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Intertemporal choice shifts in households: Do they occur and are they good?

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Abstract: We examine whether and to what extent joint choices are more or less patient and time-consistent than individual choices in households. We use data from an artefactual field experiment where both individual and joint time preferences were elicited. We find a substantial shift from individual to joint household decisions. Interestingly, joint decisions do not only generate beneficial shifts, i.e., patient and time-consistent shifts. On the contrary, a majority of the observed shifts are impatient and time-inconsistent shifts. A number of observable characteristics are significantly correlated with these shifts in preferences from individual decisions to joint decisions.

Key words: individual decisions; joint decisions; patience; time-consistency; choice shifts; rural China

JEL classification: C91, C92, C93, D10

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1. Introduction

The empirical literature on household decision making is by now extensive. A large number of studies show that household decisions may be inefficient due to limited information and limited commitment within the household (Udry, 1996; Duflo and Udry, 2004; Mazzocco, 2007; Ashraf, 2009; Mani, 2010; Robinson, 2012). Furthermore, empirical evidence looking at actual decisions in the household suggests that the outcomes of household decisions depend on who in the household has control over the resources (Thomas, 1990, 1994; Browning et al., 1994; Lundberg et al., 1997; Phipps and Burton 1998; Duflo, 2003; Namoro and Roushdy, 2008). Recently, experiments have also been used to investigate the influence of spouses on joint decisions (Bateman and Munro, 2005; Carlsson et al. 2012, 2013; Abdellaoui et al., 2011; de Palma et al., 2011; Yang and Carlsson, 2012). Experiments have allowed researchers to directly estimate the spouses' respective influences and relate them to the characteristics of the households and the individual decision makers.

At the same time, a growing number of studies have investigated the differences between group and individual decision-making (Kocher and Sutter, 2005; Charness and Sutter, 2012; Kugler et al., 2012). Although the empirical findings are mixed, there is evidence that group decisions are more in line with standard game-theoretical predictions than are individual decisions, and that groups can be used by individuals as a way to protect themselves from irrational decisions (Charness and Sutter, 2012). Furthermore, there is evidence that group decisions can become more extreme or polarized than individual decisions (Stoner, 1968; Moscovici and Zavalloni, 1969; Cason and Mui, 1997; Sunstein, 2000, 2002; Eliaz et al., 2006; Ambrus et al., 2009; Shapiro, 2010). Theoretically, there are a number of factors that can explain the difference between group and individual decisions as well as shifts in decisions. Social comparison concerns could make individuals behave differently when making decisions in a group rather than in isolation, since they obtain information about the other group members' preferences (Levinger and Schneider, 1969). For example, if people wish to portray themselves as more patient than others, they might shift their decisions when learning that other group members are more patient than themselves. Also, individuals might not want to be responsible for a certain outcome, and might therefore avoid making a risky choice that could result in an unpleasant outcome for the others (Eliaz et al., 2006). Of course, there could also simply be learning effects, i.e., that the group members learn from each other. Finally, altruistic concerns could make group decisions more rational. In the context of decisions concerning allocations over time, group decisions might become more patient and

time consistent (Shapiro, 2010). For example, a subject might think that it is better for another group member to be very patient, and therefore argue for a patient decision even if she herself would prefer an impatient decision. At the same time, group decisions based on a maximization of a weighted sum of utilities with members with different discount factors will result in present-biased joint decisions (Jackson and Yariv, 2011).

In this paper we study households' and both spouses' intertemporal decisions in an experiment where the respondents decide how much money to allocate to an early date and a later date.[1] Decisions are made both individually and jointly. Intertemporal choices are generally of great importance to households since they often concern decisions such as savings, investments, and education. Similar to group decisions, many household decisions are discussed and reflect, to varying extents, individual members' preferences. Studying to what extent joint household decisions are shifted is therefore of particular interest since the "diffusion of responsibility" and altruism play potentially important roles in household decision-making. Moreover, it is likely that men and women have different time preferences, not the least because of the differences in life expectancy.

The literature on households' intertemporal decisions is relatively scarce. Abdellauoui et al. (2011), Carlsson et al. (2012), and Yang and Carlsson (2012) explore the relationship between individual spouses' decisions and joint household decisions and investigate to what extent spouses can influence their joint decisions. In this paper we whish to answer two other empirical questions. The first is to what extent shifts in joint household decision-making occur. The second is to what extent these shifts are beneficial or not for the household.

We investigate two types of shifts that could occur in the household. The first one concerns to what extent joint decisions are more patient or impatient than individual ones. If a joint choice is more patient than the individual ones, we refer to it as a *patient shift*. The opposite case, where the joint choice is more impatient than the individual ones, is referred to as an *impatient shift*. In contrast to patient/impatient shifts without consideration of the dynamic change in discount rates over time, the second investigated type of shift concerns to what extent joint decisions are more or less time-consistent than individual decisions. A large number of studies have shown that discount rates are higher in the short run than in the long run (see, e.g., Loewenstein and Prelec, 1992, for an early contribution, and Frederick et al., 2002, for a survey). This implies that time preferences are dynamically inconsistent or

[1] Here and henceforth, the respondents indicate husbands, wives or couples.

