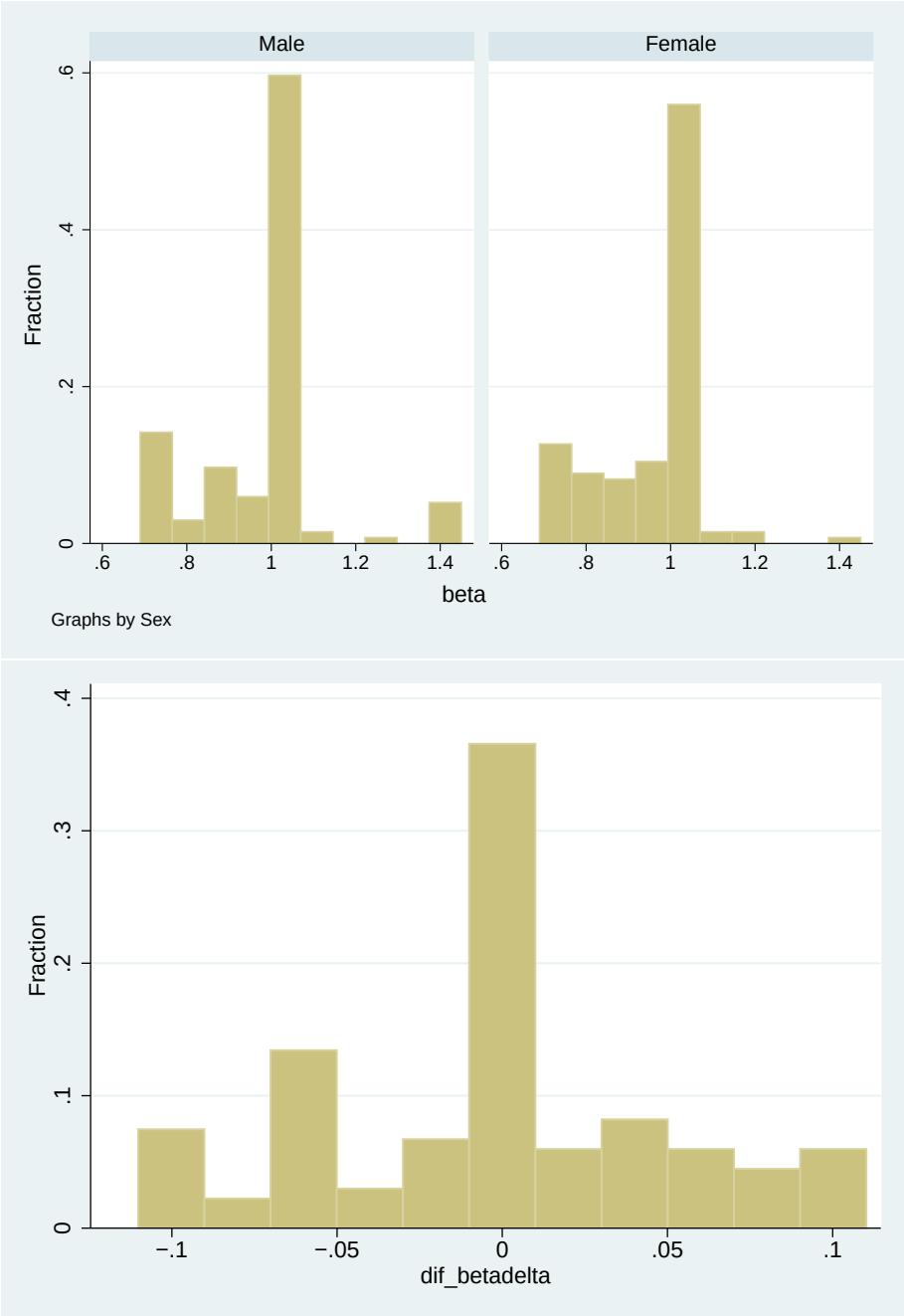
Standard errors in parentheses
Other control variables such as the differences in income, asset, age, education, arithmetic score, and financial literacy are not reported but always included.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A Appendix Figures and Tables