present-biased (Strotz, 1955-1956; Thaler, 1981; Laibson, 1997; O' Donoghue and Rabin, 1999). Hence, when making decisions that involve inter-temporal trade-offs, a person will have two sets of revealed preferences. At a present time, when evaluating future benefits and costs, the individual will use a lower discount rate for the future, which means that he or she will, for example, decide to invest in the future. However, when the future arrives, the individual is going to use a higher discount rate and might then end up not investing. This self-control problem has been addressed as an important reason for both under-saving (Laibson et al., 1998; Thaler and Benartzi, 2004) and over-consuming and acquiring high credit card debts (Meier and Sprenger, 2010). One way to overcome the problem of present-biased preferences is designing commitment devices (Bryan et al., 2010; Beshears et al., 2011). For example, Ashraf et al. (2006) find that women with present-biased preferences are more likely to open a commitment saving account. In particular, there is a wide array of literature studying the commitment role of group savings in developing economies (Anderson and Baland, 2002; Ambec and Treich, 2007; Shapiro, 2010; Basu, 2011). Since a household is a group where individuals know their partners well, household joint intertemporal decisions could be useful in helping some individuals overcome for example self-control problem (Kono et al., 2011). In this sense, individual spouses could make less time-inconsistent decisions in a joint setting than they would have made the decisions separately. We refer to this phenomenon as a *time-consistent shift*. A plausible explanation for why the joint choices are shifted to be more time-consistent or patient is that the spouses care about each other's preferences, and apply time-consistent or patient preferences when they know that the outcome will affect their spouse (Shapiro, 2010). Thus, even if, say, the husband is a hyperbolic discounter he might think it is better if the joint decision is more patient/time-consistent and is therefore willing to shift the decision. In contrast, recent theoretical literature demonstrates that the aggregation of heterogeneous time preferences can lead to a higher extent of time-inconsistency, even if the individuals exhibit constant discount rates (see, e.g., Gollier and Zeckhauser, 2005; Jackson and Yariv, 2011, 2012; Hertzberg, 2012). In this sense, it is possible that the joint intertemporal decisions could become more time-inconsistent than individual decisions. We thus refer to this phenomenon as *time-inconsistent shifts*.

One obvious question is of course whether these shifts are good or bad. When it comes to time-consistency, it is reasonable to view a more time-consistent decision as better. A more time-consistent, or less present-biased decision, implies that the household in question will not revise its decisions when the future arrives. How about patience? Patience is often seen as

a virtue, and as shown by Becker (1980), based on a conjecture of Ramsey (1928), income distribution in a long-run steady state is determined by the lowest discount rate; i.e., the household with the lowest discount rate will own all the capital. This conclusion of course rests on a number of simplifying assumptions, but, taking these as given, a more patient shift would be beneficial for the household.

In order to study the occurrence of choice shifts, we use data from an artefactual field experiment in Yang and Carlsson (2012). In this experiment, couples made both separate and joint decisions on how much money to allocate to an early date and a later date. Instead of the widely used multiple price list elicitation method in time preference literature (Coller and Williams, 1999; Harrison et al., 2002; Andersen et al., 2006, 2008; Tanaka et al., 2010), the experiment in the present paper uses the Convex Time Budget experimental method suggested by Andreoni and Sprenger (2012) to elicit individual and couple's intertemporal allocation decisions. As Andreoni and Sprenger (2012) have argued, the multiple price list method can result in upwards-biased discount rates due to the assumption of linear utility. By "convexifying" the experimental budgets, the Convex Time Budget method has provided a simple solution to the estimation bias of discount rates if utility is concave. The subjects can thus continuously allocate a certain amount of money between a sooner date and a later date. In the experiment, the subjects were asked to make ten different decisions where the interest rate and whether the early date is immediate or not are varied. With this approach we obtain detailed information about the characteristics of the choices, including to what degree preferences are present- or future-biased, and to what extent joint decisions are more or less patient and time-consistent than the respective individual decisions.

The main contribution of this paper is that we provide empirical evidence on the occurrence of time-consistent/-inconsistent and patient/impatient shifts. Of particular interest is that we study this in a household setting, which is perhaps the most common group decision environment. The rest of this paper is organized as follows. In Section 2 we introduce the details about experimental design and procedure. Section 3 presents the econometric framework. We describe and discuss results in Section 4. Finally, Section 5 concludes the paper.

2. Experimental design and procedure

2.1 Location of the experiment and description of the sample

We use data from an artefactual field experiment conducted by Yang and Carlsson (2012). The experiment was conducted in two counties of the Gansu province, which is located in northwestern China. The two counties, Linxia and Jingning, were randomly selected. In each county, three townships and in total thirteen villages were randomly chosen.

In each of the eight villages, 10 to 25 households with officially married spouses were randomly chosen from the village registration list provided by the village leaders. In the other five villages, around five households were randomly selected in each village, also with married spouses. With the assistance of one village cadre, two randomly matched experimenters (always one male and one female) approached the selected households. If both the husband and wife voluntarily agreed to be interviewed, the village cadre left. If one of the spouses was not at home when the experimenters arrived at their house, the experimenters waited for a while or made an appointment and revisited them later when both spouses were at home. However, we always made sure to interview the selected households in each village within one day in order to keep information about the experiment from spreading. If an appointment could not be made or if one spouse refused to be interviewed, the experimenters visited the neighbours instead. All in all, 164 couples agreed to voluntarily participate in the experiment.

Table 1 describes the summary statistics of the sampled households. The average ages for the husbands and wives are 49 and 46 years, respectively. They have an average of 5 and 2.5 years of education, respectively. Fifteen percent of sampled households belong to minorities. Wives' average income contribution to the households is around 40%. Husbands are the main decision makers in everyday life, but wives have more influence when it comes to daily expenses for items such as food and clothes. As for household characteristics, the average household has five members and the average length of marriage is 26 years. In 2010, the average household's gross per capita income was 7,064 yuan.[2]

[2] At the time of the experiment, 1 USD=6.59 CNY.