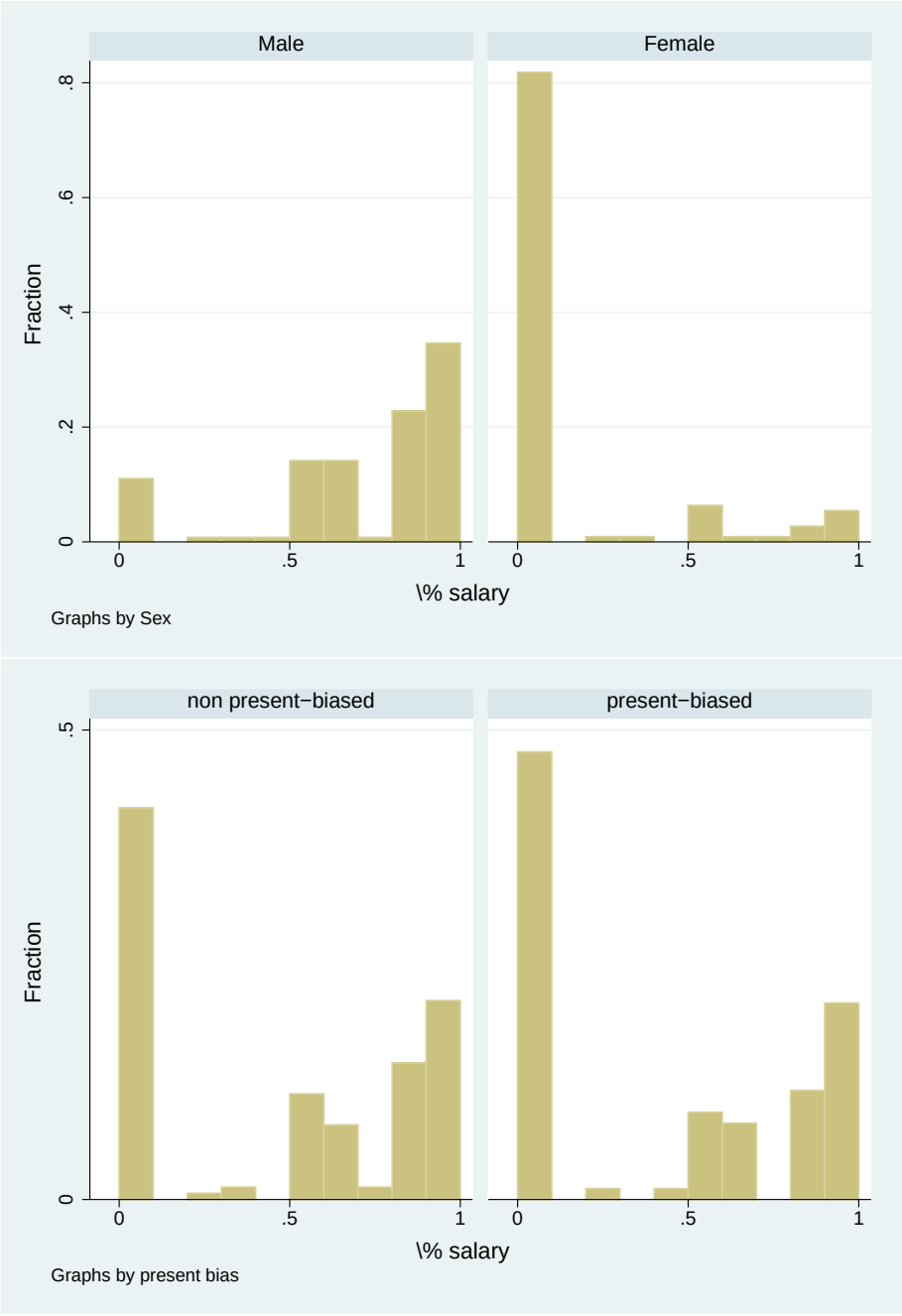
Appendix Figure 1: Choice distribution of Games 2 and Game 3