Table 1. Descriptive statistics of individual and household characteristics (N = 164 households)

	Husband		Wife	
	Mean	Std. dev.	Mean	Std. dev.
Individual characteristics				
Age (years)	48.78	9.34	46.26	9.11
Higher than primary school (1=yes)	0.50		0.19	
Communist party member (1=yes)	0.12		0.01	
Individual attitudes				
General decision maker (1=husband; 2=joint; 3=wife)	1.24	0.46	1.38	0.59
Wife income contribution share	0.40	0.17	0.39	0.17
Husband income contribution share	0.60	0.17	0.61	0.17
Decision maker on savings (1=husband; 2=joint; 3=wife)	1.31	0.49	1.34	0.51
Decision maker on daily expense (1=husband; 2=joint; 3=wife)	2.36	0.78	2.18	0.81
Decision maker on durable goods (1=husband; 2=joint; 3=wife)	1.55	0.53	1.55	0.61
Decision maker on expensive fixed asset (1=husband; 2=joint; 3=wife)	1.55	0.52	1.50	0.54
If financial conflict with spouse in the past two years (1=yes)	0.09		0.17	
Trustiness on the future payments (1=totally do not trust; 2=do not trust; 3=neither trust nor distrust; 4= trust; 5=totally trust)	4.56	0.82	4.49	0.77
Household characteristics				
Household is minority (1=yes)	0.15			
Household population (persons)	4.98	1.50		
The length of marriage (years)	26.06	9.80		
The number of children 16 years old or younger (persons)	0.85	0.85		
If the couple is living with husband's parents (1=yes)	0.24			
If household experienced serious illness or death in the past two years (1=yes)	0.34			
Log of equivalence scaled total gross income (yuan); Equivalence=(Adults+0.5*children)^0.75	9.03	0.68		

2.2 Experimental design

A Convex Time Budget method suggested by Andreoni and Sprenger (2012) was used to investigate subjects' intertemporal choices. We present the 10 intertemporal choice sets for each respondent in Table 2. There are two time frames with the same delay of one month: In

the first frame the sooner period was immediate which meant that they would receive payment on the experiment day, and in the second frame the sooner period was delayed as well which meant that they would receive payment two months from today. In the first frame, "today" and not "tomorrow" was used in the experimental design. This could imply different transaction costs between payments today and future payments (Anderson et al., 2008). To investigate how the credibility of a future payment affects respondents' decisions in the experiment, before respondents started to make decisions, we asked questions about to what extent they trusted they would receive the money in the future. From the descriptive statistics in Table 1, we can see that both husbands and wives highly trusted that they would receive the experimental payments in the future. Also, the five interest rates used in the experiment were tested and decided upon based on the results of the pilot experiment. Respondents needed to allocate 20 tokens between a sooner date and a later date with increasing interest rates.

Table 2. Description of the 10 decisions in the time preference experiment

Sooner date	Later date	Token budget	Interest rate	Sooner value of one token	Later value of one token
0	30	20	0.05	2	2.1
0	30	20	0.1	2	2.2
0	30	20	0.25	2	2.5
0	30	20	0.4	2	2.8
0	30	20	0.6	2	3.2
60	90	20	0.05	2	2.1
60	90	20	0.1	2	2.2
60	90	20	0.25	2	2.5
60	90	20	0.4	2	2.8
60	90	20	0.6	2	3.2

As described in detail below, subjects were presented with two plates: a red plate representing the sooner date (today or two months from today), and an orange plate representing the later date (one month from today or three months from today). Their task was to decide how many tokens to put on each plate. In all choices, each token was worth 2 yuan if it was allocated to the red plate, and each token was worth $2\times(1+r)$ yuan if it was allocated to the orange plate, where r is the rate of return for waiting, which increased from the first to the fifth choice.

The spouses made both individual and joint decisions. As described below, the order was randomly determined. When they made the individual choices they were clearly told that the money was theirs, and when they made the joint choices they were clearly told that they

would each receive equal amounts. Thus, even when the decisions were made jointly, each spouse would receive their own individual money. The basic idea of the analysis is to compare the decisions made individually with the decisions made jointly. It is of course possible that the individual choices were made taking into consideration the preferences of the spouse, but we have no way to control for that. However, we did stress that the choices would not be revealed to the spouse and that the money was individual and would not to be paid to the household.

2.3 Experimental procedure

Ten experimenters were employed and trained to conduct the experiment. Among them, five were from Beijing University and five were from the local university. All experiments were conducted by two experimenters, where one experimenter was from the local university.

Once the couple agreed to participate in the whole survey, one of the experimenters gave a brief introduction about the tasks. Then the couple jointly answered a set of questions about the household. The rest of the procedure depended on the order of the parts of the experiment. The order of separate and joint decision-making was varied. Half of the households first made the individual decisions and then the joint decisions. The other half first made the joint decisions and then the individual decisions. The order of the two parts of the time preference experiment was also varied. Half of the households first answered the five questions regarding money allocated between today and one month from today; the other half first answered the five questions regarding money allocated between two months from today and three months from today.[3]

We will for simplicity only describe in detail one of the orders. In the version where individual decisions were made before the joint decisions, the respondents were (following the first initial questions) physically separated into two rooms where they could not hear each other. One experimenter followed the wife and one followed the husband. The experimenter read the experimental instructions to the respondent, and the respondent was told that s/he could earn some money and that the amount earned depended on his/her decisions in the experiment. The respondent needed to make 10 separate decisions, and one of these decisions would be randomly chosen to be paid out by rolling a 10-sided die. The number that came up

[3] Experimenter effects were also controlled by interchanging their interviewing subjects in each household. For example, if the male experimenter interviewed the husband and the couple in one household, then the female experimenter interviewed the husband and the couple in the next household.

on the die decided which choice would determine the respondent's earnings. Each decision had an equal chance of being used in the end. Moreover, the respondent was told that s/he would get two vouchers, one for sooner payments and one for later payments, signed by the project coordinator. The voucher indicated the amount of cash and corresponding date the respondent could redeem the money. After the experiment, the respondent decided whether we should send the money to them by the postal savings office or other commercial bank.

To make sure the respondents had understood the experiment, they first made two trial decisions.[4] The purpose of the trial decisions is to help respondents make more informed decisions and avoid misunderstandings of the experimental tasks. The drawback with trial decisions is that the experiment takes too long and hence causes respondents to be fatigued. However, our experience from the pilot experiment was that the trial tasks were crucial for the understanding of the experiment. Once the experimenter was certain that the respondent had understood well, s/he was asked to make the first five independent decisions. Following the experimental design in Section 2.2, to help the respondent remember which dates the two plates represented, the experimenter put a sign in front of each plate with the corresponding date and the value of a token. The respondent then decided how to allocate the tokens between today and one month from today for each choice. After each decision was confirmed, the experimenter translated the value of the total tokens on each plate into Chinese yuan and wrote the decision on the whiteboard. The experimenter then repeated the allocation by pointing to the whiteboard, and at this point the respondent had the possibility to revise the decision. When the respondent had finished all five decisions, the experimenter presented the outcomes on the whiteboard and asked whether s/he would like to change the allocation for any of choices and, if so, which one(s). Once the respondent did not want to make any more changes, the experimenter moved to the next five independent choices, i.e., concerning allocation between two months and three months from today. The elicitation procedure was similar for the second five independent choices. After the respondent had finished all 10 choices, s/he was asked some questions about his/her individual characteristics.

[4] The trial decisions were about how to allocate 10 tokens between one month from today and two months from today. Before the respondent did this, the experimenter asked some control questions about the meaning of the plates and the tokens. The respondent started to make the trial decisions only once s/he had understood the meaning of the plates and the tokens. The trial decisions were the same regardless of the order between individual decisions and joint decisions.

When both spouses had finished, they were brought together for the joint decisions. The couple was told that they would make 10 intertemporal choices similar to the individual decisions they had just made. The main difference was that both of them would obtain the same experimental payment according to one of the joint decisions, which would be randomly selected by rolling a 10-sided die. Before each decision was made, they were encouraged to speak to each other and discuss the decisions, as they needed to agree on how to allocate the money between the sooner and later dates. The couple also followed the same elicitation method as for the individual decisions: they first made joint decisions about how to allocate the 20 tokens between today and one month from today, and then made the other five joint decisions about how to allocate the 20 tokens between two months and three months from today.

In the joint experiment, to control for the effects of who has the initial control over the tokens on the joint decision, there were four alternatives for how the tokens were initially distributed. The first reference situation was that the experimenter just put the 20 tokens between the husband and the wife, but did not say anything else about who was responsible to put tokens on the plates. The second situation was that the experimenter gave the 20 tokens to the wife, making her in charge of putting the tokens on the plates. In the third situation, the experimenter gave the 20 tokens to the husband, who was initially responsible to put the tokens on the plates. The fourth situation was that the experimenter gave 10 tokens to the wife and 10 tokens to the husband, making both of them in charge of putting the tokens on the plates. For all cases, both spouses could adjust the amount of tokens on the plates until they had reached an agreement, i.e., they were not told that only one or both should put the tokens on the plates.

On average, the whole survey lasted one and a half hours for each household. The average experimental payment for each individual respondent was 52 yuan, and the average experimental payment for each household was 208 yuan, which equals three days of non-farm wages for one local full-time worker.

3. Econometric framework

In the experiment, for a given interest rate, r, the respondents had to decide how much of a given initial amount of money to allocate to a sooner date, c_t, and a later date, $c_{t+\tau}$, where t indicates the sooner dates, i.e., t=0 or t=60 days; τ is the delay time, i.e., $\tau = 30$ days. In total, respondents made ten individual and ten joint choices. Since the experimental design was

exactly the same in both the individual and joint choices, we can make direct comparisons between the two spouses' choices and the joint choice in each of the ten choice situations. In particular we can investigate to what extent the joint choice is shifted outside the range of the two individual choices at the choice level. We classify the joint decisions into three categories for household *i* in choice situation *k:*

$$Joint\ Shift_{ik} = 1\ if\ c_{tik}^{J} > Max\{c_{tik}^{H},\ c_{tik}^{W}\}$$
$$Joint\ Shift_{ik} = 2\ if\ c_{tik}^{J} \in [c_{tik}^{H},\ c_{tik}^{W}]$$
$$Joint\ Shift_{ik} = 3\ if\ c_{tik}^{J} < Min\{c_{tik}^{H},\ c_{tik}^{W}\}$$

where *J*, *H*, and *W* denote the joint, husband's, and wife's decisions respectively in household *i*. The first category represents the case when the joint decision is more impatient than both individual decisions; i.e., the amount of money allocated to the sooner date in the joint decisions is larger than both the husband's and the wife's individual allocations. Thus, this is an impatient shift. The second category is that the joint decision is in between the spouses' individual decisions (or exactly the same). The third category represents the case when the joint decision is more patient than both individual decisions; i.e., the amount of money allocated to the sooner date in the joint decisions is smaller than both the husband's and the wife's individual allocations. Thus, this is a patient shift. We employ a multinomial logit model using these three categories as dependent variable, and investigate the factors that could explain the likelihood of a household joint decision ending up in a certain category. To investigate how the potential conflicts between husband's and wife's preferences affect the likelihood of a shift, we include the absolute difference between the husband's and wife's sooner allocations, and a dummy variable equals one if the husband and wife make the same sooner decisions in model specification. In addition, we control for a number of individual and household characteristics, the interest rates, and the present time dummy that is equal to one if the sooner choice involves payment today.