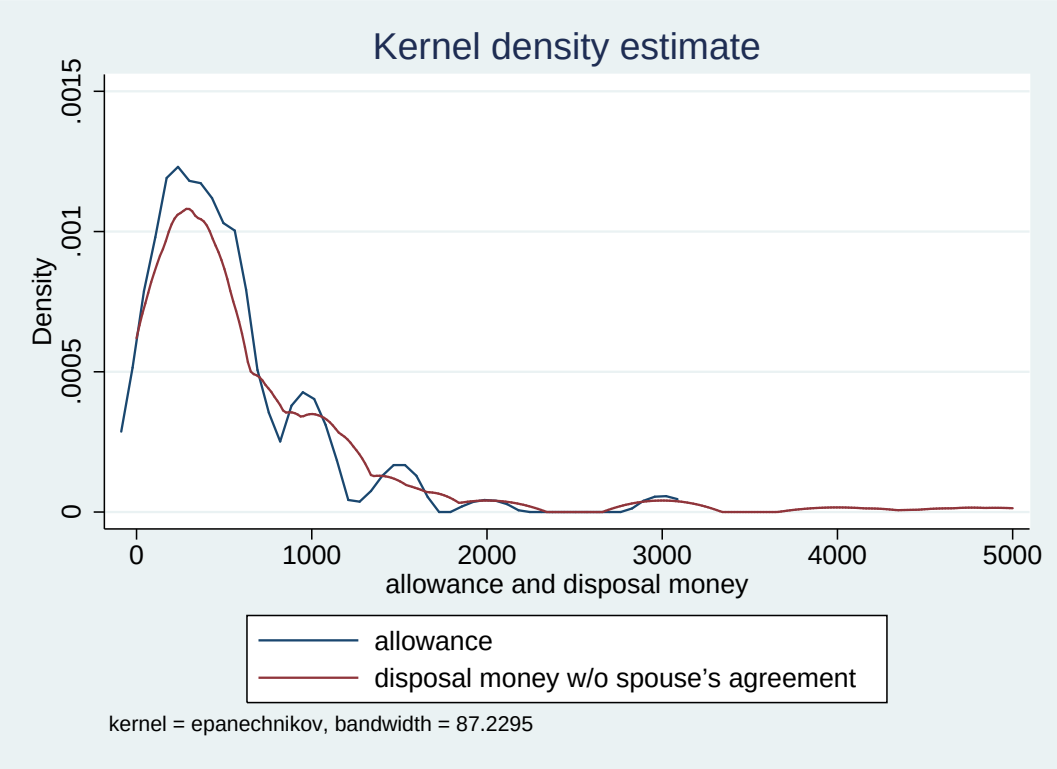
Appendix Figure 2: Elicited β and the difference in $\beta\delta$



Appendix Figure 3: The percent of salary the subject turns over to his/her spouse



Appendix Figure 4: Kernel density estimates of the monthly allowance and monthly disposal money without spouse's agreement



Appendix Table 1: The percentage of salary turned over to spouses: Ordered Probit