Second, we compare the extent to which joint choices are more or less time-consistent with the individual choices. Present bias is widely referred to as a time-inconsistent preference in the literature, but the phenomenon of future bias or reverse time-inconsistency has also been observed (Sayman and Önculer, 2009; Shapiro, 2010; Takeuchi, 2011; Gine et al., 2012). In the present paper, we analyse time-inconsistency by considering both present bias and future bias at the choice level. The respondents made 10 choices over the two time frames with different starting points but the same delay: today vs. one month from today and two months

from today vs. three months from today. We can thus partition the choices into five pairs, one for each interest rate. We use the difference between allocations today and two months from today in each pair to evaluate whether the decision is time-(in)consistent at the choice level. We define a choice to be present-biased if the allocation is larger when the sooner date is today than that when the sooner date is two months from today. Similarly, the choice is future-biased if the allocation when the sooner date is two months from today is larger than that when the sooner date is today. A decision is time-consistent if the allocations are the same over the two sooner dates. We use the absolute difference between allocations when the sooner date is today and when it is two months from today to measure the extent of time-inconsistency for the husband's, wife's, and joint decisions (thus we include both present- and future-biased preferences). We can then classify the household joint decisions into three categories for household *i* in choice pair *m*:

$$Time\ Consistency\ Shift_{im} = 1\ if\ |c_0^J - c_{60}^J|_{im} > Max\ \{|c_0^H - c_{60}^H|_{im},\ |c_0^W - c_{60}^W|_{im}\}$$
$$Time\ Consistency\ Shift_{im} = 2\ if\ |c_0^J - c_{60}^J|_{im} \in\ [|c_0^H - c_{60}^H|_{im},\ |c_0^W - c_{60}^W|_{im}]$$
$$Time\ Consistency\ Shift_{im} = 3\ if\ |c_0^J - c_{60}^J|_{im} < Min\ \{|c_0^H - c_{60}^H|_{im},\ |c_0^W - c_{60}^W|_{im}\}$$

where c_0^J, c_0^H, and c_0^W denote the joint, husband's, and wife's allocation when the sooner date is today and c_{60}^J, c_{60}^H, and c_{60}^W denotes the joint, husband's and wife's allocation when the sooner date is two months from today. The first category represents the case when the joint decisions result in a larger absolute difference between sooner allocations today and two months from today than that of both the husband and the wife, i.e., a time-inconsistent shift. The second category represents the case when the absolute difference between sooner allocations is in between that of the husband and the wife (or equal to that of one of the spouses). Finally, the third category represents the case when the joint decisions result in a smaller absolute difference between sooner allocations today and two months from today than that of both the husband and the wife, i.e., a time-consistent shift. Similar to (im)patient shifts, we employ a multinomial logit model using these three categories as dependent variable, and include interest rates and a number of individual and household characteristics in model specification. In addition, the time-(in)consistent shifts are potentially linked to the case of (im)patient shifts. For example, households that become more time-consistent when making joint decisions could do this by making a patient shift when the sooner date is today, or by making an impatient shift when the sooner date is two months from today. Consequently, it is not necessarily the case that a time-consistent shift requires a patient shift. To evaluate the

link between time-(in)consistent shifts and (im)patient shifts, we include four dummy variables based on each choice pair: the first dummy equals one if the joint choice is a patient shift when the sooner date is today; the second dummy equals one if the joint choice is a patient shift when the sooner date is two months from today; the third dummy equals one if the joint choice is an impatient shift when the sooner date is today; and the fourth dummy equals one if the joint choice is an impatient shift when the sooner date is two months from today.

4. Results

4.1 Descriptive results

Figure 1 presents the average numbers of Chinese yuan allocated to the sooner dates for husbands', wives' and joint decisions for the ten decisions. The first graph shows the distribution for the five decisions where the sooner date is today, and the second shows the distribution for the five decisions where the sooner date is two months from today.

The average allocation to the sooner date decreases as the rate of return increases, which indicates that the subjects are aware of the basic trade-offs they face in the choice tasks. The graphs also show that the husbands are on average more impatient than both wives and the decisions made jointly, but there are no significant differences between wives' decisions and joint decisions.[5] In addition, apart from the first two choices when the sooner date is today, the average joint decisions are in between the spouses' decisions. Based on our definitions of present bias, future bias, time inconsistency, and time consistency in Section 3, we present the distribution of the fractions of present-biased, future-biased, time-inconsistent, and time-consistent responses in Figure 2. Around 50% of the choice pairs are time-consistent for husbands, wives, and joint decisions, and there are no significant differences between husbands' and wives' decisions based on a Wilcoxon rank sum test, and between individual decisions and joint decisions based on a Wilcoxon signed rank test. The fraction of present-biased decisions is higher among wives than among husbands and joint decisions,[6] but the

[5] The p-value of Wilcoxon rank sum test of the difference between husbands' and wives' sooner allocations is 0.000, and the p-values of Wilcoxon signed rank tests of the differences between husbands', wives', and joint sooner allocations are 0.000 and 0.482, respectively.

[6] The p-value of the Wilcoxon rank sum test of the difference between husbands' and wives' present bias fraction is 0.003, and the p-value of the Wilcoxon signed rank test of the difference between wives' and joint present bias fraction is 0.027.

fraction of future-biased decisions is lower.[7] Finally, at this aggregate choice level, we observe that the fraction of present- and future-biased decisions and the fraction of time-consistent and -inconsistent decisions for the joint decisions are in between the corresponding fractions for the husbands' and wives' decisions.

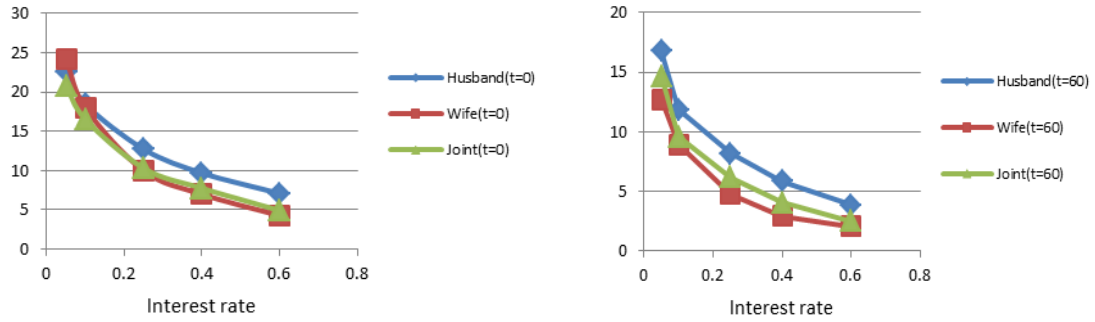

Figure 1. The average distribution of husbands', wives', and joint sooner allocations

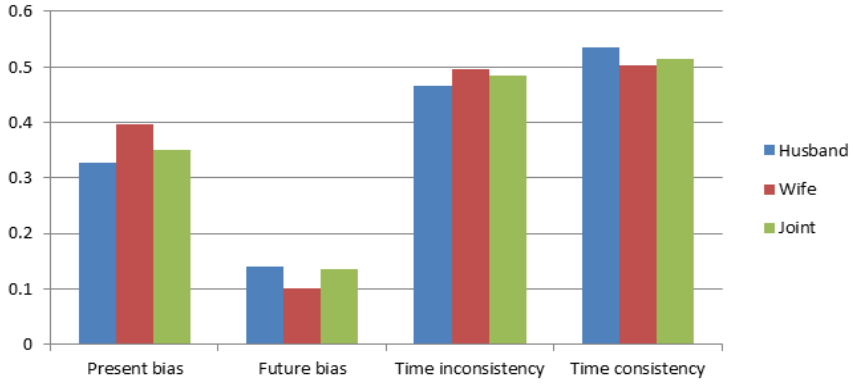

Figure 2. The distribution of the fractions of present bias, future bias, time-inconsistency and time-consistency for husbands', wives' and joint decisions

4.2 Patient and impatient shifts

In this section we examine to what extent joint decisions are more patient or impatient than individual decisions at the choice level. Based on the classification of responses in Section 3, we find that 11% of the joint choices are more impatient than both the husbands' and wives'

[7] The p-value of the Wilcoxon rank sum test of the difference between husband's and wife's future bias fraction is 0.015, and the p-value of the Wilcoxon signed rank test of the difference between wife's and joint future bias fraction is 0.017.

individual choices, while 9% of the joint choices are more patient. Thus, in 80% of the choice situations, the joint choice is in between, or equal to, the spouses' individual choices. At the same time, a majority of the households experience a shift. In 27% of the households there is at least one impatient shift, in 25% there is at least one patient shift, and in 15% there are both patient and impatient shifts. Furthermore, the size of shifts is often not small. Table 3 reports the mean and standard deviations of the observed shifts, measured as the difference between the joint allocation on the early period and the corresponding lowest or highest individual allocation. The minimum size of a shift is 2 yuan (since each token is worth 2 yuan) and the maximum size is 40 yuan. The average size of both patient and impatient shifts is around 9 yuan, i.e., a little bit more than 4 out of 20 tokens. This means that what we observe most likely is not simply due to noise in the joint decision as compared with the individual choices.

Table 3. Size of observed shifts

	Mean	Std. dev	Median	No. of obs.
Impatient shift	9.456	8.323	8	180
Patient shift	9.213	7.946	8	155
Inconsistent shift	11.285	9.439	8	137
Consistent shift	7.620	6.707	6	100

Next we estimate a multinomial logit model where the dependent variable is the three joint shift categories and the standard errors are clustered at the household level. Table 4 reports the estimated average marginal effects.

Table 4. The determinants of the likelihood of impatient and patient shifts

	Impatient shifts	In between	Patient shifts
Absolute difference between husband's and wife's sooner allocation	-0.008***	0.010***	-0.003***
	(0.001)	(0.002)	(0.001)
Husband and wife have the same sooner allocation (1=yes)	-0.097***	0.204***	-0.107***
	(0.024)	(0.033)	(0.026)
Interest rate (r)	-0.144***	0.335***	-0.191***
	(0.039)	(0.062)	(0.055)
Present time dummy (1=today)	-0.003	-0.038	0.035*
	(0.022)	(0.026)	(0.019)
Husband age (years)	-0.010***	0.005	0.005
	(0.003)	(0.003)	(0.003)
Husband higher than primary school (1=yes)	0.094***	-0.095**	0.001
	(0.026)	(0.033)	(0.022)
Husband communist party member (1=yes)	-0.061	0.005	0.055*
	(0.039)	(0.047)	(0.029)
Wife age (years)	0.007**	-0.004	-0.003
	(0.003)	(0.004)	(0.003)
Wife higher than primary school (1=yes)	-0.095***	0.094**	0.002
	(0.034)	(0.041)	(0.027)
Wife's income contribution (%)	0.042	-0.153	0.111
	(0.066)	(0.105)	(0.077)
Household is minority (1=yes)	-0.164	-0.058	0.222***
	(0.196)	(0.099)	(0.051)
Log of equivalence scaled total gross income (yuan)	-0.032	0.015	0.016
	(0.022)	(0.027)	(0.015)
The number of children 16 years old or younger (persons)	-0.027*	0.033*	-0.006
	(0.016)	(0.019)	(0.013)
If financial conflict with spouse in the past two years (1=yes)	0.033	-0.000	-0.033
	(0.031)	(0.038)	(0.025)
If household experienced serious illness or death in the past two years (1=yes)	0.009	0.043	-0.051**
	(0.027)	(0.033)	(0.022)
If the couple is living with husband's parents (1=yes)	-0.009	-0.029	0.038
	(0.029)	(0.034)	(0.024)
Experimenter gender dummy (1=female)	-0.014	0.002	-0.011
	(0.038)	(0.047)	(0.035)
If first separate then joint decision (1 = yes)	-0.059**	0.084**	-0.024
	(0.028)	(0.034)	(0.024)
If first five choices are between today and one month (1=yes)	0.006	-0.017	0.011
	(0.039)	(0.047)	(0.034)

Notes: 1. The dependent variable equals one if the joint decision is less patient than the least patient individual decision, equals two if the joint decision is in between the spouses' individual decisions, and equals three if the joint decision is more patient than the most patient individual decision.
2. The results reported in table are average marginal effects based on the multinomial logit model.
3. All the regressions are clustered at household level. Robust standard errors are in parentheses.
4. The dummies of initial control over tokens and village dummies are also included in all regressions.
5. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