	(1) All	(2) All	(3) All	(4) All	(5) Husband	(6) Wife	(7) Husband
pct_givesal3							
PB×$(\beta\delta - \beta^s\delta^s)$	-0.319						
	(2.359)						
sp PB×$(\beta\delta - \beta^s\delta^s)$	-3.911						
	(3.073)						
present bias(PB)		-0.358*	-0.321		-0.313	-0.421	
		(0.217)	(0.261)		(0.282)	(0.342)	
spouse PB(sp PB)		0.661***	0.653***		0.615**	0.977***	
		(0.218)	(0.226)		(0.290)	(0.314)	
PB but joint NPB			-0.060				
			(0.275)				
PB & sp NPB				-0.463*			-0.434
				(0.251)			(0.356)
NPB & sp PB				0.570**			0.515
				(0.253)			(0.345)
PB & sp PB				0.362			0.369
				(0.287)			(0.394)
δ		5.149**	5.120**	5.255**	5.335*	5.970*	5.507*
		(2.318)	(2.343)	(2.325)	(3.054)	(3.617)	(3.053)
δ^s		-5.235**	-5.223**	-5.173**	-6.437**	-5.298	-6.361**
		(2.432)	(2.435)	(2.442)	(3.126)	(3.698)	(3.128)
Female	-1.899***	-1.968***	-1.966***	-1.977***	0.000	0.000	0.000
	(0.275)	(0.281)	(0.280)	(0.280)	(.)	(.)	(.)
Difference in age from spouse	-0.068	-0.063	-0.061	-0.063	-0.098	-0.036	-0.101
	(0.096)	(0.102)	(0.101)	(0.102)	(0.126)	(0.185)	(0.127)
Difference in education from spouse	0.067	0.117	0.115	0.118	0.173	0.049	0.173
	(0.119)	(0.118)	(0.117)	(0.118)	(0.125)	(0.192)	(0.125)
Difference in income from spouse	0.067	0.066	0.067	0.063	0.006	0.281	0.004
	(0.083)	(0.087)	(0.086)	(0.087)	(0.110)	(0.213)	(0.112)
Difference in asset from spouse	0.060	0.066	0.069	0.065	0.236**	-0.318	0.235**
	(0.076)	(0.061)	(0.059)	(0.061)	(0.101)	(0.227)	(0.100)
Difference in inherited asset	-0.057	-0.071	-0.073	-0.072	-0.151	0.064	-0.152
	(0.100)	(0.088)	(0.089)	(0.089)	(0.113)	(0.167)	(0.114)
length_marriage	-0.014	-0.008	-0.008	-0.008	0.006	-0.049	0.005
	(0.015)	(0.016)	(0.016)	(0.015)	(0.021)	(0.034)	(0.021)
Observations	237	237	237	237	127	110	127

Standard errors in parentheses

Other control variables such as the differences in income, asset, age, education, arithmetic score, and financial literacy are not reported but always included.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 2: Interaction with bargaining power

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All	Husb	wife	All	Husb	wife	All	Husb	wife
PB & sp NPB	-0.322**	-0.241	-0.586	-0.343**	-0.258	-0.621	-0.344**	-0.299	-0.627
	(0.163)	(0.164)	(0.619)	(0.174)	(0.160)	(0.629)	(0.169)	(0.183)	(0.672)
NPB & sp PB	0.380**	0.252	1.589**	0.370**	0.216	1.263*	0.348**	0.122	1.433*
	(0.160)	(0.157)	(0.665)	(0.169)	(0.158)	(0.655)	(0.164)	(0.161)	(0.768)
PB & sp NPB× dif_asset	0.285**	0.232**	0.472						
	(0.113)	(0.090)	(0.618)						
NPB & sp PB× dif_asset	-0.050	-0.091	0.675						
	(0.124)	(0.143)	(0.454)						
PB & sp NPB× dif_edu				0.049	0.137	-0.925			
				(0.166)	(0.133)	(0.822)			
NPB & sp PB× dif_edu				0.021	-0.002	0.131			
				(0.171)	(0.111)	(0.542)			
PB & sp NPB× dif_age							0.076	0.088	0.068
							(0.151)	(0.161)	(0.512)
NPB & sp PB× dif_age							0.116	0.204*	0.197
							(0.139)	(0.118)	(0.735)
Observations	237	127	110	237	127	110	237	127	110

Appendix Table 3: Allowance: Including the share of earnings turned over to the spouse

Monthly allowance:

	(1) All	(2) All	(3) husband	(4) wife	(5) husband	(6) wife
present bias(PB)	-189.592***	-59.262	-300.929**	-65.122	-255.214*	106.893
	(69.576)	(81.643)	(130.375)	(84.050)	(148.391)	(132.299)
spouse PB(sp PB)	-103.756	-130.231	46.688	-347.321**	38.621	-385.588**
	(83.746)	(85.190)	(87.147)	(158.784)	(91.067)	(158.845)
PB but joint NPB		-210.330**			-82.355	-263.248*
		(91.000)			(138.953)	(140.400)
% salary	-110.702	-114.330	-238.200	20.428	-248.775	53.588
	(102.552)	(103.360)	(158.818)	(120.246)	(162.704)	(125.901)
Observations	237	237	127	110	127	110

Hidden disposal money:

	(1) All	(2) All	(3) husband	(4) wife	(5) husband	(6) wife
present bias(PB)	166.153	52.657	61.734	246.837	87.399	-22.383
	(109.573)	(109.708)	(107.131)	(172.533)	(139.052)	(174.192)
spouse PB(sp PB)	-90.734	-67.679	18.400	-222.786	13.871	-162.894
	(123.454)	(116.229)	(79.268)	(302.663)	(80.725)	(282.270)
PB but joint NPB		183.162			-46.235	412.009
		(149.380)			(162.965)	(276.988)
% salary	-249.895**	-246.735**	-279.871	-240.308	-285.808	-292.208*
	(101.470)	(105.056)	(184.100)	(155.238)	(195.031)	(172.675)
Observations	237	237	127	110	127	110

Appendix Table 4: Robustness

Drop observations who never shift

	(1) salary	(2) salary:husb	(3) salary:wife	(4) keepcash	(5) keepcash	(6) pass
PB & sp NPB	-0.369**	-0.231	-0.828	0.015	0.314*	-0.245***
	(0.181)	(0.178)	(0.678)	(0.073)	(0.164)	(0.083)
NPB & sp PB	0.426*	0.310	1.283	-0.116	-0.101	0.110
	(0.243)	(0.207)	(1.040)	(0.083)	(0.081)	(0.110)
PB & sp PB	0.257	0.177	0.790	0.035	0.048	-0.021
	(0.217)	(0.198)	(0.812)	(0.078)	(0.076)	(0.086)
PB & sp NPB× soph PB					-0.322*	
					(0.168)	
Observations	150	76	74	169	169	169

	(1) allowance	(2) allowance	(3) hidden money	(4) hidden money	(5) rosca	(6) rosca:wife
present bias(PB)	-166.370**	-81.887	227.438**	58.801		
	(63.747)	(89.792)	(96.857)	(97.860)		
spouse PB(sp PB)	27.751	0.448	-111.227	-56.727		
	(72.542)	(76.013)	(141.218)	(129.589)		
PB but joint NPB		-130.672		260.838**		
		(87.263)		(118.915)		
PB & sp NPB					0.113*	0.053
					(0.059)	(0.079)
NPB & sp PB					0.165**	0.173
					(0.071)	(0.111)
PB & sp PB					0.004	0.034
					(0.092)	(0.122)
Observations	169	169	169	169	169	88

Standard errors in parentheses
Other control variables such as the differences in income, asset, age, education, arithmetic score, and financial literacy are not reported but always included.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Drop observations who join ROSCAs

	(1) salary	(2) salary:husb	(3) salary:wife	(4) keepcash	(5) keepcash	(6) pass
PB & sp NPB	-0.240	-0.171	-0.260	0.056	0.397**	-0.217**
	(0.151)	(0.157)	(0.550)	(0.072)	(0.184)	(0.090)
NPB & sp PB	0.347**	0.173	1.630**	-0.019	-0.006	0.085
	(0.167)	(0.164)	(0.652)	(0.073)	(0.072)	(0.096)
PB & sp PB	0.244	0.117	1.374*	0.061	0.075	-0.045
	(0.189)	(0.176)	(0.711)	(0.074)	(0.072)	(0.090)
PB & sp NPB× soph PB					-0.373**	
					(0.188)	
Observations	212	117	95	240	240	240