There are some intriguing and conflicting results regarding the correlation between individual and household characteristics and the likelihoods of both *impatient shifts* and *patient shifts*. In households with older wives or if the husband has obtained an education higher than primary school, it is more likely that the joint choice is an impatient shift. Given that we see patience as something advantageous for the households in the long run, it is thus more likely in these households that the joint decision is worse than the individual decisions. On the other hand, in households where the husband is a communist party member, it is more likely that the joint choice is a patient shift. If the husband has obtained an education higher than primary school, it decreases the likelihood of a joint choice in between the spouses' individual choices. Yet if the wife has obtained an education higher than primary school, it increases the likelihood of a joint choice in between the spouses' individual choices. The marginal effects are not very small. For example, if the husband has more than primary school education, the probability of an impatient shift is almost 0.094 units higher, while if the wife has more than primary school education, the probability of an impatient shift decreases by 0.095 units. Regarding the household characteristics, we find that minority households are more likely to make more patient joint decisions. In households that have experienced serious illness or death in the past two years, the likelihood to make patient choice shifts for joint decisions is lower. Households with more children being 16 years old or younger are less likely to make an impatient shift. In addition, if the sooner choices involve today payment, the likelihood of a patient choice shift increases. What this suggests is that patient shifts primarily occur when the early payment is immediate. When the interest rate is high, both patient and impatient shifts are less likely. Furthermore, the absolute differences between husbands' and wives' sooner allocations significantly decrease the likelihood of choice shifts. Thus, when there is a large difference in spouses' time preference, it is more likely that the joint decision is a compromise between the two individual decisions. This is in contrast to what Schaner (2012) has found that a large difference in patience between spouses leads to inefficient savings behaviour in Kenya. As expected, if husbands and wives have the same sooner allocations, the joint decision also tends to be similar to the individual decisions. The gender of the experimenter does not affect the likelihood of patient or impatient shifts, but there is a significant order effect in that if the individual decisions were made before the joint decisions, then an impatient shift is less likely.

4.3 Time-consistent and -inconsistent shifts

Next we investigate to what extent joint decisions are more or less time-consistent than the individual decisions. In total, 17% of the joint choice pairs are more time-inconsistent than

both of the spouses' choice pairs, while 12% of the joint choice pairs are more time-consistent. In the remaining 71% of the choice pairs, the joint decision is in between or equal to both spouses' individual decisions. At the household level, in 26% of the households there is at least one time-consistent shift, in 27% there is at least one time-inconsistent shift, and in 13% of the households there are both consistent and inconsistent shifts. Again, the magnitudes of the shifts are considerable: around 11 yuan for the inconsistent shifts and almost 8 yuan for the consistent shifts (see Table 3).

We will now move on to the econometric analysis of what factors are correlated with the likelihoods of time-consistent and -inconsistent shifts. As discussed in Section 3, we estimate a multinomial logit model with the three *time consistency shift* categories as dependent variable, and the standard errors are clustered at the household level. The estimated average marginal effects are reported in Table 5.

In model (1) we find that there are relatively few individual and household characteristics that are significantly related to the likelihoods of time-consistent and -inconsistent shifts. What we find is that in households where the husband has higher than primary school education, the likelihood of joint choices in between spouses' individual choices is decreased, and if the household has experienced serious illness or death in the past two years, a time-consistent shift is also less likely. Finally, we find significant experimenter effects and time order effects on the likelihood of in-between and time-consistent joint choices. If the experimenter is female, the respondents are more likely to make a joint decision that is in between the individual decisions and less likely to make a time-consistent shift. If respondents first make five choices between today and one month from today, the likelihood of in-between joint choices decreases and the likelihood of a time-consistent shift increases.

In model (2) in Table 5 we add the dummy variables of patient and impatient shifts. What we find is that there is a consistent pattern between *patient/impatient* and time-*consistent/-inconsistent* shifts. If there is an impatient shift when the choice involves payment today, or a patient shift if the choice only involves future payment, the likelihood of a time-inconsistent shift increases. Conversely, if there is a patient shift when the choice involves payment today and when the choice only involves future payment, or an impatient shift when the choice involves payment today and when the choice only involves future payment, the likelihood of a time-consistent shift increases. Thus, as expected there is a clear link between the two types of shifts. However, it is obviously not the case that patient shifts always result in a higher

probability of a time-consistent shift, since this depends on whether the sooner date is today or not.

In model (3) we add both individual and household characteristics and the dummy variables of impatient and patient shifts. For most of the key variables, the size and significance remain the similar. We will not discuss the detailed results of the third model specification.

Table 5. The determinants of the likelihoods of time-inconsistent and time-consistent shifts