Appendix Table 5: Savings and assets

	(1)	(2)	(3)	(4)	(5)
	allowance	allowance	hidden disposable money	hidden disposable money	saving
present bias(PB)	-155.981**	-32.849	110.041	81.231	0.076
	(73.600)	(85.865)	(81.371)	(106.758)	(0.160)
spouse PB(sp PB)	-118.311	-144.156*	-11.470	-5.423	-0.032
	(76.215)	(79.608)	(69.121)	(68.319)	(0.112)
PB but joint NPB		-191.998**		44.923	-0.095
		(90.520)		(100.697)	(0.157)
PB w/ sp NPB					
NPB w/ sp PB					
PB w/ sp PB					
Observations	240	240	240	240	134

B Theoretical Appendix

B.1 Proof of Lemma 1

Notice that each player never wants to claim beyond his/her optimal consumption in period 1. Thus, without loss of generality we focus the analysis on claims $c_1^k \in [0, c_1^{k*}]$ and $c_1^l \in [0, c_1^{l*}]$ where $c_1^{k*} > c_1^{l*}$.

Suppose player l claims a positive amount in equilibrium: $c_1^l > 0$. The best response of player k is $c_1^k = c_1^{k*} - c_1^l > 0$. Then, the consumption in period 1 becomes c_1^{k*}. Player l, however, has an incentive to decrease own claim because $c_1^{k*} > c_1^{l*}$, a contradiction. Therefore, in any equilibrium player l chooses $c_1^l = 0$. Given this, player k chooses $c_1^k = c_1^{k*}$. □

B.2 Proof of Claim 3

First, suppose $\beta^i\delta^i < \beta^j\delta^j$. It leads to $c_1^{max*} = c_1^{i*}$. Then, player i takes up the external commitment device in period 0 if and only if

$$u(\bar{c}_1^i) + \delta^i u(1 - \bar{c}_1^i) - r \geq u(c_1^{i*}) + \delta^i u(1 - c_1^{i*}). \tag{10}$$

Note that the left hand side of Inequality 10 does not depend on β^i, whereas the right hand side of Inequality 10 is increasing in β^i. Thus, if $\beta^i\delta^i < \beta^j\delta^j$, then player i is more likely to use the external commitment device as β^i decreases.

Second, suppose $\beta^i\delta^i > \beta^j\delta^j$. It leads to $c_1^{max*} = c_1^{j*} > \bar{c}_1^i$. Then, player i takes up the external commitment device in period 0 if and only if

Let $\Delta u_r^i \equiv u(\bar{c}_1^i) + \delta^i u(1 - \bar{c}_1^i) - r - \{u(c_1^{j*}) + \delta^i u(1 - c_1^{j*})\}$. Then,

$$\begin{aligned}\frac{\partial \Delta u_r^i}{\partial \delta^i} &= \{u'(\bar{c}_1^i) - \delta^i u'(1 - \bar{c}_1^i)\} \cdot \frac{\partial \bar{c}_1^i}{\partial \delta^i} + u(1 - \bar{c}_1^i) - u(1 - c_1^{j*}) \\ &= u(1 - \bar{c}_1^i) - u(1 - c_1^{j*}) > 0.\end{aligned}$$

Thus, if $\beta^i\delta^i > \beta^j\delta^j$, then player i is more likely to use the external commitment device as δ^i increases.

Also, note that the left hand side of Inequality 10 does not depend on β^j and δ^j, whereas the right hand side of Inequality 10 is increasing in β^j and δ^j. Thus, if $\beta^i\delta^i > \beta^j\delta^j$, then player i is more likely to use the external commitment device as β^j and δ^j decreases. □