	Time-inconsistent shifts			In between			Time-consistent shifts		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Interest rate (r)	-0.145**	-0.145**	-0.145**	0.418***	0.294***	0.293***	-0.272***	-0.149**	-0.148***
	(0.063)	(0.062)	(0.063)	(0.077)	(0.074)	(0.073)	(0.064)	(0.061)	(0.059)
Patient shifts when the sooner date is today		-0.026	-0.030		-0.181***	-0.182***		0.208***	0.212***
(1=yes)		(0.054)	(0.054)		(0.055)	(0.054)		(0.027)	(0.027)
Patient shifts when the sooner date is two		0.116***	0.119**		-0.185***	-0.188***		0.069*	0.068*
months from today (1=yes)		(0.041)	(0.047)		(0.054)	(0.060)		(0.041)	(0.040)
Impatient shifts when the sooner date is today		0.307***	0.306***		-0.304***	-0.288***		-0.002	-0.018
(1=yes)		(0.033)	(0.032)		(0.056)	(0.052)		(0.054)	(0.038)
Impatient shifts when the sooner date is two		0.022	0.033		-0.102**	-0.117**		0.080**	0.085***
months from today (1=yes)		(0.042)	(0.044)		(0.049)	(0.049)		(0.035)	(0.032)
Husband age (years)	-0.011		-0.003	0.008		0.001	0.002		0.001
	(0.007)		(0.006)	(0.008)		(0.007)	(0.004)		(0.004)
Husband higher than primary school (1=yes)	0.055		-0.000	-0.127***		-0.080**	0.072		0.080**
	(0.043)		(0.036)	(0.046)		(0.041)	(0.039)		(0.036)
Husband communist party member (1=yes)	-0.003		0.004	-0.052		-0.031	0.055		0.027
	(0.050)		(0.043)	(0.064)		(0.049)	(0.046)		(0.035)
Wife age (years)	0.010		0.004	-0.011		-0.005	0.001		0.001
	(0.007)		(0.006)	(0.008)		(0.007)	(0.004)		(0.004)
Wife higher than primary school (1=yes)	-0.111		-0.042	0.071		-0.015	0.040		0.058
	(0.064)		(0.052)	(0.067)		(0.051)	(0.041)		(0.036)
Wife's income contribution (%)	0.005		-0.018	-0.128		-0.019	0.123		0.037
	(0.129)		(0.115)	(0.138)		(0.117)	(0.113)		(0.092)
Household is minority (1=yes)	-0.013		0.106*	-0.085		-0.045	0.098		-0.060
	(0.122)		(0.061)	(0.120)		(0.075)	(0.059)		(0.055)

(continued)

Table 5. The determinants of the likelihoods of time-inconsistent and time-consistent shifts (continued)

	Time-inconsistent shifts			In between			Time-consistent shifts		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Log of equivalence scaled total gross income	-0.029		-0.015	0.037		0.020	-0.008		-0.005
(yuan)	(0.026)		(0.020)	(0.030)		(0.026)	(0.023)		(0.021)
The number of children 16 years old or	0.011		0.016	-0.023		-0.038*	0.013		0.022
younger (persons)	(0.026)		(0.020)	(0.028)		(0.021)	(0.018)		(0.017)
If financial conflict with spouse in the past	0.003		-0.026	0.035		0.046	-0.038		-0.020
two years (1=yes)	(0.051)		(0.043)	(0.053)		(0.042)	(0.038)		(0.033)
If household experienced serious illness or	0.031		0.026	0.047		0.020	-0.077**		-0.045
death in the past two years (1=yes)	(0.044)		(0.034)	(0.048)		(0.040)	(0.033)		(0.031)
If the couple is living with husband's parents	-0.107		-0.070*	0.089		0.090*	0.018		0.020
(1=yes)	(0.061)		(0.040)	(0.063)		(0.046)	(0.032)		(0.029)
Experimenter gender dummy (1=female)	-0.006	-0.005	0.001	0.145**	0.133**	0.148***	-0.139***	-0.128***	-0.149***
	(0.063)	(0.050)	(0.049)	(0.064)	(0.057)	(0.056)	(0.051)	(0.045)	(0.042)
If first separate then joint decision	-0.035	-0.010	0.004	0.008	-0.049*	-0.034	0.027	0.060	0.030
(1=yes)	(0.048)	(0.034)	(0.033)	(0.051)	(0.042)	(0.041)	(0.046)	(0.037)	(0.037)
If first five choices are between today and one	0.080	0.023	0.024	-0.153***	-0.104**	-0.112**	0.073*	0.081**	0.088**
month (1=yes)	(0.058)	(0.046)	(0.046)	(0.058)	(0.051)	(0.052)	(0.044)	(0.039)	(0.040)

Notes: 1.The dependent variable equals one if the joint decision is less time-consistent than the least time-consistent individual decision, equals two if the joint decision is in between the spouses' individual decisions, and equals three when the joint decision is more time- consistent than the most time-consistent individual decision.
2. The results reported in table are average marginal effects based on the multinomial logit model.
3. All the regressions are clustered at household level. Robust standard errors are in parentheses.
4. The dummies of initial control over tokens and village dummies are also included in all regressions.
5. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

5. Conclusions

In this paper we have investigated the occurrence of choice shifts from individual decisions to household joint decisions regarding intertemporal choices. We use data from an artefactual field experiment conducted by Yang and Carlsson (2012), where the Convex Time Budget experimental method was used to elicit both individual and joint time preferences. We find that there are substantial shifts between individual and joint decisions.

At the choice level, 11% of the joint choices are more impatient than the individual choices, while 9% are more patient. Moreover, at the choice-pair level, we find that 17% of joint choice pairs are less time-consistent than the two individual choice pairs, while 12% of the joint choice pairs are more time-consistent. Interestingly, it is not the case that joint decisions tend to generate only beneficial shifts, i.e., patient and time-consistent shifts. On the contrary, a majority of the observed shifts are impatient and time-inconsistent shifts.

Thus, there is no clear pattern in the sense that joint household choices tend to generate beneficial shifts, i.e., patient and time-consistent shifts. Therefore, household joint decisions or marriage cannot often function as a savings commitment device to help individual spouses overcome present-biased preferences (Kono et al., 2011). In addition, our findings provide additional evidence on the efficiency and rationality of group decisions. As discussed in the introduction, there is evidence that group decisions are more in line with the standard game-theoretical predictions of rationality and selfishness than individuals (see Kugler et al., 2012; Charness and Sutter, 2012). What we find in our experiment is that there are almost as many cases where the joint decisions are improved (patient and consistent shifts) as where the joint decisions are worse (impatient and inconsistent shifts) in a joint household decisions setting. This is consistent with for example Hertzberg (2012), who documents that a household could have hyperbolic discounting preferences even if the two spouses are time-consistent if the spouses have misaligned altruistic preferences over each other's outcomes. Clearly, more empirical studies are needed to examine in what types of households these shifts are more likely to occur. Finally, we find a significant and consistent pattern between time-consistent/-inconsistent and patient/impatient shifts. In particular, we find that the time-consistent shift is caused not only by the patient shifts, but also by the impatient shifts both when the sooner date is today and when it is two months from today.

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